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Moreno Valley Thatcher

Riverside-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	66.00	Dwelling Unit	20.20	118,800.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2022
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	427.1	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - MIG Modeler: CPD. SCE GHG intensity factors adjusted downwards based on SCE corporate sustainability reports and U.S. EPA EGRID emission factors.

Land Use - Project gross acreage from tentative tract map.

Grading - estimated material import from project tentatice tract map.

Woodstoves - Woodstoves and fireplaces prohibited per SCAQMD rules.

Energy Use - T24 standards adjusted downwards to reflect increased efficiency between 2016-2019 standards (CEC, 2017).

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblEnergyUse	T24E	951.67	475.84
tblFireplaces	FireplaceWoodMass	1,019.20	0.00
tblFireplaces	NumberNoFireplace	6.60	9.90
tblFireplaces	NumberWood	3.30	0.00
tblGrading	MaterialImported	0.00	14,000.00
tblLandUse	LotAcreage	21.43	20.20
tblLandUse	Population	189.00	0.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.033
tblProjectCharacteristics	CO2IntensityFactor	702.44	427.1
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.004
tblWoodstoves	NumberCatalytic	3.30	0.00
tblWoodstoves	NumberNoncatalytic	3.30	0.00
tblWoodstoves	WoodstoveDayYear	25.00	0.00
tblWoodstoves	WoodstoveWoodMass	999.60	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.3603	3.6058	2.6870	5.4500e-003	0.2949	0.1769	0.4718	0.1268	0.1652	0.2919	0.0000	481.7617	481.7617	0.1075	0.0000	484.4495
2021	0.5621	1.7154	1.6810	2.9600e-003	0.0288	0.0909	0.1197	7.7500e-003	0.0854	0.0931	0.0000	257.9457	257.9457	0.0566	0.0000	259.3604
Maximum	**0.5621**	**3.6058**	**2.6870**	**5.4500e-003**	**0.2949**	**0.1769**	**0.4718**	**0.1268**	**0.1652**	**0.2919**	**0.0000**	**481.7617**	**481.7617**	**0.1075**	**0.0000**	**484.4495**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2020	0.3603	3.6058	2.6870	5.4500e-003	0.1467	0.1769	0.3236	0.0580	0.1652	0.2232	0.0000	481.7613	481.7613	0.1075	0.0000	484.4490
2021	0.5621	1.7154	1.6810	2.9600e-003	0.0288	0.0909	0.1197	7.7500e-003	0.0854	0.0931	0.0000	257.9454	257.9454	0.0566	0.0000	259.3602
Maximum	**0.5621**	**3.6058**	**2.6870**	**5.4500e-003**	**0.1467**	**0.1769**	**0.3236**	**0.0580**	**0.1652**	**0.2232**	**0.0000**	**481.7613**	**481.7613**	**0.1075**	**0.0000**	**484.4490**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**45.79**	**0.00**	**25.06**	**51.13**	**0.00**	**17.86**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	1-1-2020	3-31-2020	1.7724	1.7724
2	4-1-2020	6-30-2020	0.7228	0.7228
3	7-1-2020	9-30-2020	0.7307	0.7307
4	10-1-2020	12-31-2020	0.7307	0.7307
5	1-1-2021	3-31-2021	0.6484	0.6484
6	4-1-2021	6-30-2021	0.6557	0.6557
7	7-1-2021	9-30-2021	0.6174	0.6174
		Highest	1.7724	1.7724

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.4884	0.0195	0.6863	1.1000e-004		4.7100e-003	4.7100e-003		4.7100e-003	4.7100e-003	0.0000	14.5835	14.5835	1.3300e-003	2.5000e-004	14.6904
Energy	0.0109	0.0931	0.0396	5.9000e-004		7.5200e-003	7.5200e-003		7.5200e-003	7.5200e-003	0.0000	213.1260	213.1260	0.0102	2.9600e-003	214.2640
Mobile	0.1810	1.5606	2.2668	0.0105	0.8135	7.2300e-003	0.8207	0.2179	6.7800e-003	0.2247	0.0000	970.2578	970.2578	0.0478	0.0000	971.4524
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	1.3642	16.6823	18.0465	0.1414	3.4600e-003	22.6143
Total	**0.6803**	**1.6731**	**2.9927**	**0.0112**	**0.8135**	**0.0195**	**0.8329**	**0.2179**	**0.0190**	**0.2369**	**1.3642**	**1,214.6497**	**1,216.0139**	**0.2007**	**6.6700e-003**	**1,223.0211**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.4884	0.0195	0.6863	1.1000e-004		4.7100e-003	4.7100e-003		4.7100e-003	4.7100e-003	0.0000	14.5835	14.5835	1.3300e-003	2.5000e-004	14.6904
Energy	0.0109	0.0931	0.0396	5.9000e-004		7.5200e-003	7.5200e-003		7.5200e-003	7.5200e-003	0.0000	213.1260	213.1260	0.0102	2.9600e-003	214.2640
Mobile	0.1810	1.5606	2.2668	0.0105	0.8135	7.2300e-003	0.8207	0.2179	6.7800e-003	0.2247	0.0000	970.2578	970.2578	0.0478	0.0000	971.4524
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	1.3642	16.6823	18.0465	0.1414	3.4600e-003	22.6143
Total	**0.6803**	**1.6731**	**2.9927**	**0.0112**	**0.8135**	**0.0195**	**0.8329**	**0.2179**	**0.0190**	**0.2369**	**1.3642**	**1,214.6497**	**1,216.0139**	**0.2007**	**6.6700e-003**	**1,223.0211**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Moreno Valley Thatcher - Riverside-South Coast County, Annual

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2020	1/28/2020	5	20	
2	Site Preparation	Site Preparation	1/29/2020	2/11/2020	5	10	
3	Grading	Grading	2/12/2020	3/31/2020	5	35	
4	Building Construction	Building Construction	4/1/2020	8/31/2021	5	370	
5	Paving	Paving	9/1/2021	9/28/2021	5	20	
6	Architectural Coating	Architectural Coating	9/29/2021	10/26/2021	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 87.5

Acres of Paving: 0

Residential Indoor: 240,570; Residential Outdoor: 80,190; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Demolition	Excavators	3	8.00	158	0.38
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Excavators	2	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	1,750.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	24.00	7.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0331	0.3320	0.2175	3.9000e-004		0.0166	0.0166		0.0154	0.0154	0.0000	33.9986	33.9986	9.6000e-003	0.0000	34.2386
Total	**0.0331**	**0.3320**	**0.2175**	**3.9000e-004**		**0.0166**	**0.0166**		**0.0154**	**0.0154**	**0.0000**	**33.9986**	**33.9986**	**9.6000e-003**	**0.0000**	**34.2386**

3.2 Demolition - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.9000e-004	4.8000e-004	5.1600e-003	2.0000e-005	1.6500e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.3794	1.3794	3.0000e-005	0.0000	1.3803
Total	**6.9000e-004**	**4.8000e-004**	**5.1600e-003**	**2.0000e-005**	**1.6500e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.3794**	**1.3794**	**3.0000e-005**	**0.0000**	**1.3803**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0331	0.3320	0.2175	3.9000e-004		0.0166	0.0166		0.0154	0.0154	0.0000	33.9986	33.9986	9.6000e-003	0.0000	34.2385
Total	**0.0331**	**0.3320**	**0.2175**	**3.9000e-004**		**0.0166**	**0.0166**		**0.0154**	**0.0154**	**0.0000**	**33.9986**	**33.9986**	**9.6000e-003**	**0.0000**	**34.2385**

3.2 Demolition - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.9000e-004	4.8000e-004	5.1600e-003	2.0000e-005	1.6500e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.3794	1.3794	3.0000e-005	0.0000	1.3803
Total	**6.9000e-004**	**4.8000e-004**	**5.1600e-003**	**2.0000e-005**	**1.6500e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.3794**	**1.3794**	**3.0000e-005**	**0.0000**	**1.3803**

3.3 Site Preparation - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0903	0.0000	0.0903	0.0497	0.0000	0.0497	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0204	0.2121	0.1076	1.9000e-004		0.0110	0.0110		0.0101	0.0101	0.0000	16.7153	16.7153	5.4100e-003	0.0000	16.8505
Total	**0.0204**	**0.2121**	**0.1076**	**1.9000e-004**	**0.0903**	**0.0110**	**0.1013**	**0.0497**	**0.0101**	**0.0598**	**0.0000**	**16.7153**	**16.7153**	**5.4100e-003**	**0.0000**	**16.8505**

3.3 Site Preparation - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.1000e-004	2.9000e-004	3.0900e-003	1.0000e-005	9.9000e-004	1.0000e-005	1.0000e-003	2.6000e-004	1.0000e-005	2.7000e-004	0.0000	0.8276	0.8276	2.0000e-005	0.0000	0.8282
Total	**4.1000e-004**	**2.9000e-004**	**3.0900e-003**	**1.0000e-005**	**9.9000e-004**	**1.0000e-005**	**1.0000e-003**	**2.6000e-004**	**1.0000e-005**	**2.7000e-004**	**0.0000**	**0.8276**	**0.8276**	**2.0000e-005**	**0.0000**	**0.8282**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0352	0.0000	0.0352	0.0194	0.0000	0.0194	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0204	0.2121	0.1076	1.9000e-004		0.0110	0.0110		0.0101	0.0101	0.0000	16.7153	16.7153	5.4100e-003	0.0000	16.8505
Total	**0.0204**	**0.2121**	**0.1076**	**1.9000e-004**	**0.0352**	**0.0110**	**0.0462**	**0.0194**	**0.0101**	**0.0295**	**0.0000**	**16.7153**	**16.7153**	**5.4100e-003**	**0.0000**	**16.8505**

3.3 Site Preparation - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.1000e-004	2.9000e-004	3.0900e-003	1.0000e-005	9.9000e-004	1.0000e-005	1.0000e-003	2.6000e-004	1.0000e-005	2.7000e-004	0.0000	0.8276	0.8276	2.0000e-005	0.0000	0.8282
Total	**4.1000e-004**	**2.9000e-004**	**3.0900e-003**	**1.0000e-005**	**9.9000e-004**	**1.0000e-005**	**1.0000e-003**	**2.6000e-004**	**1.0000e-005**	**2.7000e-004**	**0.0000**	**0.8276**	**0.8276**	**2.0000e-005**	**0.0000**	**0.8282**

3.4 Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.1527	0.0000	0.1527	0.0631	0.0000	0.0631	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0779	0.8785	0.5593	1.0900e-003		0.0380	0.0380		0.0350	0.0350	0.0000	95.3475	95.3475	0.0308	0.0000	96.1185
Total	**0.0779**	**0.8785**	**0.5593**	**1.0900e-003**	**0.1527**	**0.0380**	**0.1907**	**0.0631**	**0.0350**	**0.0981**	**0.0000**	**95.3475**	**95.3475**	**0.0308**	**0.0000**	**96.1185**

3.4 Grading - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.6000e-003	0.2122	0.0275	6.6000e-004	0.0151	6.6000e-004	0.0158	4.1400e-003	6.4000e-004	4.7800e-003	0.0000	63.4457	63.4457	3.9800e-003	0.0000	63.5451
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6100e-003	1.1300e-003	0.0120	4.0000e-005	3.8500e-003	2.0000e-005	3.8700e-003	1.0200e-003	2.0000e-005	1.0400e-003	0.0000	3.2186	3.2186	8.0000e-005	0.0000	3.2206
Total	**6.2100e-003**	**0.2133**	**0.0395**	**7.0000e-004**	**0.0189**	**6.8000e-004**	**0.0196**	**5.1600e-003**	**6.6000e-004**	**5.8200e-003**	**0.0000**	**66.6643**	**66.6643**	**4.0600e-003**	**0.0000**	**66.7657**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0595	0.0000	0.0595	0.0246	0.0000	0.0246	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0779	0.8785	0.5593	1.0900e-003		0.0380	0.0380		0.0350	0.0350	0.0000	95.3474	95.3474	0.0308	0.0000	96.1183
Total	**0.0779**	**0.8785**	**0.5593**	**1.0900e-003**	**0.0595**	**0.0380**	**0.0976**	**0.0246**	**0.0350**	**0.0596**	**0.0000**	**95.3474**	**95.3474**	**0.0308**	**0.0000**	**96.1183**

3.4 Grading - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.6000e-003	0.2122	0.0275	6.6000e-004	0.0151	6.6000e-004	0.0158	4.1400e-003	6.4000e-004	4.7800e-003	0.0000	63.4457	63.4457	3.9800e-003	0.0000	63.5451
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.6100e-003	1.1300e-003	0.0120	4.0000e-005	3.8500e-003	2.0000e-005	3.8700e-003	1.0200e-003	2.0000e-005	1.0400e-003	0.0000	3.2186	3.2186	8.0000e-005	0.0000	3.2206
Total	**6.2100e-003**	**0.2133**	**0.0395**	**7.0000e-004**	**0.0189**	**6.8000e-004**	**0.0196**	**5.1600e-003**	**6.6000e-004**	**5.8200e-003**	**0.0000**	**66.6643**	**66.6643**	**4.0600e-003**	**0.0000**	**66.7657**

3.5 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2088	1.8898	1.6596	2.6500e-003		0.1100	0.1100		0.1035	0.1035	0.0000	228.1358	228.1358	0.0557	0.0000	229.5273
Total	**0.2088**	**1.8898**	**1.6596**	**2.6500e-003**		**0.1100**	**0.1100**		**0.1035**	**0.1035**	**0.0000**	**228.1358**	**228.1358**	**0.0557**	**0.0000**	**229.5273**

3.5 Building Construction - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.9600e-003	0.0717	0.0140	1.8000e-004	4.3500e-003	4.1000e-004	4.7600e-003	1.2600e-003	3.9000e-004	1.6400e-003	0.0000	16.9540	16.9540	1.3600e-003	0.0000	16.9878
Worker	0.0109	7.6100e-003	0.0813	2.4000e-004	0.0260	1.6000e-004	0.0261	6.9000e-003	1.5000e-004	7.0500e-003	0.0000	21.7392	21.7392	5.4000e-004	0.0000	21.7528
Total	**0.0128**	**0.0793**	**0.0953**	**4.2000e-004**	**0.0303**	**5.7000e-004**	**0.0309**	**8.1600e-003**	**5.4000e-004**	**8.6900e-003**	**0.0000**	**38.6931**	**38.6931**	**1.9000e-003**	**0.0000**	**38.7406**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2088	1.8898	1.6596	2.6500e-003		0.1100	0.1100		0.1035	0.1035	0.0000	228.1356	228.1356	0.0557	0.0000	229.5270
Total	**0.2088**	**1.8898**	**1.6596**	**2.6500e-003**		**0.1100**	**0.1100**		**0.1035**	**0.1035**	**0.0000**	**228.1356**	**228.1356**	**0.0557**	**0.0000**	**229.5270**

3.5 Building Construction - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.9600e-003	0.0717	0.0140	1.8000e-004	4.3500e-003	4.1000e-004	4.7600e-003	1.2600e-003	3.9000e-004	1.6400e-003	0.0000	16.9540	16.9540	1.3600e-003	0.0000	16.9878
Worker	0.0109	7.6100e-003	0.0813	2.4000e-004	0.0260	1.6000e-004	0.0261	6.9000e-003	1.5000e-004	7.0500e-003	0.0000	21.7392	21.7392	5.4000e-004	0.0000	21.7528
Total	**0.0128**	**0.0793**	**0.0953**	**4.2000e-004**	**0.0303**	**5.7000e-004**	**0.0309**	**8.1600e-003**	**5.4000e-004**	**8.6900e-003**	**0.0000**	**38.6931**	**38.6931**	**1.9000e-003**	**0.0000**	**38.7406**

3.5 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1644	1.5079	1.4338	2.3300e-003		0.0829	0.0829		0.0780	0.0780	0.0000	200.3662	200.3662	0.0483	0.0000	201.5747
Total	**0.1644**	**1.5079**	**1.4338**	**2.3300e-003**		**0.0829**	**0.0829**		**0.0780**	**0.0780**	**0.0000**	**200.3662**	**200.3662**	**0.0483**	**0.0000**	**201.5747**

3.5 Building Construction - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.4400e-003	0.0565	0.0109	1.5000e-004	3.8200e-003	1.1000e-004	3.9300e-003	1.1000e-003	1.0000e-004	1.2100e-003	0.0000	14.7726	14.7726	1.1300e-003	0.0000	14.8008
Worker	8.9000e-003	6.0000e-003	0.0654	2.0000e-004	0.0228	1.4000e-004	0.0230	6.0600e-003	1.3000e-004	6.1800e-003	0.0000	18.4525	18.4525	4.3000e-004	0.0000	18.4632
Total	**0.0103**	**0.0625**	**0.0762**	**3.5000e-004**	**0.0266**	**2.5000e-004**	**0.0269**	**7.1600e-003**	**2.3000e-004**	**7.3900e-003**	**0.0000**	**33.2250**	**33.2250**	**1.5600e-003**	**0.0000**	**33.2640**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1644	1.5079	1.4338	2.3300e-003		0.0829	0.0829		0.0780	0.0780	0.0000	200.3660	200.3660	0.0483	0.0000	201.5745
Total	**0.1644**	**1.5079**	**1.4338**	**2.3300e-003**		**0.0829**	**0.0829**		**0.0780**	**0.0780**	**0.0000**	**200.3660**	**200.3660**	**0.0483**	**0.0000**	**201.5745**

3.5 Building Construction - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	1.4400e-003	0.0565	0.0109	1.5000e-004	3.8200e-003	1.1000e-004	3.9300e-003	1.1000e-003	1.0000e-004	1.2100e-003	0.0000	14.7726	14.7726	1.1300e-003	0.0000	14.8008
Worker	8.9000e-003	6.0000e-003	0.0654	2.0000e-004	0.0228	1.4000e-004	0.0230	6.0600e-003	1.3000e-004	6.1800e-003	0.0000	18.4525	18.4525	4.3000e-004	0.0000	18.4632
Total	**0.0103**	**0.0625**	**0.0762**	**3.5000e-004**	**0.0266**	**2.5000e-004**	**0.0269**	**7.1600e-003**	**2.3000e-004**	**7.3900e-003**	**0.0000**	**33.2250**	**33.2250**	**1.5600e-003**	**0.0000**	**33.2640**

3.6 Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0126	0.1292	0.1465	2.3000e-004		6.7800e-003	6.7800e-003		6.2400e-003	6.2400e-003	0.0000	20.0235	20.0235	6.4800e-003	0.0000	20.1854
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0126**	**0.1292**	**0.1465**	**2.3000e-004**		**6.7800e-003**	**6.7800e-003**		**6.2400e-003**	**6.2400e-003**	**0.0000**	**20.0235**	**20.0235**	**6.4800e-003**	**0.0000**	**20.1854**

3.6 Paving - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.4000e-004	4.3000e-004	4.7200e-003	1.0000e-005	1.6500e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.3333	1.3333	3.0000e-005	0.0000	1.3341
Total	**6.4000e-004**	**4.3000e-004**	**4.7200e-003**	**1.0000e-005**	**1.6500e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.3333**	**1.3333**	**3.0000e-005**	**0.0000**	**1.3341**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0126	0.1292	0.1465	2.3000e-004		6.7800e-003	6.7800e-003		6.2400e-003	6.2400e-003	0.0000	20.0235	20.0235	6.4800e-003	0.0000	20.1854
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0126**	**0.1292**	**0.1465**	**2.3000e-004**		**6.7800e-003**	**6.7800e-003**		**6.2400e-003**	**6.2400e-003**	**0.0000**	**20.0235**	**20.0235**	**6.4800e-003**	**0.0000**	**20.1854**

3.6 Paving - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	6.4000e-004	4.3000e-004	4.7200e-003	1.0000e-005	1.6500e-003	1.0000e-005	1.6600e-003	4.4000e-004	1.0000e-005	4.5000e-004	0.0000	1.3333	1.3333	3.0000e-005	0.0000	1.3341
Total	**6.4000e-004**	**4.3000e-004**	**4.7200e-003**	**1.0000e-005**	**1.6500e-003**	**1.0000e-005**	**1.6600e-003**	**4.4000e-004**	**1.0000e-005**	**4.5000e-004**	**0.0000**	**1.3333**	**1.3333**	**3.0000e-005**	**0.0000**	**1.3341**

3.7 Architectural Coating - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3717					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.1900e-003	0.0153	0.0182	3.0000e-005		9.4000e-004	9.4000e-004		9.4000e-004	9.4000e-004	0.0000	2.5533	2.5533	1.8000e-004	0.0000	2.5576
Total	**0.3739**	**0.0153**	**0.0182**	**3.0000e-005**		**9.4000e-004**	**9.4000e-004**		**9.4000e-004**	**9.4000e-004**	**0.0000**	**2.5533**	**2.5533**	**1.8000e-004**	**0.0000**	**2.5576**

3.7 Architectural Coating - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.1000e-004	1.4000e-004	1.5700e-003	0.0000	5.5000e-004	0.0000	5.5000e-004	1.5000e-004	0.0000	1.5000e-004	0.0000	0.4444	0.4444	1.0000e-005	0.0000	0.4447
Total	**2.1000e-004**	**1.4000e-004**	**1.5700e-003**	**0.0000**	**5.5000e-004**	**0.0000**	**5.5000e-004**	**1.5000e-004**	**0.0000**	**1.5000e-004**	**0.0000**	**0.4444**	**0.4444**	**1.0000e-005**	**0.0000**	**0.4447**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3717					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.1900e-003	0.0153	0.0182	3.0000e-005		9.4000e-004	9.4000e-004		9.4000e-004	9.4000e-004	0.0000	2.5533	2.5533	1.8000e-004	0.0000	2.5576
Total	**0.3739**	**0.0153**	**0.0182**	**3.0000e-005**		**9.4000e-004**	**9.4000e-004**		**9.4000e-004**	**9.4000e-004**	**0.0000**	**2.5533**	**2.5533**	**1.8000e-004**	**0.0000**	**2.5576**

3.7 Architectural Coating - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	2.1000e-004	1.4000e-004	1.5700e-003	0.0000	5.5000e-004	0.0000	5.5000e-004	1.5000e-004	0.0000	1.5000e-004	0.0000	0.4444	0.4444	1.0000e-005	0.0000	0.4447
Total	**2.1000e-004**	**1.4000e-004**	**1.5700e-003**	**0.0000**	**5.5000e-004**	**0.0000**	**5.5000e-004**	**1.5000e-004**	**0.0000**	**1.5000e-004**	**0.0000**	**0.4444**	**0.4444**	**1.0000e-005**	**0.0000**	**0.4447**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.1810	1.5606	2.2668	0.0105	0.8135	7.2300e-003	0.8207	0.2179	6.7800e-003	0.2247	0.0000	970.2578	970.2578	0.0478	0.0000	971.4524
Unmitigated	0.1810	1.5606	2.2668	0.0105	0.8135	7.2300e-003	0.8207	0.2179	6.7800e-003	0.2247	0.0000	970.2578	970.2578	0.0478	0.0000	971.4524

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	628.32	654.06	568.92	2,130,633	2,130,633
Total	628.32	654.06	568.92	2,130,633	2,130,633

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Single Family Housing	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Single Family Housing	0.545527	0.036856	0.186032	0.115338	0.015222	0.004970	0.017525	0.069528	0.001397	0.001160	0.004547	0.000932	0.000965

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	105.3661	105.3661	8.1400e-003	9.9000e-004	105.8637
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	105.3661	105.3661	8.1400e-003	9.9000e-004	105.8637
NaturalGas Mitigated	0.0109	0.0931	0.0396	5.9000e-004		7.5200e-003	7.5200e-003		7.5200e-003	7.5200e-003	0.0000	107.7600	107.7600	2.0700e-003	1.9800e-003	108.4004
NaturalGas Unmitigated	0.0109	0.0931	0.0396	5.9000e-004		7.5200e-003	7.5200e-003		7.5200e-003	7.5200e-003	0.0000	107.7600	107.7600	2.0700e-003	1.9800e-003	108.4004

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Single Family Housing	2.01935e +006	0.0109	0.0931	0.0396	5.9000e-004		7.5200e-003	7.5200e-003		7.5200e-003	7.5200e-003	0.0000	107.7600	107.7600	2.0700e-003	1.9800e-003	108.4004
Total		**0.0109**	**0.0931**	**0.0396**	**5.9000e-004**		**7.5200e-003**	**7.5200e-003**		**7.5200e-003**	**7.5200e-003**	**0.0000**	**107.7600**	**107.7600**	**2.0700e-003**	**1.9800e-003**	**108.4004**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Single Family Housing	2.01935e+006	0.0109	0.0931	0.0396	5.9000e-004		7.5200e-003	7.5200e-003		7.5200e-003	7.5200e-003	0.0000	107.7600	107.7600	2.0700e-003	1.9800e-003	108.4004
Total		**0.0109**	**0.0931**	**0.0396**	**5.9000e-004**		**7.5200e-003**	**7.5200e-003**		**7.5200e-003**	**7.5200e-003**	**0.0000**	**107.7600**	**107.7600**	**2.0700e-003**	**1.9800e-003**	**108.4004**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Single Family Housing	543883	105.3661	8.1400e-003	9.9000e-004	105.8637
Total		**105.3661**	**8.1400e-003**	**9.9000e-004**	**105.8637**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Single Family Housing	543883	105.3661	8.1400e-003	9.9000e-004	105.8637
Total		**105.3661**	**8.1400e-003**	**9.9000e-004**	**105.8637**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.4884	0.0195	0.6863	1.1000e-004		4.7100e-003	4.7100e-003		4.7100e-003	4.7100e-003	0.0000	14.5835	14.5835	1.3300e-003	2.5000e-004	14.6904
Unmitigated	0.4884	0.0195	0.6863	1.1000e-004		4.7100e-003	4.7100e-003		4.7100e-003	4.7100e-003	0.0000	14.5835	14.5835	1.3300e-003	2.5000e-004	14.6904

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0372					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.4293					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	1.3600e-003	0.0116	4.9500e-003	7.0000e-005		9.4000e-004	9.4000e-004		9.4000e-004	9.4000e-004	0.0000	13.4717	13.4717	2.6000e-004	2.5000e-004	13.5518
Landscaping	0.0206	7.8600e-003	0.6814	4.0000e-005		3.7600e-003	3.7600e-003		3.7600e-003	3.7600e-003	0.0000	1.1118	1.1118	1.0700e-003	0.0000	1.1386
Total	**0.4884**	**0.0195**	**0.6863**	**1.1000e-004**		**4.7000e-003**	**4.7000e-003**		**4.7000e-003**	**4.7000e-003**	**0.0000**	**14.5835**	**14.5835**	**1.3300e-003**	**2.5000e-004**	**14.6904**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0372					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.4293					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	1.3600e-003	0.0116	4.9500e-003	7.0000e-005		9.4000e-004	9.4000e-004		9.4000e-004	9.4000e-004	0.0000	13.4717	13.4717	2.6000e-004	2.5000e-004	13.5518
Landscaping	0.0206	7.8600e-003	0.6814	4.0000e-005		3.7600e-003	3.7600e-003		3.7600e-003	3.7600e-003	0.0000	1.1118	1.1118	1.0700e-003	0.0000	1.1386
Total	**0.4884**	**0.0195**	**0.6863**	**1.1000e-004**		**4.7000e-003**	**4.7000e-003**		**4.7000e-003**	**4.7000e-003**	**0.0000**	**14.5835**	**14.5835**	**1.3300e-003**	**2.5000e-004**	**14.6904**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	18.0465	0.1414	3.4600e-003	22.6143
Unmitigated	18.0465	0.1414	3.4600e-003	22.6143

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Single Family Housing	4.30017 / 2.71097	18.0465	0.1414	3.4600e-003	22.6143
Total		**18.0465**	**0.1414**	**3.4600e-003**	**22.6143**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Single Family Housing	4.30017 / 2.71097	18.0465	0.1414	3.4600e-003	22.6143
Total		**18.0465**	**0.1414**	**3.4600e-003**	**22.6143**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Single Family Housing	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Moreno Valley Thatcher
Riverside-South Coast County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	66.00	Dwelling Unit	20.20	118,800.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2022
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	427.1	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - MIG Modeler: CPD. SCE GHG intensity factors adjusted downwards based on SCE corporate sustainability reports and U.S. EPA EGRID emission factors.

Land Use - Project gross acreage from tentative tract map.

Grading - estimated material import from project tentatice tract map.

Woodstoves - Woodstoves and fireplaces prohibited per SCAQMD rules.

Energy Use - T24 standards adjusted downwards to reflect increased efficiency between 2016-2019 standards (CEC, 2017).

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblEnergyUse	T24E	951.67	475.84
tblFireplaces	FireplaceWoodMass	1,019.20	0.00
tblFireplaces	NumberNoFireplace	6.60	9.90
tblFireplaces	NumberWood	3.30	0.00
tblGrading	MaterialImported	0.00	14,000.00
tblLandUse	LotAcreage	21.43	20.20
tblLandUse	Population	189.00	0.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.033
tblProjectCharacteristics	CO2IntensityFactor	702.44	427.1
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.004
tblWoodstoves	NumberCatalytic	3.30	0.00
tblWoodstoves	NumberNoncatalytic	3.30	0.00
tblWoodstoves	WoodstoveDayYear	25.00	0.00
tblWoodstoves	WoodstoveWoodMass	999.60	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2020	4.8090	62.0970	34.2255	0.1023	18.2675	2.2130	20.4661	9.9840	2.0373	12.0068	0.0000	10,265.0205	10,265.0205	2.1888	0.0000	10,319.7394
2021	37.4107	18.1447	17.5781	0.0313	0.3131	0.9614	1.2745	0.0841	0.9039	0.9880	0.0000	3,000.1798	3,000.1798	0.7177	0.0000	3,016.0746
Maximum	**37.4107**	**62.0970**	**34.2255**	**0.1023**	**18.2675**	**2.2130**	**20.4661**	**9.9840**	**2.0373**	**12.0068**	**0.0000**	**10,265.0205**	**10,265.0205**	**2.1888**	**0.0000**	**10,319.7394**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2020	4.8090	62.0970	34.2255	0.1023	7.2470	2.2130	9.4457	3.9263	2.0373	5.9491	0.0000	10,265.0205	10,265.0205	2.1888	0.0000	10,319.7394
2021	37.4107	18.1447	17.5781	0.0313	0.3131	0.9614	1.2745	0.0841	0.9039	0.9880	0.0000	3,000.1798	3,000.1798	0.7177	0.0000	3,016.0746
Maximum	**37.4107**	**62.0970**	**34.2255**	**0.1023**	**7.2470**	**2.2130**	**9.4457**	**3.9263**	**2.0373**	**5.9491**	**0.0000**	**10,265.0205**	**10,265.0205**	**2.1888**	**0.0000**	**10,319.7394**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**59.31**	**0.00**	**50.69**	**60.17**	**0.00**	**46.62**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.8294	0.9935	5.8470	6.2300e-003		0.1054	0.1054		0.1054	0.1054	0.0000	1,197.8045	1,197.8045	0.0322	0.0218	1,205.1006
Energy	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
Mobile	1.2271	8.8418	14.6739	0.0639	4.7664	0.0416	4.8079	1.2752	0.0390	1.3142		6,524.2245	6,524.2245	0.3028		6,531.7943
Total	**4.1162**	**10.3451**	**20.7378**	**0.0734**	**4.7664**	**0.1882**	**4.9545**	**1.2752**	**0.1855**	**1.4607**	**0.0000**	**8,372.9059**	**8,372.9059**	**0.3475**	**0.0337**	**8,391.6398**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.8294	0.9935	5.8470	6.2300e-003		0.1054	0.1054		0.1054	0.1054	0.0000	1,197.8045	1,197.8045	0.0322	0.0218	1,205.1006
Energy	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
Mobile	1.2271	8.8418	14.6739	0.0639	4.7664	0.0416	4.8079	1.2752	0.0390	1.3142		6,524.2245	6,524.2245	0.3028		6,531.7943
Total	**4.1162**	**10.3451**	**20.7378**	**0.0734**	**4.7664**	**0.1882**	**4.9545**	**1.2752**	**0.1855**	**1.4607**	**0.0000**	**8,372.9059**	**8,372.9059**	**0.3475**	**0.0337**	**8,391.6398**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2020	1/28/2020	5	20	
2	Site Preparation	Site Preparation	1/29/2020	2/11/2020	5	10	
3	Grading	Grading	2/12/2020	3/31/2020	5	35	
4	Building Construction	Building Construction	4/1/2020	8/31/2021	5	370	
5	Paving	Paving	9/1/2021	9/28/2021	5	20	
6	Architectural Coating	Architectural Coating	9/29/2021	10/26/2021	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 87.5

Acres of Paving: 0

Residential Indoor: 240,570; Residential Outdoor: 80,190; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Demolition	Excavators	3	8.00	158	0.38
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Excavators	2	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Building Construction	Welders	1	8.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	1,750.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	24.00	7.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category						lb/day								lb/day		
Off-Road	3.3121	33.2010	21.7532	0.0388		1.6587	1.6587		1.5419	1.5419		3,747.704 9	3,747.704 9	1.0580		3,774.153 6
Total	**3.3121**	**33.2010**	**21.7532**	**0.0388**		**1.6587**	**1.6587**		**1.5419**	**1.5419**		**3,747.704 9**	**3,747.704 9**	**1.0580**		**3,774.153 6**

3.2 Demolition - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0763	0.0451	0.6048	1.6600e-003	0.1677	1.0200e-003	0.1687	0.0445	9.3000e-004	0.0454		165.2392	165.2392	4.2400e-003		165.3451
Total	**0.0763**	**0.0451**	**0.6048**	**1.6600e-003**	**0.1677**	**1.0200e-003**	**0.1687**	**0.0445**	**9.3000e-004**	**0.0454**		**165.2392**	**165.2392**	**4.2400e-003**		**165.3451**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.3121	33.2010	21.7532	0.0388		1.6587	1.6587		1.5419	1.5419	0.0000	3,747.7049	3,747.7049	1.0580		3,774.1536
Total	**3.3121**	**33.2010**	**21.7532**	**0.0388**		**1.6587**	**1.6587**		**1.5419**	**1.5419**	**0.0000**	**3,747.7049**	**3,747.7049**	**1.0580**		**3,774.1536**

3.2 Demolition - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0763	0.0451	0.6048	1.6600e-003	0.1677	1.0200e-003	0.1687	0.0445	9.3000e-004	0.0454		165.2392	165.2392	4.2400e-003		165.3451
Total	**0.0763**	**0.0451**	**0.6048**	**1.6600e-003**	**0.1677**	**1.0200e-003**	**0.1687**	**0.0445**	**9.3000e-004**	**0.0454**		**165.2392**	**165.2392**	**4.2400e-003**		**165.3451**

3.3 Site Preparation - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	4.0765	42.4173	21.5136	0.0380		2.1974	2.1974		2.0216	2.0216		3,685.1016	3,685.1016	1.1918		3,714.8975
Total	**4.0765**	**42.4173**	**21.5136**	**0.0380**	**18.0663**	**2.1974**	**20.2637**	**9.9307**	**2.0216**	**11.9523**		**3,685.1016**	**3,685.1016**	**1.1918**		**3,714.8975**

3.3 Site Preparation - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0916	0.0542	0.7258	1.9900e-003	0.2012	1.2200e-003	0.2024	0.0534	1.1200e-003	0.0545		198.2870	198.2870	5.0800e-003		198.4141
Total	**0.0916**	**0.0542**	**0.7258**	**1.9900e-003**	**0.2012**	**1.2200e-003**	**0.2024**	**0.0534**	**1.1200e-003**	**0.0545**		**198.2870**	**198.2870**	**5.0800e-003**		**198.4141**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.0458	0.0000	7.0458	3.8730	0.0000	3.8730			0.0000			0.0000
Off-Road	4.0765	42.4173	21.5136	0.0380		2.1974	2.1974		2.0216	2.0216	0.0000	3,685.1016	3,685.1016	1.1918		3,714.8975
Total	**4.0765**	**42.4173**	**21.5136**	**0.0380**	**7.0458**	**2.1974**	**9.2433**	**3.8730**	**2.0216**	**5.8946**	**0.0000**	**3,685.1016**	**3,685.1016**	**1.1918**		**3,714.8975**

3.3 Site Preparation - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0916	0.0542	0.7258	1.9900e-003	0.2012	1.2200e-003	0.2024	0.0534	1.1200e-003	0.0545		198.2870	198.2870	5.0800e-003		198.4141
Total	**0.0916**	**0.0542**	**0.7258**	**1.9900e-003**	**0.2012**	**1.2200e-003**	**0.2024**	**0.0534**	**1.1200e-003**	**0.0545**		**198.2870**	**198.2870**	**5.0800e-003**		**198.4141**

3.4 Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					8.7240	0.0000	8.7240	3.6042	0.0000	3.6042			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000		6,005.865 3	6,005.865 3	1.9424		6,054.425 7
Total	**4.4501**	**50.1975**	**31.9583**	**0.0620**	**8.7240**	**2.1739**	**10.8979**	**3.6042**	**2.0000**	**5.6042**		**6,005.865 3**	**6,005.865 3**	**1.9424**		**6,054.425 7**

3.4 Grading - 2020

Unmitigated Construction Off-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Hauling	0.2572	11.8393	1.4608	0.0381	0.8747	0.0377	0.9124	0.2398	0.0361	0.2759		4,038.8363	4,038.8363	0.2407		4,044.8536
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1018	0.0602	0.8064	2.2100e-003	0.2236	1.3500e-003	0.2249	0.0593	1.2500e-003	0.0605		220.3189	220.3189	5.6500e-003		220.4601
Total	**0.3589**	**11.8995**	**2.2672**	**0.0403**	**1.0982**	**0.0391**	**1.1373**	**0.2991**	**0.0373**	**0.3364**		**4,259.1553**	**4,259.1553**	**0.2463**		**4,265.3136**

Mitigated Construction On-Site

Category	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
	lb/day										lb/day					
Fugitive Dust					3.4024	0.0000	3.4024	1.4056	0.0000	1.4056			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000	0.0000	6,005.8653	6,005.8653	1.9424		6,054.4257
Total	**4.4501**	**50.1975**	**31.9583**	**0.0620**	**3.4024**	**2.1739**	**5.5763**	**1.4056**	**2.0000**	**3.4056**	**0.0000**	**6,005.8653**	**6,005.8653**	**1.9424**		**6,054.4257**

3.4 Grading - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2572	11.8393	1.4608	0.0381	0.8747	0.0377	0.9124	0.2398	0.0361	0.2759		4,038.8363	4,038.8363	0.2407		4,044.8536
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.1018	0.0602	0.8064	2.2100e-003	0.2236	1.3500e-003	0.2249	0.0593	1.2500e-003	0.0605		220.3189	220.3189	5.6500e-003		220.4601
Total	**0.3589**	**11.8995**	**2.2672**	**0.0403**	**1.0982**	**0.0391**	**1.1373**	**0.2991**	**0.0373**	**0.3364**		**4,259.1553**	**4,259.1553**	**0.2463**		**4,265.3136**

3.5 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1198	19.1860	16.8485	0.0269		1.1171	1.1171		1.0503	1.0503		2,553.0631	2,553.0631	0.6229		2,568.6345
Total	**2.1198**	**19.1860**	**16.8485**	**0.0269**		**1.1171**	**1.1171**		**1.0503**	**1.0503**		**2,553.0631**	**2,553.0631**	**0.6229**		**2,568.6345**

3.5 Building Construction - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0195	0.7202	0.1318	1.8300e-003	0.0448	4.1000e-003	0.0489	0.0129	3.9200e-003	0.0168		192.7737	192.7737	0.0145		193.1351
Worker	0.1221	0.0722	0.9677	2.6500e-003	0.2683	1.6200e-003	0.2699	0.0711	1.5000e-003	0.0726		264.3827	264.3827	6.7800e-003		264.5521
Total	**0.1416**	**0.7925**	**1.0995**	**4.4800e-003**	**0.3131**	**5.7200e-003**	**0.3188**	**0.0841**	**5.4200e-003**	**0.0895**		**457.1563**	**457.1563**	**0.0212**		**457.6872**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1198	19.1860	16.8485	0.0269		1.1171	1.1171		1.0503	1.0503	0.0000	2,553.0631	2,553.0631	0.6229		2,568.6345
Total	**2.1198**	**19.1860**	**16.8485**	**0.0269**		**1.1171**	**1.1171**		**1.0503**	**1.0503**	**0.0000**	**2,553.0631**	**2,553.0631**	**0.6229**		**2,568.6345**

3.5 Building Construction - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0195	0.7202	0.1318	1.8300e-003	0.0448	4.1000e-003	0.0489	0.0129	3.9200e-003	0.0168		192.7737	192.7737	0.0145		193.1351
Worker	0.1221	0.0722	0.9677	2.6500e-003	0.2683	1.6200e-003	0.2699	0.0711	1.5000e-003	0.0726		264.3827	264.3827	6.7800e-003		264.5521
Total	**0.1416**	**0.7925**	**1.0995**	**4.4800e-003**	**0.3131**	**5.7200e-003**	**0.3188**	**0.0841**	**5.4200e-003**	**0.0895**		**457.1563**	**457.1563**	**0.0212**		**457.6872**

3.5 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013		2,553.3639	2,553.3639	0.6160		2,568.7643
Total	**1.9009**	**17.4321**	**16.5752**	**0.0269**		**0.9586**	**0.9586**		**0.9013**	**0.9013**		**2,553.3639**	**2,553.3639**	**0.6160**		**2,568.7643**

3.5 Building Construction - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0163	0.6478	0.1156	1.8100e-003	0.0448	1.2300e-003	0.0461	0.0129	1.1800e-003	0.0141		191.2757	191.2757	0.0137		191.6178
Worker	0.1138	0.0648	0.8873	2.5600e-003	0.2683	1.5800e-003	0.2698	0.0711	1.4600e-003	0.0726		255.5402	255.5402	6.0900e-003		255.6926
Total	**0.1301**	**0.7126**	**1.0029**	**4.3700e-003**	**0.3131**	**2.8100e-003**	**0.3159**	**0.0841**	**2.6400e-003**	**0.0867**		**446.8159**	**446.8159**	**0.0198**		**447.3104**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013	0.0000	2,553.3639	2,553.3639	0.6160		2,568.7643
Total	**1.9009**	**17.4321**	**16.5752**	**0.0269**		**0.9586**	**0.9586**		**0.9013**	**0.9013**	**0.0000**	**2,553.3639**	**2,553.3639**	**0.6160**		**2,568.7643**

3.5 Building Construction - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0163	0.6478	0.1156	1.8100e-003	0.0448	1.2300e-003	0.0461	0.0129	1.1800e-003	0.0141		191.2757	191.2757	0.0137		191.6178
Worker	0.1138	0.0648	0.8873	2.5600e-003	0.2683	1.5800e-003	0.2698	0.0711	1.4600e-003	0.0726		255.5402	255.5402	6.0900e-003		255.6926
Total	**0.1301**	**0.7126**	**1.0029**	**4.3700e-003**	**0.3131**	**2.8100e-003**	**0.3159**	**0.0841**	**2.6400e-003**	**0.0867**		**446.8159**	**446.8159**	**0.0198**		**447.3104**

3.6 Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235		2,207.2109	2,207.2109	0.7139		2,225.0573
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2556**	**12.9191**	**14.6532**	**0.0228**		**0.6777**	**0.6777**		**0.6235**	**0.6235**		**2,207.2109**	**2,207.2109**	**0.7139**		**2,225.0573**

3.6 Paving - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0711	0.0405	0.5546	1.6000e-003	0.1677	9.9000e-004	0.1687	0.0445	9.1000e-004	0.0454		159.7126	159.7126	3.8100e-003		159.8078
Total	**0.0711**	**0.0405**	**0.5546**	**1.6000e-003**	**0.1677**	**9.9000e-004**	**0.1687**	**0.0445**	**9.1000e-004**	**0.0454**		**159.7126**	**159.7126**	**3.8100e-003**		**159.8078**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235	0.0000	2,207.2109	2,207.2109	0.7139		2,225.0573
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2556**	**12.9191**	**14.6532**	**0.0228**		**0.6777**	**0.6777**		**0.6235**	**0.6235**	**0.0000**	**2,207.2109**	**2,207.2109**	**0.7139**		**2,225.0573**

3.6 Paving - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0711	0.0405	0.5546	1.6000e-003	0.1677	9.9000e-004	0.1687	0.0445	9.1000e-004	0.0454		159.7126	159.7126	3.8100e-003		159.8078
Total	**0.0711**	**0.0405**	**0.5546**	**1.6000e-003**	**0.1677**	**9.9000e-004**	**0.1687**	**0.0445**	**9.1000e-004**	**0.0454**		**159.7126**	**159.7126**	**3.8100e-003**		**159.8078**

3.7 Architectural Coating - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	37.1681					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e-003		0.0941	0.0941		0.0941	0.0941		281.4481	281.4481	0.0193		281.9309
Total	**37.3870**	**1.5268**	**1.8176**	**2.9700e-003**		**0.0941**	**0.0941**		**0.0941**	**0.0941**		**281.4481**	**281.4481**	**0.0193**		**281.9309**

3.7 Architectural Coating - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0237	0.0135	0.1849	5.3000e-004	0.0559	3.3000e-004	0.0562	0.0148	3.0000e-004	0.0151		53.2376	53.2376	1.2700e-003		53.2693
Total	**0.0237**	**0.0135**	**0.1849**	**5.3000e-004**	**0.0559**	**3.3000e-004**	**0.0562**	**0.0148**	**3.0000e-004**	**0.0151**		**53.2376**	**53.2376**	**1.2700e-003**		**53.2693**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	37.1681					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e-003		0.0941	0.0941		0.0941	0.0941	0.0000	281.4481	281.4481	0.0193		281.9309
Total	**37.3870**	**1.5268**	**1.8176**	**2.9700e-003**		**0.0941**	**0.0941**		**0.0941**	**0.0941**	**0.0000**	**281.4481**	**281.4481**	**0.0193**		**281.9309**

3.7 Architectural Coating - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0237	0.0135	0.1849	5.3000e-004	0.0559	3.3000e-004	0.0562	0.0148	3.0000e-004	0.0151		53.2376	53.2376	1.2700e-003		53.2693
Total	**0.0237**	**0.0135**	**0.1849**	**5.3000e-004**	**0.0559**	**3.3000e-004**	**0.0562**	**0.0148**	**3.0000e-004**	**0.0151**		**53.2376**	**53.2376**	**1.2700e-003**		**53.2693**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.2271	8.8418	14.6739	0.0639	4.7664	0.0416	4.8079	1.2752	0.0390	1.3142		6,524.2245	6,524.2245	0.3028		6,531.7943
Unmitigated	1.2271	8.8418	14.6739	0.0639	4.7664	0.0416	4.8079	1.2752	0.0390	1.3142		6,524.2245	6,524.2245	0.3028		6,531.7943

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	628.32	654.06	568.92	2,130,633	2,130,633
Total	628.32	654.06	568.92	2,130,633	2,130,633

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Single Family Housing	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Single Family Housing	0.545527	0.036856	0.186032	0.115338	0.015222	0.004970	0.017525	0.069528	0.001397	0.001160	0.004547	0.000932	0.000965

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
NaturalGas Unmitigated	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Single Family Housing	5532.45	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
Total		**0.0597**	**0.5099**	**0.2170**	**3.2500e-003**		**0.0412**	**0.0412**		**0.0412**	**0.0412**		**650.8770**	**650.8770**	**0.0125**	**0.0119**	**654.7448**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Single Family Housing	5.53245	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
Total		**0.0597**	**0.5099**	**0.2170**	**3.2500e-003**		**0.0412**	**0.0412**		**0.0412**	**0.0412**		**650.8770**	**650.8770**	**0.0125**	**0.0119**	**654.7448**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.8294	0.9935	5.8470	6.2300e-003		0.1054	0.1054		0.1054	0.1054	0.0000	1,197.8045	1,197.8045	0.0322	0.0218	1,205.1006
Unmitigated	2.8294	0.9935	5.8470	6.2300e-003		0.1054	0.1054		0.1054	0.1054	0.0000	1,197.8045	1,197.8045	0.0322	0.0218	1,205.1006

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2037					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.3522					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.1089	0.9306	0.3960	5.9400e-003		0.0752	0.0752		0.0752	0.0752	0.0000	1,188.0000	1,188.0000	0.0228	0.0218	1,195.0597
Landscaping	0.1646	0.0629	5.4510	2.9000e-004		0.0301	0.0301		0.0301	0.0301		9.8045	9.8045	9.4600e-003		10.0409
Total	**2.8294**	**0.9935**	**5.8470**	**6.2300e-003**		**0.1054**	**0.1054**		**0.1054**	**0.1054**	**0.0000**	**1,197.8045**	**1,197.8045**	**0.0322**	**0.0218**	**1,205.1006**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2037					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.3522					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.1089	0.9306	0.3960	5.9400e-003		0.0752	0.0752		0.0752	0.0752	0.0000	1,188.0000	1,188.0000	0.0228	0.0218	1,195.0597
Landscaping	0.1646	0.0629	5.4510	2.9000e-004		0.0301	0.0301		0.0301	0.0301		9.8045	9.8045	9.4600e-003		10.0409
Total	**2.8294**	**0.9935**	**5.8470**	**6.2300e-003**		**0.1054**	**0.1054**		**0.1054**	**0.1054**	**0.0000**	**1,197.8045**	**1,197.8045**	**0.0322**	**0.0218**	**1,205.1006**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Moreno Valley Thatcher

Riverside-South Coast County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Single Family Housing	66.00	Dwelling Unit	20.20	118,800.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.4	**Precipitation Freq (Days)**	28
Climate Zone	10			**Operational Year**	2022
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	427.1	**CH4 Intensity (lb/MWhr)**	0.033	**N2O Intensity (lb/MWhr)**	0.004

1.3 User Entered Comments & Non-Default Data

Project Characteristics - MIG Modeler: CPD. SCE GHG intensity factors adjusted downwards based on SCE corporate sustainability reports and U.S. EPA EGRID emission factors.

Land Use - Project gross acreage from tentative tract map.

Grading - estimated material import from project tentatice tract map.

Woodstoves - Woodstoves and fireplaces prohibited per SCAQMD rules.

Energy Use - T24 standards adjusted downwards to reflect increased efficiency between 2016-2019 standards (CEC, 2017).

Construction Off-road Equipment Mitigation -

Table Name	Column Name	Default Value	New Value
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblEnergyUse	T24E	951.67	475.84
tblFireplaces	FireplaceWoodMass	1,019.20	0.00
tblFireplaces	NumberNoFireplace	6.60	9.90
tblFireplaces	NumberWood	3.30	0.00
tblGrading	MaterialImported	0.00	14,000.00
tblLandUse	LotAcreage	21.43	20.20
tblLandUse	Population	189.00	0.00
tblProjectCharacteristics	CH4IntensityFactor	0.029	0.033
tblProjectCharacteristics	CO2IntensityFactor	702.44	427.1
tblProjectCharacteristics	N2OIntensityFactor	0.006	0.004
tblWoodstoves	NumberCatalytic	3.30	0.00
tblWoodstoves	NumberNoncatalytic	3.30	0.00
tblWoodstoves	WoodstoveDayYear	25.00	0.00
tblWoodstoves	WoodstoveWoodMass	999.60	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2020	4.8203	62.2026	34.3215	0.1011	18.2675	2.2135	20.4661	9.9840	2.0378	12.0068	0.0000	10,141.3015	10,141.3015	2.2108	0.0000	10,196.5710
2021	37.4102	18.1413	17.4282	0.0310	0.3131	0.9615	1.2746	0.0841	0.9040	0.9880	0.0000	2,966.6916	2,966.6916	0.7172	0.0000	2,982.6056
Maximum	**37.4102**	**62.2026**	**34.3215**	**0.1011**	**18.2675**	**2.2135**	**20.4661**	**9.9840**	**2.0378**	**12.0068**	**0.0000**	**10,141.3015**	**10,141.3015**	**2.2108**	**0.0000**	**10,196.5710**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2020	4.8203	62.2026	34.3215	0.1011	7.2470	2.2135	9.4457	3.9263	2.0378	5.9491	0.0000	10,141.3015	10,141.3015	2.2108	0.0000	10,196.5710
2021	37.4102	18.1413	17.4282	0.0310	0.3131	0.9615	1.2746	0.0841	0.9040	0.9880	0.0000	2,966.6916	2,966.6916	0.7172	0.0000	2,982.6056
Maximum	**37.4102**	**62.2026**	**34.3215**	**0.1011**	**7.2470**	**2.2135**	**9.4457**	**3.9263**	**2.0378**	**5.9491**	**0.0000**	**10,141.3015**	**10,141.3015**	**2.2108**	**0.0000**	**10,196.5710**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**59.31**	**0.00**	**50.69**	**60.17**	**0.00**	**46.62**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.8294	0.9935	5.8470	6.2300e-003		0.1054	0.1054		0.1054	0.1054	0.0000	1,197.8045	1,197.8045	0.0322	0.0218	1,205.1006
Energy	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
Mobile	1.0411	8.8393	12.6808	0.0590	4.7664	0.0420	4.8083	1.2752	0.0393	1.3146		6,028.1325	6,028.1325	0.3127		6,035.9500
Total	**3.9302**	**10.3426**	**18.7447**	**0.0685**	**4.7664**	**0.1886**	**4.9549**	**1.2752**	**0.1859**	**1.4611**	**0.0000**	**7,876.8140**	**7,876.8140**	**0.3574**	**0.0337**	**7,895.7955**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	2.8294	0.9935	5.8470	6.2300e-003		0.1054	0.1054		0.1054	0.1054	0.0000	1,197.8045	1,197.8045	0.0322	0.0218	1,205.1006
Energy	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
Mobile	1.0411	8.8393	12.6808	0.0590	4.7664	0.0420	4.8083	1.2752	0.0393	1.3146		6,028.1325	6,028.1325	0.3127		6,035.9500
Total	**3.9302**	**10.3426**	**18.7447**	**0.0685**	**4.7664**	**0.1886**	**4.9549**	**1.2752**	**0.1859**	**1.4611**	**0.0000**	**7,876.8140**	**7,876.8140**	**0.3574**	**0.0337**	**7,895.7955**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2020	1/28/2020	5	20	
2	Site Preparation	Site Preparation	1/29/2020	2/11/2020	5	10	
3	Grading	Grading	2/12/2020	3/31/2020	5	35	
4	Building Construction	Building Construction	4/1/2020	8/31/2021	5	370	
5	Paving	Paving	9/1/2021	9/28/2021	5	20	
6	Architectural Coating	Architectural Coating	9/29/2021	10/26/2021	5	20	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 87.5

Acres of Paving: 0

Residential Indoor: 240,570; Residential Outdoor: 80,190; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Architectural Coating	Air Compressors	1	6.00	78	0.48
Demolition	Excavators	3	8.00	158	0.38
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Grading	Excavators	2	8.00	158	0.38
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Paving	Pavers	2	8.00	130	0.42
Paving	Rollers	2	8.00	80	0.38
Demolition	Rubber Tired Dozers	2	8.00	247	0.40
Grading	Rubber Tired Dozers	1	8.00	247	0.40
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Grading	Graders	1	8.00	187	0.41
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Paving	Paving Equipment	2	8.00	132	0.36
Site Preparation	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Site Preparation	Rubber Tired Dozers	3	8.00	247	0.40
Grading	Scrapers	2	8.00	367	0.48
Building Construction	Welders	1	8.00	46	0.45

<u>Trips and VMT</u>

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	7	18.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Grading	8	20.00	0.00	1,750.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	24.00	7.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	5.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

3.2 Demolition - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.3121	33.2010	21.7532	0.0388		1.6587	1.6587		1.5419	1.5419		3,747.7049	3,747.7049	1.0580		3,774.1536
Total	**3.3121**	**33.2010**	**21.7532**	**0.0388**		**1.6587**	**1.6587**		**1.5419**	**1.5419**		**3,747.7049**	**3,747.7049**	**1.0580**		**3,774.1536**

3.2 Demolition - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0748	0.0467	0.4893	1.4900e-003	0.1677	1.0200e-003	0.1687	0.0445	9.3000e-004	0.0454		148.2354	148.2354	3.6800e-003		148.3274
Total	**0.0748**	**0.0467**	**0.4893**	**1.4900e-003**	**0.1677**	**1.0200e-003**	**0.1687**	**0.0445**	**9.3000e-004**	**0.0454**		**148.2354**	**148.2354**	**3.6800e-003**		**148.3274**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	3.3121	33.2010	21.7532	0.0388		1.6587	1.6587		1.5419	1.5419	0.0000	3,747.704 9	3,747.704 9	1.0580		3,774.153 6
Total	**3.3121**	**33.2010**	**21.7532**	**0.0388**		**1.6587**	**1.6587**		**1.5419**	**1.5419**	**0.0000**	**3,747.704 9**	**3,747.704 9**	**1.0580**		**3,774.153 6**

3.2 Demolition - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0748	0.0467	0.4893	1.4900e-003	0.1677	1.0200e-003	0.1687	0.0445	9.3000e-004	0.0454		148.2354	148.2354	3.6800e-003		148.3274
Total	**0.0748**	**0.0467**	**0.4893**	**1.4900e-003**	**0.1677**	**1.0200e-003**	**0.1687**	**0.0445**	**9.3000e-004**	**0.0454**		**148.2354**	**148.2354**	**3.6800e-003**		**148.3274**

3.3 Site Preparation - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					18.0663	0.0000	18.0663	9.9307	0.0000	9.9307			0.0000			0.0000
Off-Road	4.0765	42.4173	21.5136	0.0380		2.1974	2.1974		2.0216	2.0216		3,685.1016	3,685.1016	1.1918		3,714.8975
Total	**4.0765**	**42.4173**	**21.5136**	**0.0380**	**18.0663**	**2.1974**	**20.2637**	**9.9307**	**2.0216**	**11.9523**		**3,685.1016**	**3,685.1016**	**1.1918**		**3,714.8975**

3.3 Site Preparation - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0897	0.0560	0.5871	1.7900e-003	0.2012	1.2200e-003	0.2024	0.0534	1.1200e-003	0.0545		177.8824	177.8824	4.4200e-003		177.9929
Total	**0.0897**	**0.0560**	**0.5871**	**1.7900e-003**	**0.2012**	**1.2200e-003**	**0.2024**	**0.0534**	**1.1200e-003**	**0.0545**		**177.8824**	**177.8824**	**4.4200e-003**		**177.9929**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					7.0458	0.0000	7.0458	3.8730	0.0000	3.8730			0.0000			0.0000
Off-Road	4.0765	42.4173	21.5136	0.0380		2.1974	2.1974		2.0216	2.0216	0.0000	3,685.1016	3,685.1016	1.1918		3,714.8975
Total	**4.0765**	**42.4173**	**21.5136**	**0.0380**	**7.0458**	**2.1974**	**9.2433**	**3.8730**	**2.0216**	**5.8946**	**0.0000**	**3,685.1016**	**3,685.1016**	**1.1918**		**3,714.8975**

3.3 Site Preparation - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0897	0.0560	0.5871	1.7900e-003	0.2012	1.2200e-003	0.2024	0.0534	1.1200e-003	0.0545		177.8824	177.8824	4.4200e-003		177.9929
Total	**0.0897**	**0.0560**	**0.5871**	**1.7900e-003**	**0.2012**	**1.2200e-003**	**0.2024**	**0.0534**	**1.1200e-003**	**0.0545**		**177.8824**	**177.8824**	**4.4200e-003**		**177.9929**

3.4 Grading - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					8.7240	0.0000	8.7240	3.6042	0.0000	3.6042			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000		6,005.8653	6,005.8653	1.9424		6,054.4257
Total	**4.4501**	**50.1975**	**31.9583**	**0.0620**	**8.7240**	**2.1739**	**10.8979**	**3.6042**	**2.0000**	**5.6042**		**6,005.8653**	**6,005.8653**	**1.9424**		**6,054.4257**

3.4 Grading - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2705	11.9428	1.7109	0.0371	0.8747	0.0383	0.9130	0.2398	0.0366	0.2764		3,937.789 1	3,937.789 1	0.2635		3,944.375 4
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0997	0.0623	0.6524	1.9800e-003	0.2236	1.3500e-003	0.2249	0.0593	1.2500e-003	0.0605		197.6472	197.6472	4.9100e-003		197.7699
Total	**0.3702**	**12.0051**	**2.3633**	**0.0391**	**1.0982**	**0.0396**	**1.1379**	**0.2991**	**0.0379**	**0.3369**		**4,135.436 3**	**4,135.436 3**	**0.2684**		**4,142.145 3**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					3.4024	0.0000	3.4024	1.4056	0.0000	1.4056			0.0000			0.0000
Off-Road	4.4501	50.1975	31.9583	0.0620		2.1739	2.1739		2.0000	2.0000	0.0000	6,005.865 3	6,005.865 3	1.9424		6,054.425 7
Total	**4.4501**	**50.1975**	**31.9583**	**0.0620**	**3.4024**	**2.1739**	**5.5763**	**1.4056**	**2.0000**	**3.4056**	**0.0000**	**6,005.865 3**	**6,005.865 3**	**1.9424**		**6,054.425 7**

3.4 Grading - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.2705	11.9428	1.7109	0.0371	0.8747	0.0383	0.9130	0.2398	0.0366	0.2764		3,937.789 1	3,937.789 1	0.2635		3,944.375 4
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0997	0.0623	0.6524	1.9800e-003	0.2236	1.3500e-003	0.2249	0.0593	1.2500e-003	0.0605		197.6472	197.6472	4.9100e-003		197.7699
Total	**0.3702**	**12.0051**	**2.3633**	**0.0391**	**1.0982**	**0.0396**	**1.1379**	**0.2991**	**0.0379**	**0.3369**		**4,135.436 3**	**4,135.436 3**	**0.2684**		**4,142.145 3**

3.5 Building Construction - 2020

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1198	19.1860	16.8485	0.0269		1.1171	1.1171		1.0503	1.0503		2,553.063 1	2,553.063 1	0.6229		2,568.634 5
Total	**2.1198**	**19.1860**	**16.8485**	**0.0269**		**1.1171**	**1.1171**		**1.0503**	**1.0503**		**2,553.063 1**	**2,553.063 1**	**0.6229**		**2,568.634 5**

3.5 Building Construction - 2020

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0206	0.7165	0.1543	1.7600e-003	0.0448	4.1400e-003	0.0490	0.0129	3.9700e-003	0.0169		185.5299	185.5299	0.0161		185.9322
Worker	0.1196	0.0747	0.7828	2.3800e-003	0.2683	1.6200e-003	0.2699	0.0711	1.5000e-003	0.0726		237.1766	237.1766	5.8900e-003		237.3239
Total	**0.1402**	**0.7912**	**0.9371**	**4.1400e-003**	**0.3131**	**5.7600e-003**	**0.3189**	**0.0841**	**5.4700e-003**	**0.0895**		**422.7065**	**422.7065**	**0.0220**		**423.2560**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	2.1198	19.1860	16.8485	0.0269		1.1171	1.1171		1.0503	1.0503	0.0000	2,553.0631	2,553.0631	0.6229		2,568.6345
Total	**2.1198**	**19.1860**	**16.8485**	**0.0269**		**1.1171**	**1.1171**		**1.0503**	**1.0503**	**0.0000**	**2,553.0631**	**2,553.0631**	**0.6229**		**2,568.6345**

3.5 Building Construction - 2020

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0206	0.7165	0.1543	1.7600e-003	0.0448	4.1400e-003	0.0490	0.0129	3.9700e-003	0.0169		185.5299	185.5299	0.0161		185.9322
Worker	0.1196	0.0747	0.7828	2.3800e-003	0.2683	1.6200e-003	0.2699	0.0711	1.5000e-003	0.0726		237.1766	237.1766	5.8900e-003		237.3239
Total	**0.1402**	**0.7912**	**0.9371**	**4.1400e-003**	**0.3131**	**5.7600e-003**	**0.3189**	**0.0841**	**5.4700e-003**	**0.0895**		**422.7065**	**422.7065**	**0.0220**		**423.2560**

3.5 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013		2,553.3639	2,553.3639	0.6160		2,568.7643
Total	**1.9009**	**17.4321**	**16.5752**	**0.0269**		**0.9586**	**0.9586**		**0.9013**	**0.9013**		**2,553.3639**	**2,553.3639**	**0.6160**		**2,568.7643**

3.5 Building Construction - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0174	0.6422	0.1367	1.7500e-003	0.0448	1.2700e-003	0.0461	0.0129	1.2100e-003	0.0141		184.0813	184.0813	0.0153		184.4624
Worker	0.1117	0.0670	0.7162	2.3000e-003	0.2683	1.5800e-003	0.2698	0.0711	1.4600e-003	0.0726		229.2465	229.2465	5.3000e-003		229.3789
Total	**0.1290**	**0.7092**	**0.8530**	**4.0500e-003**	**0.3131**	**2.8500e-003**	**0.3159**	**0.0841**	**2.6700e-003**	**0.0867**		**413.3277**	**413.3277**	**0.0206**		**413.8413**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.9009	17.4321	16.5752	0.0269		0.9586	0.9586		0.9013	0.9013	0.0000	2,553.3639	2,553.3639	0.6160		2,568.7643
Total	**1.9009**	**17.4321**	**16.5752**	**0.0269**		**0.9586**	**0.9586**		**0.9013**	**0.9013**	**0.0000**	**2,553.3639**	**2,553.3639**	**0.6160**		**2,568.7643**

3.5 Building Construction - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0174	0.6422	0.1367	1.7500e-003	0.0448	1.2700e-003	0.0461	0.0129	1.2100e-003	0.0141		184.0813	184.0813	0.0153		184.4624
Worker	0.1117	0.0670	0.7162	2.3000e-003	0.2683	1.5800e-003	0.2698	0.0711	1.4600e-003	0.0726		229.2465	229.2465	5.3000e-003		229.3789
Total	**0.1290**	**0.7092**	**0.8530**	**4.0500e-003**	**0.3131**	**2.8500e-003**	**0.3159**	**0.0841**	**2.6700e-003**	**0.0867**		**413.3277**	**413.3277**	**0.0206**		**413.8413**

3.6 Paving - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235		2,207.2109	2,207.2109	0.7139		2,225.0573
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2556**	**12.9191**	**14.6532**	**0.0228**		**0.6777**	**0.6777**		**0.6235**	**0.6235**		**2,207.2109**	**2,207.2109**	**0.7139**		**2,225.0573**

3.6 Paving - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0698	0.0419	0.4476	1.4400e-003	0.1677	9.9000e-004	0.1687	0.0445	9.1000e-004	0.0454		143.2790	143.2790	3.3100e-003		143.3618
Total	**0.0698**	**0.0419**	**0.4476**	**1.4400e-003**	**0.1677**	**9.9000e-004**	**0.1687**	**0.0445**	**9.1000e-004**	**0.0454**		**143.2790**	**143.2790**	**3.3100e-003**		**143.3618**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.2556	12.9191	14.6532	0.0228		0.6777	0.6777		0.6235	0.6235	0.0000	2,207.2109	2,207.2109	0.7139		2,225.0573
Paving	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.2556**	**12.9191**	**14.6532**	**0.0228**		**0.6777**	**0.6777**		**0.6235**	**0.6235**	**0.0000**	**2,207.2109**	**2,207.2109**	**0.7139**		**2,225.0573**

3.6 Paving - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0698	0.0419	0.4476	1.4400e-003	0.1677	9.9000e-004	0.1687	0.0445	9.1000e-004	0.0454		143.2790	143.2790	3.3100e-003		143.3618
Total	**0.0698**	**0.0419**	**0.4476**	**1.4400e-003**	**0.1677**	**9.9000e-004**	**0.1687**	**0.0445**	**9.1000e-004**	**0.0454**		**143.2790**	**143.2790**	**3.3100e-003**		**143.3618**

3.7 Architectural Coating - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	37.1681					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e-003		0.0941	0.0941		0.0941	0.0941		281.4481	281.4481	0.0193		281.9309
Total	**37.3870**	**1.5268**	**1.8176**	**2.9700e-003**		**0.0941**	**0.0941**		**0.0941**	**0.0941**		**281.4481**	**281.4481**	**0.0193**		**281.9309**

3.7 Architectural Coating - 2021

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0233	0.0140	0.1492	4.8000e-004	0.0559	3.3000e-004	0.0562	0.0148	3.0000e-004	0.0151		47.7597	47.7597	1.1000e-003		47.7873
Total	**0.0233**	**0.0140**	**0.1492**	**4.8000e-004**	**0.0559**	**3.3000e-004**	**0.0562**	**0.0148**	**3.0000e-004**	**0.0151**		**47.7597**	**47.7597**	**1.1000e-003**		**47.7873**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	37.1681					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.2189	1.5268	1.8176	2.9700e-003		0.0941	0.0941		0.0941	0.0941	0.0000	281.4481	281.4481	0.0193		281.9309
Total	**37.3870**	**1.5268**	**1.8176**	**2.9700e-003**		**0.0941**	**0.0941**		**0.0941**	**0.0941**	**0.0000**	**281.4481**	**281.4481**	**0.0193**		**281.9309**

3.7 Architectural Coating - 2021

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0233	0.0140	0.1492	4.8000e-004	0.0559	3.3000e-004	0.0562	0.0148	3.0000e-004	0.0151		47.7597	47.7597	1.1000e-003		47.7873
Total	**0.0233**	**0.0140**	**0.1492**	**4.8000e-004**	**0.0559**	**3.3000e-004**	**0.0562**	**0.0148**	**3.0000e-004**	**0.0151**		**47.7597**	**47.7597**	**1.1000e-003**		**47.7873**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0411	8.8393	12.6808	0.0590	4.7664	0.0420	4.8083	1.2752	0.0393	1.3146		6,028.1325	6,028.1325	0.3127		6,035.9500
Unmitigated	1.0411	8.8393	12.6808	0.0590	4.7664	0.0420	4.8083	1.2752	0.0393	1.3146		6,028.1325	6,028.1325	0.3127		6,035.9500

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Single Family Housing	628.32	654.06	568.92	2,130,633	2,130,633
Total	628.32	654.06	568.92	2,130,633	2,130,633

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Single Family Housing	14.70	5.90	8.70	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Single Family Housing	0.545527	0.036856	0.186032	0.115338	0.015222	0.004970	0.017525	0.069528	0.001397	0.001160	0.004547	0.000932	0.000965

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
NaturalGas Unmitigated	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Single Family Housing	5532.45	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
Total		**0.0597**	**0.5099**	**0.2170**	**3.2500e-003**		**0.0412**	**0.0412**		**0.0412**	**0.0412**		**650.8770**	**650.8770**	**0.0125**	**0.0119**	**654.7448**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
Single Family Housing	5.53245	0.0597	0.5099	0.2170	3.2500e-003		0.0412	0.0412		0.0412	0.0412		650.8770	650.8770	0.0125	0.0119	654.7448
Total		**0.0597**	**0.5099**	**0.2170**	**3.2500e-003**		**0.0412**	**0.0412**		**0.0412**	**0.0412**		**650.8770**	**650.8770**	**0.0125**	**0.0119**	**654.7448**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	2.8294	0.9935	5.8470	6.2300e-003		0.1054	0.1054		0.1054	0.1054	0.0000	1,197.8045	1,197.8045	0.0322	0.0218	1,205.1006
Unmitigated	2.8294	0.9935	5.8470	6.2300e-003		0.1054	0.1054		0.1054	0.1054	0.0000	1,197.8045	1,197.8045	0.0322	0.0218	1,205.1006

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2037					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.3522					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.1089	0.9306	0.3960	5.9400e-003		0.0752	0.0752		0.0752	0.0752	0.0000	1,188.0000	1,188.0000	0.0228	0.0218	1,195.0597
Landscaping	0.1646	0.0629	5.4510	2.9000e-004		0.0301	0.0301		0.0301	0.0301		9.8045	9.8045	9.4600e-003		10.0409
Total	**2.8294**	**0.9935**	**5.8470**	**6.2300e-003**		**0.1054**	**0.1054**		**0.1054**	**0.1054**	**0.0000**	**1,197.8045**	**1,197.8045**	**0.0322**	**0.0218**	**1,205.1006**

6.2 Area by SubCategory

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.2037					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	2.3522					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.1089	0.9306	0.3960	5.9400e-003		0.0752	0.0752		0.0752	0.0752	0.0000	1,188.0000	1,188.0000	0.0228	0.0218	1,195.0597
Landscaping	0.1646	0.0629	5.4510	2.9000e-004		0.0301	0.0301		0.0301	0.0301		9.8045	9.8045	9.4600e-003		10.0409
Total	**2.8294**	**0.9935**	**5.8470**	**6.2300e-003**		**0.1054**	**0.1054**		**0.1054**	**0.1054**	**0.0000**	**1,197.8045**	**1,197.8045**	**0.0322**	**0.0218**	**1,205.1006**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

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Biological Resource Assessment, Burrowing Owl Survey, and MSHCP Consistency Analysis

Krameria Avenue Project Site
City of Moreno Valley, Western Riverside County, California

Prepared for:
PI Properties No. 67 LLC
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February 2020

This document is formatted for double-sided printing

TABLE OF CONTENTS

Attachments

Appendices

List of Abbreviated Terms

AMM	Avoidance and Minimization Measures
AMSL	Above Mean Sea Level
APN	Assessor's Parcel Number
BMP	Best Management Practice
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Code
CFR	Code of Federal Regulations
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CWA	Clean Water Act
DBESP	Determination of Biological Equivalent or Superior Preservation
EPA	Environmental Protection Agency
FESA	Federal Endangered Species Act
GBRA	General Biological Resources Assessment
GIS	Geographic Information System
HCP	Habitat Conservation Plan
IPaC	Information for Planning and Consultation
LSAA	Lake and Streambed Alteration Agreement
MBTA	Migratory Bird Treaty Act
MJPA	March Joint Powers Authority
MSHCP	Multiple Species Habitat Conservation Plan
NCCP	Natural Community Conservation Planning
NMFS	National Marine Fisheries Service
NOAA	National Oceanic Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPPA	Native Plant Protection Act
NRCS	Natural Resource Conservation Service
RWQCB	Regional Water Quality Control Board
SKR	Stephen's Kangaroo Rat
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1.0 INTRODUCTION

The purpose of this Biological Resource Assessment and Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) Consistency Analysis is to verify the type, location, and extent of potential sensitive biological resources within the 20.18-acre Krameria Avenue Project Site and vicinity. An MSHCP burrowing owl survey (MSHCP 2006) was also completed to determine the potential for burrowing owl to occur on the Project Site.

MIG conducted a field survey of the Project Site on April 1, 2019. This report provides information regarding the location, extent, and condition of biological resources occurring on the Project Site. This report provides a thorough description of the biological setting of the site and surrounding area, as well as a description of the vegetation communities, wildlife, potential movement/migration corridors, special status species, sensitive natural communities, and potentially jurisdictional waters and wetlands. An assessment of the project impacts and recommended mitigation measures to avoid, minimize, or compensate for potential adverse impacts to sensitive habitats and species is also included in the report. The evaluation of potential project impacts follows the checklist items from Appendix G of the California Environmental Quality Act (CEQA) guidelines and has been prepared in a format suitable to support CEQA review and to submit with any future regulatory application packages that might be required.

1.1 Project Location

The 20.18-acre Project Site is located in the City of Moreno Valley, Riverside County, California and includes APNs 316-110-005, -006, -022, -023, and -024. The Project Site is south of Krameria Avenue, east of Tarano Lane, and west of Perris Boulevard (Attachment E-1, *Vicinity Map* and Attachment E-2, *Project Site Map*). The Project Site occurs within the United States Geological Survey (USGS) 7.5' series Sunnymead Quadrangle, Township 3S, Range 3W, Section 30. The Project Site is relatively flat, with elevations ranging between approximately 1,480-1,490 feet above mean sea level (AMSL). Residential land use borders the Project Site on all sides. An unnamed, ephemeral drainage flows north to south along the western boundary of the Project Site.

2.0 REGULATORY SETTING

The following discussion identifies federal, state, and local environmental regulations that serve to protect sensitive biological resources relevant to the proposed Project Site and CEQA review process.

2.1 Federal

2.1.1 Federal Endangered Species Act

The Federal Endangered Species Act (FESA) of 1973, as amended, provides the regulatory framework for the protection of plant and animal species (and their associated critical habitats), which are formally listed, proposed for listing, or candidates for listing as endangered or threatened under the FESA. The FESA has the following four major components: (1) provisions for listing species, (2) requirements for consultation with the United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA NMFS), (3) prohibitions against "taking" (meaning harassing, harming, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting to engage in any such conduct) of listed species, and (4) provisions for permits that allow incidental "take". The FESA also discusses recovery plans and the designation of critical habitat for listed species. Section 7 requires Federal agencies, in consultation with, and with the assistance of the USFWS or NOAA NMFS, as appropriate, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat for these species. Both the USFWS and NOAA NMFS share the responsibility for administration of the FESA.

2.1.2 The Migratory Bird Treaty Act

The Federal Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703 et seq.), Title 50 Code of Federal Regulations (CFR) Part 10, prohibits taking, killing, possessing, transporting, and importing of migratory birds, parts of migratory birds, and their eggs and nests, except when specifically authorized by the Department of the Interior. As used in the act, the term "take" is defined as meaning, "to pursue, hunt, capture, collect, kill or attempt to pursue, hunt, shoot, capture, collect or kill, unless the context otherwise requires." With a few exceptions, most birds are considered migratory under the MBTA. Disturbances that causes nest abandonment and/or loss of reproductive effort or loss of habitat upon which these birds depend would be in violation of the MBTA.

2.1.3 Clean Water Act Sections 404 and 401

The United States Army Corps of Engineers (USACE) and the United States Environmental Protection Agency (EPA) regulate the discharge of dredged or fill material into waters of the United States, including wetlands, under Section 404 of the Clean Water Act (CWA) (33 USC 1344). Waters of the United States are defined in Title 33 CFR Part 328.3(a) and include a range of wet environments such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds. The lateral limits of jurisdiction in those waters may be divided into three categories – territorial seas, tidal waters, and non-tidal waters – and is determined depending on which type of waters is present (Title 33 CFR Part 328.4(a), (b), (c)). Activities in waters of the United States regulated under Section 404 include fill for development, water resource projects (e.g., dams and levees), infrastructure developments (e.g., highways, rail lines, and airports) and mining projects. Section 404 of the CWA requires a federal permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g., certain farming and forestry activities).

Section 401 of the CWA (33 U.S.C. 1341) requires an applicant for a federal license or permit to conduct any activity that may result in a discharge of a pollutant into waters of the United States to obtain a water quality certification from the state in which the discharge originates. The discharge is required to comply with the applicable water quality standards. A certification obtained for the construction of any facility must also pertain to the subsequent operation of the facility. The Environmental Protection Agency (EPA) has delegated responsibility for the protection of water quality in California to State Water Resources Control Board (SWRCB) and its nine Regional Water Quality Control Boards (RWQCBs).

2.1.4 National Pollutant Discharge Elimination System (NPDES)

The NPDES program requires permitting for activities that discharge pollutants into waters of the United States. This includes discharges from municipal, industrial, and construction sources. These are considered point-sources from a regulatory standpoint. Generally, these permits are issued and monitored under the oversight of the SWRCB and administered by each regional water quality control board. Construction activities that disturb one acre or more (whether a single project or part of a larger development) are required to obtain coverage under the state's General Permit for Dischargers of Storm Water Associated with Construction Activity. All dischargers are required to obtain coverage under the Construction General Permit. The activities covered under the Construction General Permit include clearing, grading, and other disturbances. The permit requires preparation of a Storm Water Pollution Prevention Plan (SWPPP) and implementation of Best Management Practices (BMPs) with a monitoring program. The project will require coverage under the Construction General Permit.

2.2 State

2.2.1 California Endangered Species Act

The State of California enacted similar laws to the FESA, the California Native Plant Protection Act (NPPA) in 1977, and the California Endangered Species Act (CESA) in 1984. The CESA expanded upon the original NPPA and enhanced legal protection for plants, but the NPPA remains part of the California Fish and Game Code. To align with the FESA, CESA created the categories of "threatened" and "endangered" species. It converted all "rare" animals into the CESA as threatened species but did not do so for rare plants. Thus, these laws provide the legal framework for protection of California-listed rare, threatened, and endangered plant and animal species. The California Department of Fish and Wildlife (CDFW) implements NPPA and CESA, and its Wildlife and Habitat Data Analysis Branch maintains the California Natural Diversity Database (CNDDB), a computerized inventory of information on the general location and status of California's rarest plants, animals, and natural communities. During the CEQA review process, the CDFW is given the opportunity to comment on the potential of the proposed Project to affect listed plants and animals.

2.2.2 Native Plant Protection Act

The NPPA of 1977 (California Fish and Game Code [CFGC], §§ 1900 through 1913) directed the CDFW to carry out the Legislature's intent to "preserve, protect and enhance rare and endangered plants in this State." The NPPA is administered by the CDFW, which has the authority to designate native plants as endangered or rare and to protect them from "take."

2.2.3 California Environmental Quality Act

CEQA was enacted in 1970 to provide for full disclosure of environmental impacts to the public before issuance of a permit by state and local public agencies. CEQA (Public Resources Code Sections 21000 et. seq.) requires public agencies to review activities which may affect the quality of the environment so that consideration is given to preventing damage to the environment. When a lead agency issues a permit for development that could affect the environment, it must disclose the potential environmental effects of the project. This is done with an Initial Study and Negative Declaration (or Mitigated Negative Declaration) or with an Environmental Impact Report. Certain classes of projects are exempt from detailed analysis under CEQA. CEQA Guidelines Section 15380 defines endangered, threatened, and rare species for purposes of CEQA and clarifies that CEQA review extends to other species that are not formally listed under the state or federal Endangered Species Acts but that meet specified criteria.

2.2.4 Fully Protected Species and Species of Special Concern

The classification of "fully protected" was the CDFW's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, amphibian and reptiles, birds, and mammals. Most of the species on these lists have subsequently been listed under CESA and/or FESA. The CFGC sections (fish at §5515, amphibian and reptiles at §5050, birds at §3511, and mammals at §4700) dealing with "fully protected" species states that these species "…may not be taken or possessed at any time and no provision of this code or any other law shall be construed to authorize the issuance of permits or licenses to take any fully protected species," (CDFW Fish and Game Commission 1998) although take may be authorized for necessary scientific research. This language makes the "fully protected" designation the strongest and most restrictive regarding the "take" of these species. In 2003, the code sections dealing with fully protected species were amended to allow the CDFW to authorize take resulting from recovery activities for state-listed species.

Species of special concern are broadly defined as animals not listed under the FESA or CESA, but which are nonetheless of concern to the CDFW because they are declining at a rate that could result in listing or historically occurred in low numbers and known threats to their persistence currently exist. This designation is intended to result in special consideration for these animals by the CDFW, land managers, consulting biologist, and others, and is intended to focus attention on the species to help avert the need for costly listing under FESA and CESA and cumbersome recovery efforts that might ultimately be required. This designation also is intended to stimulate collection of additional information on the biology, distribution, and status of poorly known at-risk species, and focus research and management attention on them. Although these species generally have no special legal status, they are given special consideration under the CEQA during project review.

2.2.5 California Fish and Wildlife Code Sections 3503 and 3513

According to Section 3503 of the California Fish and Wildlife Code, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird (except English sparrow (*Passer domesticus*) and European Starling (*Sturnus vulgaris*). Section 3503.5 specifically protects birds in the orders Falconiformes and Strigiformes (birds-of-prey). Section 3513 essentially overlaps with the MBTA, prohibiting the take or possession of any migratory non-game bird. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "take" by the CDFW.

2.2.6 Other Sensitive Plants – California Native Plant Society

The California Native Plant Society (CNPS), a non-profit plant conservation organization, publishes and maintains an Inventory of Rare and Endangered Vascular Plants of California in both hard copy and electronic version (http://www.cnps.org/cnps/rareplants/inventory/).
The Inventory assigns plants to the following categories:

- 1A Presumed extinct in California;
- 1B Rare, threatened, or endangered in California and elsewhere;
- 2 Rare, threatened, or endangered in California, but more common elsewhere;
- 3 Plants for which more information is needed – A review list; and
- 4 Plants of limited distribution – A watch list.

Additional endangerment codes are assigned to each taxon as follows:

- 1 Seriously endangered in California (over 80% of occurrences threatened/high degree of immediacy of threat).
- 2 Fairly endangered in California (20-80% occurrences threatened).
- 3 Not very endangered in California (<20% of occurrences threatened or no current threats known).

Plants on Lists 1A, 1B, and 2 of the CNPS Inventory consist of plants that may qualify for listing, and the CDFW, as well as other state agencies (e.g., California Department of Forestry and Fire Protection). As part of the CEQA process, such species should be fully considered, as they meet the definition of threatened or endangered under the NPPA and Sections 2062 and 2067 of the California Fish and Game Code. California Rare Plant Rank 3 and 4 species are considered to be plants about which more information is needed or are uncommon enough that their status should be regularly monitored. Such plants may be eligible or may become eligible for state listing, and CNPS and CDFW recommend that these species be evaluated for consideration during the preparation of CEQA documents (CNPS 2018, CDFW 2018b).

2.2.7 Sensitive Natural Communities

Sensitive natural communities are habitats that are either unique in constituent components, of relatively limited distribution in the region, or of particularly high wildlife value. These communities may or may not necessarily contain special-status species. Sensitive natural communities are usually identified in local or regional plans, policies or regulations, or by the CDFW or the USFWS. The CNDDB identifies a number of natural communities as rare, which are given the highest inventory priority (CDFW 2018a). Impacts to sensitive natural communities and habitats must be considered and evaluated under the CEQA (CCR: Title 14, Div. 6, Chap. 3, Appendix G)

2.2.8 Waters of the State

Section 401 of the Clean Water Act

The Regional Water Quality Control Board (RWQCB) regulates activities in “waters of the state”, including wetlands, through Section 401 of the CWA. “Waters of the state” are defined by the Porter-Cologne Control Act (see below) as “any surface water or groundwater, including saline waters, within the boundaries of the state.” While the USACE administers permitting programs that authorize impacts to “waters of the US”, any USACE permit authorized for a project would be invalid unless the RWQCB has issued a project-specific water quality certification or waiver of water quality. A water quality certification requires a finding by the

RWQCB that the activities permitted by the USACE will not violate water quality standards individually or cumulatively over the term of the issued USACE permit.

Porter-Cologne Water Quality Control Act
The Porter-Cologne Water Quality Act (Porter-Cologne Act) (California Water Code Section 13260) requires "any person discharging waste, or proposing to discharge waste, within any region that could affect the "waters of the state" to file a report of discharge" with the RWQCB through an application for waste discharge. The RWQCB protects all waters in its regulatory scope but has special responsibility for isolated wetlands and headwaters. These water bodies have high resource value, are vulnerable to filling, and may not be regulated by other programs (e.g. Section 404 of the CWA).

California Fish and Game Code Section 1600-1603
Under Section 1602 of California Fish and Game Code, CDFW has authority over any proposed activity that may substantially modify a river, stream, or lake. CDFW requires notification for any activity that will do one or more of the following: (1) substantially obstruct or divert the natural flow of a river, stream, or lake; (2) substantially change or use any material from the bed, channel, or bank of a river, stream, or lake; or (3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into a river, stream, or lake.

The notification requirement applies to any work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel. This includes ephemeral streams, desert washes, and watercourses with a subsurface flow. The CDFW typically considers a river, stream, or lake to include its riparian vegetation, but it may also extend to its floodplain. The term "stream", which includes creeks and rivers, is defined in the CCR as follows: "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life". This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation (14 CCR 1.72). In addition, the term stream can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife. Riparian is defined as "on, or pertaining to, the banks of a stream"; therefore, riparian vegetation is defined as, "vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself" (CDFW 1994).

If the CDFW determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement (LSAA) will be prepared, which includes reasonable conditions necessary to protect those resources. The applicant may then proceed with the activity in accordance with the final LSAA. Section 1602 does not extend to isolated wetlands and waters, such as small ponds not located on drainages.

2.3 Local

2.3.1 Western Riverside County Multiple Species Habitat Conservation Plan

In June of 2003, the Riverside County Board of Supervisors adopted a comprehensive MSHCP to provide a regional conservation solution to species and habitat issues that have historically threatened to stall infrastructure and land use development. The MSHCP is a multi-jurisdictional effort that encompasses approximately 1.26 million acres (1,966 square miles) and includes all unincorporated Riverside County land west of the crest of the San Jacinto Mountains to the Orange County line, as well as the jurisdictional areas of fourteen cities, including the City of Moreno Valley (Western Riverside County MSHCP 2004).

2.3.2 City of Moreno Valley General Plan

The Project Site occurs within the East March AFB Planning Area of the City of Moreno Valley General Plan. The Project Site is subject to the jurisdiction of the MSHCP and not the March Joint Powers Authority (MJPA) (Riverside County GIS 2019). The following measures have been developed to provide assurances that potential significant biological impacts associated with the implementation of the proposed General Plan Update will be mitigated. Subsequent project-level environmental review could identify more detailed site-specific mitigation measures.

B1 The City and all future public and private development projects within the City shall comply with the Long-term HCP for the Stephen's Kangaroo Rat.

B2 The City shall comply with the Western Riverside County Multi-Species Habitat Conservation Plan (MSHCP) and the associated state and federal permits.

B3 Where feasible, projects shall be designed to minimize impacts on sensitive habitat.

B4 Prior to physical disturbance of any natural drainage course or wetland determined to contain riparian vegetation or otherwise qualify as a "jurisdictional" wetland or non-wetland Water of the U.S., the applicant shall obtain a Streambed Alteration Agreement (SAA) and/or permit, or written waiver of the requirement for such an agreement or permit, from all resource agencies with jurisdiction over such areas (CDFW and United States Army Corps of Engineers [USACE]).

3.0 METHODS

This analysis of potential biological resources located on the Project Site includes a review of available background information in and around the vicinity of the Project Site and completion of two field surveys.

3.1 Literature Review

Prior to conducting field surveys, MIG biologists reviewed available background information pertaining to the biological resources on and in the vicinity of the project. Available literature and resource mapping reviewed included the occurrence records for special-status species and sensitive natural communities and numerous other information sources listed below:

- CDFW California Natural Communities Database (CNDDB) record search within the Sunnymead and surrounding eight USGS quadrangles (CDFW 2019a)
- CNPS Rare Plant Program, Inventory of Rare and Endangered Plants of California (CNPS 2019) records search within the Sunnymead and surrounding eight USGS quadrangles
- Soil Survey Staff, Natural Resource Conservation Service (NRCS), United States Department of Agricultural (USDA NRCS 2019)
- CDFW California Natural Community List (CDFW 2018a)
- CDFW State & Federally Listed Endangered & Threatened Animals of California (CDFW 2018b)
- CDFW State and Federally Listed Endangered, Threatened, and Rare Plants of California (CDFW 2018c)
- USFWS Information for Planning and Consultation (IPaC; USFWS 2019a)
- USFWS National Wetlands Inventory (USFWS 2019b)
- Western Riverside County MHSCP (2004)
- Western Riverside County MHSCP Burrowing Owl Survey Instructions (MSHCP 2006)

3.2 Field Surveys

A biological field survey was conducted by MIG biologist Jonathan Campbell, PhD on April 1, 2019. The field survey was conducted on foot to assess the existing conditions of the Project Site, including recording observed plant and wildlife species, characterizing and delineating the vegetation communities and associated wildlife habitats, and evaluating the potential for these habitats to support special-status species and sensitive communities. In addition, the field survey included a burrowing owl (*Athene cunicularia*) habitat assessment and focused burrow survey, per the Western Riverside County MHSCP Burrowing Owl Survey Instructions (MSHCP 2006)

3.2.1 Plant Communities

During the field survey, MIG biologists traversed the entire Project Site by foot and evaluated the suitability of onsite vegetation communities to support special status species documented in the vicinity of Project Site. Plant communities were preliminarily mapped with the aid of an aerial photograph using the MSHCP uncollapsed vegetation community classification system and Holland (1986)/CDFW (2010) vegetation community classification systems when appropriate. When a vegetation community could not be accurately characterized using this information, an updated community classification code was developed to more accurately represent onsite habitat types.

3.2.2 Sensitive Plant Species

Sensitive plant species include those (1) listed, proposed for listing, or candidates for listing as threatened or endangered by the USFWS under the FESA; (2) listed or proposed for listing as rare, threatened, or endangered by the CDFW under the CESA; (3) occurring on List 1A, List 1B, List 2, List 3, or List 4 of the CNPS Inventory; or (4) listed as an MSHCP covered species (MSHCP Section 9.2).

3.2.3 Sensitive Wildlife Species

Sensitive wildlife species include those (1) listed, proposed for listing or candidates for listing as threatened or endangered by the USFWS or NOAA Fisheries under FESA; (2) listed or proposed for listing as rare, threatened, endangered, fully protected, or species of special concern by the CDFW under CESA; and (3) birds protected by the USFWS under the MTBA and/or by the CDFW under Fish and Game Code Sections 3503 and 3513; or (4) listed as an MSHCP covered species (MSCHP Section 9.2).

In accordance with the MSHCP Burrowing Owl Survey Instructions (MSHCP 2006), the burrowing owl survey protocol consists of two steps: Step I – Habitat Assessment and Step II – Locating Burrows and Burrowing Owls. Step II is comprised of two parts, Part A: Focused Burrow Surveys and Part B: Focused Burrowing Owl Surveys. In addition to complying with MSHCP survey guidelines, the protocol was augmented to ensure compliance with the CDFW updated Staff Report on Burrowing Owl Mitigation breeding season survey guidelines (CDFW 2012). The Step I - Habitat Assessment surveys consisted of a walking survey to determine if suitable habitat is present onsite. Upon arrival at the Project Site, and prior to initiating the assessment survey, surveyors used binoculars to scan all suitable habitats on and adjacent to the property, including perch locations, to ascertain owl presence. All suitable areas of the Project Site were surveyed on foot by walking slowly and methodically while recording/mapping areas that may represent suitable owl habitat onsite. Primary indicators of suitable burrowing owl habitat in western Riverside County include, but are not limited to, native and non-native grassland, interstitial grassland within shrub lands, shrub lands with low density shrub cover, golf courses, drainage ditches, earthen berms, unpaved airfields, pastureland, dairies, fallow fields, and agricultural use areas. Burrowing owls typically use burrows made by fossorial mammals, such as ground squirrels (*Otospermophilus beecheyi*) or badgers (*Taxidea taxus*), but they often utilize man-made structures, such as earthen berms, cement culverts, cement, asphalt, rock, or wood debris piles, or openings beneath cement or asphalt pavement. Burrowing owls are often found within, under, or in close proximity to man-made structures.

3.2.3 Special-Status Species Habitat Assessment

The potential occurrence of special-status plant and animal species on the Project Site was initially evaluated by developing a list of special-status species that are known to or have the potential to occur in the vicinity of the Project Site based on a review of past studies including species-specific studies; search of current database records (e.g., CNDDB and CNPS Electronic Inventory records); and review of the USFWS list of federal endangered and threatened species (See Appendix C). The potential for occurrence of those species included on the list were then evaluated based on the habitat requirements of each species relative to the conditions observed during the field survey conducted by MIG. Plant species that have been documented to occur well outside of the elevation and geographic range of the Project Site were eliminated from further consideration. Each species was evaluated for its potential to occur on or in the immediate vicinity of the Project Site according to the following criteria.

> **Not Expected.** There is no suitable habitat present on the Project Site (i.e., habitats on the Project Site are clearly unsuitable for the species requirements [e.g., foraging, breeding, cover, substrate, elevation, hydrology, plant community, disturbance regime, etc.]). Additionally, there are no recent

known records of occurrence in the vicinity of the Project Site. The species has no potential of being found on the Project Site.

Low Potential. Limited suitable habitat is present on the Project Site (i.e., few of the habitat components meeting the species requirements are present and/or the majority of habitat on the Project Site is unsuitable or of very low quality). Additionally, there are no or few recent known records of occurrence in the vicinity of the Project Site. The species has a low probability of being found on the Project Site.

Moderate Potential. Suitable habitat is present on the Project Site (i.e., some of the habitat components meeting the species requirements are present and/or the majority of the habitat on the Project Site is suitable or of marginal quality). Additionally, there are few or many recent known records of occurrences in the vicinity of the Project Site. The species has a moderate probability of being found on the Project Site.

High Potential. Highly suitable habitat is present on the Project Site (i.e., all habitat components meeting the species requirements are present and/or all of the habitat on the Project Site is highly suitable or of high quality). Additionally, there are few or many recent known records of occurrences in the vicinity of the Project Site. This species has a high probability of being found on the Project Site.

Present. Species was observed on the Project Site (i.e., species was either observed during recent surveys or has a recorded observation in the CNDDB on the Project Site).

Appendices A and B present the list of special-status plants and wildlife (respectively) that have the potential to occur in the vicinity of the Project Site, their habitat requirements, and a ranking of potential for occurrence on the Project Site. Nomenclature used for plant names follows the Second Edition of The Jepson Manual (Baldwin et al. 2012). Nomenclature for wildlife follows CDFW's Complete List of Amphibian, Reptile, Bird, And Mammal Species in California (CDFW 2016) and any changes made to species nomenclature as published in scientific journals since the publication of CDFW's list.

3.2.4 MSHCP Riparian/Riverine Resources, Vernal Pools, and Jurisdictional Resources

This report provides a general review of topographic features and habitats observed onsite that could be subject to USACE jurisdiction pursuant to Section 404 of the Clean Water Act (CWA), Regional Water Quality Control Board (RWQCB) jurisdiction pursuant to Section 401 of the CWA, and CDFW jurisdiction pursuant to Division 2, Chapter 6, Section 1600 of the Fish and Game Code. A formal jurisdictional delineation was not undertaken as part of this effort.

Habitats were also assessed to determine if MSHCP riparian/riverine resources and/or vernal pools, pursuant to section 6.1.2 of the MSHCP (2004) are present onsite. Riparian/riverine resources are those lands that contain habitat dominated by trees, shrubs, persistent emergents, or emergent mosses and lichens, which occur close to or which depend upon soil moisture from a nearby fresh water source; or areas with fresh water flow during all or a portion of the year. Vernal pools are seasonal wetlands that occur in depression areas that have wetlands indicators of all three parameters (soils, vegetation, and hydrology) during the wetter portion of the growing season but normally lack wetlands indicators of hydrology and/or vegetation during the drier portion of the growing season (MSHCP 2004). In addition, stock ponds, ephemeral pools, and other areas of potential fairy shrimp habitat are noted, if applicable.

3.2.1 Wildlife Corridors and Urban/Wildland Interface

Providing functional habitat connectivity between natural areas is essential to sustaining healthy wildlife populations and allowing for the continued dispersal of native plant and animal species. The regional movement and migration of wildlife species has been substantially altered due to habitat fragmentation over the past century. This fragmentation is most commonly caused by development of open areas, which can result in large patches of land becoming inaccessible and forming a virtual barrier between undeveloped areas. Additional roads associated with development, although narrow, may result in barriers to smaller or less mobile wildlife species. Habitat fragmentation results in isolated islands of habitat, which affects wildlife behavior, foraging activity, reproductive patterns, immigration and emigration or dispersal capabilities, and survivability. Wildlife corridors can consist of a sequence of stepping-stones across the landscape (i.e., discontinuous areas of habitat such as isolated wetlands), continuous lineal strips of vegetation and habitat (e.g., riparian strips and ridge lines), or they may be parts of larger habitat areas selected for its known or likely importance to local wildlife.

4.0 EXISTING CONDITIONS

The following provides a description of the soils, vegetation communities, wildlife, and wildlife movement corridors present on the Project Site.

4.1 Physical Characteristics

The Project Site is flat with elevations ranging between 1,480 to 1,490 feet AMSL (Attachment E-2, *Project Site Map*). The Project Site is regularly disked, although ruderal vegetation was growing robustly during the April 1, 2019 field survey. Residential land uses border the Project Site on all sides. An unnamed, ephemeral drainage flows north to south along the western boundary of the Project Site.

4.2 Soils

The Web Soil Survey reports the following soils within the boundary of the 20.18-acre Project Site as shown on Attachment E-5, *Soils Map* (USDA NRCS 2019):

- Greenfield sandy loam, 0 to 2 percent slopes (GyA: 14.73 ac)
- Exeter sandy loam, deep, 0 to 2 percent slopes (EpA: 4.39 ac)
- Exeter sandy loam, 0 to 2 percent slopes (EnA: 0.68 ac)
- Exeter very fine sandy loam, 0 to 5 percent slopes (EwB: 0.38 ac)

4.3 Plant Communities & Associated Wildlife Habitats

As described in Section 3 (Methods), onsite vegetation communities were mapped in the field onto a color aerial photograph (Attachment E-6, *Biological Resources Map*) and were evaluated to determine if they are considered sensitive under federal, state, or local regulations or policies. Biological communities were classified as sensitive or non-sensitive as defined by CEQA and other applicable laws and regulations.

The 20.18-acre Project Site is dominated by ruderal vegetation. A single exotic tree is present in the northeast portion of the Project Site, while several non-native trees overhang the southern boundary. Vegetation communities observed onsite during the April 1, 2019 field survey are described in detail below.

Ruderal (19.03 acres)

The Project Site is regularly disked and is currently dominated by ruderal species that have arisen following the recent winter and spring rains. The Project Site is currently dominated by non-native annual herbs and grasses including foxtail barley (*Hordeum murinium*), wild oats (*Avena fatua*), red brome (*Bromus madritensis* ssp. *rubens*), soft chess (*Bromus hordeaceus*), shepard's purse (*Capsella bursa-pastoris*), wild radish (*Raphanus sativus*), stinknet *(Oncosiphon piluliferum*), London rocket (*Sisymbrium irio*), big heron bill (*Erodium botrys*), coastal heron's bill (*Erodium cicutarium*), and cheeseweed (*Malva parviflora*), (Attachment E-7, *Current Project Site Photographs*). Native annual herbs found onsite include common fiddleneck (*Amsinckia intermedia*), slender goldfields (*Lasthenia gracilis*), and miniature lupine (*Lupinus bicolor*).

Developed (1.07 acres)

A sidewalk is present along the eastern boundary of the Project Site. Developed areas are generally devoid of vegetation.

Exotic Tree (0.07 acres)
A Peruvian pepper tree (*Schinus molle*) is the only free-standing tree located onsite and is located in the northeast corner of the Project Site. A Peruvian pepper tree, eucalyptus (*Eucalyptus* sp.), and queen palm (*Syagrus romanzoffiana*) are located just south of the Project Site in neighboring residential properties. These trees overhang onto the Project Site (Attachment E-7, *Current Project Site Photographs*).

Black Willow (0.01 ac)
A single black willow (*Salix goodingii*) tree is found on the western boundary of the Project Site, along Tarano Lane.

4.4 Wildlife

Wildlife species that were observed on site during the April 1, 2019 biological field survey include: red-tailed hawk (*Buteo jamaicensis),* European starling (*Sturnus vulgaris*), black phoebe (*Sayornis nigricans),* Anna's hummingbird (*Calypte anna*), house finch (*Haemorhous mexicanus*), northern mockingbird (*Mimus polyglottus*), common raven (*Corvus corvax*), American crow (*Corvus brachyrhynchos*), house sparrow (*Passer domesticus*), mourning dove (*Zenaida macroura*), and western kingbird (*Tyrannus verticalis*).

4.5 Sensitive Plant Communities

No sensitive plant communities were observed on the Project Site.

4.6 Special-Status Plants

No sensitive plant species were observed on the Project Site. In addition, no sensitive plant species have been documented in the vicinity of the Project Site or have the potential to occur on the Project Site due to the absence of essential habitat requirements for the species, the absence of known occurrences in the vicinity of the Project Site, and/or the Project Site is outside the species known range of distribution. The MSHCP has determined that any other sensitive species potentially occurring onsite have been adequately covered (MSHCP Table 2-2 Species Considered for Conservation Under the MSHCP Since 1999, 2004).

4.7 Special-Status Wildlife

Although suitable burrowing owl habitat is present onsite in the ruderal vegetation community, burrowing owls are not expected to occur in or around the Project Site due to the lack of suitable burrows (Attachment E-9, *Burrowing Owl Survey Map*). Therefore, Step II - Part B: Focused Burrowing Owl Surveys are not required.

No other special-status wildlife species were observed on the Project Site or have the potential to occur onsite due to the absence of suitable habitat.

Nesting Birds
The Federal MBTA prohibits killing any migratory bird or disturbing or destroying an active nest of a migratory bird; this list contains hundreds of birds, including many of which are considered common or even nuisance or non-native species. Nesting birds are also protected under California Fish and Game Code 3503, 3503.5, and 3512, which prohibits the take of active bird nests. Trees on and around the Project Site provide potentially suitable nesting habitat for songbirds. Ground-nesting birds may be present throughout the Project Site in ruderal habitats. Although no active nests were observed during the field surveys, there is potential for ground- and tree-nesting birds to establish nests on the Project Site prior to initiation of

project construction. These species are protected under the MBTA and would be protected under the California Fish and Game Code when actively nesting.

4.8 Wildlife Movement Corridors

Providing functional habitat connectivity between natural areas is essential to sustaining healthy wildlife populations and allowing for the continued dispersal of native plant and animal species. The regional movement and migration of wildlife species has been substantially altered due to habitat fragmentation over the past century. This fragmentation is most commonly caused by development of open areas, which can result in large patches of land becoming inaccessible and forming a virtual barrier between undeveloped areas. Additional roads associated with development, although narrow, may result in barriers to smaller or less mobile wildlife species. Habitat fragmentation results in isolated islands of habitat, which affects wildlife behavior, foraging activity, reproductive patterns, immigration and emigration or dispersal capabilities, and survivability. Wildlife corridors can consist of a sequence of stepping-stones across the landscape (i.e., discontinuous areas of habitat such as isolated wetlands), continuous lineal strips of vegetation and habitat (e.g., riparian strips and ridge lines), or they may be parts of larger habitat areas selected for its known or likely importance to local wildlife. The Project Site does not act as a wildlife movement corridor due to the regular onsite disking and dense residential land uses surrounding the property.

4.9 MSHCP Riparian/Riverine, Vernal Pools, and Jurisdictional Resources

An unnamed ephemeral drainage (D1) flows north to south along the western Project Site boundary This drainage represents MSHCP riparian (0.010 ac) and riverine (0.108 ac) resources pursuant to Section 6.1.2 of the MSHCP (2004) (MIG Jurisdictional Delineation Report 2020). No vernal pools were observed on the Project Site.

5.0 MSHCP CONSISTENCY ANALYSIS

The purpose of this analysis is to document existing biological resources, identify general vegetation types, and assess the potential biological and regulatory constraints and potential impacts associated with the proposed development within the Project Site as outlined by the Western Riverside County MSHCP. The following sections summarize the Project Site's relationship to MSHCP compliance guidelines.

5.1 Criteria Areas

The Project Site is located within the Western Riverside County MSHCP Reche Canyon/Badlands Area Plan. The Project Site is not located within an MSHCP criteria area or area plan subunit.

5.2 Narrow Endemic Plant Species Survey Area

The Project Site does not occur within a predetermined Survey Area for narrow endemic plant species. No surveys are required.

5.3 Criteria Area Species Survey Area

The Project Site does not occur within a predetermined Survey Area for criteria area plant species. No surveys are required.

5.4 Amphibian Species Survey Area

The Project Site does not occur within a predetermined Survey Area for amphibian species. No surveys are required.

5.5 Mammal Species Survey Area

The Project Site does not occur within a predetermined Survey Area for mammal species. No surveys are required.

5.6 Burrowing Owl Survey Area

The Project Site occurs within a predetermined Survey Area for the burrowing owl. Although suitable burrowing owl habitat is present onsite in the ruderal vegetation communities, burrowing owls are not expected to occur in or around the Project Site due to the lack of suitable burrows (Attachment E-9, *Burrowing Owl Survey Map*). Regardless, a 30-day pre-construction survey will be required prior to the initiation of construction to ensure protection of this species and compliance with the conservation goals as outlined in the MSHCP (MSHCP 2004: Section 7.2).

5.7 MSHCP Riparian/Riverine Resources and Vernal Pools

The Project Site contains both MSHCP riparian (0.010 ac) and riverine (0.108 ac) resources pursuant to Section 6.1.2 of the MSHCP (2004) (Attachment E-6, *Biological Resources Map* and Attachment E-8*, Current Project Site Photographs,* MIG Jurisdictional Delineation Report 2020). No vernal pool resources were observed on the Project Site.

5.8 Urban/Wildlands Interface

The Project Site does not occur within or adjacent to an MSHCP Core, Linkage, Constrained Linkage, or Non-Contiguous Habitat Block. Therefore, an Urban/Wildland Interface analysis pursuant to Section 6.1.4 of the MSHCP is not required.

5.9 Stephen's Kangaroo Rat Fee Area

The Project Site is located within the MSHCP Stephens' Kangaroo Rat (SKR: *Dipodomys stephensi*) Habitat Conservation Plan (HCP) Fee Area which is administered by the Riverside County Habitat Conservation Agency (RCHCA). The SKR Fee is established at $500 per acre.

6.0 ENVIRONMENTAL IMPACTS

This section describes potential impacts to sensitive biological resources—including special-status plants and animals, and aquatic resources that may occur in the Project Site. Each impact discussion includes mitigation measures that would be implemented during the project to avoid and/or reduce the potential for and/or level of impacts to each resource. With the implementation of the recommended mitigation measures, all impacts to biological resources are anticipated to be reduced to less than significant pursuant to CEQA.

6.1 Thresholds of Significance

This section describes potential impacts to biological resources that may occur as a result of the construction of the proposed project. CEQA Guidelines provide guidance in evaluating project impacts and determining whether impacts may be significant. CEQA defines "significant effect on the environment" as "a substantial adverse change in the physical conditions which exist in the area affected by the proposed project." In accordance with Appendix G of the CEQA Guidelines, a project could have a significant environmental impact on biological resources if it would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS
- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the CWA (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrologic interruption, or other means
- Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance
- Conflict with the provisions of an adopted Habitat Conservation Plan (HCP), Natural Community Conservation Plant (NCCP), or other approved local, regional, or state HCP

6.2 Impacts and Mitigation Measures

Consistent with the requirements of CEQA and local regulations, the significance of potential impacts is evaluated through the application of the significance criteria described above. The objective of the biological resources analysis is to identify potential adverse effects and/or significant impacts on biological resources. Avoidance is often the preferred approach for the management of biological resources; however, it is not always possible to completely avoid impacts. Mitigation measures to avoid or minimize impacts are identified, as appropriate, including procedures to be followed if significant biological resources are identified prior to the initiation of construction.

The following discussion provides an overview of the direct and indirect impacts to special status species, sensitive habitats, and other resources that may occur within the Project Site.

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations or by the CDFW or USFWS;

6.2.1 Special-Status Plants

No special-status plant species were detected on the Project Site during the April 1, 2019 field survey. None of the sixty-four (64) special-status plant species found in the vicinity of the Project Site (refer to Appendix A) are expected due to a lack of suitable habitat.

6.2.2 Special-Status Wildlife

The MSHCP has determined that all of the sensitive species potentially occurring onsite have been adequately covered (MSHCP Table 2-2 Species Considered for Conservation Under the MSHCP Since 1999, 2004). However, additional surveys may be required for criteria area species and specific wildlife species if suitable habitat is documented onsite and/or if the property is located within a predetermined "Survey Area" (MSHCP 2004). No special-status wildlife species were detected on the Project Site during the April 1, 2019 field survey. Of the 62 special-status wildlife species found in the vicinity of the Project Site (refer to Appendix B), suitable habitat is only present for burrowing owl.

Impact BIO-1: Burrowing Owl

A burrowing owl habitat assessment and focused burrow survey was performed during the April 1, 2019 field survey, per the Western Riverside County MHSCP Burrowing Owl Survey Instructions (MSHCP 2006). During this survey, it was determined that no suitable burrowing owl burrows were present onsite. Implementation of Mitigation Measure BIO-1 would be required to reduce potential impacts to burrowing owl to a less than significant level.

Impact BIO-2: Nesting Birds

Vegetation communities on the Project Site have the potential to provide nesting habitat for bird species protected by the MBTA and CFGC Sections 3503 and 3513. Although no active nests were observed during the April 1, 2109 field survey, there is potential for ground- and tree-nesting birds to establish nests on the Project Site prior to project construction. Destruction of, or disturbance to, an active nest is prohibited. Construction activities including site mobilization, tree removal other vegetation clearing activities, grubbing, grading, and noise/vibration from the operation of heavy equipment also has the potential to result in significant direct (i.e., death or physical harm) and/or indirect (i.e., nest abandonment) impacts to nesting birds. Implementation of Mitigation Measure BIO-2 would be required to reduce potential impacts to nesting birds to a less than significant level.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS;

Ruderal vegetation communities, exotic trees, and developed areas are present throughout the entirety of the Project Site. No sensitive natural vegetation communities or riparian habitat are present on the Project Site. Therefore, no impacts to riparian habitat or other sensitive natural vegetation communities are anticipated.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

Impact BIO-3: Regulatory Agency Permits
A jurisdictional delineation was performed on the Project Site on June 13, 2019. An unnamed ephemeral drainage (D1) flowing north to south along the western Project Site boundary represents an aquatic feature potentially subject to the jurisdiction of the USACE, RWQCB, and/or CDFW (Attachment E-6, *Biological Resources Map* and Attachment E-8, *Current Project Site Photographs)*. Implementation of Mitigation Measure BIO-3 would be required to reduce impacts to aquatic resources to a less than significant level.

d) Interfere substantially with the movement of any native resident or migratory fish and wildlife species or with established native resident or migratory wildlife corridors, or impede the use of a native wildlife nursery site;

The Project Site is surrounded on all sides by residential development and is not located within an established wildlife movement corridor. The Project Site is not located within a known wildlife nursery site. Thus, no impacts to wildlife species, migratory corridors, or native wildlife nursery sites are anticipated.

e) Conflict with any local polices or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or

The Project will not conflict with local policies or ordinances protecting biological resources. No impacts are anticipated.

f) Conflict with the provisions of an adopted HCP, NCCP, or other approved local, regional, or state habitat conservation plan.

The Project Site is located within the Western Riverside County MSHCP Reche Canyon/Badlands Area Plan. The Project Site is not located within an MSHCP Criteria Area or Area Plan subunit. The Project Site does not occur within a predetermined Survey Area for narrow endemic plant species, criteria area plant species, amphibian species, or mammal species. No surveys are required for these species.

The Project Site occurs within a predetermined Survey Area for the burrowing owl. Although suitable burrowing owl habitat is present onsite in the ruderal vegetation communities, burrowing owls are not expected to occur in or around the Project Site due to the lack of suitable burrows.

The Project Site does not occur within or adjacent to an MSHCP Core, Linkage, Constrained Linkage, or Non-Contiguous Habitat Block. Therefore, an Urban/Wildland Interface analysis pursuant to Section 6.1.4 of the MSHCP is not required.

Impact BIO-4: MSHCP Riparian/Riverine Resources
The onsite drainage contains both MSHCP riparian (0.010 ac) and riverine (0.108 ac) resources pursuant to Section 6.1.2 of the MSHCP (2004) (Attachment E-6, *Biological Resources Map* and Attachment E-8, *Current Project Site Photographs,* MIG Jurisdiction Delineation Report 2020*)*. No vernal pool resources were observed on the Project Site. Implementation of Mitigation Measure BIO-4 would be required to reduce impacts to MSHCP riparian/riverine resources to a less than significant level.

Impact BIO-5: Stephen's Kangaroo Rat Fee Area

The Project Site is located within the Stephens' kangaroo rat (SKR) HCP Fee Area which is administered by the RCHCA. Implementation of Mitigation Measure BIO-5 would be required to reduce impacts to Stephen's kangaroo rat to a less than significant level.

6.2.3 Mitigation Measures

BIO-1 Pre-Construction Burrowing Owl Survey

All project sites containing suitable burrowing owl habitat or burrows (based on Step I - Habitat Assessment) whether owls were found or not, require pre-construction surveys that shall be conducted within thirty (30) days prior to ground disturbance to avoid direct take of burrowing owls. Pre-construction surveys will follow the guidance outlined in Burrowing Owl Survey Instructions for the Western Riverside MSHCP (2006).

BIO-2: Pre-Construction Nesting Bird Survey

If vegetation removal is scheduled during the nesting season (typically February 1 to September 1), then a focused survey for active nests shall be conducted by a qualified biologist (as determined by a combination of academic training and professional experience in biological sciences and related resource management activities) no more than five (5) days prior to the beginning of project-related activities (including but not limited to equipment mobilization and staging, clearing, grubbing, vegetation removal, and grading). Surveys shall be conducted in proposed work areas, staging and storage areas, and soil, equipment, and material stockpile areas. For passerines and small raptors, surveys shall be conducted within a 250-foot radius surrounding the work area (in areas where access is feasible). For larger raptors, such as those from the genus *Buteo*, the survey area shall encompass a 500-foot radius. Surveys shall be conducted during weather conditions suited to maximize the observation of possible nests and shall concentrate on areas of suitable habitat. If a lapse in project-related work of five (5) days or longer occurs, an additional nest survey shall be required before work can be reinitiated. If nests are encountered during any preconstruction survey, a qualified biologist shall determine if it may be feasible for construction to continue as planned without impacting the success of the nest, depending on conditions specific to each nest and the relative location and rate of construction activities. If the qualified biologist determines construction activities have potential to adversely affect a nest, the biologist shall immediately inform the construction manager to halt construction activities within minimum exclusion buffer of 50 feet for songbird nests, and 200 to 500 feet for raptor nests, depending on species and location. Active nest(s) within the Project Site shall be monitored by a qualified biologist during construction if work is occurring directly adjacent to the established no-work buffer. Construction activities within the no-work buffer may proceed after a qualified biologist determines the nest is no longer active due to natural causes (e.g. young have fledged, predation, or other non-anthropogenic nest failure).

BIO-3 Regulatory Agency Permits

Based on the result of regulatory agency review, appropriate permits will be obtained prior to impacting the onsite drainage feature (D1). The discharge of dredged or fill material (temporarily or permanently) into waters of the US may require prior authorization from the USACE pursuant to Section 404 of the CWA. In addition, a Section 401 Water Quality Certification, or waiver thereof, may also be required from the RWQCB. Activities that usually involve a regulated discharge of dredged or fill materials include (but are not limited to) grading, placing of riprap for erosion control, pouring concrete, laying sod, preparing soil for planting (e.g., turning soil over, adding soil amendments), stockpiling excavated material, mechanized removal of vegetation, and driving of piles for certain types of structures. Unlike the USACE, CDFW regulates not only the discharge of dredged or fill material into streambeds, but all activities that alter streams and lakes and their associated riparian vegetation habitats. A CDFW Section 1602 Lake and Streambed Alteration Agreement (LSAA) may be required for all activities resulting in impacts to streambeds and their associated riparian habitats

BIO-4 MSHCP Riparian/Riverine Resources

All onsite MSHCP riparian (0.010 ac) and riverine (0.108 ac) resources will be impacted as a result of project implementation. In order to mitigate to an equivalent or superior level, 0.118 acres of re-establishment credits will be purchased at the Riverpark Mitigation Bank (1:1 mitigation ratio). Due to the comparatively low biological value of the current onsite drainage (overall CRAM score = 41), this purchase will result in the re-establishment of biologically equivalent or superior MSHCP riparian/riverine resources.

BIO-5 SKR Fee Area

The Project Site is located within the Stephens' kangaroo rat (SKR) HCP Fee Area which is administered by the RCHCA. The SKR Fee is established at $500 per acre.

7.0 References

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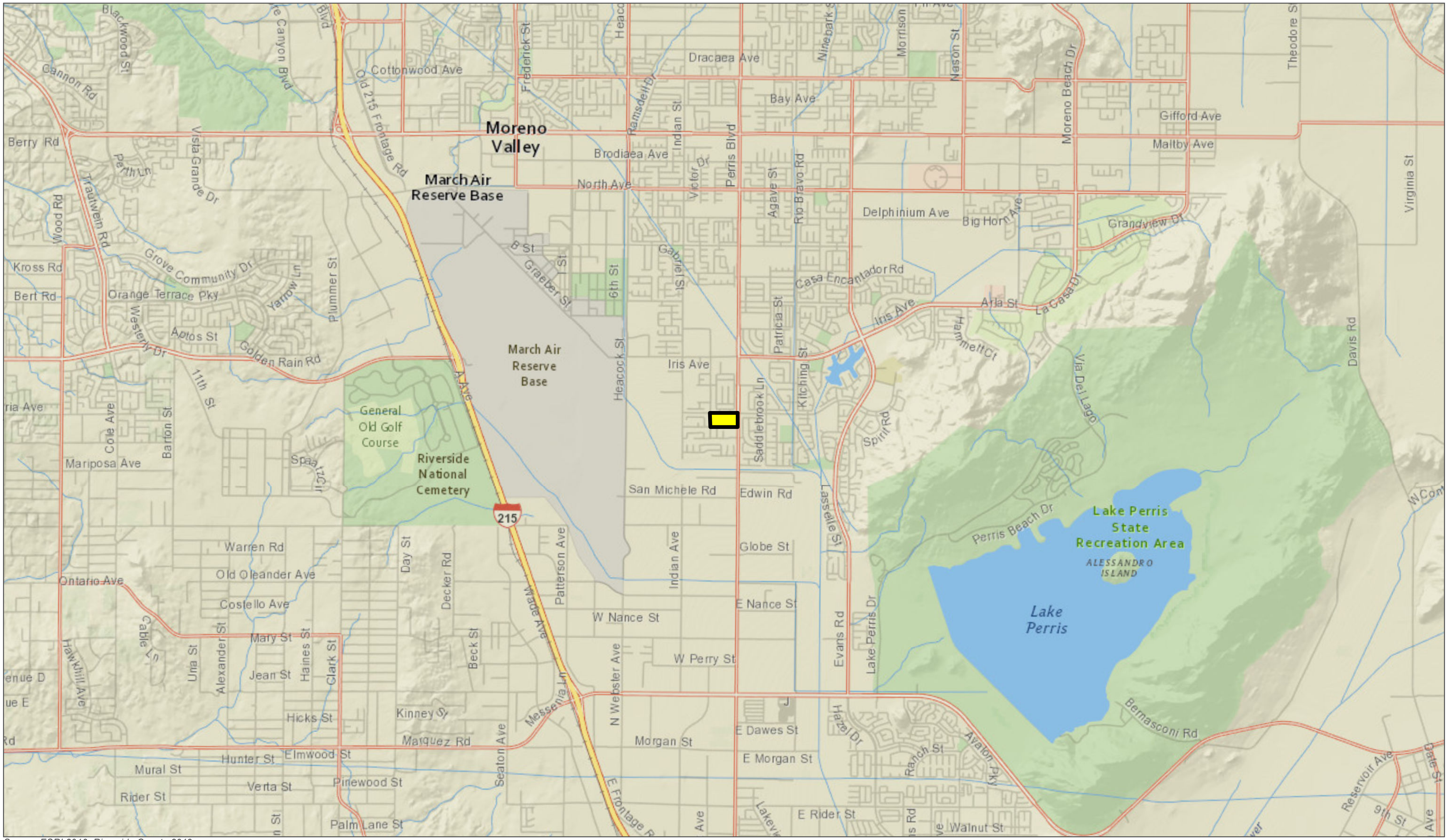
ATTACHMENTS



Source: ESRI 2019, Riverside County 2019

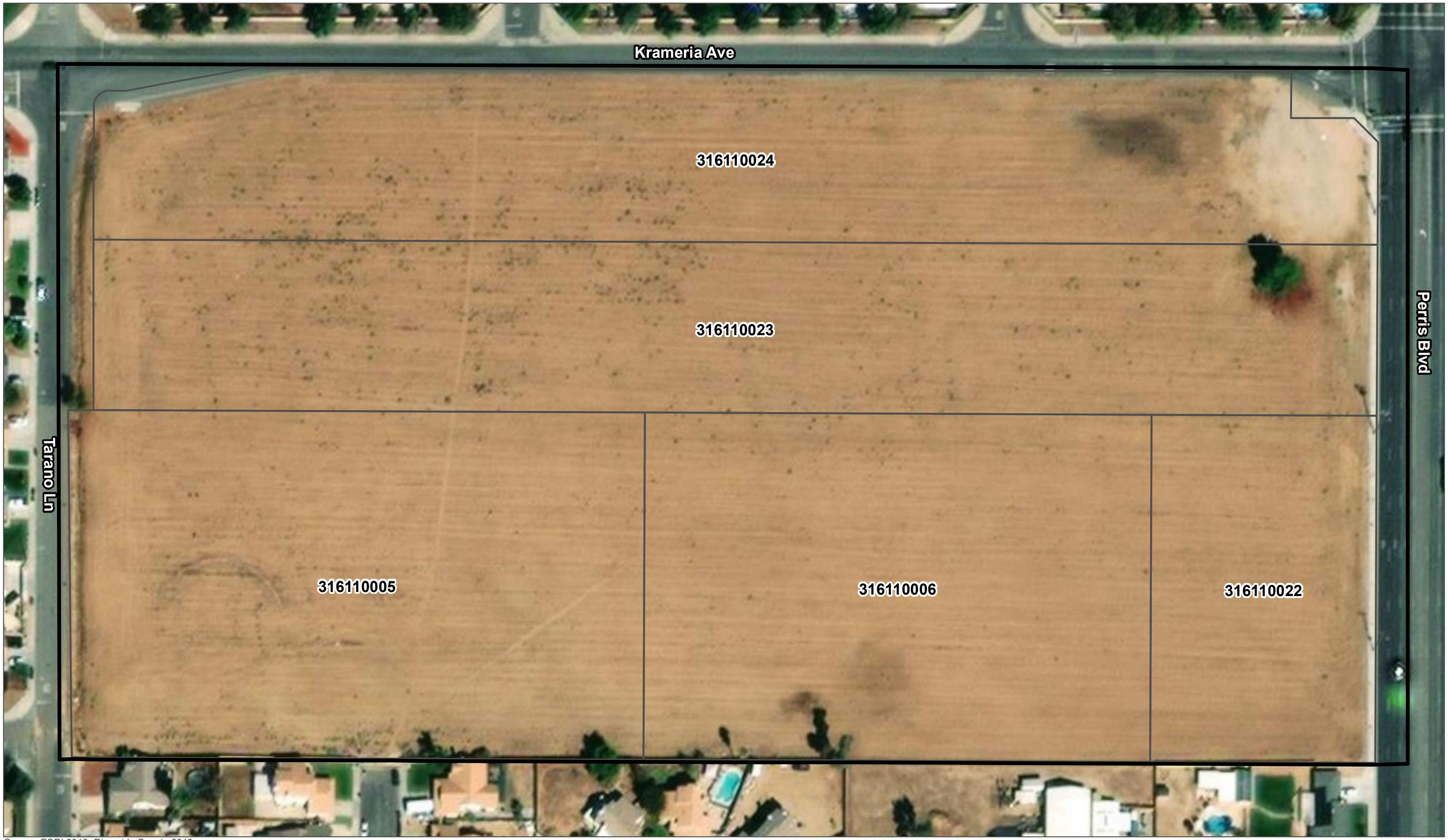
Project Site Boundary (20.18 ac)

Miles
0 0.5 1 2

N

Attachment E-1 Vicinity Map

Krameria Project Site, Moreno Valley, CA



Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)

Parcels

Feet
0
100
200
400

MIG

Attachment E-2 Project Site Map

Krameria Project Site, Moreno Valley, CA

Attachment E-3

BIOLOGICAL REPORT SUMMARY SHEET

(Submit two copies to the County)

Applicant Name: PI Properties no. 67, LL
Assessor's Parcel Number (APN): 316-110-005, -006, -022, -023, and -024
APN cont. :
Site Location: Section: 30 **Township:** 3S **Range:** 3W
Site Address: SE Corner of Krameria Avenue and Perris Boulevard, Moreno Valley, CA
Related Case Number(s): **PDB Number:**

CHECK SPECIES SURVEYED FOR	SPECIES or ENVIRONMENTAL ISSUE OF CONCERN	(Circle Yes, No or N/A regarding species findings on the referenced site)		
	Arroyo Southwestern Toad	Yes	No	N/A
X	Blueline Stream(s)	Yes	No	N/A
	Coachella Valley Fringed-Toed Lizard	Yes	No	N/A
	Coastal California Gnatcatcher	Yes	No	N/A
X	Coastal Sage Scrub	Yes	No	N/A
	Delhi Sands Flower-Loving Fly	Yes	No	N/A
	Desert Pupfish	Yes	No	N/A
	Desert Slender Salamander	Yes	No	N/A
	Desert Tortoise	Yes	No	N/A
	Flat-Tailed Horned Lizard	Yes	No	N/A
	Least Bell's Vireo	Yes	No	N/A
X	Oak Woodlands	Yes	No	N/A
	Quino Checkerspot Butterfly	Yes	No	N/A
	Riverside Fairy Shrimp	Yes	No	N/A
	Santa Ana River Woolystar	Yes	No	N/A
	San Bernardino Kangaroo Rat	Yes	No	N/A
	Slender Horned Spineflower	Yes	No	N/A
	Stephen's Kangaroo Rat	Yes	No	N/A
	Vernal Pools	Yes	No	N/A
X	Wetlands	Yes	No	N/A

CHECK SPECIES SURVEYED FOR	SPECIES or ENVIRONMENTAL ISSUE OF CONCERN	(Circle Yes, No or N/A regarding species findings on the referenced site)		
X	Burrowing Owl	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A
	Other	Yes	No	N/A

Species of concern shall be any unique, rare, endangered, or threatened species. It shall include species used to delineate wetlands and riparian corridors. It shall also include any hosts, perching, or food plants used by any animals listed as rare, endangered, threatened or candidate species by either State, or Federal regulations, or for Riverside County as listed by the California Department of Fish and Game Natural Diversity Data Base (NDDB).

I declare under penalty of perjury that the information provided on this summary sheet is in accordance with the information provided in the biological report.

Jonathan E. Campbell MIG, Inc. September 10, 2019

Signature and Company Name Report Date

10(a) Permit Number (if applicable) Permit Expiration Date

County Use Only

Received by:____Date:__________

PD-B#____

LEVEL OF SIGNIFICANCE CHECKLIST
For Biological Resources
(Submit Two Copies)

Case Number: ___________**Lot/Parcel No.** 316-110-005, -006, -022, -023, and -024 **EA Number**_____________

Wildlife & Vegetation

Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less than Significant Impact	No Impact

(Check the level of impact the applies to the following questions)

a) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state conservation plan?
Less than significant with Mitigation Incorporated

b) Have a substantial adverse effect, either directly or through habitat modifications, on any endangered, or threatened species, as listed in Title 14 of the California Code of Regulations (Sections 670.2 or 670.5) or in Title 50, Code of Federal Regulations (Sections 17.11 or 17.12)?
Less than significant with Mitigation Incorporated

c) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U. S. Wildlife Service?
Less than significant with Mitigation Incorporated

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident migratory wildlife corridors, or impede the use of native wildlife nursery sites?
No Impact

e) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U. S. Fish and Wildlife Service?
No Impact

f) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?
Less than significant with Mitigation Incorporated

g) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?
No Impact

Source: CGP Fig. VI.36-VI.40

Findings of Fact:

The 20.18 ac Project Site is located within the Western Riverside County MSHCP Reche Canyon/Badlands Area Plan. The Project Site is not located within an MSHCP Criteria Area or Area Plan subunit. The Project Site does not occur within a predetermined Survey Area for narrow endemic plant species, criteria area plant species, amphibian species, or mammal species. The Project Site occurs within a pretermined survey area for burrowing owl. A focused burrowing owl survey was undertaken on April 1, 2019 and no suitable burrows were identified onsite. At a minimum, a 14-day preconstruction burrowing owl survey and a 5-day preconstruction nesting bird survey will be required immediately prior to the initation of construction. The Project Site is located within the Stephens' Kangaroo Rat (SKR) Habitat Conservation Plan (HCP) Fee Area which is administered by the Riverside County Habitat Conservation Agency (RCHCA). The Project Site does not occur within or adjacent to an MSHCP Core, Linkage, or Non-Contiguous Habitat Block. An onsite drainage (D1, 0.118 ac) is subject to the potential jurisdiction of the USACE, CDFW, and RWQCB, and Riverside County RCA (Section 6.1.2 riparian and riverine resource). No MSHCP riparian or vernal pool resources were documented onsite.

Proposed Mitigation:

To Be Determined

Monitoring Recommended:

To Be Determined

Source: ESRI 2019, Riverside County 2019, USDA NRCS 2019

Project Site Boundary (20.18 ac)

Soils

Greenfield sandy loam, 0 to 2 percent slopes (GyA: 14.73 ac)

Exeter sandy loam, deep, 0 to 2 percent slopes (EpA: 4.39 ac)

Exeter sandy loam, 0 to 2 percent slopes (EnA: 0.68 ac)

Exeter very fine sandy loam, 0 to 5 percent slopes (EwB: 0.38 ac)

0 100 200 400 Feet

MIG

Atachment E-5 Soil Map

Krameria Project Site, Moreno Valley, CA

Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)
Ephemeral Drainage
Drainage Outlet
Drainage Inlet

Vegetation Community
Ruderal (19.03 ac)
Developed (1.07 ac)
Exotic Tree (0.07 ac)
Black Willow (0.01 ac)

0 100 200 400 Feet

N

M I G

Attachment E-6 Biological Resources Map

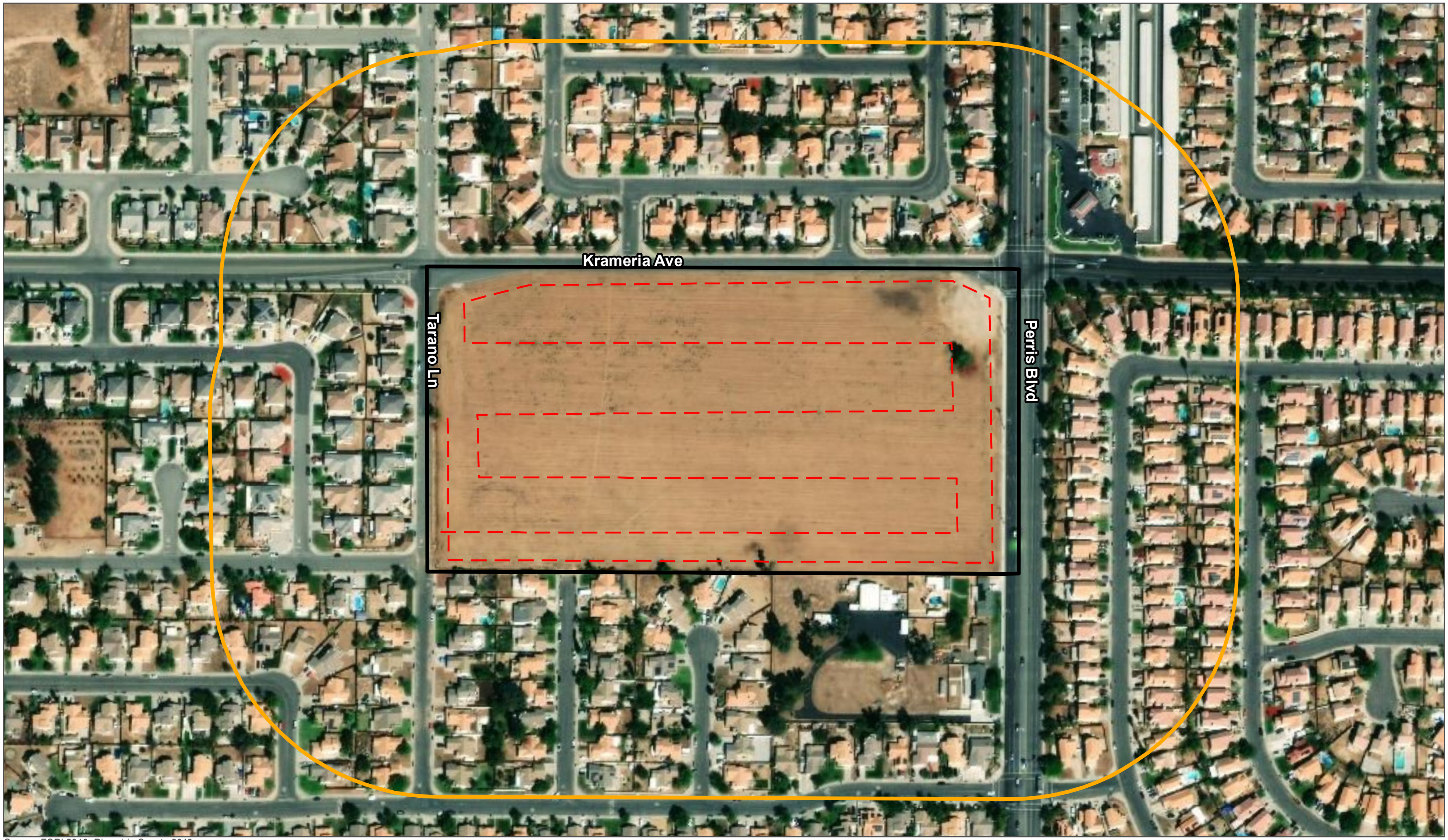
Krameria Project Site, Moreno Valley, CA

PHOTOGRAPH 1- The Project Site is dominated by non-native grasses, herbs, and other ruderal species .

PHOTOGRAPH 2 - A single Peruvian pepper tree is located in the northeast portion of the Project Site.

PHOTOGRAPH 3 - An unnamed drainage flows north to south along the western perimeter of the Project Site.

PHOTOGRAPH 4 - The onsite, ephemeral drainage feature is fed from a storm drain outlet at the northwest corner of the Project Site and flows south.



Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)
Project Site Boundary: 500 ft Buffer
Burrowing Owl Survey Transect

Feet
0 250 500 1,000

N

MIG

Attachment E-9 Burrowing Owl Survey Map

Krameria Project Site, Moreno Valley, CA

APPENDICES

Appendix A
Special-Status Plant Species with Potential to Occur on the Project Site

Appendix A: Special Status Plant Species With Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
DICOTS						
Chaparral sand-verbena *Abronia villosa var. aurita*	--	--	1B.1/--	Occurs in chaparral, coastal scrub, desert dunes, and sandy areas.	91-650 m; Annual herb; Blooms January to September	**Not Expected.** The Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 4.9 miles southeast of the Project Site.
Marsh sandwort *Arenaria paludicola*	FE	SE	1B.1/--	Occurs in freshwater marsh, marsh, swamp, and wetland. Found growing up through dense mats of *Typha, Juncus,* and *Scirpus* in freshwater marsh habitat.	10-170 m; Perennial herb; Blooms from May to August	**Not Expected.** The Project Site does not contain any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 7.9 miles northwest of the Project Site.
San Diego sagewort *Artemisia palmeri*	--	--	4.2/--	Occurs in chaparral, coastal scrub, riparian forests, riparian scrub, and riparian woodland. Occurs in drainages and riparian areas in sandy soil within chaparral and other habitats.	15-915 m; Perennial deciduous shrub; Blooms from May to September.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Horn's milk-vetch *Astragalus hornii var. hornii*	--	--	1B.1/--	Found in meadows, seeps, playas, lake margins, and alkaline sites.	90-890 m; Annual herb; Blooms May to October	**Not Expected.** The Project Site does not contain any of the aquatic-adjacent habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 15.1 miles north of the Project Site.
Jaeger's milk-vetch *Astragalus pachypus var. jaegeri*	--	--	1B.1/COV	Occurs in coastal scrub, chaparral, valley and foothill grassland, cismontane woodlands. Found on dry ridges and valleys and open sandy slopes; often in grassland and oak-chaparral.	460-1,060 m; Shrub; Blooms December to June	**Not Expected.** The Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 12.5 miles east of the Project Site.
San Jacinto Valley crownscale *Atriplex coronata var. notatior*	FE	--	1B.1/COV	Occurs in playas, valley and foothill grassland, vernal pools, and alkaline areas in the San Jacinto River Valley.	370-480 m; Annual herb; Blooms April to August	**Not Expected.** The Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 5.3 miles southeast of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
south coast saltscale *Atriplex pacifica*	--	--	1B.2/--	Occurs in coastal scrub, coastal bluff scrub, playas, and coastal dunes; within alkali soils.	1-400 m; Annual herb; Bloom March to October.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
Parish's brittlescale *Atriplex parishii*	--	--	1B.1/COV	Occurs in vernal pools, chenopod scrub, playas. Usually on drying alkali flats with fine soils.	30-500 m; Annual herb; Blooms June to October	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 5.7 miles southeast of the Project Site.
Davidson's saltscale *Atriplex serenana var. davidsonii*	--	--	1B.2/COV	Coastal bluff scrub, coastal scrub. Alkaline soil.	0-470 m; Annual herb; Blooms April to October	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 5.9 miles southeast of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Nevin's barberry *Berberis nevinii*	FE	SE	1B.1/COV	Occurs in chaparral, cismontane woodland, coastal scrub, riparian scrub and on steep, north-facing slopes or in low grade sandy washes.	290-1,575 m; Shrub; Blooms March to June	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 8.5 miles north of the Project Site.
Payson's jewelflower *Caulanthus simulans*	--	--	4.2/COV	Chaparral, coastal scrub. Frequently in burned areas, or in disturbed sites such as streambeds; also on rocky, steep slopes. Sandy, granitic soils.	190-2,190 m; Annual herb; Blooms March to May	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 8.8 miles southeast of the Project Site.
Smooth tarplant *Centromadia pungens* ssp. *laevis*	--	--	1B.1/COV	Found in valley and foothill grassland, chenopod scrub, meadows, playas, riparian woodland. Occurs in alkali meadows, alkali scrub, and also in disturbed places.	0-640 m; Annual herb; Blooms April to September	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 3.8 miles northwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Salt marsh bird's-beak *Chloropyron maritimum* ssp. *maritimum*	FE	SE	1B.2/--	Occurs in coastal salt marsh, coastal dunes. Limited to the higher zones of the salt marsh habitat.	0-30 m; Annual herb; Blooms May to October	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 7.9 miles northwest of the Project Site.
Peninsular spineflower *Chorizanthe leptotheca*	--	--	4.2/COV	Occurs in chaparral, coastal scrub, and lower montane coniferous forest in granitic soils and/or alluvial fans.	300-1900 m; Annual herb; Blooms May to August.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
Parry's spineflower *Chorizanthe parryi* var. *parryi*	--	--	1B.1/COV	Occurs in coastal scrub, chaparral, cismontane woodland, valley, and foothill grassland. Found in dry slopes and flats; sometimes at interface of two vegetation types, such as chaparral and oak woodland; dry, sandy soils.	225-1,220 m; Annual herb; Blooms April to June	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 6 miles northwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Long-spined spineflower *Chorizanthe polygonoides var. longispina*	--	--	1B.2/COV	Occurs in chaparral, coastal scrub, meadows and seeps, valley and foothill grassland, and vernal pools. Found in gabbroic clay.	110-1,610m; Annual herb; Blooms April to July	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 4.6 miles south of the Project Site.
White-bracted spineflower *Chorizanthe xanti var. leucotheca*	--	--	1B.2/--	Occurs in Mojavean desert scrub, pinyon-juniper woodland, coastal scrub (alluvial fans). Found in sandy or gravelly places.	390-1,630 m; Annual herb; Blooms April to June	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 16.6 miles northeast of the Project Site.
small-flowered morning-glory *Convolvulus simulans*	--	--	4.2/COV	Occurs in chaparral, coastal scrub, and valley and foothill grassland in wet clay and serpentine ridges.	30-700 m; Annual herb; Bloom March-July.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Peruvian dodder *Cuscuta obtusiflora var. glandulosa*			2B.2/--	Marshes and swamps (freshwater).	15-280 m; Annual herb/vine; Blooms July to October	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 13.2 miles northwest of the Project Site.
snake cholla *Cylindropuntia californica* var. *californica*	--	--	1B.1/--	Occurs in chaparral and coastal scrub.	15-290 m; perennial stem succulent; Blooms April to May.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
paniculate tarplant *Deinandra paniculate*	--	--	4.2/--	Occurs in coastal scrub, valley and foothill grassland, and vernal pools. Usually in vernally mesic sites. Sometimes in vernal pools or on mima mounds near them.	25-940 m; Annual herb; Blooms April to November.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Slender-horned spineflower *Dodecahema leptoceras*	FE	SE	1B.1/COV	Occurs in chaparral, cismontane woodland, coastal scrub (alluvial fan sage scrub). Found in flood deposited terraces and washes; associates include *Encelia, Dalea*, and *Lepidospartum*. Sandy soils.	200-760 m; Annual herb; Blooms April to June	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 12.8 miles northwest of the Project Site.
Santa Ana River woollystar *Eriastrum densifolium* ssp. *sanctorum*	FE	SE	1B.1/COV	Occurs in coastal scrub and chaparral. Found in sandy soils on river floodplains or terraced fluvial deposits.	90-610 m; Perennial herb; Blooms May to September	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 12.2 miles northwest of the Project Site.
Alvin Meadow bedstraw *Galium californicum ssp. primum*	--	--	1B.2/COV	Found in chaparral and lower montane coniferous forest. Grows in shade of trees and shrubs at the lower edge of the pine belt in the pine forest-chaparral ecotone. Prefers granitic, sandy soils.	1,420-1,740 m; Perennial herb; Blooms May to July	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 9.9 miles northwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Palmer's grapplinghook *Harpagonella palmeri*	--	--	4.2/COV	Found in chaparral, coastal scrub, valley and foothill grassland. Occurs in clay soils and open grassy areas within shrubland.	13-1,210 m; Annual herb; Blooms March to May	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 8.6 miles southwest of the Project Site.
Los Angeles sunflower *Helianthus nuttallii ssp. parishii*	--	--	1A/--	Found in marshes and swamps (coastal salt and freshwater).	40-910 m; Perennial herb (rhizomatous); Blooms August to October	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 12.8 miles northwest of the Project Site.
Mesa horkelia *Horkelia cuneata* var. *puberula*	--	--	1B.1/--	Occurs in chaparral, cismontane woodland, coastal scrub. Found on sandy or gravelly sites.	70-810 m; Perennial herb; Blooms February to July	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 14.2 miles northwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
southern California black walnut *Juglans californica*	--	--	4.2/--	Occurs in chaparral, coastal scrub, cismontane woodland, and riparian woodland. Occurs on slopes, canyons, and/or alluvial habitats.	50-900 m; Perennial deciduous tree; Blooms March to August.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
Coulter's goldfields *Lasthenia glabrata* ssp. *coulteri*	--	--	1B.1/COV	Occurs in coastal salt marshes, playas, vernal pools. Usually found on alkaline soils in playas, sinks, and grasslands.	1-1,200 m; Annual herb; Blooms February to June	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 5.4 miles southeast of the Project Site.
heart-leaved pitcher sage *Lepechinia cardiophylla*	--	--	1B.2/COV	Occurs in closed-cone coniferous forest, chaparral, and cismontane woodland.	115-1345 m; Perennial shrub; Blooms April to July.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status: Federal	Status: State	Status: CNPS/ MSHCP	Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
Robinson's pepper-grass *Lepidium virginicum* var. *robinsonii*	--	--	4.3/--	Occurs in chaparral, coastal scrub. Found on dry soils and shrubland.	1-885 m; Annual herb; Blooms January to July	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 6 miles northwest of the Project Site.
Parish's desert-thorn *Lycium parishii*	--	--	2B.3/--	Occurs in coastal scrub and Sonoran desert scrub communities.	160-1,030 m; Shrub; Blooms March to April	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 16.7 miles northwest of the Project Site.
Parish's bush-mallow *Malacothamnus parishii*	--	--	1A/--	Found in chaparral, coastal sage scrub, and washes.	0-2,440; Shrub; Blooms April to July	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 11.9 miles northwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status: Federal	Status: State	Status: CNPS/ MSHCP	Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
Hall's monardella *Monardella macrantha* ssp. *hallii*	--	--	1B.3/COV	Occurs in broadleaved upland forest, chaparral, lower montane coniferous forest, cismontane woodland, valley, and foothill grassland. Found on dry slopes and ridges in openings within the above communities.	730-2,195 m; Perennial herb; Blooms June to October	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 18.1 miles northeast of the Project Site.
Pringle's monardella *Monardella pringlei*	--	--	1A/--	Occurs in Coastal scrub communities and on sandy hills.	280-350 m; Annual herb; Blooms May to June	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 14.2 miles northwest of the Project Site.
Little mousetail *Myosurus minimus ssp. apus*	--	--	3.1/COV	Found in vernal pools, valley and foothill grassland. This subspecies has taxonomic problems; distinguishing between this and *M. sessilis* is difficult. Occurs in alkaline soils.	30-770 m; Annual herb; Blooms March to June	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 8.5 miles southwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Mud nama *Nama stenocarpa*	--	--	2B.2/COV	Found in marshes and swamps. Occurs in lake shores, river banks, and intermittently wet areas.	Annual herb; No elevation or blooming period information available	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 9.7 miles east of the Project Site.
Gambel's water cress *Nasturtium gambelii*	FE	ST	1B.1/--	Found in marshes and swamps. Occurs in freshwater and brackish marshes at the margins of lakes and along streams, in or just above the water level.	5-780 m; Perennial herb; Blooms April to October	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 13.7 miles northwest of the Project Site.
Spreading navarretia *Navarretia fossalis*	FT	--	1B.1/--	Found in vernal pools, chenopod scrub, marshes, swamps, and playas. Occurs in San Diego hardpan and San Diego claypan vernal pools; in swales and vernal pools, often surrounded by other habitat types.	90-1,070 m; Annual herb; Blooms April to June	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 5.4 miles southeast of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Parish's gooseberry *Ribes divaricatum var. parishii*	--	--	1A/--	Found in riparian woodlands. Occurs in *Salix* swales in riparian habitats.	290-310 m; Shrub; Blooms February to April	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 16.1 miles north of the Project Site.
Coulter's matilija poppy *Romneya coulteri*	--	--	4.2/COV	Found in coastal shrub and chaparral in washes and on slopes; also after burns.	20-1200 m; Perennial rhizomatous herb; Blooms March to July.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
Parish's rupertia *Rupertia rigida*	--	--	4.3/--	Occurs in chaparral, lower montane coniferous forest, cismontane woodland, meadows and seeps, pebble plain, and valley and foothill grassland.	700-2500 m; Perennial herb; Blooms June to August.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status: Federal	Status: State	Status: CNPS/ MSHCP	Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
chaparral ragwort *Senecio aphanactis*	--	--	2B.2/--	Found in chaparral, cismontane woodland, coastal scrub; alkaline flats.	20-855 m; annual herb; blooms January-April (May)	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 7.9 miles northwest of the Project Site.
San Gabriel ragwort *Senecio astephanus*	--	--	4.3/--	Found in chaparral and coastal bluff scrub on rocky slopes.	400-1500 m; Perennial herb; Blooms May to June.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
Parish's checkerbloom *Sidalcea hickmanii ssp. parishii*	--	Rare	1B.2/--	Found in chaparral, cismontane woodland, and lower montane coniferous forest. Occurs in disturbed burned or cleared areas on dry, rocky slopes, in fuel breaks and fire roads along the mountain summits.	1,510 to 2,010 m; Perennial herb; Blooms June to August	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 18 miles northeast of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status: Federal	Status: State	Status: CNPS/ MSHCP	Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
Salt Spring checkerbloom *Sidalcea neomexicana*	--	--	2B.2/--	Occurs on playas, chaparral, coastal scrub, lower montane coniferous forest, and Mojavean desert scrub. Found in alkali springs and marshes.	0-1,390; Perennial herb; Blooms March to June	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 12.6 miles southeast of the Project Site.
Southern jewelflower *Streptanthus campestris*	--	--	1B.3/--	Found in chaparral, lower montane coniferous forest, and pinyon-juniper woodland. Occurs in open, rocky areas.	820-2,750 m; Perennial herb; Blooms May to July	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 19.4 miles northeast of the Project Site.
San Bernardino aster *Symphyotrichum defoliatum*	--	--	1B.2/--	Occurs in meadows and seeps, marshes and swamps, coastal scrub, cismontane woodland, lower montane coniferous forest, and grassland. Found in vernally mesic grassland or near ditches, streams and springs; disturbed areas.	2-2,040 m; Perennial herb; Blooms July to November	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 9.1 miles northeast of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Wright's trichocoronis *Trichocoronis wrightii var. wrightii*	--	--	2B.1/COV	Found in marshes and swamps, riparian forest, meadows, seeps, and vernal pools. Occurs in mud flats of vernal lakes, drying river beds, and alkali meadows.	10-460 m; Annual herb; Blooms May to September	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 5.1 miles southeast of the Project Site.
MONOCOTS						
Yucaipa onion *Allium marvinii*	--	--	1B.2/COV	Found in chaparral in openings in clay soils.	850-1070 m; Perennial bulbiferous herb; Blooms April to May.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
Munz's onion *Allium munzii*	FE	ST	1B.1/COV	Found in chaparral, coastal scrub, cismontane woodland, pinyon-juniper woodland, valley and foothill grassland. Occurs in heavy clay soils; grows in grasslands and openings within shrublands or woodlands.	350-1,070 m; Perennial herb; Blooms March to May	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 7.8 miles southwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status: Federal	Status: State	Status: CNPS/ MSHCP	Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
Thread-leaved brodiaea *Brodiaea filifolia*	FT	FE	1B.1/COV	Found in chaparral (openings), cismontane woodland, coastal scrub, playas, valley and foothill grassland, vernal pools. Usually associated with annual grassland and vernal pools; often surrounded by shrubland habitats. Occurs in openings on clay soils.	40-1,130 m; Perennial herb (bulb); Blooms March to June	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 6 miles southeast of the Project Site.
Plummer's mariposa-lily *Calochortus plummerae*	--	--	4.2/COV	Occurs in coastal scrub, chaparral, valley and foothill grassland, cismontane woodland, and lower montane coniferous forest. Found on rocky and sandy sites, usually of granitic or alluvial material. Can be very common after fire.	140-1,920 m; Perennial herb (bulb); Blooms May to July	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 6.8 miles northeast of the Project Site.
Bristly sedge *Carex comosa*	--	--	2B.1/--	Marshes and swamps, coastal prairie, valley and foothill grassland. Lake margins, wet places; site below sea level is on a Delta island.	270-1,030 m; Perennial grasslike herb (rhizomatous); Blooms May to September	**Not Expected.** The Project Site does not contain and is far from any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 12.8 miles northwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
vernal barley *Hordeum intercedens*	--	--	3.2/COV	Found in valley and foothill grassland, vernal pools, coastal dunes, and coastal scrub habitat within vernal pools, dry saline streambeds, and/or alkaline flats.	5-1000 m; Annual herb; Blooms March to June	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
California satintail *Imperata brevifolia*	--	--	2B.1/--	Found in coastal scrub, chaparral, riparian scrub, Mojavean scrub, meadows, seeps (alkali), and riparian scrub.	190-1,190; Perennial grass; Blooms September to May	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 13.1 miles northeast of the Project Site.
Duran's rush *Juncus duranii*	--	--	4.3/--	Found in meadows and seeps, lower montane coniferous forest, and upper montane coniferous forest. Occurs in wet places in montane coniferous forests.	1770-2805 m; Perennial rhizomatous herb; Blooms July to August	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the inundated habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
ocellated Humboldt lily *Lilium humboldtii* ssp. *ocellatum*	--	--	4.2/COV	Found in chaparral, coastal scrub, cismontane woodland, lower montane coniferous forest, and riparian forest. Occurs in yellow-pine forest or openings, or in oak canyons.	30-1800 m; Perennial bulbiferous herb; Blooms March to July.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
crowned muilla *Muilla coronate*	--	--	4.2/--	Found in Joshua tree woodland, pinyon and juniper woodland, Mojavean desert scrub, and chenopod scrub. Occurs mostly on barren flats and ridges in sandy, granitic soils.	670-1960 m; Perennial bulbiferous herb; Blooms March to April.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
narrow-petaled rein orchid *Piperia leptopetala*	--	--	4.3/--	Found in cismontane woodland, lower montane coniferous forest, and upper montane coniferous forest.	380-2225 m; Perennial herb; Blooms May to July.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Prairie wedge grass *Sphenopholis obtusata*	--	--	2B.2/--	Occurs in cismontane woodland, meadows, and seeps. Found in open moist sites, along rivers and springs, alkaline desert seeps.	240 to 2,870 m; Perennial grass; Blooms August to July	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 11.8 miles northwest of the Project Site.
Bryophytes						
California screw moss *Tortula californica*	--	--	1B.2/--	Found in chenopod scrub, valley, and foothill grassland. Moss growing on sandy soil.	Moss; No elevation or blooming period information available	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 8.9 miles southeast of the Project Site.
Lichens						
Woven-spored lichen *Texosporium sancti-jacobi*	--	--	3/--	Found in chaparral habitats. Occurs in open sites; in California with *Adenostoma fasciculatum*, *Eriogonum*, and *Selaginella*. Found at Pinnacles, on small mammal pellets.	Lichen; No elevation or blooming period information available	**Not Expected.** The Project Site does not contain and is far from any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site. The nearest documented occurrence of this species is approximately 8.7 miles southwest of the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

Species	Status			Habitat Requirements	Elevation Range; Life Form; Blooming Period	Potential Occurrence in the Project Area
	Federal	State	CNPS/ MSHCP			
Ferns						
western spleenwort *Asplenium verpertinum*	--	--	4.2/--	Found in chaparral, cismontane woodland, and coastal scrub at rocky sites.	180-1000 m; Perennial rhizomatous herb; Blooms February to June.	**Not Expected.** Although this species occurs within the general vicinity of the Project Site, the Project Site does not contain any of the habitat types or soil types required by this species. In addition, the Project Site is regularly disked, likely precluding this species from establishing on the Project Site.
Plant Communities						
Canyon Live Oak Ravine Forest						This plant community is not present on the Project Site.
Riversidian Alluvial Fan Sage Scrub						This plant community is not present on the Project Site.
Southern Coast Live Oak Riparian Forest						This plant community is not present on the Project Site.
Southern Cottonwood Willow Riparian Forest						This plant community is not present on the Project Site.
Southern Riparian Forest						This plant community is not present on the Project Site.
Southern Riparian Scrub						This plant community is not present on the Project Site.
Southern Sycamore Alder Riparian Woodland						This plant community is not present on the Project Site.
Southern Willow Scrub						This plant community is not present on the Project Site.

Appendix A: Special Status Plant Species with Potential to Occur on the Project Site.

STATUS KEY:

Federal

FE: Federally-listed Endangered

FT: Federally-listed Threatened

State

CE: California-listed Endangered

CT: California-listed Threatened

California Native Plant Society (CNPS)

1B: Plants listed as rare, threatened, or endangered in California and elsewhere

2B: Plants rare, threatened, or endangered in California, but more common elsewhere

3: Plants about which we need more information

CNPS added a decimal threat rank to the List rank to parallel that used by the CNDDB. This extension replaces the E (Endangerment) value from the R-E-D Code. CNPS ranks therefore read like this: 1B.1, 1B.2, etc. Threat code extensions and their meanings are as follows:

.1 – Seriously endangered in California (over 80% of occurrences threatened / high degree of immediacy of threat)

.2 – Fairly endangered in California (20-80% occurrences threatened)

.3 – Not very endangered in California (<20% of occurrences threatened or no current threats known)

Western Riverside Multiple Species Habitat Conservation Plant (MSHCP)

COV: MSHCP Covered Species

SOURCES:

1 Calflora (April 2019)

2 CNPS Rare and Endangered Plant Inventory (April 2019)

3 CDFW CNDDB (April 2019)

4 Western Riverside MSHCP (2004)

Appendix B
Special-Status Wildlife Species with Potential to Occur on the Project Site

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
INVERTEBRATES					
Crotch bumble bee *Bombus crotchii*	--	--	--	Found along coastal California east to the Sierra-Cascade crest and south into Mexico. Food plant genera include *Antirrhinum, Phacelia, Clarkia, Dendromecon, Eschscholzia, and Eriogonum.*	**Not Expected.** The Project Site is entirely disked, surrounded by over one mile of heavy residential and commercial development, and does not contain any flowering plants required by this species. The nearest documented occurrence of this species is approximately 4.5 miles south of the Project Site.
Busck's gallmoth *Carolella busckana*	--	--	--	Inhabits coastal dunes and coastal scrub.	**Not Expected.** The Project Site does not contain any of the coastal dune or coastal scrub habitat required by this species. The nearest documented occurrence of this species is approximately 11 miles north of the Project Site.
Desert cuckoo wasp *Ceratochrysis longimala*	--	--	--	No habitat information available.	**Low Potential.** While not much is known about this species, the Project Site provides only extremely marginal habitat for wildlife with very sparse vegetation available for invertebrates. The nearest documented occurrence of this species is approximately 9.5 miles northwest of the Project Site.
Quino checkerspot butterfly *Euphydryas editha quino*	FE	--	COV	Found within sunny openings within chaparral and coastal sage shrublands in parts of Riverside and San Diego counties. Occurs in hills and mesas near the coast and requires high densities of food plants including *Plantago erecta, P. insularis,* and *Orthocarpus purpurescens*.	**Not Expected.** The Project Site does not contain the chaparral and/or coastal sage shrublands or the food plants required by this species. The nearest documented occurrence of this species is approximately 8.5 miles southwest of the Project Site.
Delhi Sands flower-loving fly *Rhaphiomidas terminatus abdominalis*	FE	--	COV	Found only in areas of the Delhi Sands formation in southwestern San Bernardino and northwestern Riverside counties. Requires fine, sandy soils, often with wholly or partly consolidated dunes and sparse vegetation.	**Not Expected.** The Project Site does not contain the sandy dune habitat required by this species. The nearest documented occurrence of this species is approximately 8 miles north of the Project Site.

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
CRUSTACEANS					
Riverside fairy shrimp *Streptocephalus woottoni*	FE	--	COV	Endemic to western Riverside, Orange, and San Diego counties in areas of tectonic swales/earth slump basins in grassland and coastal sage scrub. Inhabit seasonally astatic pools filled by winter/spring rains. Hatch in warm water later in the season.	**Not Expected.** The Project Site does not contain any aquatic habitat required by this species and is surrounded by over one mile of heavy residential and commercial development that would preclude any inundation and/or cyst transplantation into the Project Site. The nearest documented occurrence of this species is approximately 2 miles west of the Project Site, however this occurrence is listed as possibly extirpated.
FISHES					
Santa Ana sucker *Catostomus santaanae*	FT	--	COV	Endemic to Los Angeles Basin south coastal streams. Habitat generalists, but prefer sand-rubble-boulder bottoms, cool, clear water, and algae.	**Not Expected.** The Project Site does not contain any riparian habitat required by this species. The nearest documented occurrence of this species is approximately 12 miles northwest of the Project Site.
Arroyo chub *Gila orcuttii*	--	CSC	COV	Native to streams from Malibu Creek to San Luis Rey River basin. Introduced into streams in Santa Clara, Ventura, Santa Ynez, Mohave and San Diego river basins. Inhabits slow water stream sections with mud or sand bottoms. Feeds heavily on aquatic vegetation and associated invertebrates.	**Not Expected.** The Project Site does not contain any riparian habitat required by this species. The nearest documented occurrence of this species is approximately 12 miles northwest of the Project Site.
steelhead-southern California DPS *Oncorhychus mykiss irideus* pop. 10	FE	--	--	Federal listing refers to populations from Santa Maria River south to southern extent of range (San Mateo Creek in San Diego County). Occurs in aquatic and southern coastal streams. Southern steelhead likely have greater physiological tolerances to warmer water and more variable conditions.	**Not Expected.** The Project Site does not contain any riparian habitat required by this species. The nearest documented occurrence of this species is approximately 12 miles northwest of the Project Site.

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
Santa Ana speckled dace *Rhinichthys osculus* ssp. 3	--	CSC	--	Inhabits headwaters of the Santa Ana and San Gabriel rivers. May be extirpated from the Los Angeles River system. Requires permanent flowing streams with summer water temps of 17-20 Celsius. Usually inhabits shallow cobble and gravel riffles.	**Not Expected.** The Project Site does not contain any riparian habitat required by this species. The nearest documented occurrence of this species is approximately 15 miles northeast of the Project Site.
AMPHIBIANS					
Southern mountain yellow-legged frog *Rana muscosa*	FE	SE, CSC	COV	Species always encountered within a few feet of water. Tadpoles may require 2 to 4 years to complete their aquatic development.	**Not Expected.** The Project Site does not contain any suitable aquatic habitat for this species and is surrounded by over one mile of heavy residential and commercial development. The nearest documented occurrence of this species is approximately 15.5 miles northeast of the Project Site.
Western spadefoot *Spea hammondii*	--	CSC	COV	Occurs primarily in grassland habitats, but can be found in valley-foothill hardwood woodlands. Vernal pools are essential for breeding and egg-laying.	**Not Expected.** The Project Site does not contain any grassland, woodland, and/or vernal pool habitat utilized by this species. In addition, the Project Site is surrounded by over one mile of heavy residential and commercial development that precludes this species migration into the Project Site. The nearest documented occurrence of this species is approximately 3.2 miles northwest of the Project Site within a Stephen's kangaroo rat reserve.
REPTILES					
southern California legless lizard *Anniella stebbinsi*	--	CSC	--	Generally south of the Transverse Range, extending to northwestern Baja California. Occurs in sandy or loose loamy soils under sparse vegetation. Disjunct populations in the Tehachapi and Piute Mountains in Kern County.	**Not Expected.** The Project Site is heavily disturbed with only marginal weedy and sparse vegetation. Additionally, the Project Site is surrounded by over one mile of heavy residential and commercial development that likely precludes this species migration into the Project Site. The nearest documented occurrence of this species is approximately 6 miles northeast of the Project Site.
California glossy snake *Arizona elegans occidentalis*	--	CSC	--	Patchily distributed from the eastern portion of San Francisco Bay, southern San Joaquin Valley, and the Coast,	**Not Expected.** The Project Site is heavily disturbed with only marginal weedy and sparse vegetation. Additionally, the Project

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
				Transverse, and Peninsular ranges, south to Baja California. Generalist reported from a range of scrub and grassland habitats, often with loose or sandy soils.	Site is surrounded by over one mile of heavy residential and commercial development that likely precludes this species migration into the Project Site from occupied habitat in the Lake Perris State Recreation Area 1.2 miles southeast of the Project Site. The nearest documented occurrence of this species is approximately 1.8 miles southeast of the Project Site.
orange-throated whiptail *Aspidoscelis hyperythra*	--	CSC	COV	Inhabits low-elevation coastal scrub, chaparral, and valley-foothill hardwood habitats. Prefers washes and other sandy areas with patches of brush and rocks. Perennial plants necessary for its major food (i.e. termites).	**Not Expected.** The Project Site does not contain any of the coastal scrub, chaparral, and/or valley-foothill hardwood habitats preferred by this species. Additionally, the Project Site is heavily disturbed with only marginal weedy and sparse vegetation that likely does not support this species' prey. The Project Site is also surrounded by over one mile of heavy residential and commercial development that likely precludes this species' migration into the site. The nearest documented occurrence of this species is approximately 1.5 miles southeast of the Project Site.
Coastal whiptail *Aspidoscelis tigris stejnegeri*	--	--	COV	Found in deserts and semiarid areas with sparse vegetation and open areas. Also found in woodland and riparian areas. Ground may be firm soil, sandy, or rocky.	**Not Expected.** The Project Site is heavily disturbed with only marginal weedy and sparse vegetation that likely cannot support this species. Additionally, the Project Site is surrounded by over one mile of heavy residential and commercial development that likely precludes this species' migration into the site. The nearest documented occurrence of this species is approximately 3.3 miles west of the Project Site.
San Diego banded gecko *Coleonyx variegatus abbotti*	--	CSC	COV	Found in granite or rocky outcrops in coastal scrub and chaparral habitats.	**Not Expected.** The Project Site is far from and does not contain any granite or rocky outcrops in coastal scrub and/or chaparral habitats required for this species. The nearest documented occurrence of this species is approximately 12 miles northwest of the Project Site.

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
Red-diamond rattlesnake *Crotalus ruber*	--	CSC	COV	Inhabits chaparral, Mojavean desert scrub, and Sonoran desert scrub from coastal San Diego County to the eastern slopes of the mountains. Occurs in rocky areas and dense vegetation. Needs rodent burrows, cracks in rocks, or surface cover objects.	**Not Expected.** The Project Site does not contain any of the chaparral, Mojavean desert scrub, and/or Sonoran desert scrub habitat required by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that likely precludes this species' migration into the site. The nearest documented occurrence of this species is approximately 1.6 miles southeast of the Project Site.
San Bernardino ringneck snake *Diadophis punctatus modestus*	--	--	--	Most common in open, relatively rocky areas. Found in somewhat moist microhabitats near intermittent streams. Avoids moving through open or barren areas by restricting movements to areas of surface litter or herbaceous vegetation.	**Not Expected.** The Project Site does not contain and is not near any of the moist microhabitat near intermittent streams utilized by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that likely precludes this species' migration into the site. The nearest documented occurrence of this species is approximately 5 miles southwest of the Project Site.
Western pond turtle *Emys marmorata*	--	CSC	--	Inhabits ponds, marshes, rivers, streams, and irrigation ditches with aquatic vegetation. Requires basking sites and sandy banks or open grassy fields up to 0.5 kilometers from the water's edge for egg-laying.	**Not Expected.** The Project Site does not contain and is not near the aquatic habitat required by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that likely precludes this species' migration into the site. The nearest documented occurrence of this species is approximately 6 miles south of the Project Site.
California mountain kingsnake (San Bernardino population) *Lampropeltis zonata (parvirubra)*	--	CSC	COV	Inhabits bigcone spruce and chaparral at lower elevations. Inhabits black oak, incense cedar, Jeffrey pine, and ponderosa pine at higher elevations. Found in well-lit canyons with rocky outcrops or rocky talus.	**Not Expected.** The Project Site does not contain and is far from any of the hilly and/or mountainous spruce, chaparral, black oak, cedar, or pine habitat utilized by this species. The nearest documented occurrence of this species is approximately 19.5 miles northeast of the Project Site.
Coast horned lizard *Phrynosoma blainvillii*	--	CSC	COV	Frequents a wide variety of habitats, most common in lowlands along sandy washes with scattered low bushes. Requires open areas for sunning, bushes	**Not Expected.** The Project Site is heavily disturbed with only marginal weedy and sparse vegetation that likely cannot support this species. Additionally, the

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
				for cover, patches of loose soil for refuge, and abundant supply of insects.	Project Site is surrounded by over one mile of heavy residential and commercial development that likely precludes this species' migration into the site. The nearest documented occurrence of this species is approximately 1.7 miles southwest of the Project Site.
coast patch-nosed snake *Salvadora hexalepsis virgultea*	--	CSC	--	Brushy or shrubby vegetation in coastal Southern California. Requires small mammal burrows for refuge and overwintering sites.	**Not Expected.** The Project Site does not contain the shrubby coastal habitat or small mammal burrows utilized by this species. Additionally, the Project Site is surrounded by over one mile of heavy residential and commercial development that likely precludes this species' migration into the site. The nearest documented occurrence of this species is approximately 8.7 miles northeast of the Project Site.
two-striped garter snake *Thamnophis hammondii*	--	CSC	--	Found along coastal California from vicinity of Salinas to northwest Baja California. Inhabits areas from the sea to about 7,000 feet in elevation. Highly aquatic, found in or near permanent fresh water. Often found along streams with rocky beds and riparian growth.	**Not Expected.** The Project Site does not contain any aquatic habitat required for this species. Additionally, the Project Site is surrounded by over one mile of heavy residential and commercial development that likely precludes this species' migration through the site. The nearest documented occurrence of this species is approximately 16 miles north of the Project Site.
BIRDS					
Cooper's hawk *Accipiter cooperii*	--	--	COV	Found in woodland, chiefly of open, interrupted or marginal type. Nests mainly in riparian growths of deciduous trees located in canyon bottoms in river flood-plains and in live oaks.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain any of the riparian and/or woodlands near aquatic habitat typically utilized by this species. There is no suitable nesting habitat for this species as vegetation is sparse and very limited, lacking the capacity to support the large structure of a raptor nest. Additionally, the Project Site is surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
					species is approximately 5 miles north of the Project Site.
Tricolored blackbird *Agelaius tricolor*	--	SCE CSC	COV	Inhabits freshwater marsh, marsh and swamp, swamp, and wetland habitats. Highly colonial species, most numerous in Central Valley and vicinity. Largely endemic to California. Requires open water, protected nesting substrate, and foraging area with insect prey within a few kilometers of the colony.	**Not Expected (nesting), Not Expected (foraging).** The Project Site lacks and is far from the aquatic habitat and adjacent upland habitat typically preferred by this species. Additionally, the Project Site is surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 5 miles northeast of the Project Site.
Southern California rufous-crowned sparrow *Aimophila ruficeps canescens*	--	--	COV	Resident in Southern California coastal sage scrub and sparse mixed chaparral. Frequents relatively steep, often rocky hillsides with grass and forb patches.	**Not Expected (nesting), Low Potential (foraging).** The Project Site lacks the coastal sage scrub, sparse mixed chaparral, and/or rocky hillside habitat typically utilized by this species Additionally, the Project Site is surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 3.7 miles southwest of the Project Site.
Golden eagle *Aquila chrysaetos*	--	--	COV	Inhabits rolling foothills, mountain areas, sage-juniper flats, and desert. Nesting habitat includes cliff-walled canyons and large trees in open areas.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain any of the habitat typically utilized by this species. In addition, the vegetation within the Project Site cannot support the size and structure of this species' nest or the habitat required by this species typical prey (small mammals).The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 9.3 miles northwest of the Project Site within a mountainous and rural region.

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
Bell's sage sparrow *Artemisiospiza belli belli*	--	--	COV	Nests in chaparral dominated by fairly dense stands of chamise. Found in coastal sage scrub in south of range.	**Not Expected (nesting), Not Expected (foraging).** The Project Site lacks the chaparral with chamise and/or coastal sage scrub typically utilized by this species. Additionally, the Project Site is surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 5.5 miles north of the Project Site.
Long-eared owl *Asio otus*	--	CSC	--	Inhabits riparian bottomlands grown to tall willows and cottonwoods as well as belts of live oak paralleling stream courses. Requires adjacent open land productive of mice and the presence of old nests of crows, hawks, or magpies for breeding.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain any of the habitat typically utilized by this species. In addition, the vegetation within the Project Site cannot support the size and structure of this species' nest or the habitat required by this species typical prey (small mammals).The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 8.2 miles southwest of the Project Site.
Burrowing owl *Athene cunicularia*	--	CSC	COV	Inhabits open, dry annual or perennial grasslands, deserts and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel (*Otospermophilius beecheyi*).	**Not Expected (nesting), Low (foraging).** The Project Site is regularly disked and does not contain the California ground squirrel and/or other small mammal burrows required by this species for both nesting and most foraging. If the Project Site lies fallow for enough time for rodent and/or small common reptile species to establish, this species may rarely forage within the Project Site. The nearest documented occurrence of this species is approximately 1.5 miles southeast of the Project Site.
Ferruginous hawk Buteo regalis	--	--	COV	Found in open grasslands, sagebrush flats, desert scrub, low foothills and fringes of pinyon and juniper habitats.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain any of the habitat typically utilized

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
				Eats mostly lagomorphs, ground squirrels, and mice. Population trends may follow lagomorph population cycles.	by this species. In addition, the vegetation within the Project Site cannot support the size and structure of this species' nest or the habitat required by this species typical prey (small mammals).The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 5.8 miles northeast of the Project Site.
Swainson's hawk *Buteo swainsoni*	--	ST	COV	Occurs in Great Basin grassland, riparian forest, riparian woodland, valley and foothill grassland habitats. Breeds in grasslands with scattered trees, juniper-sage flats, riparian areas, savannahs, and agricultural or ranch lands with groves or lines of trees. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain any of the habitat typically utilized by this species. In addition, the vegetation within the Project Site cannot support the size and structure of this species' nest or the habitat required by this species typical prey (small mammals).The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 14 miles northeast of the Project Site, however this species is also very rare to the region of the Project Site.
Coastal cactus wren *Campylorhynchus brunneicapillus sandiegensis*	--	CSC	COV	Inhabits southern California coastal sage scrub communities. Wrens require tall opuntia cactus for nesting and roosting.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain the coastal sage scrub habitat required by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 11 miles east of the Project Site.

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
Western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FT	SE	COV	Riparian forest nester, along the broad, lower flood-bottoms of larger river systems. Nests in riparian jungles of willow (*Salix* sp.) often mixed with cottonwoods (*Populus* sp.), with lower story of blackberry (*Rubus sp.*), nettles (*Urtica sp.*), or wild grape (*Vitis girdiana*).	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near the riparian habitat required by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 5.3 miles north of the Project Site.
White-tailed kite *Elanus leucurus*	--	--	COV	Inhabits rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodlands. Requires open grasslands, meadows or marshes for foraging in proximity to isolated, dense-topped trees for nesting and perching.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain any of the habitat typically utilized by this species. In addition, the vegetation within the Project Site cannot support the size and structure of this species' nest or the habitat required by this species typical prey (small mammals and/or reptiles).The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 9 miles southwest of the Project Site.
Southwestern Willow Flycatcher *Empidonax traillii extimus*	FE	SE	COV	Inhabits riparian and wetland thickets, generally of willow, tamarisk, or both, sometimes boxelder or Russian olive.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near the riparian or wetland habitat required by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 9.4 miles northeast of the Project Site.
California horned lark *Eremophila alpestris actia*	--	--	COV	Coastal regions, chiefly from Sonoma Co. to San Diego Co. Also main part of San Joaquin Valley & east to foothills. Short-	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain the grassland, prairie, meadows,

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
				grass prairie, "bald" hills, mountain meadows, open coastal plains, fallow grain fields, alkali flats.	coastal plains, grain fields, and/or alkali flat habitat typically utilized by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 3.4 miles west of the Project Site.
merlin *Falco columbarius*	--	WL	COV	Seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands & deserts, farms & ranches. Clumps of trees or windbreaks are required for roosting in open country.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain the coastal, woodland, savannah, grassland, or agricultural habitat typically utilized by this species for nesting and foraging. In addition, the Project Site lacks vegetation large enough to support and/or protect this species while nesting. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 13.3 miles northwest of the Project Site.
Bald eagle *Haliaeetus leucocephalus*	DL	SE	COV	Ocean shore, lake margins, & rivers for both nesting & wintering. Most nests within 1 mi of water. Nests in large, old-growth, or dominant live tree w/open branches, especially ponderosa pine. Roosts communally in winter.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain any of the aquatic or aquatic-adjacent habitat typically utilized by this species for both nesting and foraging. In addition, the vegetation within the Project Site cannot support the size and structure of this species' nest or the habitat required by this species typical prey (fish).The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 8.8 miles southwest of the Project Site.

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
Yellow-breasted chat *Icteria virens*	--	CSC	COV	Summer resident; inhabits riparian thickets of willow and other brushy tangles near watercourses. Nests in low, dense riparian, consisting of willow, blackberry, wild grape.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near the riparian habitat required by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 5.3 miles north of the Project Site.
California black rail *Laterallus jamaicensis coturniculus*	--	ST FP	--	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near the marsh and/or wetland habitat required by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 9.5 miles northwest of the Project Site.
Loggerhead shrike *Lanius ludovicianus*	--	CSC	COV	Inhabits broken woodlands, savannah, pinyon-juniper, Joshua tree, and riparian woodlands, desert oases, scrub and washes. Prefers open country for hunting, with perches for scanning, and fairly dense shrubs and brush for nesting.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain the woodland, savannah, pinyon-juniper, Joshua tree and/or riparian woodland habitat typically utilized by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 3.2 miles west of the Project Site.
White-faced ibis *Plegadis chihi*	--	--	COV	Inhabits shallow, fresh-water mashes. Requires dense thickets for nesting interspersed with areas of shallow water for foraging.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near the marsh and/or wetland habitat required by this species for both nesting and foraging. The Project Site

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
					is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 6.4 miles east of the Project Site.
Coastal California gnatcatcher *Polioptila californica californica*	FT	CSC	COV	Obligate, permanent resident of coastal sage scrub below 2,500 feet in Southern California. Inhabits low, coastal sage scrub in arid washes, on mesas and slopes. Not all areas classified as coastal sage scrub are occupied.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near any coastal sage scrub habitat required for this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 4.5 miles southwest of the Project Site.
Yellow warbler *Setophaga petechia*	--	CSC	COV	Occurs in riparian plant associations in close proximity to water. Also nests in montane shrubbery in open conifer forests in Cascades and Sierra Nevada. Frequently found nesting and foraging in willow shrubs and thickets, and in other riparian plants including cottonwoods, sycamores, ash, and alders.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near any riparian, montane shrubbery, and/or conifer forest habitat typically utilized by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 9.2 miles northeast of the Project Site.
Lawrence's goldfinch *Spinus lawrencei*	--	--	--	Nests in open oak or other arid woodland and chaparral, near water. Nearby herbaceous habitats used for feeding. Closely associated with oaks.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near any woodland, chaparral, and/or aquatic habitat typically utilized by this species for nesting. In addition, the Project Site has only very sparse and weedy vegetation that would not support this species' foraging. The Project Site is also surrounded by over one

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
					mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 5.3 north of the Project Site.
Least Bell's vireo *Vireo bellii pusillus*	FE	SE	COV	Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms below 2,000 feet. Nests placed along margins of bushes or on twigs projecting into pathways (usually *salix*, *baccharis*, *Prosopis*).	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near the riparian habitat required by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 3.2 miles west of the Project Site.
yellow-headed blackbird *Xanthocephalus xanthocephalus*	--	CSC	--	Nests in freshwater emergent wetlands with dense vegetation and deep water. Often along borders of lakes or ponds. Nests only where large insects such as Odonata are abundant, nesting timed with maximum emergence of aquatic insects.	**Not Expected (nesting), Not Expected (foraging).** The Project Site does not contain and is not near the marsh and/or other aquatic habitat typically utilized by this species for both nesting and foraging. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 12.9 miles southeast of the Project Site.
MAMMALS					
Pallid bat *Antrozous pallidus*	--	CSC	--	Occurs in deserts, grasslands, shrublands, woodlands, and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**Not Expected.** The Project Site does not contain and is not near the desert, grassland, shrubland, woodland, and/or forests typically utilized by this species for roosting. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 11.3 miles north of the Project Site.

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
Northwestern San Diego pocket mouse *Chaetodipus fallax fallax*	--	CSC	COV	Inhabits chaparral, coastal scrub, chaparral, grasslands, and sagebrush habitats in western San Diego County. Found in sandy, herbaceous areas, usually in association with rocks or coarse gravel.	**Not Expected.** The Project Site does not contain and is not near the chaparral, coastal scrub, chaparral, grassland, and/or sagebrush habitat typically utilized by this species. The Project Site is also outside this species' typical range within western San Diego county. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 3.8 miles north of the Project Site.
San Bernardino kangaroo rat *Dipodomys merriami parvus*	FE	CSC	COV	Inhabits alluvial scrub vegetation on sandy loam substrates characteristic of alluvial fans and flood plains.	**Not Expected.** The Project Site is not located and is not near alluvial scrub vegetation or sandy loam habitat typically utilized by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 3.4 miles west of the Project Site.
Stephens' kangaroo rat *Dipodomys stephensi*	FE	ST	COV	Inhabits primarily annual and perennial grasslands, but also occurs in coastal scrub and sagebrush with sparse canopy cover. Prefers buckwheat (*Eriogonum sp.*), chamise (*Adenostoma fasciculatum*), brome grass (*Bromus sp.*) and filaree (*Erodium sp.*). Will burrow into firm soil.	**Not Expected.** The Project Site does not contain the annual and/or perennial grassland, coastal scrub, and/or sagebrush habitat, or any of the preferred plant species typically utilized by this species. In addition, the Project Site is regularly disked, preventing establishment of this burrowing species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 2.2 miles west of the Project Site within the Riverside National Cemetery.
Western mastiff bat *Eumops perotis californicus*	--	CSC	--	Inhabits many open, semi-arid to arid habitats, including conifer and deciduous woodlands, coastal scrub, valley and	**Not Expected.** The Project Site does not contain and is not near the woodland, coastal scrub valley/foothill grassland,

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
				foothill grasslands, and chaparral. Roosts in crevices in cliff faces, high buildings, trees and tunnels.	and/or chaparral habitat with cliff faces, high buildings, trees, and/or tunnels typically utilized by this species for foraging and roosting. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 0.9 mile northeast of the Project Site, however the occurrence is from 29 years ago before much of the development within the general vicinity of the Project Site.
Western yellow bat *Lasiurus xanthinus*	--	CSC	--	Found in valley foothill riparian, desert riparian, desert wash, and palm oasis habitats. Roosts in trees, particularly palms. Forages over water and among trees.	**Not Expected.** The Project Site does not contain and is not near any of the valley foothill riparian, desert riparian, desert wash, or palm oasis habitats typically utilized by this species for roosting. The Project Site also does not contain and is not near freshwater water sources required by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 0.9 mile northeast of the Project Site, however the occurrence is from 29 years ago before much of the development within the general vicinity of the Project Site.
Lesser long-nosed bat *Leptonycteris yerbabuenae*	FE	--	--	Found in arid regions such as desert grasslands and shrub land. Suitable day roosts (caves and mines) and suitable concentrations of food plants (columnar cacti and agaves) are critical resources. Caves and mines are used as day roosts and caves, mines, rock crevices, trees, shrubs, and abandoned buildings are used as night roosts for digesting meals.	**Not Expected.** The Project Site does not contain any of the roosting habitat or foraging requirements of this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
				Nectar, pollen, and fruit eating bat; primarily feeding on agaves, saguaro, and organ pipe cactus.	species is approximately 14 miles northeast of the Project Site.
San Diego black-tailed jackrabbit *Lepus californicus bennettii*	--	CSC	COV	Found in intermediate canopy stages of shrub habitats and open shrub/herbaceous and tree/herbaceous edges. Inhabits coastal sage scrub habitats in Southern California.	**Not Expected.** The Project Site does not contain and is not near any of the shrub and/or coastal sage scrub habitat typically utilized by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 5.5 miles west of the Project Site.
San Diego desert woodrat *Neotoma lepida intermedia*	--	CSC	COV	Inhabits coastal scrub of Southern California from San Diego County to San Luis Obispo County. Moderate to dense canopies preferred. They are particularly abundant in rock outcrops and rocky cliffs and slopes.	**Not Expected.** The Project Site does not contain and is not near the coastal scrub habitat typically utilized by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 6.7 miles west of the Project Site.
Pocketed free-tailed bat *Nyctinomops femorosaccus*	--	CSC	--	Inhabits a variety of arid areas in Southern California, including pine-juniper woodlands, desert scrub, palm oasis, desert wash, and desert riparian. Prefers rocky areas with high cliffs.	**Not Expected.** The Project Site does not contain and is not near any of the woodland, scrub, palm oasis, desert wash, and/or desert riparian habitat typically utilized by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 1.9 miles west of the Project Site.
Southern grasshopper mouse *Onychomys torridus ramona*	--	CSC	--	Inhabits desert areas, especially scrub habitats with friable soils for digging. Prefers low to moderate shrub cover.	**Not Expected.** The Project Site does not contain any of the scrub habitat typically utilized by this species and is regularly disked, precluding this burrowing species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status			Habitat Requirements	Potential for Occurrence
	Federal	State	MSHCP		
					species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 3.2 miles northwest of the Project Site.
Los Angeles pocket mouse *Perognathus longimembris brevinasus*	--	CSC	COV	Inhabits lower elevation grasslands and coastal sage communities in and around the Los Angeles Basin. Found in open ground with fine sandy soils. May not dig extensive burrows, hiding under weeds and dead leaves instead.	**Not Expected.** The Project Site does not contain and is not near any of the grassland and/or coastal sage habitat typically utilized by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. There are several nearby documented occurrences of this species, however they are from 27-29 years ago before much of the development within the general vicinity of the Project Site.
American badger *Taxidea taxus*	--	CSC	--	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	**Not Expected.** The Project Site does not have the open, uncultivated tracts of land required by this species. The Project Site is also surrounded by over one mile of heavy residential and commercial development that makes this species' migration through the site unlikely. The nearest documented occurrence of this species is approximately 5.7 miles east of the Project Site.

Appendix B: Special-Status Animal Species with Potential to Occur on the Project Site**.**

KEY:

(nesting and/or wintering) = For most taxa, the CNDDB is interested in information that indicates the presence of a resident population. For some species (primarily birds), the CNDDB only tracks certain parts of the species range or life history (e.g., nesting locations).

STATUS:

Federal	State	MSHCP
FE: Federally-listed Endangered	SE: State-listed Endangered	COV: MSHCP Covered Species
FT: Federally-listed Threatened	ST: State-listed Threatened	
FD: Federally-delisted	CSC: State Species of Special Concern	
	WL: Watch List	
	FP: Fully-Protected	
	SCE: State-listed Candidate Endangered	

SOURCES:

1 California Natural Diversity Database (CNDDB 2019) and BIOS 5 Data Viewer were used to identify preferred habitat for each species

2 Western Riverside MSHCP (2004)

Appendix C
State and Federal Database Search Results for Special-Status Plant and Wildlife Species

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Sunnymead (3311782) OR Redlands (3411712) OR Yucaipa (3411711) OR El Casco (3311781) OR Lakeview (3311771) OR Perris (3311772) OR Steele Peak (3311773) OR Riverside East (3311783) OR San Bernardino South (3411713))
 AND Taxonomic Group IS (Ferns OR Gymnosperms OR Monocots OR Dicots OR Lichens OR Bryophytes)
 AND CNPS List IS (1A OR 1B OR 1B.1 OR 1B.2 OR 1B.3 OR 2A OR 2B OR 2B.1 OR 2B.2 OR 2B.3 OR 3 OR 3.1 OR 3.2 OR 3.3 OR 4 OR 4.1 OR 4.2 OR 4.3)

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Alvin Meadow bedstraw *Galium californicum ssp. primum*	PDRUB0N0E6	None	None	G5T2	S2	1B.2
bristly sedge *Carex comosa*	PMCYP032Y0	None	None	G5	S2	2B.1
California satintail *Imperata brevifolia*	PMPOA3D020	None	None	G4	S3	2B.1
California screw moss *Tortula californica*	NBMUS7L090	None	None	G2G3	S2S3	1B.2
chaparral ragwort *Senecio aphanactis*	PDAST8H060	None	None	G3	S2	2B.2
chaparral sand-verbena *Abronia villosa var. aurita*	PDNYC010P1	None	None	G5T2?	S2	1B.1
Coulter's goldfields *Lasthenia glabrata ssp. coulteri*	PDAST5L0A1	None	None	G4T2	S2	1B.1
Davidson's saltscale *Atriplex serenana var. davidsonii*	PDCHE041T1	None	None	G5T1	S1	1B.2
Gambel's water cress *Nasturtium gambelii*	PDBRA270V0	Endangered	Threatened	G1	S1	1B.1
Hall's monardella *Monardella macrantha ssp. hallii*	PDLAM180E1	None	None	G5T3	S3	1B.3
Horn's milk-vetch *Astragalus hornii var. hornii*	PDFAB0F421	None	None	G4G5T1T2	S1	1B.1
Jaeger's milk-vetch *Astragalus pachypus var. jaegeri*	PDFAB0F6G1	None	None	G4T1	S1	1B.1
little mousetail *Myosurus minimus ssp. apus*	PDRAN0H031	None	None	G5T2Q	S2	3.1
long-spined spineflower *Chorizanthe polygonoides var. longispina*	PDPGN040K1	None	None	G5T3	S3	1B.2
Los Angeles sunflower *Helianthus nuttallii ssp. parishii*	PDAST4N102	None	None	G5TH	SH	1A
marsh sandwort *Arenaria paludicola*	PDCAR040L0	Endangered	Endangered	G1	S1	1B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
mesa horkelia *Horkelia cuneata var. puberula*	PDROS0W045	None	None	G4T1	S1	1B.1
mud nama *Nama stenocarpa*	PDHYD0A0H0	None	None	G4G5	S1S2	2B.2
Munz's onion *Allium munzii*	PMLIL022Z0	Endangered	Threatened	G1	S1	1B.1
Nevin's barberry *Berberis nevinii*	PDBER060A0	Endangered	Endangered	G1	S1	1B.1
Palmer's grapplinghook *Harpagonella palmeri*	PDBOR0H010	None	None	G4	S3	4.2
Parish's brittlescale *Atriplex parishii*	PDCHE041D0	None	None	G1G2	S1	1B.1
Parish's bush-mallow *Malacothamnus parishii*	PDMAL0Q0C0	None	None	GXQ	SX	1A
Parish's checkerbloom *Sidalcea hickmanii ssp. parishii*	PDMAL110A3	None	Rare	G3T1	S1	1B.2
Parish's desert-thorn *Lycium parishii*	PDSOL0G0D0	None	None	G3?	S1	2B.3
Parish's gooseberry *Ribes divaricatum var. parishii*	PDGRO020F3	None	None	G5TX	SX	1A
Parry's spineflower *Chorizanthe parryi var. parryi*	PDPGN040J2	None	None	G3T2	S2	1B.1
Payson's jewelflower *Caulanthus simulans*	PDBRA0M0H0	None	None	G4	S4	4.2
Peruvian dodder *Cuscuta obtusiflora var. glandulosa*	PDCUS01111	None	None	G5T4?	SH	2B.2
Plummer's mariposa-lily *Calochortus plummerae*	PMLIL0D150	None	None	G4	S4	4.2
prairie wedge grass *Sphenopholis obtusata*	PMPOA5T030	None	None	G5	S2	2B.2
Pringle's monardella *Monardella pringlei*	PDLAM180J0	None	None	GX	SX	1A
Robinson's pepper-grass *Lepidium virginicum var. robinsonii*	PDBRA1M114	None	None	G5T3	S3	4.3
salt marsh bird's-beak *Chloropyron maritimum ssp. maritimum*	PDSCR0J0C2	Endangered	Endangered	G4?T1	S1	1B.2
salt spring checkerbloom *Sidalcea neomexicana*	PDMAL110J0	None	None	G4	S2	2B.2
San Bernardino aster *Symphyotrichum defoliatum*	PDASTE80C0	None	None	G2	S2	1B.2
San Jacinto Valley crownscale *Atriplex coronata var. notatior*	PDCHE040C2	Endangered	None	G4T1	S1	1B.1

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Santa Ana River woollystar *Eriastrum densifolium ssp. sanctorum*	PDPLM03035	Endangered	Endangered	G4T1	S1	1B.1
slender-horned spineflower *Dodecahema leptoceras*	PDPGN0V010	Endangered	Endangered	G1	S1	1B.1
smooth tarplant *Centromadia pungens ssp. laevis*	PDAST4R0R4	None	None	G3G4T2	S2	1B.1
southern jewelflower *Streptanthus campestris*	PDBRA2G0B0	None	None	G3	S3	1B.3
spreading navarretia *Navarretia fossalis*	PDPLM0C080	Threatened	None	G2	S2	1B.1
thread-leaved brodiaea *Brodiaea filifolia*	PMLIL0C050	Threatened	Endangered	G2	S2	1B.1
white-bracted spineflower *Chorizanthe xanti var. leucotheca*	PDPGN040Z1	None	None	G4T3	S3	1B.2
woven-spored lichen *Texosporium sancti-jacobi*	NLTEST7980	None	None	G3	S1	3
Wright's trichocoronis *Trichocoronis wrightii var. wrightii*	PDAST9F031	None	None	G4T3	S1	2B.1

Record Count: 46

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Sunnymead (3311782) OR Redlands (3411712) OR Yucaipa (3411711) OR El Casco (3311781) OR Lakeview (3311771) OR Perris (3311772) OR Steele Peak (3311773) OR Riverside East (3311783) OR San Bernardino South (3411713))
 AND Taxonomic Group IS (Fish OR Amphibians OR Reptiles OR Birds OR Mammals OR Mollusks OR Arachnids OR Crustaceans OR Insects)
 AND (Federal Listing Status IS (Endangered OR Threatened OR Proposed Endangered OR Proposed Threatened OR Candidate OR All CNDDB element occurrences OR Delisted) OR State Listing Status IS (Endangered OR Threatened OR Rare OR All CNDDB element occurrences OR Delisted OR Candidate Endangered OR Candidate Threatened))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
American badger *Taxidea taxus*	AMAJF04010	None	None	G5	S3	SSC
arroyo chub *Gila orcuttii*	AFCJB13120	None	None	G2	S2	SSC
bald eagle *Haliaeetus leucocephalus*	ABNKC10010	Delisted	Endangered	G5	S3	FP
Bell's sage sparrow *Artemisiospiza belli belli*	ABPBX97021	None	None	G5T2T3	S3	WL
burrowing owl *Athene cunicularia*	ABNSB10010	None	None	G4	S3	SSC
Busck's gallmoth *Carolella busckana*	IILEM2X090	None	None	G1G3	SH	
California black rail *Laterallus jamaicensis coturniculus*	ABNME03041	None	Threatened	G3G4T1	S1	FP
California glossy snake *Arizona elegans occidentalis*	ARADB01017	None	None	G5T2	S2	SSC
California horned lark *Eremophila alpestris actia*	ABPAT02011	None	None	G5T4Q	S4	WL
California mountain kingsnake (San Bernardino population) *Lampropeltis zonata (parvirubra)*	ARADB19062	None	None	G4G5	S2?	WL
coast horned lizard *Phrynosoma blainvillii*	ARACF12100	None	None	G3G4	S3S4	SSC
coast patch-nosed snake *Salvadora hexalepis virgultea*	ARADB30033	None	None	G5T4	S2S3	SSC
coastal cactus wren *Campylorhynchus brunneicapillus sandiegensis*	ABPBG02095	None	None	G5T3Q	S3	SSC
coastal California gnatcatcher *Polioptila californica californica*	ABPBJ08081	Threatened	None	G4G5T2Q	S2	SSC
coastal whiptail *Aspidoscelis tigris stejnegeri*	ARACJ02143	None	None	G5T5	S3	SSC

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Cooper's hawk *Accipiter cooperii*	ABNKC12040	None	None	G5	S4	WL
Crotch bumble bee *Bombus crotchii*	IIHYM24480	None	None	G3G4	S1S2	
Delhi Sands flower-loving fly *Rhaphiomidas terminatus abdominalis*	IIDIP05021	Endangered	None	G1T1	S1	
Desert cuckoo wasp *Ceratochrysis longimala*	IIHYM71040	None	None	G1	S1	
ferruginous hawk *Buteo regalis*	ABNKC19120	None	None	G4	S3S4	WL
golden eagle *Aquila chrysaetos*	ABNKC22010	None	None	G5	S3	FP
Lawrence's goldfinch *Spinus lawrencei*	ABPBY06100	None	None	G3G4	S3S4	
least Bell's vireo *Vireo bellii pusillus*	ABPBW01114	Endangered	Endangered	G5T2	S2	
lesser long-nosed bat *Leptonycteris yerbabuenae*	AMACB03030	Delisted	None	G4	S1	
loggerhead shrike *Lanius ludovicianus*	ABPBR01030	None	None	G4	S4	SSC
long-eared owl *Asio otus*	ABNSB13010	None	None	G5	S3?	SSC
Los Angeles pocket mouse *Perognathus longimembris brevinasus*	AMAFD01041	None	None	G5T1T2	S1S2	SSC
merlin *Falco columbarius*	ABNKD06030	None	None	G5	S3S4	WL
northwestern San Diego pocket mouse *Chaetodipus fallax fallax*	AMAFD05031	None	None	G5T3T4	S3S4	SSC
orange-throated whiptail *Aspidoscelis hyperythra*	ARACJ02060	None	None	G5	S2S3	WL
pallid bat *Antrozous pallidus*	AMACC10010	None	None	G5	S3	SSC
pocketed free-tailed bat *Nyctinomops femorosaccus*	AMACD04010	None	None	G4	S3	SSC
quino checkerspot butterfly *Euphydryas editha quino*	IILEPK405L	Endangered	None	G5T1T2	S1S2	
red-diamond rattlesnake *Crotalus ruber*	ARADE02090	None	None	G4	S3	SSC
Riverside fairy shrimp *Streptocephalus woottoni*	ICBRA07010	Endangered	None	G1G2	S1S2	
San Bernardino kangaroo rat *Dipodomys merriami parvus*	AMAFD03143	Endangered	None	G5T1	S1	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
San Bernardino ringneck snake *Diadophis punctatus modestus*	ARADB10015	None	None	G5T2T3	S2?	
San Diego banded gecko *Coleonyx variegatus abbotti*	ARACD01031	None	None	G5T3T4	S1S2	SSC
San Diego black-tailed jackrabbit *Lepus californicus bennettii*	AMAEB03051	None	None	G5T3T4	S3S4	SSC
San Diego desert woodrat *Neotoma lepida intermedia*	AMAFF08041	None	None	G5T3T4	S3S4	SSC
Santa Ana speckled dace *Rhinichthys osculus ssp. 3*	AFCJB3705K	None	None	G5T1	S1	SSC
Santa Ana sucker *Catostomus santaanae*	AFCJC02190	Threatened	None	G1	S1	
southern California legless lizard *Anniella stebbinsi*	ARACC01060	None	None	G3	S3	SSC
southern California rufous-crowned sparrow *Aimophila ruficeps canescens*	ABPBX91091	None	None	G5T3	S3	WL
southern grasshopper mouse *Onychomys torridus ramona*	AMAFF06022	None	None	G5T3	S3	SSC
southern mountain yellow-legged frog *Rana muscosa*	AAABH01330	Endangered	Endangered	G1	S1	WL
southwestern willow flycatcher *Empidonax traillii extimus*	ABPAE33043	Endangered	Endangered	G5T2	S1	
steelhead - southern California DPS *Oncorhynchus mykiss irideus pop. 10*	AFCHA0209J	Endangered	None	G5T1Q	S1	
Stephens' kangaroo rat *Dipodomys stephensi*	AMAFD03100	Endangered	Threatened	G2	S2	
Swainson's hawk *Buteo swainsoni*	ABNKC19070	None	Threatened	G5	S3	
tricolored blackbird *Agelaius tricolor*	ABPBXB0020	None	Candidate Endangered	G2G3	S1S2	SSC
two-striped gartersnake *Thamnophis hammondii*	ARADB36160	None	None	G4	S3S4	SSC
western mastiff bat *Eumops perotis californicus*	AMACD02011	None	None	G5T4	S3S4	SSC
western pond turtle *Emys marmorata*	ARAAD02030	None	None	G3G4	S3	SSC
western spadefoot *Spea hammondii*	AAABF02020	None	None	G3	S3	SSC
western yellow bat *Lasiurus xanthinus*	AMACC05070	None	None	G5	S3	SSC
western yellow-billed cuckoo *Coccyzus americanus occidentalis*	ABNRB02022	Threatened	Endangered	G5T2T3	S1	

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
white-faced ibis *Plegadis chihi*	ABNGE02020	None	None	G5	S3S4	WL
white-tailed kite *Elanus leucurus*	ABNKC06010	None	None	G5	S3S4	FP
yellow warbler *Setophaga petechia*	ABPBX03010	None	None	G5	S3S4	SSC
yellow-breasted chat *Icteria virens*	ABPBX24010	None	None	G5	S3	SSC
yellow-headed blackbird *Xanthocephalus xanthocephalus*	ABPBXB3010	None	None	G5	S3	SSC

Record Count: 62

CNPS California Native Plant Society

Plant List

Inventory of Rare and Endangered Plants

63 matches found. *Click on scientific name for details*

Search Criteria

Found in Quads 3411713, 3411712, 3411711, 3311783, 3311782, 3311781, 3311773 3311772 and 3311771;

Modify Search Criteria Export to Excel Modify Columns Modify Sort Display Photos

Scientific Name	Common Name	Family	Lifeform	Blooming Period	CA Rare Plant Rank	State Rank	Global Rank
Abronia villosa var. aurita	chaparral sand-verbena	Nyctaginaceae	annual herb	(Jan)Mar-Sep	1B.1	S2	G5T2?
Allium marvinii	Yucaipa onion	Alliaceae	perennial bulbiferous herb	Apr-May	1B.2	S1	G1
Allium munzii	Munz's onion	Alliaceae	perennial bulbiferous herb	Mar-May	1B.1	S1	G1
Arenaria paludicola	marsh sandwort	Caryophyllaceae	perennial stoloniferous herb	May-Aug	1B.1	S1	G1
Artemisia palmeri	San Diego sagewort	Asteraceae	perennial deciduous shrub	(Feb)May-Sep	4.2	S3?	G3?
Asplenium vespertinum	western spleenwort	Aspleniaceae	perennial rhizomatous herb	Feb-Jun	4.2	S4	G4
Astragalus hornii var. hornii	Horn's milk-vetch	Fabaceae	annual herb	May-Oct	1B.1	S1	G4G5T1T2
Astragalus pachypus var. jaegeri	Jaeger's bush milk-vetch	Fabaceae	perennial shrub	Dec-Jun	1B.1	S1	G4T1
Atriplex coronata var. notatior	San Jacinto Valley crownscale	Chenopodiaceae	annual herb	Apr-Aug	1B.1	S1	G4T1
Atriplex pacifica	South Coast saltscale	Chenopodiaceae	annual herb	Mar-Oct	1B.2	S2	G4
Atriplex parishii	Parish's brittlescale	Chenopodiaceae	annual herb	Jun-Oct	1B.1	S1	G1G2
Atriplex serenana var. davidsonii	Davidson's saltscale	Chenopodiaceae	annual herb	Apr-Oct	1B.2	S1	G5T1
Berberis nevinii	Nevin's barberry	Berberidaceae	perennial evergreen shrub	(Feb)Mar-Jun	1B.1	S1	G1
Brodiaea filifolia	thread-leaved brodiaea	Themidaceae	perennial bulbiferous herb	Mar-Jun	1B.1	S2	G2
Calochortus plummerae	Plummer's mariposa lily	Liliaceae	perennial bulbiferous herb	May-Jul	4.2	S4	G4
Carex comosa	bristly sedge	Cyperaceae	perennial rhizomatous herb	May-Sep	2B.1	S2	G5
Caulanthus simulans	Payson's jewelflower	Brassicaceae	annual herb	(Feb)Mar-May(Jun)	4.2	S4	G4
	smooth tarplant	Asteraceae	annual herb	Apr-Sep	1B.1	S2	G3G4T2

Centromadia pungens ssp. laevis							
Chloropyron maritimum ssp. maritimum	salt marsh bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	May-Oct(Nov)	1B.2	S1	G4?T1
Chorizanthe leptotheca	Peninsular spineflower	Polygonaceae	annual herb	May-Aug	4.2	S3	G3
Chorizanthe parryi var. parryi	Parry's spineflower	Polygonaceae	annual herb	Apr-Jun	1B.1	S2	G3T2
Chorizanthe polygonoides var. longispina	long-spined spineflower	Polygonaceae	annual herb	Apr-Jul	1B.2	S3	G5T3
Chorizanthe xanti var. leucotheca	white-bracted spineflower	Polygonaceae	annual herb	Apr-Jun	1B.2	S3	G4T3
Convolvulus simulans	small-flowered morning-glory	Convolvulaceae	annual herb	Mar-Jul	4.2	S4	G4
Cuscuta obtusiflora var. glandulosa	Peruvian dodder	Convolvulaceae	annual vine (parasitic)	Jul-Oct	2B.2	SH	G5T4?
Cylindropuntia californica var. californica	snake cholla	Cactaceae	perennial stem succulent	Apr-May	1B.1	S1	G3T2
Deinandra paniculata	paniculate tarplant	Asteraceae	annual herb	(Mar)Apr-Nov(Dec)	4.2	S4	G4
Dodecahema leptoceras	slender-horned spineflower	Polygonaceae	annual herb	Apr-Jun	1B.1	S1	G1
Eriastrum densifolium ssp. sanctorum	Santa Ana River woollystar	Polemoniaceae	perennial herb	Apr-Sep	1B.1	S1	G4T1
Galium californicum ssp. primum	Alvin Meadow bedstraw	Rubiaceae	perennial herb	May-Jul	1B.2	S2	G5T2
Harpagonella palmeri	Palmer's grapplinghook	Boraginaceae	annual herb	Mar-May	4.2	S3	G4
Helianthus nuttallii ssp. parishii	Los Angeles sunflower	Asteraceae	perennial rhizomatous herb	Aug-Oct	1A	SH	G5TH
Hordeum intercedens	vernal barley	Poaceae	annual herb	Mar-Jun	3.2	S3S4	G3G4
Horkelia cuneata var. puberula	mesa horkelia	Rosaceae	perennial herb	Feb-Jul(Sep)	1B.1	S1	G4T1
Imperata brevifolia	California satintail	Poaceae	perennial rhizomatous herb	Sep-May	2B.1	S3	G4
Juglans californica	Southern California black walnut	Juglandaceae	perennial deciduous tree	Mar-Aug	4.2	S4	G4
Juncus duranii	Duran's rush	Juncaceae	perennial rhizomatous herb	Jul-Aug	4.3	S3	G3
Lasthenia glabrata ssp. coulteri	Coulter's goldfields	Asteraceae	annual herb	Feb-Jun	1B.1	S2	G4T2
Lepechinia cardiophylla	heart-leaved pitcher sage	Lamiaceae	perennial shrub	Apr-Jul	1B.2	S2S3	G3
Lepidium virginicum var. robinsonii	Robinson's pepper-grass	Brassicaceae	annual herb	Jan-Jul	4.3	S3	G5T3
Lilium humboldtii ssp. ocellatum	ocellated Humboldt lily	Liliaceae	perennial bulbiferous herb	Mar-Jul(Aug)	4.2	S4?	G4T4?
Malacothamnus parishii	Parish's bush-mallow	Malvaceae	perennial deciduous shrub	Jun-Jul	1A	SX	GXQ

Monardella macrantha ssp. hallii	Hall's monardella	Lamiaceae	perennial rhizomatous herb	Jun-Oct	1B.3	S3	G5T3
Monardella pringlei	Pringle's monardella	Lamiaceae	annual herb	May-Jun	1A	SX	GX
Muilla coronata	crowned muilla	Themidaceae	perennial bulbiferous herb	Mar-Apr(May)	4.2	S3	G3
Myosurus minimus ssp. apus	little mousetail	Ranunculaceae	annual herb	Mar-Jun	3.1	S2	G5T2Q
Nama stenocarpa	mud nama	Namaceae	annual / perennial herb	Jan-Jul	2B.2	S1S2	G4G5
Nasturtium gambelii	Gambel's water cress	Brassicaceae	perennial rhizomatous herb	Apr-Oct	1B.1	S1	G1
Navarretia fossalis	spreading navarretia	Polemoniaceae	annual herb	Apr-Jun	1B.1	S2	G2
Piperia leptopetala	narrow-petaled rein orchid	Orchidaceae	perennial herb	May-Jul	4.3	S4	G4
Ribes divaricatum var. parishii	Parish's gooseberry	Grossulariaceae	perennial deciduous shrub	Feb-Apr	1A	SX	G5TX
Romneya coulteri	Coulter's matilija poppy	Papaveraceae	perennial rhizomatous herb	Mar-Jul(Aug)	4.2	S4	G4
Rupertia rigida	Parish's rupertia	Fabaceae	perennial herb	Jun-Aug	4.3	S4	G4
Senecio aphanactis	chaparral ragwort	Asteraceae	annual herb	Jan-Apr(May)	2B.2	S2	G3
Senecio astephanus	San Gabriel ragwort	Asteraceae	perennial herb	May-Jul	4.3	S3	G3
Sidalcea hickmanii ssp. parishii	Parish's checkerbloom	Malvaceae	perennial herb	(May)Jun-Aug	1B.2	S1	G3T1
Sidalcea neomexicana	salt spring checkerbloom	Malvaceae	perennial herb	Mar-Jun	2B.2	S2	G4
Sphenopholis obtusata	prairie wedge grass	Poaceae	perennial herb	Apr-Jul	2B.2	S2	G5
Streptanthus campestris	southern jewelflower	Brassicaceae	perennial herb	(Apr)May-Jul	1B.3	S3	G3
Symphyotrichum defoliatum	San Bernardino aster	Asteraceae	perennial rhizomatous herb	Jul-Nov(Dec)	1B.2	S2	G2
Texosporium sancti-jacobi	woven-spored lichen	Caliciaceae	crustose lichen (terricolous)		3	S1	G3
Tortula californica	California screw-moss	Pottiaceae	moss		1B.2	S2S3	G2G3
Trichocoronis wrightii var. wrightii	Wright's trichocoronis	Asteraceae	annual herb	May-Sep	2B.1	S1	G4T3

Suggested Citation

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IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Riverside County, California

Local office

Carlsbad Fish And Wildlife Office

(760) 431-9440
(760) 431-5901

2177 Salk Avenue - Suite 250
Carlsbad, CA 92008-7385

http://www.fws.gov/carlsbad/

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

San Bernardino Merriam's Kangaroo Rat Dipodomys merriami parvus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/2060	Endangered
Stephens' Kangaroo Rat Dipodomys stephensi (incl. D. cascus) No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/3495	Endangered

Birds

NAME	STATUS
Coastal California Gnatcatcher Polioptila californica californica There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8178	Threatened
Least Bell's Vireo Vireo bellii pusillus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/5945	Endangered
Southwestern Willow Flycatcher Empidonax traillii extimus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6749	Endangered

Crustaceans

NAME	STATUS
Riverside Fairy Shrimp Streptocephalus woottoni There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/8148	Endangered
Vernal Pool Fairy Shrimp Branchinecta lynchi There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS

Nevin's Barberry Berberis nevinii — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8025

San Diego Ambrosia Ambrosia pumila — Endangered
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/8287

San Jacinto Valley Crownscale Atriplex coronata var. notatior — Endangered
There is **final** critical habitat for this species. However, no *actual* acres or miles were designated due to exemptions and/or exclusions. See Federal Register publication for details.
https://ecos.fws.gov/ecp/species/4353

Santa Ana River Woolly-star Eriastrum densifolium ssp. sanctorum — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/6575

Spreading Navarretia Navarretia fossalis — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1334

Thread-leaved Brodiaea Brodiaea filifolia — Threatened
There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/6087

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Burrowing Owl Athene cunicularia — Breeds Mar 15 to Aug 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9737

Common Yellowthroat Geothlypis trichas sinuosa — Breeds May 20 to Jul 31
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/2084

Costa's Hummingbird Calypte costae — Breeds Jan 15 to Jun 10
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9470

Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Nuttall's Woodpecker Picoides nuttallii — Breeds Apr 1 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Song Sparrow Melospiza melodia — Breeds Feb 20 to Sep 5
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Spotted Towhee Pipilo maculatus clementae — Breeds Apr 15 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/4243

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ

"Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

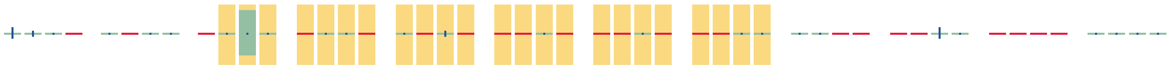
No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data

SPECIES	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

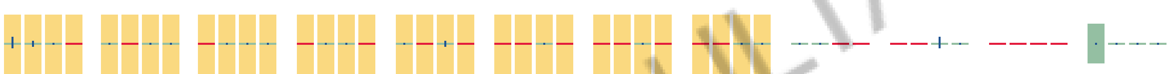
Burrowing Owl
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



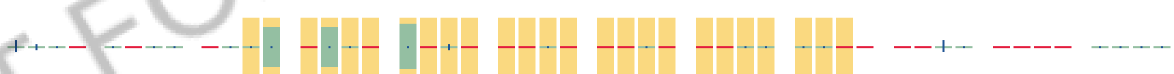
Common Yellowthroat
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

Costa's Hummingbird
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)

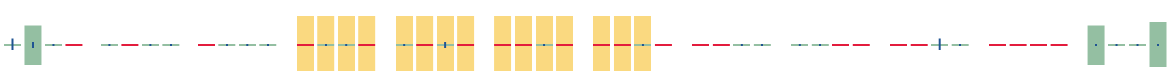
Golden Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)



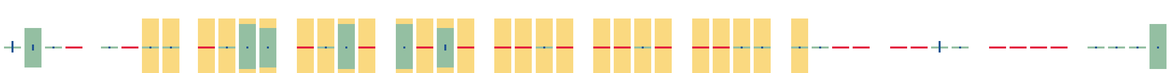
Lawrence's Goldfinch
BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



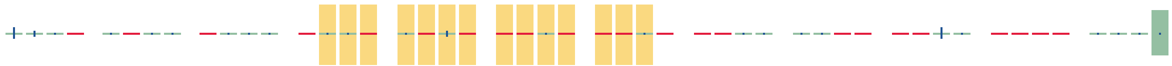
Nuttall's Woodpecker
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Song Sparrow
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Spotted Towhee
BCC - BCR (This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA)



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ “Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds” at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

THERE ARE NO KNOWN WETLANDS AT THIS LOCATION.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Determination of Biologically Equivalent or Superior Preservation Report

Krameria Avenue Project Site
City of Moreno Valley, Western Riverside County, California

Applicant:
PI Properties No. 67 LLC
610 North Santa Anita Avenue
Arcadia, CA 91006

Consultant:
MIG
109 West Union Avenue
Fullerton, CA 92832

January 2020

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Figures

Appendices

1.0 EXECUTIVE SUMMARY

This document presents the results of a Western Riverside Multiple Species Habitat Conservation Plan (MSHCP) Determination of Biologically Equivalent or Superior Preservation (DBESP) analysis conducted for the Krameria Avenue Project Site as required under MSHCP (2004) Section 6.1.2, *Protection of Species Associated with Riparian/Riverine Areas and Vernal Pools*. This document is informed by the December 11, 2019 pre-application meeting with the Western Riverside County Regional Conservation Authority (RCA) and participating regulatory agencies.

All onsite MSHCP riparian (0.010 ac) and riverine (0.108 ac) resources will be impacted as a result of project implementation. In order to mitigate to an equivalent or superior level, 0.118 acres of re-establishment credits will be purchased at the Riverpark Mitigation Bank (1:1 mitigation ratio). Due to the low biological value of current onsite drainage (overall CRAM score = 41), this purchase will result in the re-establishment of biologically superior riparian/riverine resources.

2.0 INTRODUCTION

2.1 Project Area

The 20.18-acre Project Site is located in the City of Moreno Valley, Riverside County, California and includes Assessor Parcel Numbers (APNs) 316-110-005, -006, -022, -023, and -024. The Project Site is located south of Krameria Avenue, east of Tarano Lane, and west of Perris Boulevard (Figure 1, *Vicinity Map* and Figure 2, *Project Site Map)*. The Project Site occurs within the United States Geological Survey (USGS) 7.5' series Sunnymead Quadrangle, Township 3S, Range 3W, Section 30 and is located within the Lower San Jacinto River watershed (HUC 1807020203).

The Project Site is located within the Western Riverside County MSHCP Reche Canyon/Badlands Area Plan and occurs within a predetermined survey area for burrowing owl (*Athene cunicularia*). The Project Site is not located within an MSHCP criteria area or area plan subunit. Therefore, an MSHCP Habitat Evaluation and Acquisition Negotiation Strategy (HANS) and Joint Project Review (JPR) will not be required. The Project Site does not occur within or adjacent to an MSHCP Core, Linkage, Constrained Linkage, or Non-Contiguous Habitat Block. The Project Site does not occur within an MSHCP predetermined survey area for narrow endemic plants, criteria area plants, mammals, or amphibians.

A review of historical aerial photography indicate that the Project Site and environs were agriculture in 1966 (Figure 3, *Historical Aerial Photographs)*. By 1997, residential land uses had nearly enveloped the Project Site. Currently, the Project Site is relatively flat, with elevations ranging between approximately 1,480-1,490 feet above mean sea level (AMSL). Residential land use borders the Project Site on all sides. An unnamed, ephemeral drainage flows north to south along the western boundary of the Project Site.

2.2 Project Description

The Project Site is approximately 20.18 acres and is currently vacant. The project includes the subdivision of the Project Site into sixty-six (66) single-family residential lots ranging in size from 7,212 square feet to 15,950 square feet. (Figure 2, *Project Site Map*). The Project also includes one (1) lettered lot at the southwest corner of the site, which would be designated for future use as an infiltration basin. The MSHCP riverine resource onsite drains into this basin. Access to the Project Site would be provided via a 35-foot wide driveway on Krameria Avenue just west of Perris Boulevard, and via the extension of the existing Kettenburg Lane on the south side of the site. Interior circulation will be provided via a roadway connecting both site access points. The Project will also include landscape and utility easements, street and sidewalk improvements, drainage improvements, and a six-foot high block wall around the entire site. The proposed project will connect to existing water, sanitary sewer, electricity, and gas facilities. Water and sewer service is provided by the Eastern Municipal Water District. Electricity would be provided by Moreno Valley Electric Utility and natural gas will be provided by the Southern California Gas Company. Utility undergrounding would be required.

All 20.18 acres of the Project Site, including all 0.118 acres of MSHCP riparian/riverine resources, will be permanently impacted as a result of project activities. Currently, the entire Project Site is characterized by highly disturbed vegetation communities and exotic species (Section 2.3.2). The episodic drainage that flows along the western Project Site boundary is similarly dominated by non-native plant species. No sensitive vegetation communities occur onsite and no onsite preservation is warranted or proposed. Therefore, there are no alternatives to the proposed project design.

Project-proponents engaged in a pre-application meeting with the Regional Conservation Authority (RCA) and regulatory agency officials (USACE, CDFW, RWQCB) on December 11, 2019. During this meeting, the USACE indicated that they will not be taking jurisdiction over the onsite drainage (D1) due to its characterization as an ephemeral feature that flows only in response to rainfall.

2.3 Existing Conditions

Survey and reports completed to date for the Project Site are listed in Table 1, *Survey History*. The Project Site is flat with elevations ranging between 1,480 to 1,490 feet AMSL (Figure 2, *Project Site Map*). The Project Site is regularly disked, although ruderal vegetation was growing robustly during the April 1, 2019 habitat assessment survey (Appendix A, *General Biological Resource Assessment)*. Residential land uses border the Project Site on all sides. An unnamed, ephemeral drainage flows north to south along the western boundary of the Project Site.

Table 1. Survey History

Survey	Survey Date
General Biological Resource Assessment	April 2019
Focused Burrowing Owl Survey (Phase I and Phase II)	April 2019
Jurisdictional Delineation	June 2019
CRAM Analysis	August 2019

2.3.1 Soils

The Web Soil Survey reports the following soils within the boundary of the 20.18-acre Project Site, as shown on Figure 4, *Soil Map* (USDA NRCS 2019):

- Greenfield sandy loam, 0 to 2 percent slopes (GyA: 14.73 ac)
- Exeter sandy loam, deep, 0 to 2 percent slopes (EpA: 4.39 ac)
- Exeter sandy loam, 0 to 2 percent slopes (EnA: 0.68 ac)
- Exeter very fine sandy loam, 0 to 5 percent slopes (EwB: 0.38 ac)

2.3.2 Vegetation Communities

Vegetation communities observed onsite during the April 1, 2019 habitat assessment survey are described in detail below and depicted in Figure 5, *Vegetation Community Map* (Appendix A, *General Biological Resource Assessment)*. No sensitive natural communities are present onsite. Project-related construction activities will permanently impact all onsite vegetation communities (Table 2, *Vegetation Community Impacts*).

Ruderal (19.03 acres)

The Project Site is regularly disked and is currently dominated by ruderal species that have arisen following recent winter and spring rains. The Project Site is dominated by non-native annual herbs and grasses including foxtail barley (*Hordeum murinium*), wild oats (*Avena fatua*), red brome (*Bromus madritensis* ssp. *rubens*), soft chess (*Bromus hordeaceus*), shepard's purse (*Capsella bursa-pastoris*), wild radish (*Raphanus sativus*), stinknet *(Oncosiphon piluliferum*), London rocket (*Sisymbrium irio*), big heron bill (*Erodium botrys*), coastal heron's bill (*Erodium cicutarium*), and cheeseweed (*Malva parviflora*). Native annual herbs found onsite include common fiddleneck (*Amsinckia intermedia*), slender goldfields (*Lasthenia gracilis*), and miniature lupine (*Lupinus bicolor*).

Developed (1.07 acres)

Sidewalks and roads bound the northern, western, and eastern perimeters of the Project Site. Developed areas are typically devoid of vegetation, but ornamental and/or weedy species may be occasional.

Exotic Tree (0.07 acres)

A Peruvian pepper tree (*Schinus molle*) is the only free-standing tree located onsite and is located in the northeast corner of the Project Site. A Peruvian pepper tree, eucalyptus (*Eucalyptus* sp.), and queen palm (*Syagrus romanzoffiana*) are rooted just south of the Project Site in neighboring residential properties and overhang onto the Project Site.

Black Willow (0.01 acres)

A single black willow (*Salix goodingii*) is present on the western boundary of the Project Site, adjacent to Tarano Lane and overhanging the unnamed MSHCP riverine resource onsite.

Table 2. Vegetation Community Impacts

Vegetation Community	Onsite (ac)	Impact (ac)
Ruderal	19.03	19.03
Developed	1.07	1.07
Exotic Tree	0.07	0.07
Black Willow	0.01	0.01
TOTAL	**20.18**	**20.18**

2.3.3 General Wildlife

Wildlife species that were observed onsite during the April 1, 2019 habitat assessment survey include: red-tailed hawk (*Buteo jamaicensis),* European starling (*Sturnus vulgaris*), black phoebe (*Sayornis nigricans),* Anna's hummingbird (*Calypte anna*), house finch (*Haemorhous mexicanus*), northern mockingbird (*Mimus polyglottus*), common raven (*Corvus corvax*), American crow (*Corvus brachyrhynchos*), house sparrow (*Passer domesticus*), mourning dove (*Zenaida macroura*), and western kingbird (*Tyrannus verticalis*).

3.0 RIPARIAN/RIVERINE MITIGATION

3.1 Methods

All onsite habitats were assessed to determine if MSHCP riparian/riverine resources and/or vernal pools, pursuant to Section 6.1.2 of the Western Riverside MSHCP (2004) are present onsite. MIG wetland delineator Jonathan Campbell conducted a jurisdictional delineation on June 13, 2019 (Appendix B, Jurisdictional Delineation Report). The delineation survey area included the entire 20.18-acre Project Site (Figure 2, *Project Site Map*). The wetland delineation was completed according to the USACE's 1987 Wetland Delineation Manual (Environmental Laboratory 1987) in conjunction with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (Arid West Supplement) (USACE 2008). Vegetation, hydrology, and soils data were collected at two sample point locations (SP1 and SP2) to determine if CWA Section 404 wetlands and/or other waters were present onsite. During this delineation, MSHCP riparian/riverine resources were identified and mapped according to the requirements set forth in Section 6.1.2, *Protection of Species Associated with Riparian/Riverine Areas and Vernal Pools*.

A California Rapid Assessment Method (CRAM) analysis was conducted on the episodic riverine drainage (Appendix C, *CRAM Report*). A single assessment area (AA1) encompassed the entire onsite drainage feature. The overall score for AA1 is 41 (Buffer and Landscape Context = 36; Hydrology = 75; Physical Structure = 25; Biotic Structure = 28). Stressors identified at AA1 include point source discharges, non-point source discharges, plowing/discing, vegetation management, trash/refuse, mowing, urban residential, industrial/commercial, military training/air traffic, flow disruption, and transportation corridors.

3.2 Results/Impacts

3.2.1 Riverine Resources

A single, disturbed ephemeral wash (0.108 ac) is located onsite and represents an MSHCP riverine resource. This unnamed drainage flows north to south along the western perimeter of the Project Site (Figure 6, *MSHCP Riparian/Riverine Resource Map;* Figure 7, *Current Project Site Photographs*). All onsite MSHCP riverine resources will be impacted as a result of project implementation (Table 3, *MSHCP Resource Impacts*).

3.2.2 Riparian Resources

A single, small arroyo willow tree is present along the western boundary of the Project Site (Figure 7, *Current Project Site Photographs*). This tree is situated along the western bank of the unnamed drainage described above and represents an MSHCP riparian resource (0.010 ac). The entire MSHCP riparian resource will be impacted as a result of project implementation (Table 3, *MSHCP Resource Impacts*). Despite the presence of limited MSHCP riparian resources (a single, small arroyo willow tree), the Project Site does not possess suitable habitat for riparian birds as described in MSHCP Section 6.1.2 (including least Bell's vireo, southwestern willow flycatcher, and/or yellow-billed cuckoo).

3.2.3 Vernal Pool Resources

No vernal pool resources are present on or adjacent to the Project Site due to the lack of suitable soils, vegetation communities, topography, and hydrology, as well as a review of historic aerial photography (NETROnline 2019).

Table 3. MSHCP Resource Impacts

Resource	Onsite (ac)	Impact (ac)
MSHCP Riverine	0.108	0.108
MSHCP Riparian	0.010	0.010
Vernal Pool	-	-
TOTAL	**0.118**	**0.118**

3.3 Mitigation and Equivalency

3.3.1 Direct Effects

All onsite MSHCP riparian (0.010 ac) and riverine (0.108 ac) resources will be permanently impacted as a result of project implementation (Figure 6, *MSHCP Riparian/Riverine Resource Map).* In order to mitigate to an equivalent or superior level, the applicant will offset these impacts by purchasing 0.118 acres of credits at the Riverpark Mitigation Bank. Due to the low biological value of current onsite drainage (overall CRAM score = 41), this credit purchase will result in the re-establishment of biologically superior riparian/riverine resources.

The Riverpark Mitigation Bank is a 619-ac mitigation bank located along the San Jacinto River in western Riverside County (Figure 1, *Vicinity Map*). The Project Site is located within the Lower San Jacinto River watershed (HUC 1807020203) and therefore falls within the service area of the Riverpark Mitigation Bank. The US Army Corp of Engineers (USACE 2015) describes the Riverpark Mitigation Bank as follows:

> *The primary objective of the proposed mitigation bank would be to replace functions and services of aquatic resources and associated habitats that have been degraded or destroyed as a result of activities conducted in compliance or in violation of Section 404 of the CWA. The proposed mitigation bank would provide mitigation for both permanent and temporary impacts to waters of the U.S. In addition, the proposed mitigation bank may be used to offset environmental losses resulting from unavoidable impacts related to regulated activities by the California Department of Fish and Wildlife and the San Diego and Santa Ana Regional Water Quality Control Boards. Specific objectives include:*
>
> - *Restoration of fluvial processes on site within the San Jacinto River floodplain.*
> - *Restoration of alkali playa and vernal pool habitat.*
> - *Expansion of existing sensitive plant populations across the site.*
> - *Removal of ongoing agricultural activities on the site.*
> - *Removal of existing berms and the low flow channel.*
> - *Permanent protection of the site through transfer of fee title to the Western Riverside Regional Conservation Authority (RCA).*
> - *Permanent management of the site through funding of a non-wasting endowment.*

3.3.2 Indirect Effects

The guidelines pertaining to the Urban/Wildlands Interface (MSHCP Section 6.1.4) are intended to address indirect effects associated with locating developments in proximity to the MSHCP Conservation Area. The Project Site is not located proximal to an existing MSHCP Conservation Area and is surrounded on all sides by residential development. Project design will incorporate the following guidelines to minimize indirect effects associated with project implementation.

Drainages

Project work has the potential to result in indirect impacts to downstream waters through an increase in sedimentation and decrease in water quality and cumulative impacts resulting in the degradation of overall habitat quality for aquatic plant and wildlife species. In order to avoid and minimize these potential effects during construction activities, the following measures will be implemented:

- Appropriate sediment and erosion control best management practices (BMPs) (e.g., use of silt fencing and/or straw waddles around the perimeter of the construction zone) will be implemented to minimize surface runoff originating from the development and thereby protect water quality of downstream areas. Erosion/sediment control BMPs will be implemented during project construction, will be described in the project's SWPPP, and could include the following:
    - Scheduling
    - Soil Binders
    - Earth Dike and Drainage Swales
    - Soil Preparation-Roughening
    - Wind Erosion Control
    - Silt Fence
    - Gravel Bag Berm
    - Street Sweeping
    - Storm Drain Inlet Protection
    - Stabilized Construction Entrance/Exit
- Prior to the onset of construction activities, construction personnel will be briefed on the location of sensitive habitat and other resources that will be preserved and the importance of avoidance.
- All fueling and maintenance of vehicles and other equipment and staging areas will be at least 50 feet (15 meters) from storm drains or drainages. During refueling and maintenance of vehicles and equipment, secondary containment will be used.
- No vehicle or equipment cleaning will take place on site during construction.
- Vehicles will be checked daily and maintained in accordance with manufactures' specifications to minimize potential for leaks. Cleanup materials will be kept on-site to recover any accidental spills. Spills will be cleaned up immediately upon discovery.
- Disturbed soil areas and soil stockpiles will be covered with tarps prior to forecasted rain events.
- Waste facilities will be maintained. Waste facilities include concrete wash-out facilities, porta-potties, and hydraulic fluid containers. Waste will be removed to a proper disposal site. The dumpster will be covered at the end of each business day and prior to rain events.

A Water Quality Management Plan will be implemented to ensure that the project would not cause an increase in storm water runoff and would include water quality treatment prior to discharge from the site. The project will include permanent BMPs and source control BMPs to protect downstream watercourses after construction. The existing site generally drains from the northeast corner to the southwest corner with portions of the flows entering into Kettenburg Lane where they continue southerly. Once developed, all private lots will drain to a public street. All street drainage from the interior streets, Tarano Lane and private lots will be directed to one of two bioretention areas to be constructed at the southwest corner of the site. The bioretention areas consist of a 6" deep ponding area with mulch and planting, with engineered soil media below ground. Once treated in the bioretention area media, flows will enter an underdrain and will outlet to a proposed storm drain in Kettenburg Lane. This storm drain is proposed to be extended from Northern Dancer Drive. From here, flows continue via City of Moreno Valley Storm Drain to Perris Valley Channel and Canyon Lake as they do historically.

Runoff from the Krameria Avenue frontage, adjacent parkway and landscape easement will be directed to one of three proposed bioretention swales, via curb openings. The bioretention swales will include engineered soil media below ground. Once treated in the soil media, runoff will enter an underdrain, ultimately directing flows to the existing storm drain in Krameria Avenue. From here, flows continue via City of Moreno Valley Storm Drain to Perris Valley Channel and Canyon Lake as they do historically.

<u>Toxics</u>
Stormwater conveyance systems will be designed to prevent the release of toxins, chemicals, or biohazards that could degrade or injure downstream biological resources. To accomplish this, the project will incorporate structural Best Management Practices (BMPs), as required by Waste Discharge Requirements (WDRs) and the National Pollutant Discharge and Elimination System (NPDES) permit system.

<u>Lighting</u>
The Project Site is not located in or adjacent to an MSHCP Conservation Area and indirect impacts from lighting are not expected on common wildlife species. Adjacent land uses are residential on all sides.

<u>Noise</u>
Short-term noise related to construction-activities will be reduced by ensuring that all construction machinery is equipped with properly operating mufflers. In addition, all construction and haul truck deliveries will occur within standard, daytime construction hours.

<u>Invasive Species</u>
The landscaping plan shall avoid the use of invasive, exotic species, as listed in MSHCP Table 6.2, *Plants That Should be Avoided Adjacent to the MSHCP Conservation Area*.

<u>Barriers</u>
The Project Site is not located adjacent to an existing MSHCP Conservation Area, but temporary construction fencing will limit local movement in and out of the Project Site during construction.

4.0 NARROW ENDEMIC PLANT SPECIES MITIGATION

The Project Site does not occur within a predetermined Survey Area for Narrow Endemic Plant Species (WRC-RCA Information Tool, September 2019). No further action is required.

5.0 ADDITIONAL SURVEYS

5.1 Criteria Area Plant Species
The Project Site does not occur within a predetermined Survey Area for Criteria Area Plant Species. No surveys are required.

5.2 Burrowing Owl

The Project Site occurs within a predetermined Survey Area for the burrowing owl. A focused burrowing owl survey was initiated on April 1, 2019 (MSHCP 2006). Although suitable burrowing owl habitat is present onsite in the ruderal vegetation community (Step 1 – Habitat Assessment), burrowing owls are not expected to occur in or around the Project Site due to the lack of suitable burrows (Step 2a – Focused Burrow Survey) (Appendix A, *General Biological Resource Assessment*). Regardless, a 30-day pre-construction survey is required prior to the initiation of construction to ensure protection of this species and compliance with the conservation goals as outlined in the MSHCP (Section 7.2).

5.3 Mammals

The Project Site does not occur within a predetermined Survey Area for mammal species. No surveys are required.

5.4 Amphibians

The Project Site does not occur within a predetermined Survey Area for amphibian species. No surveys are required.

6.0 Delhi Sands Flower-Loving Fly

The Project Site does not possess Delhi Sands soils (Figure 4, *Soils Map*) (USDA 2019). No further action is required.

7.0 References

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experimental Station, Vicksburg, MS. 117 pp.

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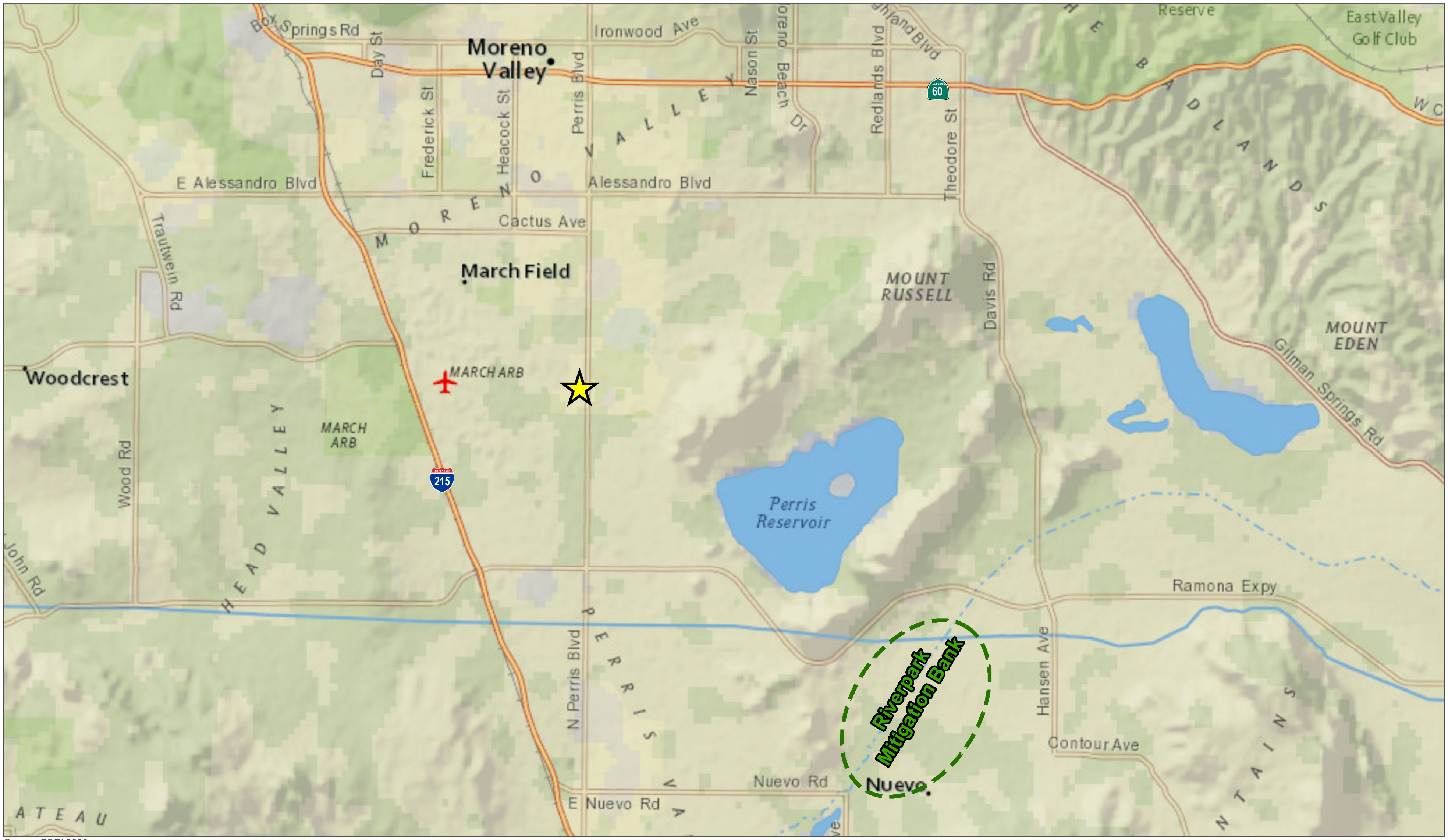
MSHCP. March 2006. Burrowing Owl Survey Instructions. Available online at: http://rctlma.org/Portals/1/EPD/consultant/burrowing_owl_survey_instructions.pdf.

NETROnline. 2019. Historic Aerials. https://www.historicaerials.com/. [Accessed December 2019].

USACE. 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). Eds. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-06-16, U.S. Army Engineer Research and Development Center, Vicksburg, MS. May 2008.

USACE. 2015. Prospectus for Mitigation Bank and Application for Permit, Riverpark Mitigation Bank. SPL-2015-00318-MBT

USDA. 2019. Web Soil Survey. NRCS. Available online at http://websoilsurvey.nrcs.usda.gov/. [Accessed April 2019].



Source: ESRI 2020

Project Location

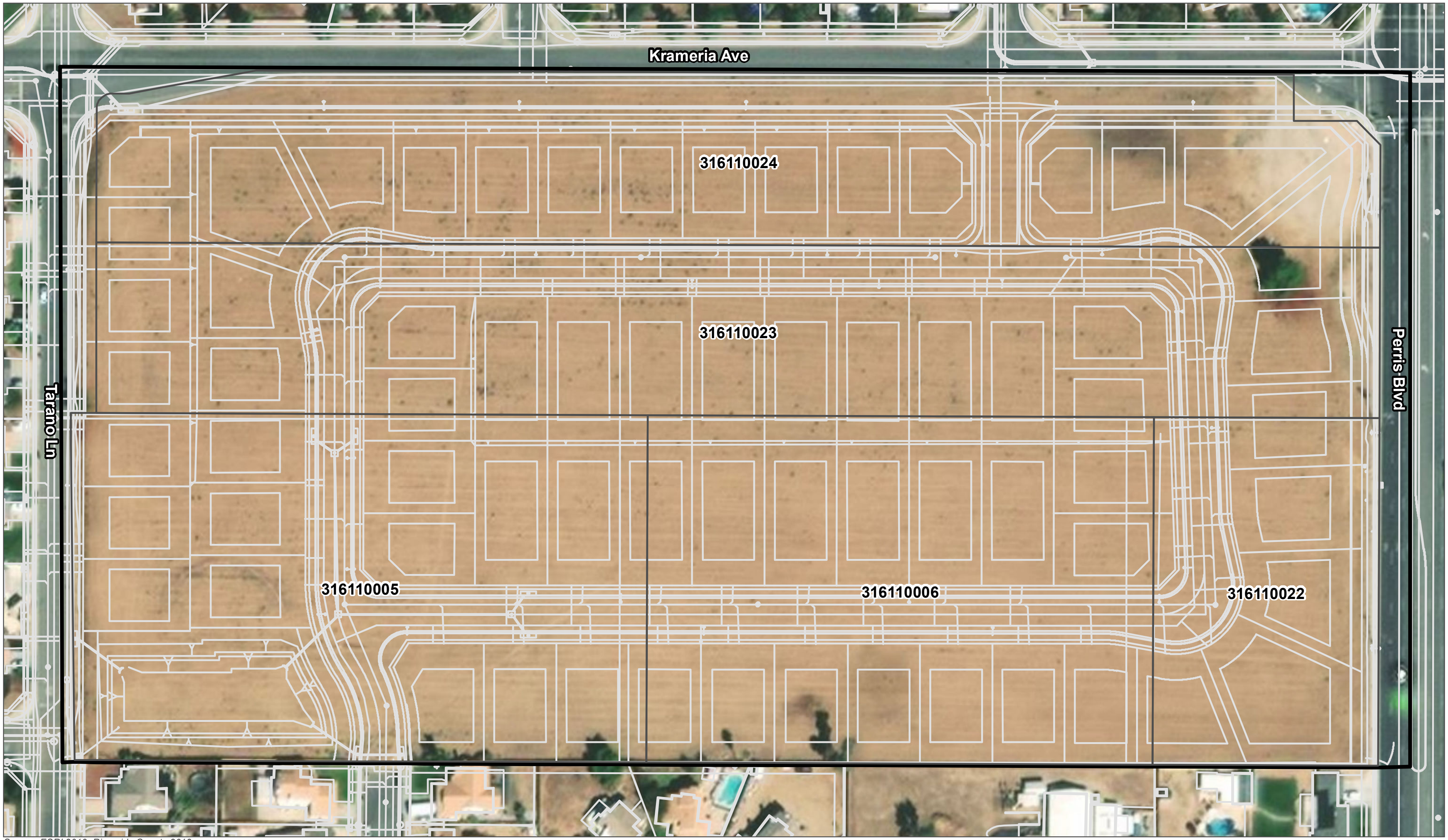
Riverpark Mitigation Bank (Approximate)

0 1 2 4 Miles

Figure 1 Vicinity Map

Krameria Project Site, Moreno Valley, CA

MIG



Source: ESRI 2019, Riverside County 2019

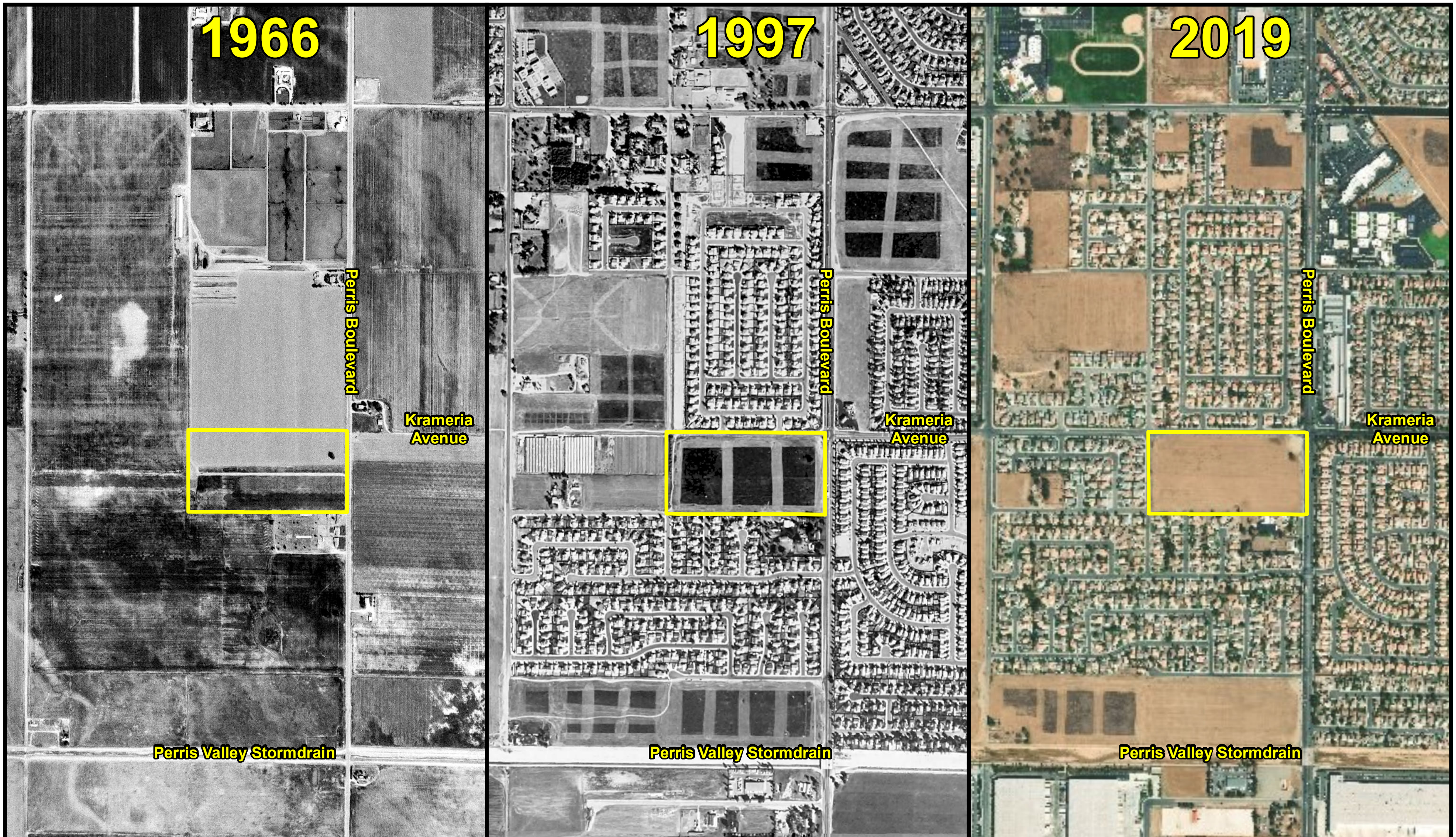
Project Site Boundary (20.18 ac)

Parcels

Development Plan (20.18 ac)

Figure 2 Project Site Map

Krameria Avenue Project Site, Moreno Valley, CA



Source: ESRI 2019, Riverside County 2019; NETRonline Historical Aerials 2019.

Project Site Boundary (20.18 ac)

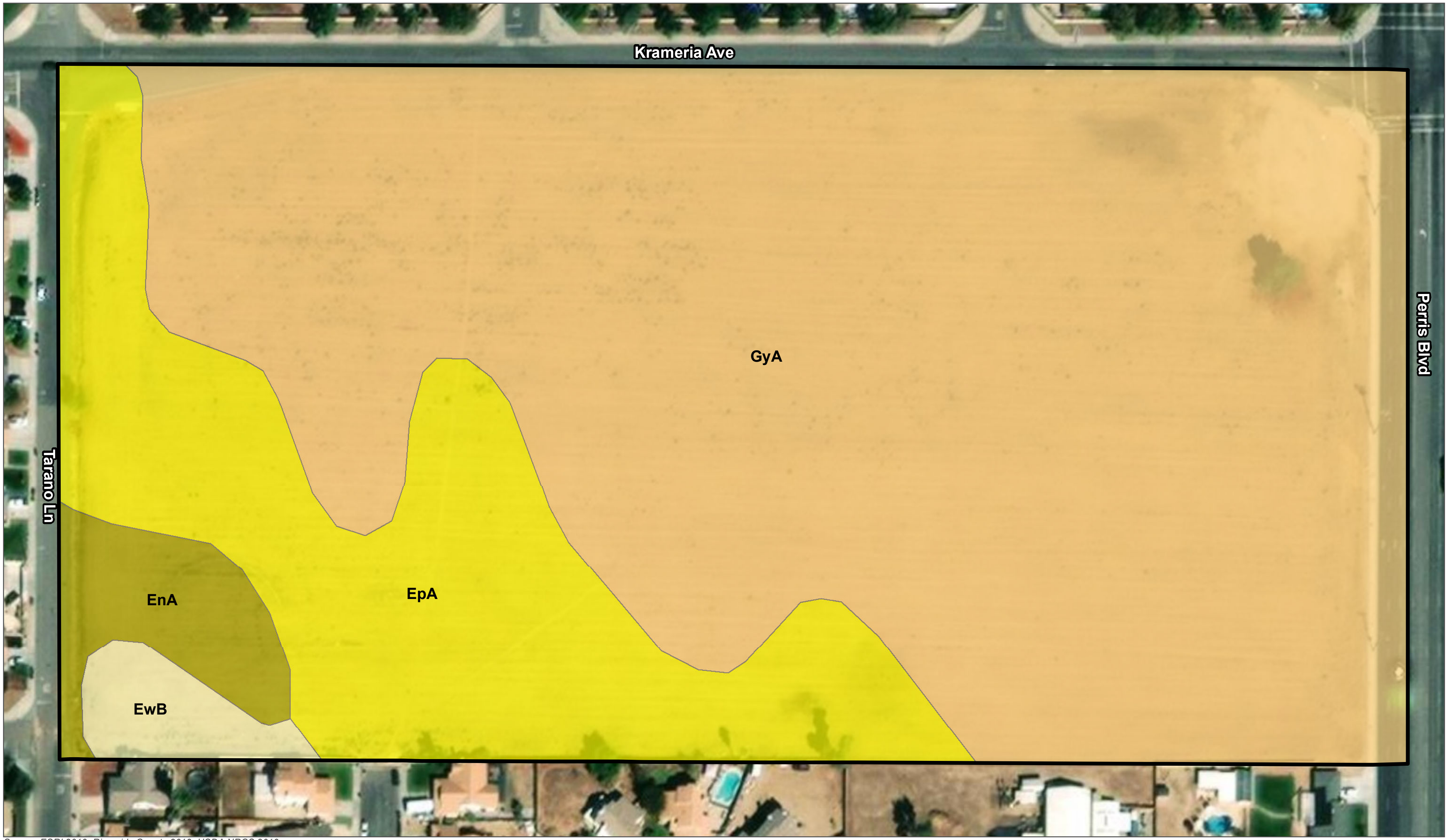
Feet
0 500 1,000 2,000

N

MIG

Figure 3 Historical Aerial Photographs

Krameria Avenue Project Site, Moreno Valley, CA



Source: ESRI 2019, Riverside County 2019, USDA NRCS 2019

Project Site Boundary (20.18 ac)

Soils

- GYA: Greenfield sandy loam, 0 to 2 percent slopes (14.73 ac)
- EpA: Exeter sandy loam, deep, 0 to 2 percent slopes (4.39 ac)
- EnA: Exeter sandy loam, 0 to 2 percent slopes (0.68 ac)
- EwB: Exeter very fine sandy loam, 0 to 5 percent slopes (0.38 ac)

0 100 200 400 Feet

Figure 4 Soil Map

Krameria Project Site, Moreno Valley, CA

MIG

Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)

Vegetation Community

Ruderal (19.03 ac)

Developed (1.07 ac)

Exotic Tree (0.07 ac)

Black Willow (0.01 ac)

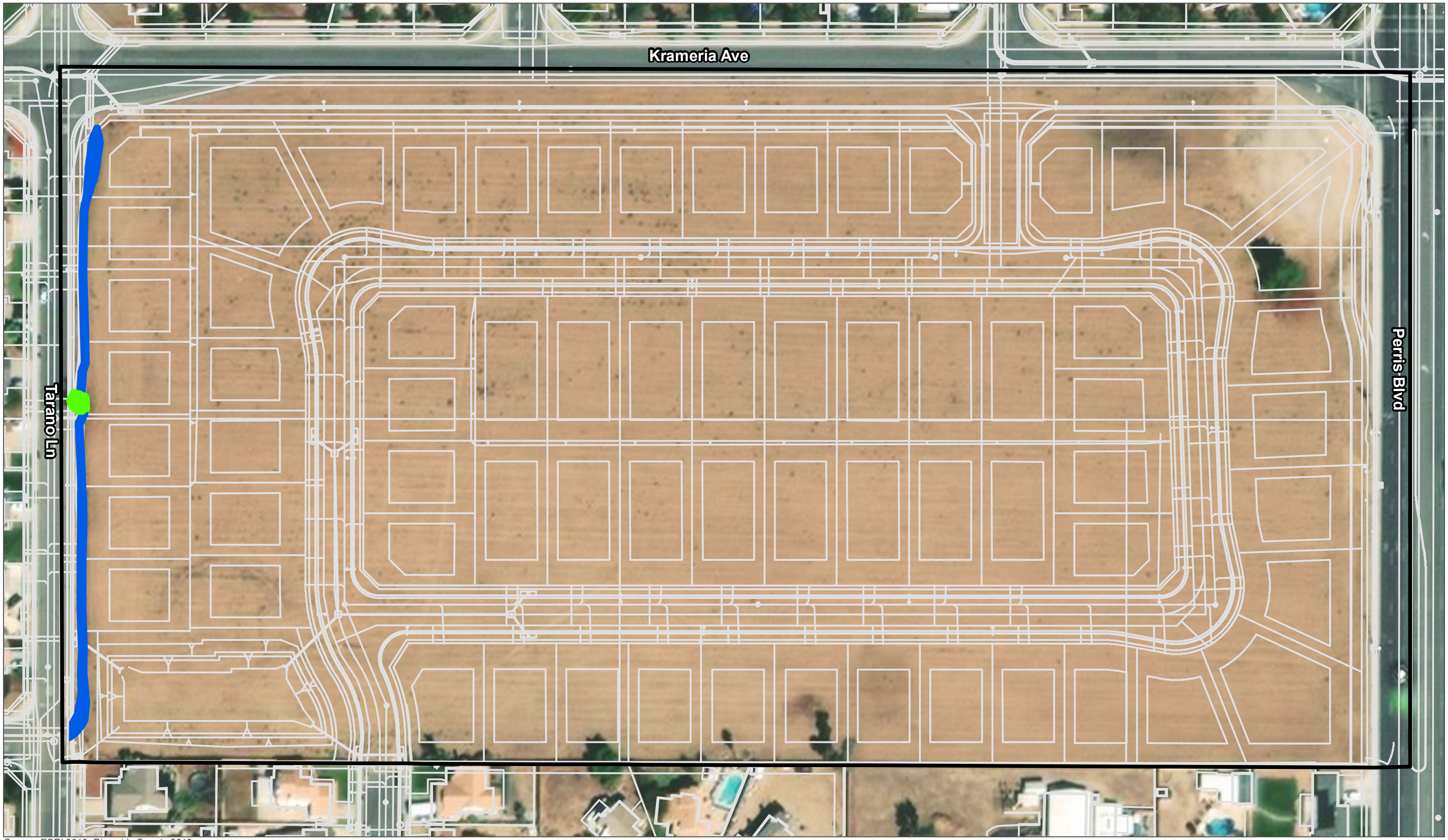
Feet

0 100 200 400

MIG

Figure 5 Vegetation Community Map

Krameria Avenue Project Site, Moreno Valley, CA



Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)
Permanently Impacted MSHCP Riverine Area (0.108 ac)
Permanently Impacted MSHCP Riparian Area (0.010 ac)
Development Plan

Feet
0 100 200 400

MIG

Figure 6 MSHCP Riparian/Riverine Resources Map

Krameria Avenue Project Site, Moreno Valley, CA

PHOTOGRAPH 1 - Looking upstream from downstream portion of AA1. Tarano Lane serves to confine flows along the western bank of the unnamed drainage.

PHOTOGRAPH 2 - Looking downstream from downstream portion of AA1. The channel widens as it flows southward. At the southern end of the AA1, the unnamed drainage flows onto Tarano Lane and subsequently into a roadside storm drain.

Figure 7 Current Project Site Photographs

Krameria Avenue Project Site
Jurisdictional Delineation Report

Prepared for:
PI Properties No. 67 LLC
610 North Santa Anita Avenue
Arcadia, CA 91006

Prepared by:
MIG, Inc.
1500 Iowa Avenue, Suite 110
Riverside, California 92507
Contact: Jonathan Campbell (310) 903-7876
jcampbell@migcom.com

February 2020

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List of Abbreviated Terms

AMSL	Above Mean Sea Level
APN	Assessor's Parcel Number
AWRS	Arid West Regional Supplement
CCR	California Code of Regulations
CFR	Code of Federal Regulations
CDFW	California Department of Fish and Wildlife
CNRFC	California Nevada River Forecast Center
CWA	Clean Water Act
EPA	Environmental Protection Agency
°F	degrees Fahrenheit
FAC	Facultative
FACU	Facultative Upland
FACW	Facultative Wetland
FEMA	Federal Emergency Management Agency
GPS	Global Positioning System
HUC	Hydrologic Unit Code
LSAA	Lake and Streambed Alteration Agreement
MSCHP	Multiple Species Habitat Conservation Plan
NCDC	National Climatic Data Center
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resource Conservation Service
NTCHS	National Technical Committee for Hydric Soils
NWI	National Wetland Inventory
NWS	National Weather Service
OBL	Obligate
OHWM	Ordinary High Water Mark
RPW	Relatively Permanent Waters
RWQCB	Regional Water Quality Control Board
SP	Sample Point
SWANCC	Solid Waste Agency of Northern Cook County
TNW	Traditional Navigable Water
TOB	Top of Bank
UPL	Upland
US	United States
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1 Introduction

MIG, Inc. (MIG) was retained by PI Properties No. 67 LLC to conduct a jurisdictional delineation of potential wetlands and waters of the United States (US) for the Krameria Avenue Project Site (Project Site) located in the City of Moreno Valley, Riverside County, California (Figure 1, *Vicinity Map*, Figure 2, *USGS Topographic Map*, and Figure 3, *Aerial Photograph of the Project Site*). The purpose of this report is to determine the location and extent of wetland and/or water features within the Project Site that are potentially regulated by the US Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA). Findings in this report are considered preliminary until the USACE has completed its formal review and verification process. This report also provides maps and acreages of Waters of the State that fall under the jurisdiction of the Regional Water Quality Control Board (RWQCB), California Department of Fish and Wildlife (CDFW), and Western Riverside Multiple Species Habitat Conservation Plan (MHSCP).

This jurisdictional delineation report has been prepared in compliance with the USACE's Minimum Standards for Acceptance for Preliminary Delineations (USACE 2001) and Final Map and Drawing Standards for the South Pacific Division Regulatory Program (USACE 2012).

1.1 Project Site Location and Setting

The 20.18-acre Project Site is located in the City of Moreno Valley, Riverside County, California and includes Assessor Parcel Numbers (APN): 316-110-005, -006, -022, -023, and -024 (Figure 1, *Vicinity Map* and Figure 3, *Aerial Photograph of the Project Site*). The Project Site is south of Krameria Avenue, east of Tarano Lane, and west of Perris Boulevard. The Project Site occurs within the United States Geological Survey (USGS) 7.5' series Sunnymead Quadrangle, Township 3S, Range 3W, Section 30 (Figure 2, *USGS Topographic Map)*. The Project Site is relatively flat, with elevations ranging between approximately 1,480-1,490 feet above mean sea level (AMSL). Residential land use borders the Project Site on all sides.

1.2 Applicant Information

PI Properties No. 67 LLC
610 North Santa Anita Avenue
Arcadia, CA 91006

1.3 Project Site Directions

Regional access to the Project Site is provided by taking the Cactus Avenue exit east of Interstate 215 (I-215). Follow Cactus Avenue 3.2 miles east of I-215, turn south on Perris Boulevard. Travel south for 2.0 miles to Krameria Avenue. The Project Site is located southwest of the intersection of Krameria Avenue and Perris Boulevard.

1.4 Project Description

The project proposes to subdivide 20.18 acres into sixty-six (66) single-family residential lots ranging in size from 7,212 SF to 15,950 SF, and one lettered lot. All street drainage from the Project Site will be directed to a 0.483 acre bioretention area to be constructed at the southwest corner of the site. The bioretention area consists of a 6" deep ponding area with mulch and planting, with 3' of engineered soil media below ground. Once treated in the bioretention area media, flows will enter an underdrain and will outlet via a sump and pump and drain to Tarano Lane. From here, flows continue via City of Moreno Valley Storm Drain to Perris Valley Channel and Canyon Lake, as they have historically.

2 Regulatory Setting

Environments and habitats associated with wetlands and other aquatic features are regulated under federal, state, and local laws. Each of the laws is administered independently and in coordination with the following agencies: USACE, US Fish and Wildlife Service (USFWS), the US Environmental Protection Agency (EPA), CDFW, RWQCB, and the Western Riverside MSHCP.

2.1 Waters of the US

2.1.1 Section 404 of the Clean Water Act

The objective of the CWA is to maintain and restore the chemical, physical, and biological integrity of the Waters of the US (33 CFR Part 328 Section 328.4). "Waters of the US" is the encompassing term for areas that qualify for federal regulation under Section 404 of the CWA. Section 404 of the CWA gives the EPA and the USACE regulatory and permitting authority regarding discharge of dredged or fill material into "navigable waters of the US." Section 502(7) of the CWA defines navigable waters as "waters of the US, including territorial seas." Section 328 of Chapter 33 in the Code of Federal Regulations (CFR) defines the term "waters of the US" as it applies to the jurisdictional limits of the authority of the USACE under the CWA. A summary of this definition of "waters of the US" in 33 CFG 328.3 includes (1) waters used for commerce and subject to tides; (2) interstate waters and wetlands; (3) "other waters" such as intrastate lakes, rivers, streams, and wetlands; (4) impoundments of waters; (5) tributaries of waters; (6) territorial seas; and (7) wetlands adjacent to waters. Therefore, for purposes of determining USACE jurisdiction under the CWA, "navigable waters" as defined in the CWA are the same as "waters of the US" defined in the Code of Federal Regulations above. Waters of the U.S include non-isolated "wetlands" and "other waters of the US"

<u>Section 404 Wetlands</u>

The term "wetlands" (a subset of waters of the US) is defined at 33 CFR 328.3(b) as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support...a prevalence of vegetation typically adapted for life in saturated soil conditions." The USACE developed field methods for identifying the location and extent of jurisdictional wetlands (a subset of waters of the US) using the USACE Wetland Delineation Manual (Environmental Laboratory 1987): Arid West Regional Supplement [AWRS]) (USACE 2008a). This supplement was intended to address specific wetland issues within the arid west and supersedes much of the 1987 Wetland Delineation Manual in arid regions.

<u>Section 404 Other Waters</u>

In the absence of wetlands, other waters of the US refer to unvegetated waterways and other water bodies with a defined bed and bank, such as drainages, creeks, rivers, and lakes. This approximately translates to the bank to bank portion of water bodies, up to the ordinary high water mark (OHWM) (USACE 2008b). The limits of USACE jurisdiction in non-tidal waters, such as intermittent streams, extend to the ordinary high water mark (OHWM) which is defined at 33 CFR 328.3(e) as: "...*that line on the shore established by the fluctuation of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas*."

The OHWM in the Arid West Region is consistent with the physical and biological signature[1] established and maintained at the boundaries of the active channel.[2] Delineation of the active channel signature, and thus the OHWM, is based largely on identification of three primary physical or biological indicators—topographic break in slope, change in sediment characteristics, and change in vegetation characteristics. A break in slope refers to a localized and distinct change in the lateral topographic gradient (i.e., perpendicular to the principal direction of flow) within a stream system. Changes in sediment characteristics include any transition in the physical, chemical, or biological qualities of the sediments within and adjacent to a stream channel. For the purposes of OHWM identification, changes in vegetation characteristics include any lateral transition (i.e., perpendicular to the principal direction of flow) in the abundance, growth stage, or plant cover and composition within and adjacent to a stream channel. Supporting features including drift/wrack (i.e., debris deposits), signs of erosion/scour, bank undercutting, root exposure, point bars (meanders), silt deposits, and shelving ("benches" and breaks in slope along the active channel), were also used to help determine the location of the OHWM.

2.1.2 Isolated Areas Excluded from Section 404 Jurisdiction

In addition to areas that may be exempt from Section 404 jurisdiction, some isolated wetlands and waters may also be considered outside of USACE jurisdiction as a result of the Supreme Court's decision in Solid Waste Agency of Northern Cook County (SWANCC) v. US Army Corps of Engineers (531 US 159 [2001]). The key factor in this decision was language in the CWA that relates to navigable waters. Isolated wetlands and waters are those areas that do not have a connection to and are not adjacent to a navigable "waters of the US," and do not otherwise exhibit an interstate commerce connection. Under Section 404 of the CWA, federal protection extends to those wetlands located on or adjacent to navigable waters of the US or their tributary systems. Wetlands that do not meet this requirement, such as isolated wetlands with no link to interstate commerce, are not regulated as waters of the US and are therefore not protected under the CWA. In general, the USACE considers isolated wetlands to be those of any size that are not adjacent to or do not have a sufficient hydrologic connection to navigable waters.

2.1.3 Executive Order 11990 for Protection of Wetlands

Executive Order 11990 for the Protection of Wetlands (May 24, 1977) establishes a national policy to avoid adverse impacts on wetlands whenever there is a practicable alternative. On federally funded projects, impacts on wetlands must be identified in the environmental document. Alternatives that avoid wetlands must be considered. If wetland impacts cannot be avoided, then all practicable measures to minimize harm must be included. This must be documented in a specific "Wetlands Only Practicable Alternative Finding" in the final environmental document. An additional requirement is to provide early public involvement in projects affecting wetlands.

[1] A combination of physical and biological features that act to form a distinct mark on the landscape.

[2] The hydrogeomorphic unit of a stream system within which the local hydrologic regime and geo-morphic processes are effective in maintaining a linear topographic depression or conduit on the land surface, typically characterized by the presence of a bed and banks.

2.2 Waters of the State

2.2.1 Section 401 of the Clean Water Act

The RWQCB regulates activities in "Waters of the State", including wetlands, through Section 401 of the CWA. While the USACE administers permitting programs that authorize impacts to waters of the US, any USACE permit authorized for a project would be invalid unless the RWQCB has issued a project-specific water quality certification or waiver of water quality. A water quality certification requires a finding by the RWQCB that the activities permitted by the USACE will not violate water quality standards individually or cumulatively over the term of the issued USACE permit.

2.2.2 Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Act (Porter-Cologne Act) (California Water Code Section 13260) requires "any person discharging waste, or proposing to discharge waste, within any region that could affect the "Waters of the State" to file a report of discharge" with the RWQCB through an application for waste discharge. "Waters of the State" are defined by the Porter-Cologne Control Act as "any surface water or groundwater, including saline waters, within the boundaries of the state." The RWQCB protects all waters in its regulatory scope but has special responsibility for isolated wetlands and headwaters. These water bodies have high resource value, are vulnerable to filling, and may not be regulated by other programs, such as Section 404 of the CWA.

2.2.3 California Fish and Game Code Section 1600-1603

Under Section 1602 of California Fish and Game Code, CDFW has authority over any proposed activity that may substantially modify a river, stream, or lake. The CDFW requires notification for any activity that will do one or more of the following: (1) substantially obstruct or divert the natural flow of a river, stream, or lake; (2) substantially change or use any material from the bed, channel, or bank of a river, stream, or lake; or (3) deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into a river, stream, or lake.

The notification requirement applies to any work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel. This includes ephemeral streams, desert washes, and watercourses with a subsurface flow. The CDFW typically considers a river, stream, or lake to include its riparian vegetation, but it may also extend to its floodplain. The term "stream", which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as follows: "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life". This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation (14 CCR 1.72). In addition, the term stream can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife (CDFW 1994). Riparian is defined as "on, or pertaining to, the banks of a stream"; therefore, riparian vegetation is defined as, "vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself" (CDFW 1994).

If the CDFW determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement (LSAA) will be prepared, which includes reasonable conditions necessary to protect those resources. The applicant may then proceed with the activity in accordance with the final LSAA. Section 1602 does not extend to isolated wetlands and waters, such as small ponds not located on drainages.

2.3 Western Riverside MSHCP

2.3.1 MSHCP Riparian/Riverine and Vernal Pools

Habitats were assessed to determine if MSHCP riparian/riverine resources and/or vernal pools, pursuant to section 6.1.2 of the MSHCP are present onsite. MSHCP riparian/riverine resources are defined as, "*those lands that contain habitat dominated by trees, shrubs, persistent emergents, or emergent mosses and lichens, which occur close to or which depend upon soil moisture from a nearby fresh water source; or areas with fresh water flow during all or a portion of the year. Vernal pools are seasonal wetlands that occur in depression areas that have wetlands indicators of all three parameters (soils, vegetation, and hydrology) during the wetter portion of the growing season but normally lack wetlands indicators of hydrology and/or vegetation during the drier portion of the growing season"* (MSHCP 2004). In addition, stock ponds, ephemeral pools, and other areas of potential fairy shrimp habitat are noted, if applicable.

3 Methods

The methods utilized in the preparation of this report included a background information review and multiple site visits to collect pertinent wetland field data. Prior to conducting the initial field visit a 200-scale color aerial photograph of the Project Site and USGS topographic maps were assessed to determine the locations of potential federal and state jurisdictional habitats. Suspected jurisdictional areas were then field-checked and or sampled where access was feasible for the presence of wetland vegetation, soils, and hydrology. The presence of potentially jurisdictional features on the site was evaluated using the methodologies described below.

3.1 Background Information Review

Prior to conducting field studies, available reference materials were reviewed including but not limited to:

- US Department of Agriculture (USDA) National Resources Conservation Service (NRCS) Online Soil Survey of Western Riverside County, California (USDA NRCS 2019). http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
- National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC) WETS Table https://www.wcc.nrcs.usda.gov/climate/navigate_wets.html (NOAA NCDC 2019a)
- NOAA Palmer Drought Indices. https://www.ncdc.noaa.gov/temp-and-precip/drought/historical-palmers/ (NOAA NCDC 2019b)
- NOAA California Nevada River Forecast Center. (NOAA CNRFC 2019). http://www.cnrfc.noaa.gov
- National Wetland Inventory (NWI) Map Data (USFWS 2019) for the Sunnymead 7.5 Minute USGS quadrangle that characterize wetland and waters of the US according to the Classification of Wetlands and Deepwater Habitats of the United States developed by USFWS (Cowardin et al. 1979).

3.2 Jurisdictional Delineation

MIG wetland delineator Jonathan Campbell conducted a jurisdictional delineation on June 13, 2019. The delineation survey area included the entire 20.18-acre Project Site (Figure 3, *Aerial Photograph of Project Site*). The wetland delineation was completed according to the USACE's 1987 Wetland Delineation Manual (Environmental Laboratory 1987) in conjunction with the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (Arid West Supplement) (USACE 2008a). Vegetation, hydrology, and soils data were collected at two sample point locations (SP1 and SP2) to determine if CWA Section 404 wetlands and/or other waters were present onsite (Appendix A, *Wetland Delineation Data Forms*). The methods of assessing each of these parameters is discussed below.

3.2.1 Hydrophytic Vegetation

Hydrophytic vegetation is generally defined as plant species that are adapted to grow in wet, oxygen-poor soils. Hydrophytic vegetation is determined to be present when the plant community is dominated by species that can tolerate prolonged inundations or soil saturation during the growing season. The National Wetland Plant List (Lichvar et al. 2016) provides a wetland indicator status for all hydrophytic plant species in the US The wetland indicator status is a predictor of the likelihood of the plant to occur in wetlands, and is defined as follows:

- Obligate Plant (OBL): a plant that almost always occurs in wetlands
- Facultative Wetland Plant (FACW): a plant that usually occurs in wetlands, but may occur in non-wetlands
- Facultative Plant (FAC): a plant that occurs in wetlands and non-wetlands
- Facultative Upland Plant (FACU): a plant that usually occurs in non-wetlands, but may occur in wetlands
- Upland Plant (UPL): a plant that almost never occurs in wetlands
-

The Arid West Supplement (USACE 2008a) requires that a three-step process be conducted to determine if hydrophytic vegetation is present. The procedure first requires the delineator to apply the "50/20 rule" (Indicator 1) described in the manual. For each sampling point, the biologists visually estimated absolute percent cover of plant species within an approximately 10-foot radius and the wetland indicator status (i.e., OBL, FACW, FAC, FACU, and UPL) of the species was recorded. For species not on the 2016 National Wetland Plant List for the Arid West Region, the indicator status was assumed to be UPL (USACE 2008a). To apply the "50/20 rule", dominant species are evaluated within each herb, shrub, and tree stratum of the community. In general, dominants are the most abundant species that individually or collectively account for more than 50 percent of the total coverage of vegetation in the stratum, plus any other species that, by itself, accounts for at least 20 percent of the total. If greater than 50 percent of the dominant species can be classified by an OBL, FACW, or FAC wetland indicator status, ignoring + and - qualifiers, hydrophytic vegetation is present. If the community passes Indicator 1 then the community is hydrophytic. If the community fails Indicator 1 and both hydric soils and wetland hydrology are not present, then hydrophytic vegetation is not present, unless the site is a problematic wetland situation. However, if the plant community fails Indicator 1 but hydric soils and wetland hydrology are both present, the delineator must apply Indicator 2.

Indicator 2 is known as the Prevalence Index. The prevalence index is a weighted average of the wetland indicator status for all plant species within the sampling plot. Each indicator status is given a numeric code (OBL = 1, FACW = 2, FAC = 3, FACU = 4, and UPL = 5). Indicator 2 requires the delineator to estimate the percent cover of each species in every stratum of the community and sum the cover estimates for any species that is present in more than one stratum. All species are then organized into groups according to their wetland indicator status and the Prevalence Index is calculated using the following formula:

$$\mathrm{PI} = \frac{\mathrm{A_{OBL}} + 2\mathrm{A_{FACW}} + 3\mathrm{A_{FAC}} + 4\mathrm{A_{FACU}} + 5\mathrm{A_{UPL}}}{\mathrm{A_{OBL}} + \mathrm{A_{FACW}} + \mathrm{A_{FAC}} + \mathrm{A_{FACU}} + \mathrm{A_{UPL}}}$$

The Prevalence Index will yield a number between 1 and 5. If the Prevalence Index is equal or less than 3, hydrophytic vegetation is present. However, if the community fails Indicator 2, the delineator must proceed to Indicator 3.

Indicator 3 is known as Morphological Adaptations. Some hydrophytes in the Arid West Region develop easily recognized physical characteristics (or morphological adaptations) when they occur in wetland areas. Some of these adaptations may include, but are not necessarily limited to, adventitious roots and shallow root systems developed on or near the soil surface. If more than 50 percent of the individuals of a FACU species exhibit morphological adaptations for life in wetlands that species is considered to be a hydrophyte and its wetland indicator status should be reassigned to FAC. If such observations are made, the delineator must recalculate Indicator 1 and 2 using a FAC indicator status for this species. The vegetation is hydrophytic if either test is satisfied.

3.2.2 Hydric Soils

The National Technical Committee for Hydric Soils (NTCHS) defines hydric soils as “a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part” (US Department of Agriculture [USDA], Soil Conservation Service [SCS] 1994). Nearly all hydric soils exhibit characteristic morphologies that result from repeated periods of saturation or inundation for more than a few days, including redoximorphic features such as orange oxidized mottles or light-colored (high value, low chroma) reduced matrix or mottle colors. The AWRS (USACE 2008a) contains a list of 23 hydric soil indicators that are known to occur in the Arid West region. Soils samples were collected and described according to the methodology provided in the AWRS. Soil chroma and values were determined by utilizing a standard Munsell soil color chart (Munsell 2000). Hydric soils were determined to be present if any of the soil samples met one or more of the 23 hydric soil indicators described in the AWRS (USACE 2008a). Characteristic field indicators of hydric soils include the presence of a histic epipedon, the presence of sulfidic material, the presence of an aquic or peraquic moisture regime, reducing soil conditions, soil color (including gleyed soils or soils with a low matrix chroma, with or without bright mottles), iron or manganese concretions, and soils listed as hydric by the USDA on the National Hydric Soils List (NRCS 2019).

3.2.3 Wetland Hydrology

Wetland hydrology is indicated by an area that is inundated or saturated for a period long enough to create anaerobic vegetation and soil conditions during the growing season. (USACE 2008a, Section 4). Primary field indicators of wetland hydrology include surface water, soil saturation, sediment deposits, drift deposits, surface soil cracks, oxidized rhizospheres along living roots. Secondary indicators include drainage patterns. Wetland hydrology was determined to be present if one or more primary indicators or two or more secondary indicators were observed. According to the AWRS (USACE 2008a), wetland hydrology is satisfied if the sampled area is seasonally inundated or saturated to the surface for a minimum of 14 consecutive days during the growing season.

During the wetland delineation, the hydrological setting of the Project Site was evaluated to identify the jurisdictional boundaries of wetlands and waters of the US and their connection to off-site navigable waters. In addition, the overall landforms and climatic/hydrological conditions were assessed.

3.3 Jurisdictional Other Waters Delineation

For non-wetland, “other water” features, the extent of USACE jurisdiction is defined by the OWHM. Delineation of other waters was based on observing indicators for the OHWM (33 CFR 328.3), following established USACE criteria and considering hydrological connectivity or isolation. The OHWM was determined through an examination of both recent and past physical evidence of surface flows. Common physical characteristics that indicate the presence of an OHWM include, but are not limited to, a clear natural line impressed on the bank; evidence of scour; recent bank erosion; destruction of native terrestrial vegetation; sediment deposition; and the presence of litter and debris. The bank-to-bank extent (i.e., bankfull width) of drainages and ponds or lakes that contain water during a normal rainfall year generally serves as a reliable approximation of the lateral limit of USACE jurisdiction.

The limit of the OHWM was recorded in the field based on observations of changes in vegetation and break in bank slope. The upper limit of flow fluctuations by a sharp break in the bank slope, with a corresponding change in vegetation and/or scour; this level was typically mapped as the OHWM.

3.4 Mapping CDFW Jurisdictional Lakes and Streambeds

Streams with associated woody vegetation were assessed to determine if these areas would be considered riparian habitat by the CDFW following A Field Guide to Lake and Streambed Alteration Agreements, Section 1600-1607, California Fish and Game Code (CDFG 1994). CDFW streambeds include unvegetated waterways and other water bodies with a defined bed and bank, such as streams, lakes, drainages and rivers. CDFW jurisdiction was delineated by measuring outer width boundaries of state jurisdiction (lakes or streambeds), consisting of the greater of either the “top of bank” (TOB) measurement or the extent of associated riparian vegetation. Delineation of CDFW lakes and streambeds was based on indicators of an ephemeral, intermittent or perennial watercourses (including dry washes) and lakes characterized by the presence of (1) definable bed and banks and (2) existing fish or wildlife resources. In the Project Site, the TOB was identified as a distinct break in the bank slope.

4 Environmental Setting

4.1 Topography and Soils

The Project Site is relatively flat, with elevations ranging between approximately 1,480-1,490 feet AMSL. Residential land use borders the Project Site on all sides. The site is regularly and recently disked. The USDA NRCS has identified two soil map units within the Project Site: Exeter and Greenfield. The National List of Hydric Soils was reviewed to determine if the soils within the Project Site are hydric (USDA NRCS 2018). The following soil descriptions, listed below, are from the Online Soil Survey of Western Riverside Area (USDA NRCS 2019) and are depicted on Figure 4, *Map of Soils within the Project Site* and Appendix C, *USDA NRCS Soils Report*.

- Greenfield sandy loam, 0 to 2 percent slopes (GyA: 14.73 ac)
- Exeter sandy loam, deep, 0 to 2 percent slopes (EpA: 4.39 ac)
- Exeter sandy loam, 0 to 2 percent slopes (EnA: 0.68 ac)
- Exeter very fine sandy loam, 0 to 5 percent slopes (EwB: 0.38 ac)

Greenfield sandy loam (GyA). These soils are located throughout all but the southwestern portion of the Project Site. This gently to moderately sloping soil occurs on alluvial fans and terraces. These well-drained soils developed in alluvium consisting mainly of granitic materials. The vegetation is chiefly non-native annual grasses and forbs. In a typical profile, the surface layer is brown sandy loam about 26 inches thick. The subsoil is brown sandy loam and pale-brown loam and extends to a depth of about 60 inches. Permeability of the soil is moderate. Runoff is slow to medium, and the hazard of erosion is light to moderate. The available water holding capacity of 7.5 to 10.0 inches. The root zone is more than 60 inches deep. This is not classified as a hydric soil (USDA NRCS 2019).

Exeter sandy loam (EnA, Epa, EwB). The Exeter series consists of moderately deep to moderately well drained soils that formed in alluvium mainly from granitic sources. Exeter soils are on alluvial fans and stream terraces and have slopes of 0 to 5 percent. Vegetation found on Exeter soils is primarily annual grasses and forbs. The mean annual precipitation is about 11 inches and the mean annual air temperature is about 64 degrees F. This series, which includes three map units within the Project Site, is not classified as a hydric soil (USDA NRCS 2019).

4.2 Vegetation Communities and Land Cover Types

Vegetation communities were mapped in the field onto a color aerial photograph (Figure 5, *Vegetation Communities Map*) and classified according to *A Manual of California Vegetation,* Second Edition (Sawyer et al 2009) or *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986), as appropriate. The Project Site supports three (3) vegetation communities and/or land cover types. Nomenclature used for dominant plant species discussed below follows The *Jepson Manual: Vascular Plants of California*, Second Edition (Baldwin et al 2012). Nomenclature changes made after the publication date of this manual follow the Jepson eFlora (2019) website.

The 20.18-acre Project Site is dominated by ruderal vegetation. A non-native Peruvian pepper tree (*Schinus mole*) is present in the northeast portion of the Project Site, while several non-native trees overhang the southern boundary. Vegetation communities observed onsite during the June 13, 2019 field survey are described in detail below.

Ruderal (19.03 acres)
The entire Project Site has been recently disked and is dominated by non-native annual herbs and grasses including foxtail barley (*Hordeum murinium*), wild oats (*Avena fatua*), red brome (*Bromus madritensis* ssp. *rubens*), soft chess (*Bromus hordeaceus*), shepard's purse (*Capsella bursa-pastoris*), wild radish (*Raphanus sativus*), stinknet *(Oncosiphon piluliferum*), London rocket (*Sisymbrium irio*), big heron bill (*Erodium botrys*), coastal heron's bill (*Erodium cicutarium*), and cheeseweed (*Malva parviflora*). Native annual herbs found onsite include common fiddleneck (*Amsinckia intermedia*), slender goldfields (*Lasthenia gracilis*), and miniature lupine (*Lupinus bicolor*). A single arroyo willow (*Salix lasiolepis*) tree is present along the western boundary of the Project Site.

Developed (1.07 acres)
A sidewalk is present along the eastern boundary of the Project Site. Developed areas are generally devoid of vegetation.

Exotic Tree (0.07 acres)
A Peruvian pepper tree is located in the northeast corner of the Project Site. Additional Peruvian pepper trees, eucalyptus (*Eucalyptus* sp.), and queen palms (*Syagrus romanzoffiana*) are located just south of the Project Site in neighboring residential properties and their canopies overhang onto the Project Site.

Black Willow (0.01 ac)
A single black willow (Salix goodingii) tree is found on the western boundary of the Project Site, along Tarano Lane.

4.3 Climate and Precipitation
The climate within the Project Site is characterized as Mediterranean, bordering on a semi-arid climate with dry, hot summers and mild, wet winters. At the nearest National Weather Service (NWS) station with at least 20 years of data (RIVERSIDE FIRE STATION 3, CA), the mean annual precipitation in the vicinity of the Project Site is 9.31 inches (average calculated from 1950-2019), with the majority of rain falling from November through March (NOAA NCDC 2019a). Climate data from this weather station indicate that the growing season (based on air temperature thresholds of greater than 32 degrees Fahrenheit [°F] at a frequency of 5 years in 10) is approximately 365 days. The Palmer Drought Index's (NOAA NCDC 2019b) most recent data (June 22, 2019) show that the Project Site region maintained "Near Normal" conditions (-1.9 to +1.9) at the time of the field survey.

4.4 Hydrology
The Project Site is located in the San Jacinto Watershed (USGS Hydrologic Unit 18070202). The Perris Valley Storm Drain is the nearest named hydrologic feature, which is located approximately 1,900 feet to the south of the Project Site (Figure 6, *Local Hydrology*). The Perris Valley Storm Drain is confluent to the San Jacinto River, which flows into Lake Elsinore. Lake Elsinore generally acts as a sink, although high water flows are occasionally diverted through the Elsinore Spillway Channel to Temescal Creek. Temescal Creek flows to the Santa Ana River (nearest Traditional Navigable Water [TNW]) and finally to the Pacific Ocean.

Primary sources of hydrology that support the unnamed drainage (D1) onsite include storm flows, as well as "nuisance flows" from surrounding residential areas.

4.5 NWI Features

According to the USFWS NWI map (USFWS 2019), no wetland features are present in or around the Project Site.

4.6 FEMA Flood Zone

The Federal Emergency Management Agency (FEMA) produces maps which depict flood zones which are generally associated with rivers, oceans and other water bodies. Like NWI maps, FEMA flood zone maps are based predominantly on topography and regional modeling. Based upon a review of local FEMA flood zone maps, the entire Project Site is characterized as Zone X (Area of Minimal Flood Hazard) (Appendix D, *FEMA National Flood Hazard Layer FIRMette*) (FEMA 2019).

5 Results

The 20.18-acre Project Site was evaluated for the presence of waters of the US subject to USACE jurisdiction, as well as Waters of the State which are regulated by RWQCB/CDFW, and Western Riverside MSHCP riparian/riverine resources. Wetlands and other water features were delineated and mapped based on federal and state delineation guidance, methodology, and regulatory framework and code, as described in Section 2 (Regulatory Setting). The results of this delineation are based on conditions observed at the time of the field surveys conducted on June 13, 2019. All other waters and wetlands (including final acreages and types) delineated within the Project Site are subject to final determination performed by USACE.

Field data were recorded on standard USACE AWRS datasheets provided in Appendix A, *Wetland Delineation Data Forms*. Per USACE mapping guidelines, the delineation map shown in Figures 7, 8, and 9 depict the extent of potential federal, state, and local jurisdictional features mapped within Project Site at a scale of 1 inch = 200 feet. Representative photographs taken during site surveys to document existing conditions at each Sample Point (SP) location are provided in Appendix B, *Current Project Site Photographs*. Soils mapped by the USDA NRCS within the Project Site is provided in Appendix C, USDA NRCS Soils Report. A summary of jurisdictional resources is presented in Table 1.

Table 1. Jurisdictional Resources (D1)

Agency	Length (lf)	Area (ac)
USACE	N/A	N/A
RWQCB	592	0.067
CDFW	592	0.118
MSHCP Riverine	26	0.108
MSHCP Riparian	566	0.010
MSHCP Vernal Pool	N/A	N/A

5.1 USACE Jurisdictional Resources / Non-Waters of the US

A single unnamed ephemeral drainage (D1) (0.067 ac) originates from a concrete storm drain outlet located at the northwest corner of the Project Site and flows directly south to the southwest corner (Appendix B**,** *Current Project Site Photographs*). At the southwest corner, this drainage begins to dissipate and flow onto Tarano Boulevard for approximately 490 feet and into a storm drain inlet that flows to the Perris Valley Storm Drain and then into the San Jacinto River. D1 is a tributary to the Perris Valley Storm Drain (Figure 6, *Local Hydrology*), which is ultimately a tributary to the Pacific Ocean. As D1 is an ephemeral feature that contains water only during or in response to rainfall, the USACE does not exert jurisdiction over this drainage.

Two wetland sample points were taken proximal to D1 (Appendix A, *Wetland Delineation Data Forms*). Sample Point 1 (SP1) is located under the canopy of a black willow (*Salix goodingii*) and adjacent to the drainage feature's top of bank. Sample Point 2 (SP2) is located within the OHWM of D1 and just south of the drainage outlet at the northwest corner of the Project Site. Based on the results of SP1 and SP2, no wetland features are present within the Project Site.

5.2 RWQCB Jurisdictional Resources

The RWQCB protects all waters in its regulatory scope but has special responsibility for regulating isolated wetlands and headwaters that may not be regulated by Section 404 of the CWA. Therefore, in addition to all features potentially regulated by Section 404 of the CWA, all wetlands and other water features identified as isolated from CWA 404 jurisdiction, as well those not regulated by USACE due to the lack of a significant nexus to a Traditional Navigable Water, may be considered jurisdictional by RWQCB pursuant to the Section 401 of the Clean Water Act and/or Porter-Cologne Act. There is a total of 0.067 acres in the Project Site that may be regulated by RWQCB as Waters of the State (Figure 7, *RWQCB Jurisdictional Resources Map*; Appendix B, *Current Project Site Photographs;* and Table 1, *Jurisdictional Resources*).

5.3 CDFW Jurisdictional Resources

Pursuant to Division 2, Chapter 6, Section 1600-1603 of the California Fish and Game Code, CDFW regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake which supports fish or wildlife. A total of 0.118 acres of CDFW jurisdictional areas were mapped on the Project Site and include a streambed feature measured from the top of bank and riparian vegetation associated with this feature, measured from the dripline (Figure 8, *CDFW Jurisdictional Resources Map*; Appendix B, *Current Project Site Photographs;* and Table 1, *Jurisdictional Resources*).

5.4 Western Riverside MSHCP Jurisdictional Resources

Based on Section 6.1.2 of the MHSCP (2004), the onsite ephemeral drainage (D1) receives small amounts of residential nuisance water and also conveys freshwater flow during short duration seasonal rain events. The onsite drainage contains both MSHCP riparian (0.010 ac) and riverine (0.108 ac) resources pursuant to Section 6.1.2 of the MSHCP (Figure 9, *MSHCP Riparian/Riverine Resources Map*; Appendix B, *Current Project Site Photographs;* and Table 1, *Jurisdictional Resources*). No vernal pool resources were observed on the Project Site.

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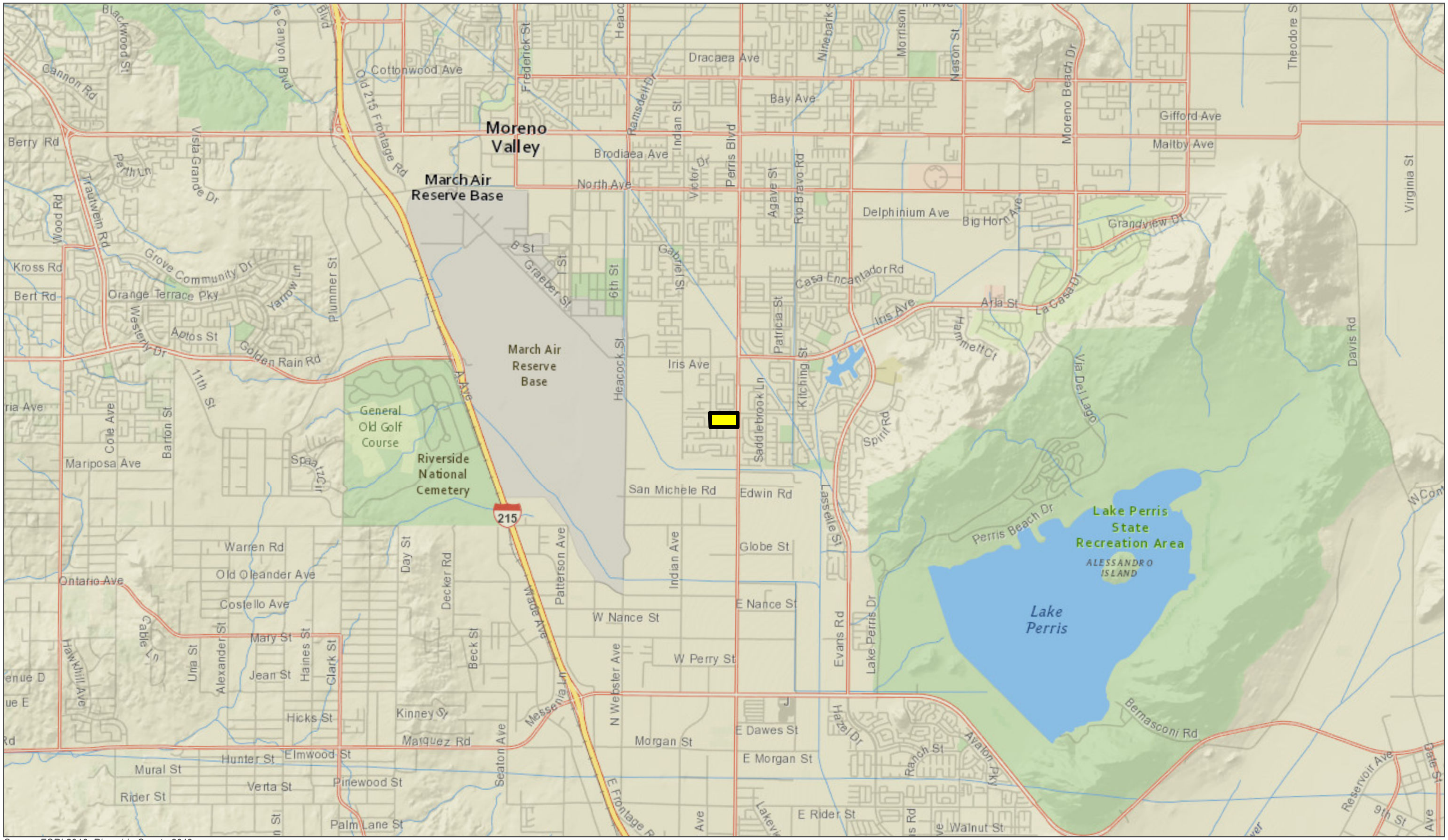
FIGURES

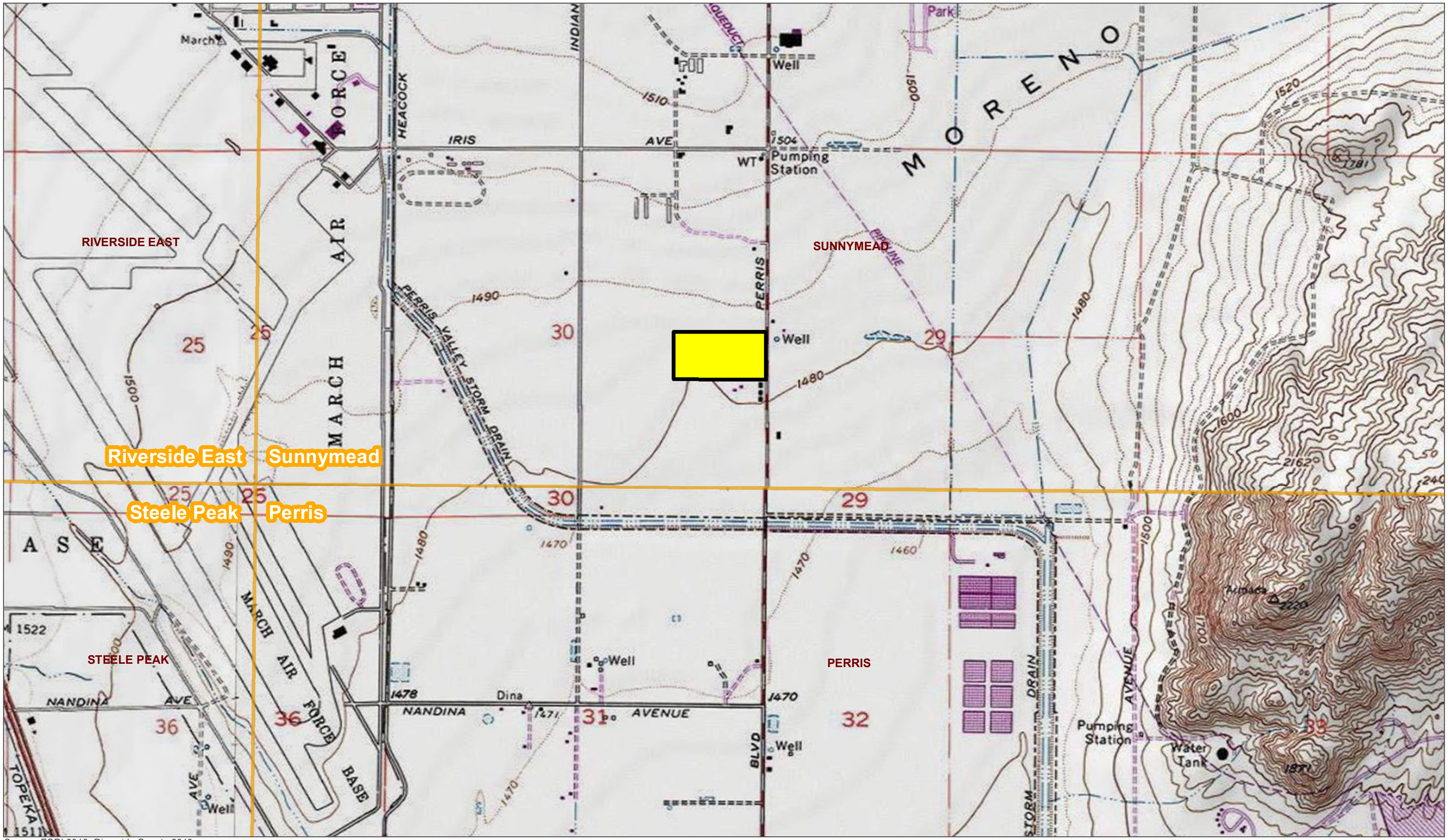


Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)

Figure 1 Vicinity Map

Krameria Avenue Project Site, Moreno Valley, CA



Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)

USGS 7.5' Quadrangle

0 0.25 0.5 1 Miles

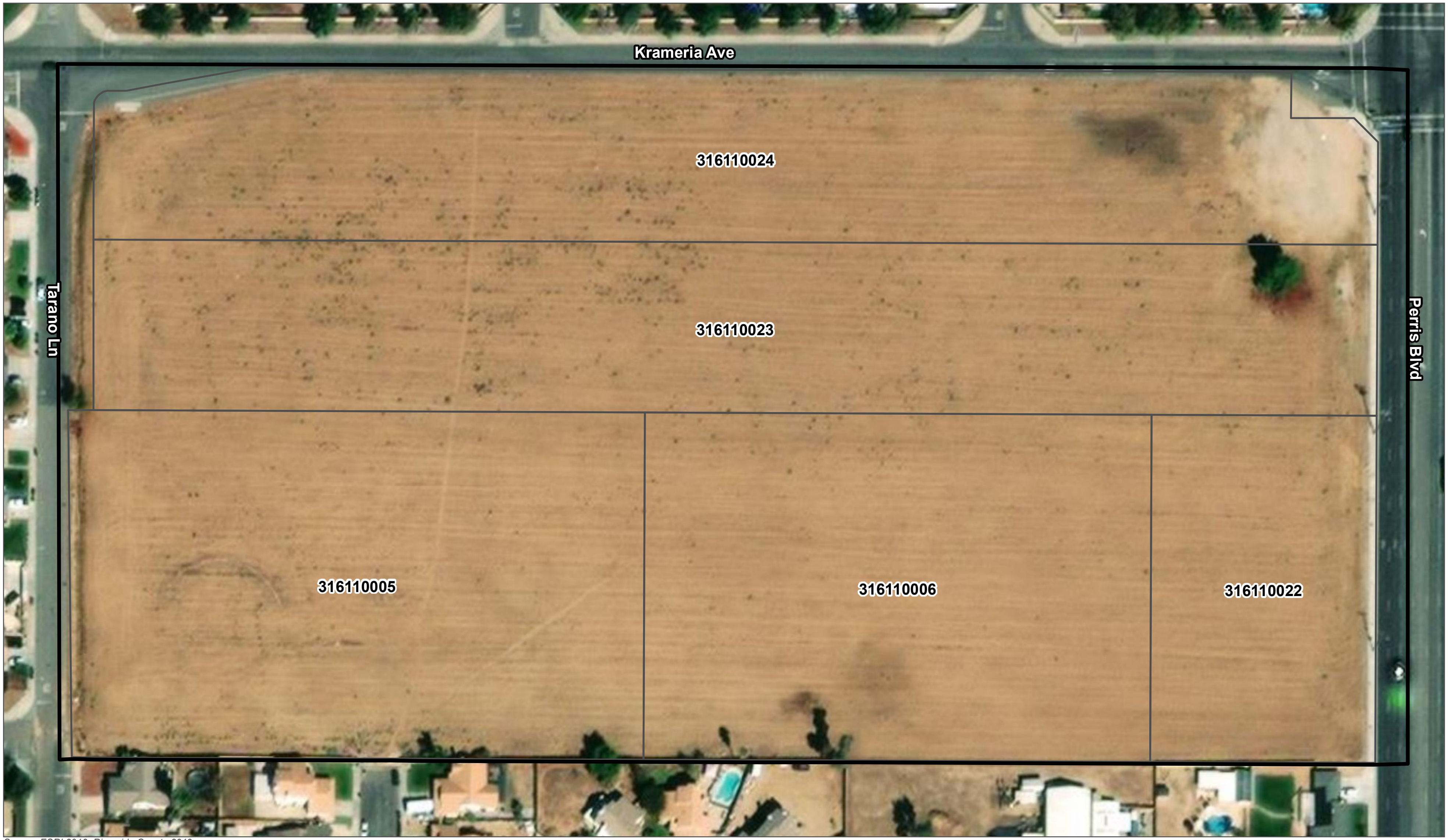
1:24,000

Section 30, Township 3S, Range 3W

Figure 2 USGS Topographic Map

Krameria Avenue Project Site, Moreno Valley, CA

MIG



Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)

Parcels

Feet 0 100 200 400

Figure 3 Aerial Photograph of Project Site

Krameria Avenue Project Site, Moreno Valley, CA

MIG

Source: ESRI 2019, Riverside County 2019, USDA NRCS 2019

Project Site Boundary (20.18 ac)

Soils

Greenfield sandy loam, 0 to 2 percent slopes (GyA: 14.73 ac)

Exeter sandy loam, deep, 0 to 2 percent slopes (EpA: 4.39 ac)

Exeter sandy loam, 0 to 2 percent slopes (EnA: 0.68 ac)

Exeter very fine sandy loam, 0 to 5 percent slopes (EwB: 0.38 ac)

Feet

0 100 200 400

Figure 4 Map of Soils within the Project Site

Krameria Avenue Project Site, Moreno Valley, CA

Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)

Vegetation Community

Ruderal (19.03 ac)

Developed (1.07 ac)

Exotic Tree (0.07 ac)

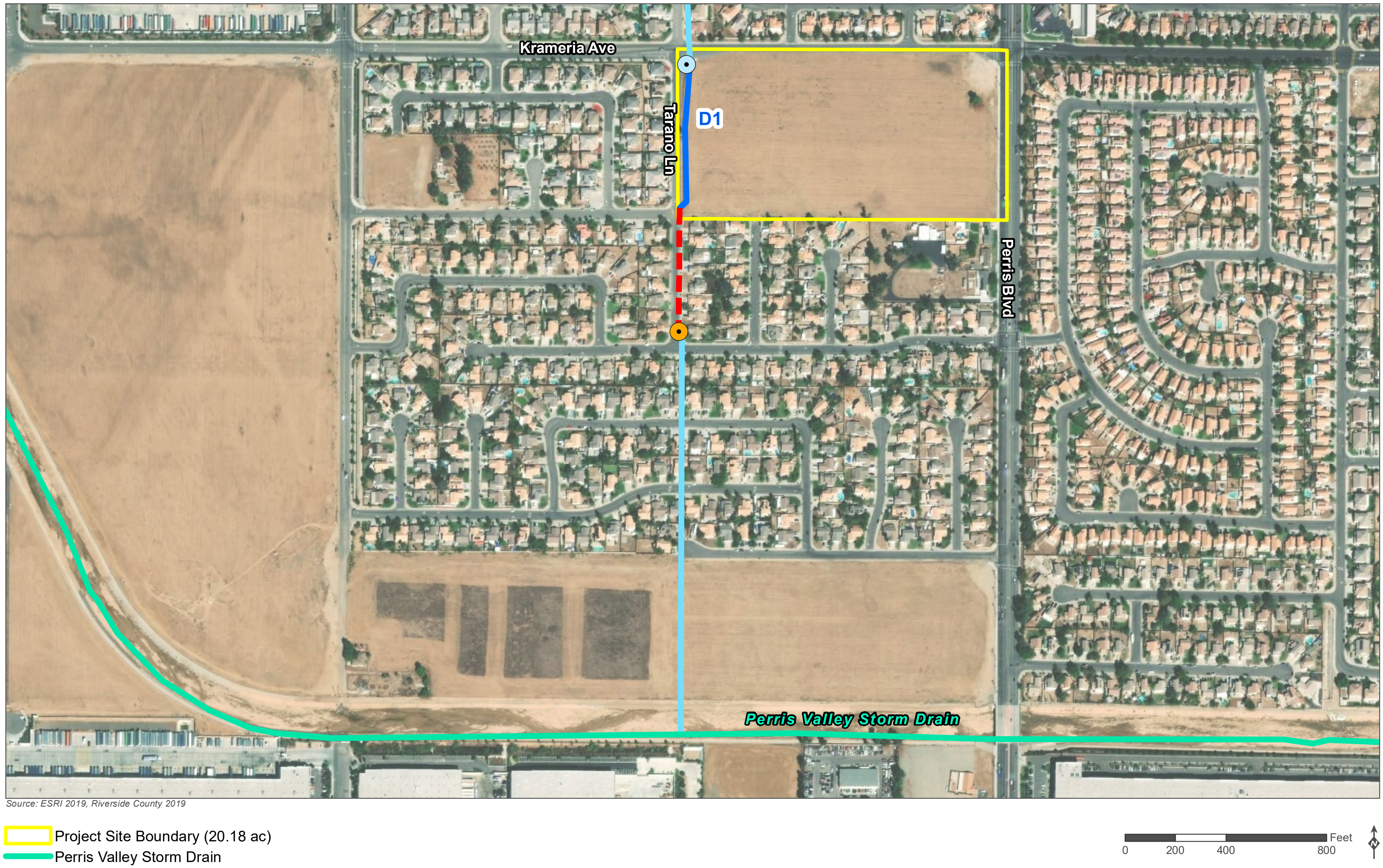
Black Willow (0.01 ac)

0 100 200 400 Feet

MIG

Figure 5 Biological Resources Map

Krameria Avenue Project Site, Moreno Valley, CA

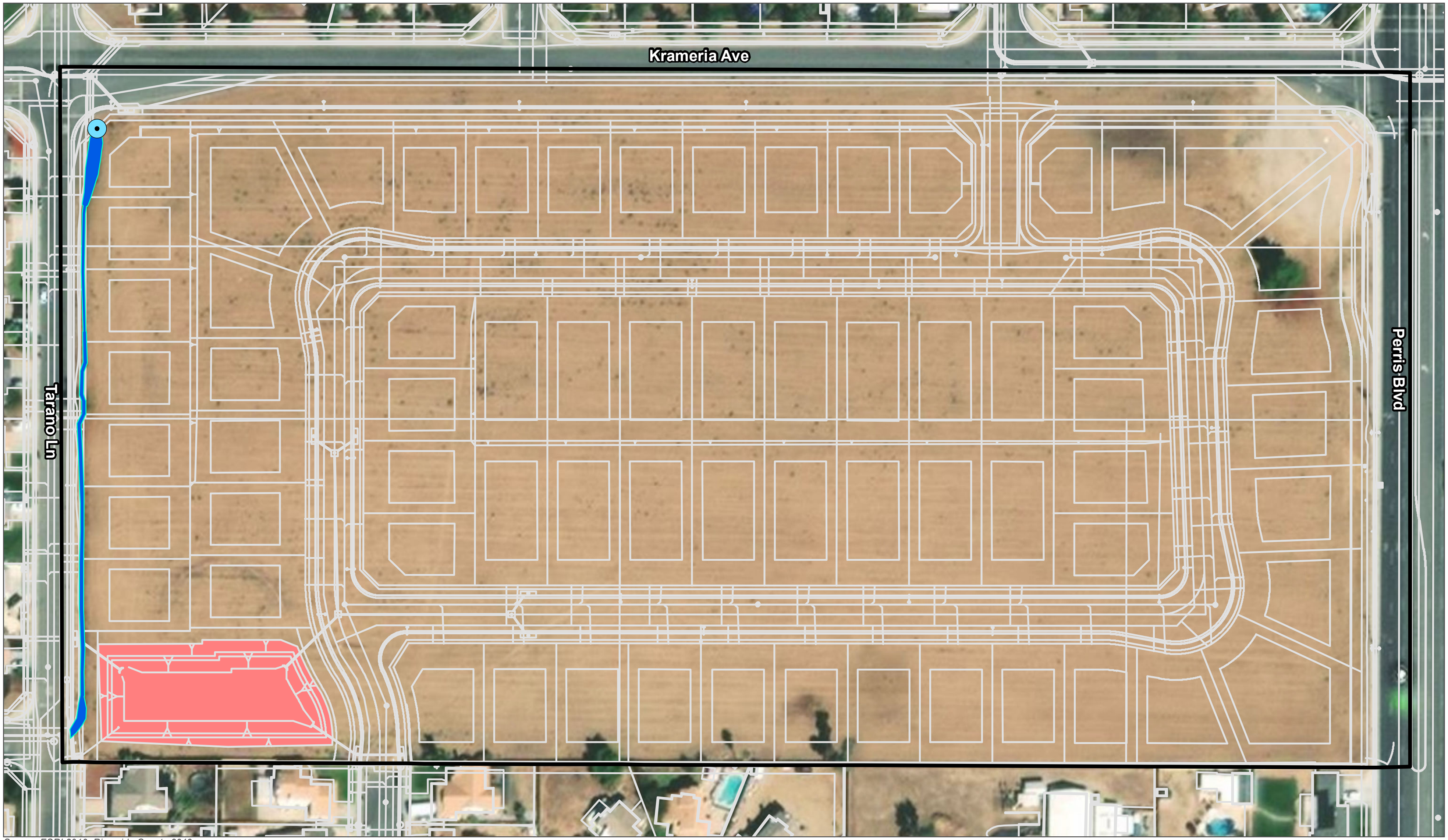


Source: ESRI 2019, Riverside County 2019

MIG

Figure 6 Local Hydrology

Krameria Avenue Project Site, Moreno Valley, CA



Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)
Proposed Bioretention Area (0.483 ac)
Ordinary High Water Mark (OHWM)
Permanently Impacted RWQCB Jurisdictional Area (0.067 ac)
Development Plan
Drainage Outlet

Date of Map Preparation: 10/07/2019
Imagery: ESRI (10/19/2018)
Coordinate System: State Plane, Zone VI
Datum: NAD83
Vertical Datum: NAVD88
Map Created by: Jonathan Campbell
Delineation by: Jonathan Campbell

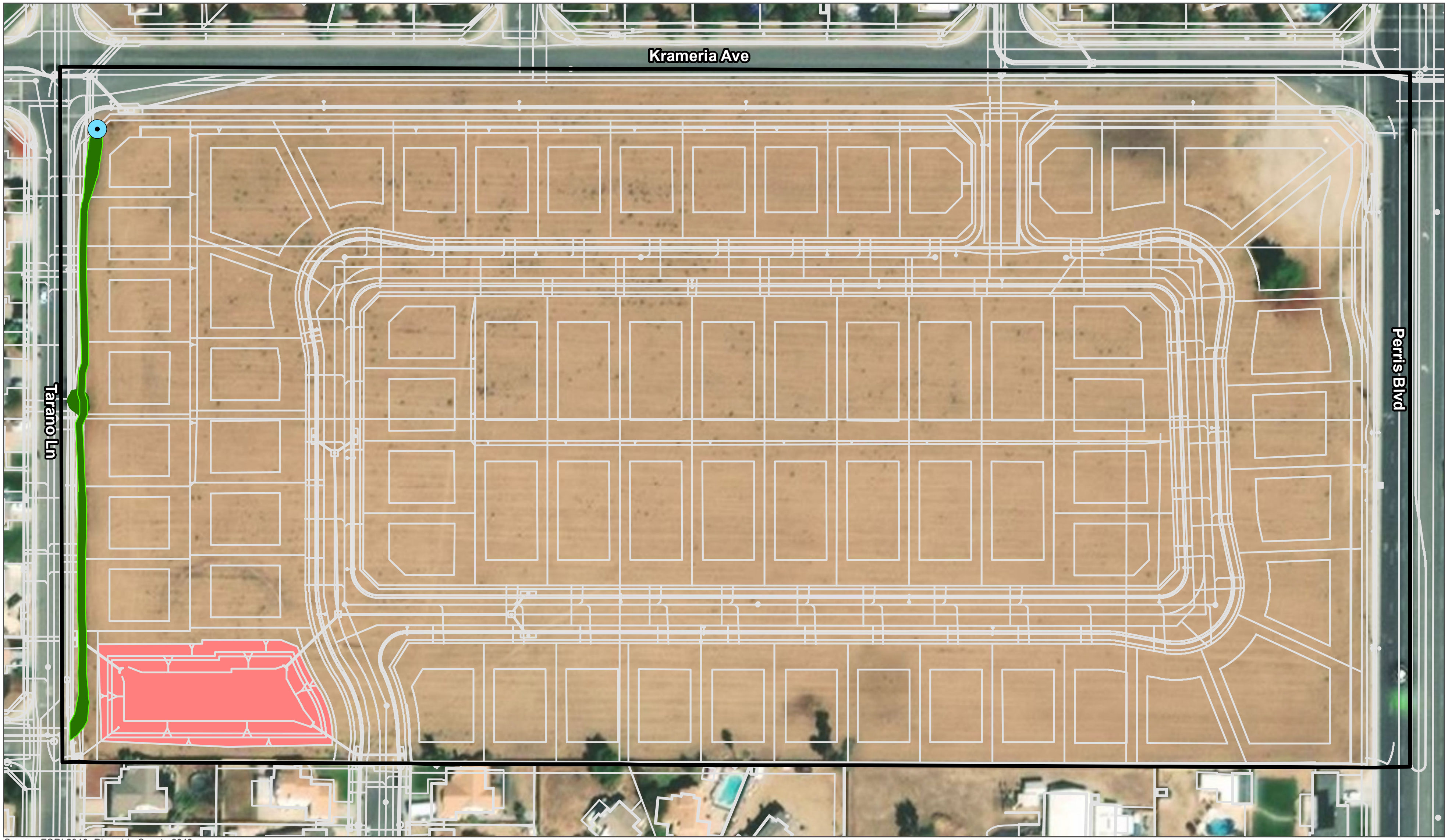
0 100 200 400 Feet

N

Figure 7 RWQCB Jurisdictional Resources Map

Krameria Avenue Project Site, Moreno Valley, CA

MIG



Source: ESRI 2019, Riverside County 2019

- Project Site Boundary (20.18 ac)
- Proposed Bioretention Area (0.483 ac)
- Top of Bank
- Permanently Impacted CDFW Jurisdictional Area (0.118 ac)
- Development Plan
- Drainage Outlet

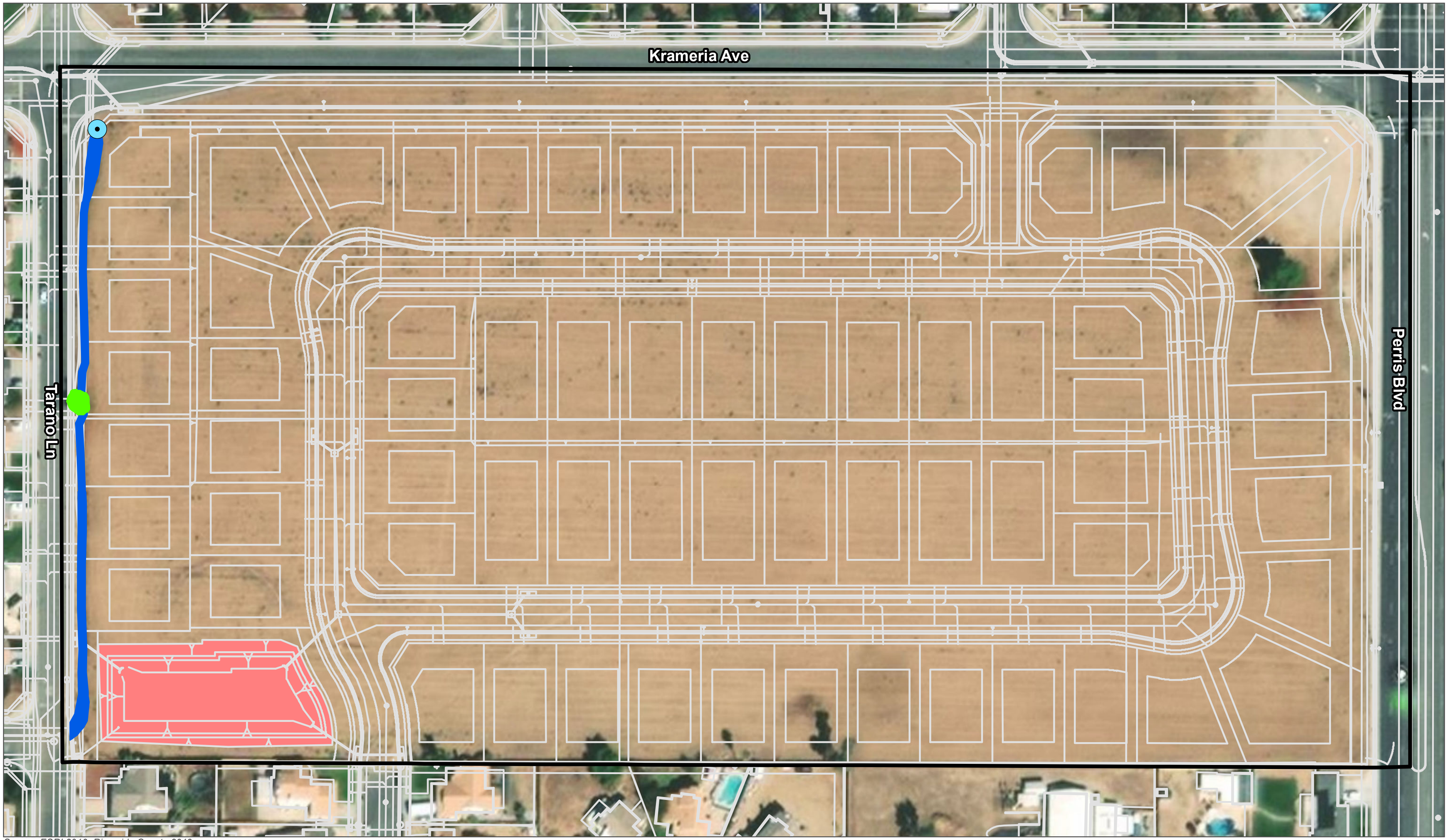
Date of Map Preparation: 10/07/2019
Imagery: ESRI (10/19/2018)
Coordinate System: State Plane, Zone VI
Datum: NAD83
Vertical Datum: NAVD88
Map Created by: Jonathan Campbell
Delineation by: Jonathan Campbell

0 100 200 400 Feet

Figure 8 CDFW Jurisdictional Resources Map

Krameria Avenue Project Site, Moreno Valley, CA

MIG



Source: ESRI 2019, Riverside County 2019

Project Site Boundary (20.18 ac)
Proposed Bioretention Area (0.483 ac)
Permanently Impacted MSHCP Riverine Area (0.108 ac)
Permanently Impacted MSHCP Riparian Area (0.010 ac)
Development Plan
Drainage Outlet

Date of Map Preparation: 10/07/2019
Imagery: ESRI (10/19/2018)
Coordinate System: State Plane, Zone VI
Datum: NAD83
Vertical Datum: NAVD88
Map Created by: Jonathan Campbell
Delineation by: Jonathan Campbell

0 100 200 400 Feet

N

Figure 9 MSHCP Riparian/Riverine Resources Map

Krameria Avenue Project Site, Moreno Valley, CA

MIG

APPENDICES

Appendix A – Wetland Delineation Data Forms

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Krameria Project Site City/County: Moreno Valley, Riverside Co Sampling Date: 06/11/2019

Applicant/Owner: PI Properties No. 67, LLC State: CA Sampling Point: SP1

Investigator(s): Jonathan Campbell Section, Township, Range: 30, 3S, 3W

Landform (hillslope, terrace, etc.): drainage ditch Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): C Lat: 33.88015N Long: -117.23045W Datum: WGS84

Soil Map Unit Name: Exeter sandy loam, deep, 0 to 2 percent slopes (EpA) NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ✓, Soil ✓, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		✓
Hydric Soil Present?		✓
Wetland Hydrology Present?		✓

Is the Sampled Area within a Wetland? Yes ___ No ✓

Remarks:

SP1 has been subject to recent disking.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 2mx2m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Salix lasiolepis	30	Y	FACW
2.			
3.			
4.			
	30 = Total Cover		
Sapling/Shrub Stratum (Plot size: 2mx2m)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 2mx2m)			
1. Avena fatua	20	Y	UPL
2. Hordeum murinum	15	Y	FACU
3. Bromus hordaceus	5	Y	FACU
4. Erodium cicutarium	5	Y	UPL
5. Malva parviflora	5	Y	UPL
6.			
7.			
8.			
	50 = Total Cover		
Woody Vine Stratum (Plot size: 2mx2m)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 50 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 17% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	30	x 2 = 60
FAC species		x 3 =
FACU species	20	x 4 = 80
UPL species	30	x 5 = 150
Column Totals:	80 (A)	290 (B)

Prevalence Index = B/A = 3.625

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No ✓

Remarks:

SOIL

Sampling Point: SP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-16	10YR 4/3	100					sandy loa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

recently and regularly disked

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______

Water Table Present? Yes ______ No ✓ Depth (inches): ______

Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Krameria Project Site City/County: Moreno Valley, Riverside Co Sampling Date: 06/11/2019

Applicant/Owner: PI Properties No. 67, LLC State: CA Sampling Point: SP2

Investigator(s): Jonathan Campbell Section, Township, Range: 30, 3S, 3W

Landform (hillslope, terrace, etc.): drainage ditch Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): C Lat: 33.88090N Long: -117.23045W Datum: WGS84

Soil Map Unit Name: Exeter sandy loam, deep, 0 to 2 percent slopes (EpA) NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___
Hydric Soil Present?	Yes ___	No ✓
Wetland Hydrology Present?	Yes ___	No ✓

Is the Sampled Area within a Wetland? Yes ___ No ✓

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 1mx3m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size: 1mx3m)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size: 1mx3m)			
1. Echinochloa colona	65	Y	FAC
2. Portulaca oleracea	10	N	FAC
3. Malva parviflora	5	N	UPL
4. Polygonum aviculara	5	N	FAC
5. Lepidium didymum	3	N	UPL
6. Sonchus oleraceus	2	N	UPL
7.			
8.			
= Total Cover	90		
Woody Vine Stratum (Plot size: 1mx3m)			
1.			
2.			
= Total Cover	0		

% Bare Ground in Herb Stratum 10 % Cover of Biotic Crust 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks:

SOIL

Sampling Point: SP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-14	10YR 2/1	100					sandy	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5) (**LRR C**)
___ 1 cm Muck (A9) (**LRR D**)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

___ 1 cm Muck (A9) (**LRR C**)
___ 2 cm Muck (A10) (**LRR B**)
___ Reduced Vertic (F18)
___ Red Parent Material (TF2)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ______ No ✓

Remarks:

Restrictive cobbles at 14"

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1) (**Nonriverine**)
___ Sediment Deposits (B2) (**Nonriverine**)
___ Drift Deposits (B3) (**Nonriverine**)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Water-Stained Leaves (B9)
___ Salt Crust (B11)
___ Biotic Crust (B12)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water Marks (B1) (**Riverine**)
___ Sediment Deposits (B2) (**Riverine**)
___ Drift Deposits (B3) (**Riverine**)
✓ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ______ No ✓ Depth (inches): ______
Water Table Present? Yes ______ No ✓ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ______ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ______ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix B – Current Project Site Photographs

PHOTOGRAPH 3 - D1 flows along the western edge of the Project Site and represents a USACE, RWQCB, CDFW, and MSHCP riverine resource (0.096). The onsite arroyo willow tree (pictured) represents a CDFW and MSHCP riparian resource (0.007 ac).

PHOTOGRAPH 4 - Storm water (blue line) flows overland off the Project Site, directly onto Tarano Blvd and then into a storm drain.

PHOTOGRAPH 1 - The onsite, ephemeral drainage feature (D1) is fed from a storm drain outlet at the northwest corner of the Project Site and flows south.

PHOTOGRAPH 2 - Although a relatively mesic vegetation community is present at the storm drain outlet, this area does not represent a USACE jurisdictional wetland (see Appendix A, SP2).

Appendix C - USDA NRCS Soils Report

United States Department of Agriculture

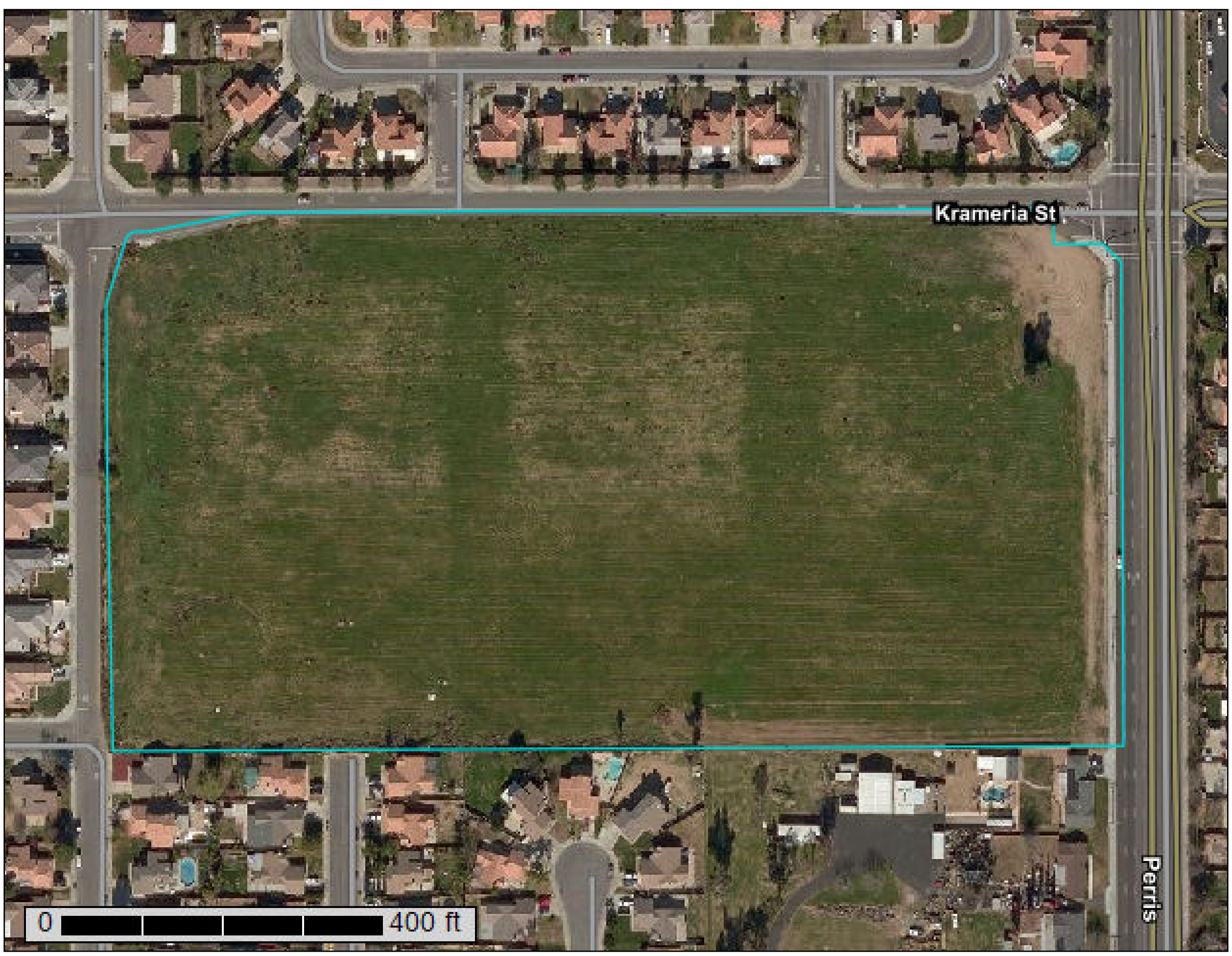
NRCS

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

Western Riverside Area, California



June 27, 2019

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 (https://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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Contents

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 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.

Soil Map

Map Scale: 1:2,120 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 30, 60, 120, 180

Feet: 0, 100, 200, 400, 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Western Riverside Area, California
Survey Area Data: Version 11, Sep 12, 2018

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

Date(s) aerial images were photographed: Jan 14, 2015—Jan 21, 2015

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 Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EnA	Exeter sandy loam, 0 to 2 percent slopes	0.6	2.9%
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	4.0	21.1%
EwB	Exeter very fine sandy loam, 0 to 5 percent slopes	0.4	1.9%
GyA	Greenfield sandy loam, 0 to 2 percent slopes	14.2	74.1%
Totals for Area of Interest		**19.2**	**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 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.

Western Riverside Area, California

EnA—Exeter sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hctg
Elevation: 20 to 700 feet
Mean annual precipitation: 7 to 20 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Exeter and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Exeter

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 4 percent
Hydric soil rating: No

Ramona

Percent of map unit: 4 percent
Hydric soil rating: No

Monserate

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hctk
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Exeter and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Exeter

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 35 to 60 inches to duripan

Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

Monserate

Percent of map unit: 5 percent
Hydric soil rating: No

EwB—Exeter very fine sandy loam, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hctm
Elevation: 20 to 700 feet
Mean annual precipitation: 7 to 20 inches
Mean annual air temperature: 61 to 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Exeter and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Exeter

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 16 inches: very fine sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

Monserate

Percent of map unit: 5 percent
Hydric soil rating: No

GyA—Greenfield sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcvv
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Greenfield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Greenfield

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam
H4 - 60 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 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 to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: LOAMY (1975) (R019XD029CA)
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 10 percent
Hydric soil rating: No

Pachappa

Percent of map unit: 2 percent
Hydric soil rating: No

Arlington

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Reports

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

Soil Physical Properties

This folder contains a collection of tabular reports that present soil physical properties. The reports (tables) include all selected map units and components for each map unit. Soil physical properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

Physical Soil Properties

This table shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

Sand as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Silt as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity (Ksat), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates in the table are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity (Ksat) is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. The amount and type of clay minerals in the soil influence volume change.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter. The content of organic matter in a soil can be maintained by returning crop residue to the soil.

Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in the table as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and Ksat. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Reference:
United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. (http://soils.usda.gov)

Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Physical Soil Properties–Western Riverside Area, California														
Map symbol and soil name	**Depth**	**Sand**	**Silt**	**Clay**	**Moist bulk density**	**Saturated hydraulic conductivity**	**Available water capacity**	**Linear extensibility**	**Organic matter**	**Erosion factors**			**Wind erodibility group**	**Wind erodibility index**
										Kw	**Kf**	**T**		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
EnA—Exeter sandy loam, 0 to 2 percent slopes														
Exeter	0-16	-66-	-19-	10-15- 20	1.50-1.55- 1.60	4.00-9.00-14.00	0.10-0.12-0.1 3	0.0- 1.5- 2.9	0.0- 0.5- 1.0	.17	.17	2	3	86
	16-37	-58-	-18-	18-24- 30	1.40-1.45- 1.50	4.00-9.00-14.00	0.14-0.16-0.1 7	3.0- 4.5- 5.9	0.0- 0.3- 0.5	.24	.24			
	37-50	—	—	—	—	0.00-0.00-0.01	—	—	—					
	50-60	-33-	-57-	5-10- 15	1.60-1.65- 1.70	1.40-2.70-4.00	0.09-0.12-0.1 5	0.0- 1.5- 2.9	0.0- 0.3- 0.5	.64	.64			
EpA—Exeter sandy loam, deep, 0 to 2 percent slopes														
Exeter	0-16	-66-	-19-	10-15- 20	1.50-1.55- 1.60	4.00-9.00-14.00	0.10-0.12-0.1 3	0.0- 1.5- 2.9	0.5- 0.8- 1.0	.20	.20	2	3	86
	16-37	-54-	-17-	22-29- 35	1.45-1.53- 1.60	1.40-2.70-4.00	0.14-0.16-0.1 7	3.0- 4.5- 5.9	0.0- 0.0- 0.0	.24	.24			
	37-50	—	—	—	—	0.00-0.00-0.01	—	—	—					
	50-60	-33-	-57-	5-10- 15	1.50-1.58- 1.65	1.40-2.70-4.00	0.09-0.12-0.1 5	0.0- 1.5- 2.9	0.0- 0.0- 0.0	.64	.64			

Physical Soil Properties–Western Riverside Area, California														
Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors			Wind erodibility group	Wind erodibility index
										Kw	Kf	T		
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*					
EwB—Exeter very fine sandy loam, 0 to 5 percent slopes														
Exeter	0-16	-62-	-23-	10-15- 20	1.45-1.50-1.55	4.00-9.00-14.00	0.14-0.15-0.16	0.0- 1.5- 2.9	0.0- 0.5-1.0	.37	.37	2	3	86
	16-37	-58-	-18-	18-24- 30	1.40-1.45-1.50	4.00-9.00-14.00	0.14-0.16-0.17	3.0- 4.5- 5.9	0.0- 0.3-0.5	.24	.24			
	37-50	—	—	—	—	0.00-0.00-0.01	—	—	—					
	50-60	-33-	-57-	5-10- 15	1.60-1.65-1.70	1.40-2.70-4.00	0.09-0.12-0.15	0.0- 1.5- 2.9	0.0- 0.3-0.5	.64	.64			
GyA—Greenfield sandy loam, 0 to 2 percent slopes														
Greenfield	0-26	-66-	-23-	7-11- 15	1.45-1.50-1.55	14.00-28.00-42.00	0.10-0.13-0.15	0.0- 1.5- 2.9	0.5- 0.8-1.0	.28	.28	5	3	86
	26-43	-70-	-16-	10-14- 18	1.50-1.55-1.60	14.00-28.00-42.00	0.11-0.14-0.16	0.0- 1.5- 2.9	0.0- 0.0-0.0	.28	.28			
	43-60	-41-	-37-	18-22- 25	1.45-1.50-1.55	4.00-9.00-14.00	0.14-0.15-0.16	0.0- 1.5- 2.9	0.0- 0.0-0.0	.37	.37			
	60-72	-66-	-23-	7-11- 15	-1.50-	14.00-28.00-42.00	0.07-0.10-0.12	0.0- 1.5- 2.9	0.0- 0.0-0.0	.17	.28			

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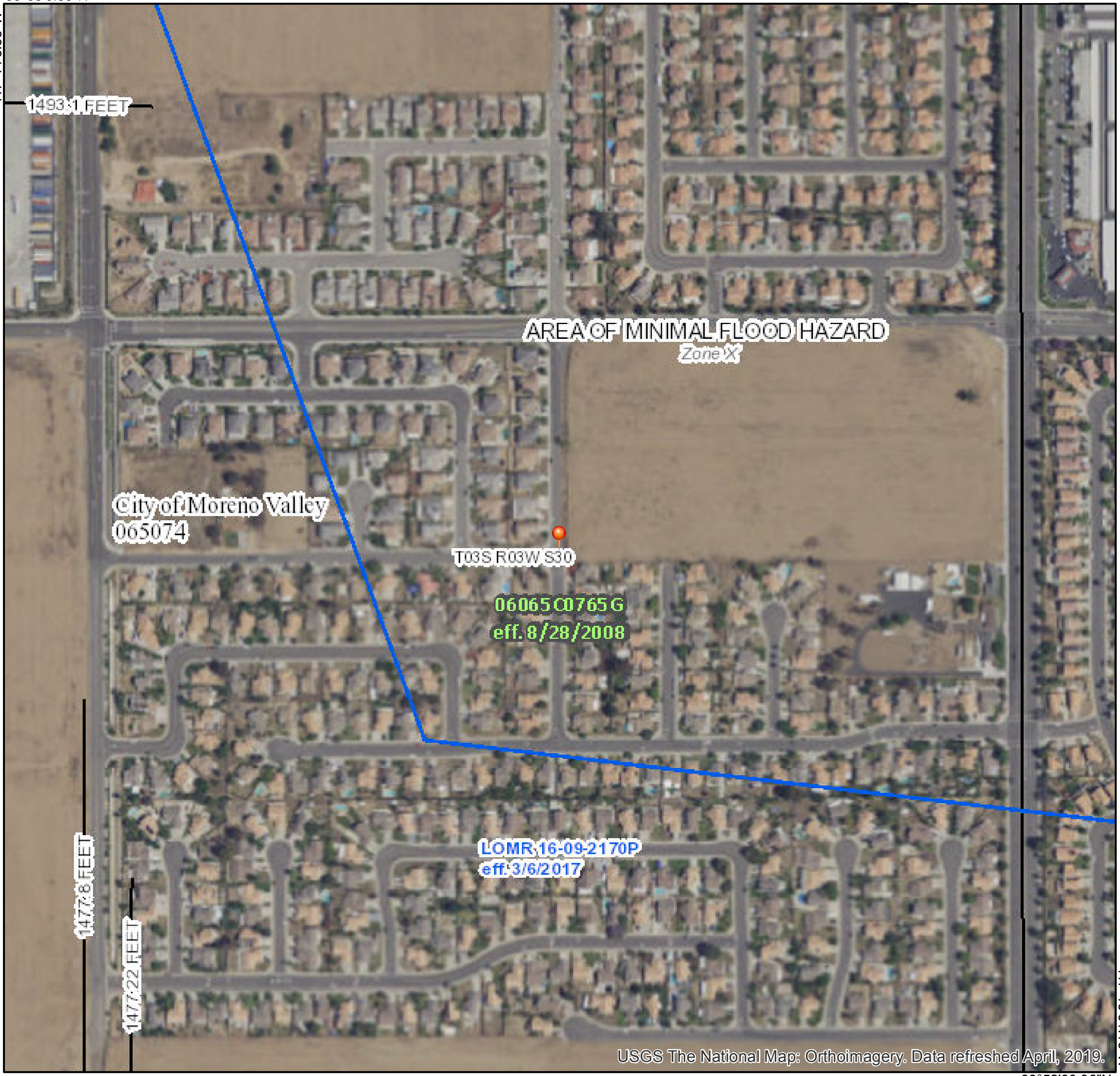
Appendix D - FEMA National Flood Hazard Layer FIRMette

National Flood Hazard Layer FIRMette

FEMA

33°53'0.83"N

117°14'8.58"W



117°13'31.13"W

33°52'30.96"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR* Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X* Future Conditions 1% Annual Chance Flood Hazard *Zone X* Area with Reduced Flood Risk due to Levee. See Notes. *Zone X* Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X* Effective LOMRs Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer Levee, Dike, or Floodwall
OTHER FEATURES	20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation Coastal Transect 513 Base Flood Elevation Line (BFE) Limit of Study Jurisdiction Boundary Coastal Transect Baseline Profile Baseline Hydrographic Feature
MAP PANELS	Digital Data Available No Digital Data Available Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/11/2019 at 5:33:54 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

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Phase I Cultural Resources Assessment of the Proposed 69-Lot Single-Family Residential Subdivision City of Moreno Valley, County of Riverside, California

Prepared for:

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Prepared by:

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Author:
Christopher W. Purtell, M.A., RPA, Director of Cultural Resources

Sunnymead and Perris, CA United States Geological Survey 7.5” Quadrangle Maps, Section 30 Township 3 South, Range 3 West

Project Acreage: 19.08
Resources Identified: None

May 30, 2019

This document is designed for double-sided printing

Table of Contents

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1-EXECUTIVE SUMMARY

The proposed Project is a Tentative Tract Map for 69-Lot Single-Family Residential Subdivision situated on a 19.08-acres of vacant land in the City of Moreno Valley, County of Riverside, California (APN: 316-110-005, -006, -022, -023, and -029).

The proposed project includes the new construction of a residential subdivision consisting of 69 single family residences, which construction design elements and landscaping have yet to be finalized. The Project is located in an urbanized setting on the southwest corner of Perris Boulevard and Krameria Avenue in the City of Moreno Valley. The Project Site is located approximately 2.42 miles east of Interstate Freeway 215 and 1.2 miles southeast of March Air Force Base. For this report, all project components will collectively be referred to as the "Study Area," unless otherwise noted. The proposed project will include excavations across the majority of the "Study Area".

MIG conducted a Phase I Cultural Resources Assessment of the Study Area to determine the potential impacts to cultural resources (including archaeological, historical, and paleontological resources) for compliance with the California Environmental Quality Act (CEQA) and the local cultural resource regulations. This assessment's scope of work includes a cultural resources records search through the California Historical Resources Information System-Eastern Information Center (CHRIS-EIC), a Sacred Lands File (SLF) search through the California Native American Heritage Commission (NAHC), a land use history research, a paleontological resources records search through the Vertebrate Paleontological Department of the Natural History Museum of Los Angeles County (NHMLAC), pedestrian field survey, eligibility evaluations for resources identified within the Study Area, impact analyses, and the recommendation of additional work and mitigation measures.

1.1 – ARCHAEOLOGICAL RESOURCES

The cultural resources records search results from the Eastern Information Center (CHRIS-EIC) indicated that there were no archaeological resources located within the Study Area. However, there are two historic archaeological trash refuse (P-33-028072 and P-33-028073) located within a one-mile radius of the Study Area. These two historic archaeological resources will not be impacted by the proposed Project. There were no archaeological resources identified during the pedestrian survey.

A review of the City of Moreno Valley's General Plan indicate that the Study Area is located within a one and one-half-mile radius from the Wolfskill Ranch West Complex, is approximately four and one-half miles northeast from the Wolfskill Ranch North Complex and is approximately five miles southeast of the Moreno Hills Complex. These archaeological complexes are comprised of a series of hills and drainages that stretch into Moreno Valley and are characterized as prehistoric habitation areas consisting of bedrock milling stations, cupule rocks, petroglyphs, and pictographs. Additionally, the City's General Plan has identified archaeological sites located at the Moreno School and at the intersection of Lassalle Street & Brodiaea Avenue. These archaeological sites are located approximately four and one-half miles northeast of the Study Area and have been classified as rocky outcrops containing bedrock milling stations (City of Moreno Valley General Plan 2006).[1] None of these archaeological resources will be impacted by the proposed Project.

[1] City of Moreno Valley. 2006. General Plan Final Program EIR; Chapter 5.10- Cultural Resources. Report on file at the City of Moreno Valley, City Hall.

Therefore, the proposed project would result in no substantial adverse change in the significance of an archaeological resource as defined in CEQA Guidelines Section 15064.5. Despite the disturbances of the Study Area due to human activities and environmental factors that may have displaced archaeological resources on the surface, it is possible that intact archaeological resources exist at depth. As a result, recommended mitigation measures are provided in Section 6 to reduce potentially significant impacts to a less than significant level regarding previously undiscovered archaeological resources that may be accidentally encountered during project implementation.

1.2 – HISTORICAL RESOURCES

The cultural resources records search results from the (CHRIS-EIC) indicated that there are no historical resources located within the Study Area. However, there is a one (1) historic built environment (P-33-021503: a concrete foundation and floor from a demolished grain milling facility) located within a one-mile radius of the Study Area. The historic foundation and floor will be not impacted by the proposed Project. There were no historic resources identified during the pedestrian survey. Therefore, the proposed project would result in no adverse change in the significance of a historical resource as defined in §15064.5.

1.3 – PALEONTOLOGICAL RESOURCES

Results of the paleontological resources records search through NHMLAC indicate that no vertebrate fossil localities from the NHMLAC records have been previously recorded within the Study Area or within a one-mile radius. Moreover, no paleontological resources were identified by MIG during the pedestrian survey. Nevertheless, the results of the literature review and the search at the NHMLAC indicate that the Study Area is situated upon younger and older Quaternary alluvial fan deposits, derived from the more elevated terrain to the north. These sedimentary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but they may be underlain by older Quaternary deposits that do contain significant vertebrate fossils.

A review of the City of Moreno Valley's General Plan indicates that the Study Area is located within a vicinity of low paleontological potential, based on extensive field work (City of Moreno Valley General Plan 2006). As a result, recommended mitigation measures are provided in Chapter 9 to reduce potentially significant impacts to previously undiscovered paleontological resources or unique geological features that may be accidentally encountered during project implementation to a less than significant level.

1.4 – TRIBAL CULTURAL RESOURCES

CEQA defines Tribal Cultural Resources (TCR) as either a site, feature, place, or landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American Tribe, that is listed or eligible for listing, on the CRHR or on a local register of historical resources as defined in Public Resources Code (PRC) Section 5020.1(k), or a resource determined by a lead agency, in its discretion and supported by substantial evidence, to be significant according to the historic register criteria in Public Resources Code Section 5024.1(c), and considering the significance of the resources to a California Native American Tribe.[2]

Results of the records research compiled from the CHRIS-EIC and a Sacred Lands File Search commissioned through the NAHC, and a pedestrian field survey failed to indicate known TCR

[2] California Public Resources Code Section 21074

within the Study Area as specified in PRC Section 210741, 5020.1(k), or 5024.1. Despite the heavy disturbances of the Study Area that may have displaced or submerged archaeological resources relating to TCRs on the surface, it is possible that intact tribal cultural resources exist at depth given the proven prehistoric occupation of the region and the favorable natural conditions that would have attracted prehistoric inhabitants to the area.

As a result, recommended mitigation measures are provided in Section 9 to reduce potentially significant impacts to previously undiscovered archaeological resources relating to TCRs that may be accidentally encountered during project implementation to a less than significant level.

AB 52 (Gatto, 2014) contains provisions requiring Cities, Counties and other government entities to engage in tribal consultations for projects that are not exempt from the California Environmental Quality Act (CEQA). Government to government consultation may provide “Tribal Knowledge” of the Study Area that can be used in determining tribal cultural resources that cannot be obtained through other investigative means. Additionally, it is anticipated that during the application process the City of Moreno Valley (Lead Agency) will notify the tribes of the proposed project and will commence AB 52 consultations as specified in the regulations.

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2-INTRODUCTION AND BACKGROUND

2.1 – PROJECT LOCATION

The project site is located within an urbanized setting on a 19.08-acres of vacant land in the City of Moreno Valley, County of Riverside, California (APN: 316-110-005, -006. -022, -023, and -029). The Project proposes the new construction of a residential subdivision consisting of 69 single family residences which design elements and landscaping have yet to be finalized. The Project Site is located south of Krameria Avenue, east of Tarano Lane, and west of Perris Boulevard (Figure 1, Regional and Vicinity Map). The Study Area is depicted in United States Geological Survey (USGS) 7.5' topographic maps of Sunnymead and Perris, California, topographic quadrangle in portions of Section 30, Township 3 North, Range 3 West (see Figure 2, USGS Topographic Map). Residential tract housing borders the Project Site on all sides and is located approximately 2.42-miles east of Interstate Freeway 215 and 1.2-miles southeast of March Air Force Base. Excavations associated with implementation of the proposed project would occur across the majority of the Study Area.

2.2 – SCOPE OF STUDY AND PERSONNEL

MIG conducted a Phase I Cultural Resources Assessment of the Study Area from April 4 through May 30, 2019 to identify potential impacts to cultural resources (including archaeological, historical, and paleontological resources) and to develop mitigation measures to avoid, reduce, or mitigate potential impacts to resources for complying with CEQA and local cultural resource guidelines. The scope of work for this assessment included a cultural resources records search through the CHRIS-EIC, a Sacred Lands File (SLF) search through the Native American Heritage Commission (NAHC) and a paleontological resources records search through the NHMLAC, a pedestrian field survey, eligibility evaluations for the resources identified within the Study Area, impact analyses, and the recommendations of additional work and mitigation measures, if necessary. The assessment was managed, and this report compiled by Mr. Christopher Purtell, M.A., RPA. The record searches and site surveys were conducted by Mr. Purtell. Qualifications of key personnel are provided in Appendix A.

2.3 – ENVIRONMENTAL SETTING

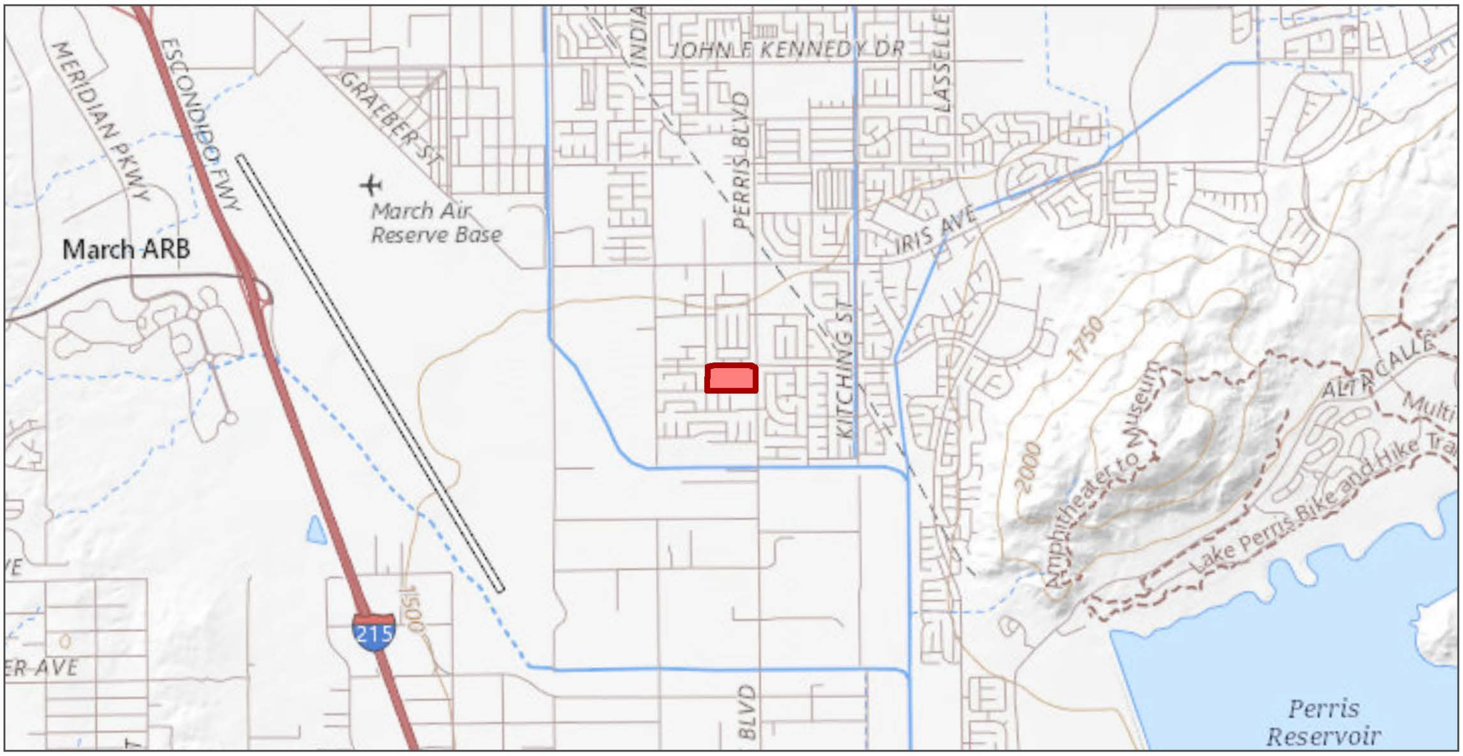
The Study Area is a 19.08-acre parcel located within an urbanized area and bound in all directions by single-family residential track housing, Interstate 215, and March Air Force Base to the west. The Project Site is relatively flat, with elevations ranging between approximately 1,480-1,490 feet above mean sea level (AMSL). An unnamed, ephemeral drainage flows north to south along the western boundary of the Project Site.

Historical aerial photographs (1966-2014) shows that the Project Area to be undeveloped land that received regular plowing/disking for possible weed abatement occurring from at least 1966 to 2014.[3]

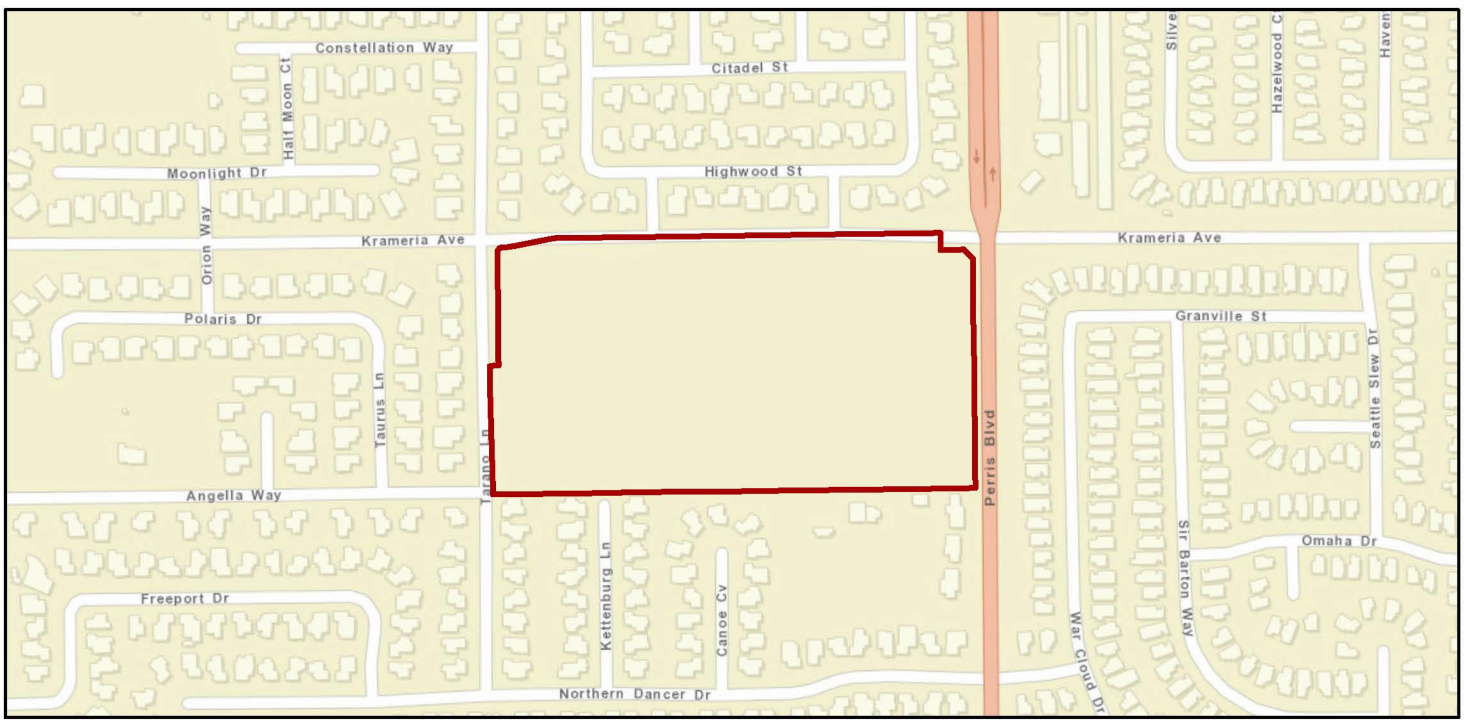
Geologically, the Study Area is located in the northwest portion of the Peninsular Ranges geomorphic province. The Peninsular Ranges province is distinguished by northwest trending mountain ranges and valleys following faults branching from the San Andreas Fault. The Peninsular Ranges are bound to the east by the Colorado Desert and extend north to the San Bernardino – Riverside county line (Norris and Webb 1976), west into the submarine continental shelf, and south to the California state line. Previous geological mapping of the Study Area

[3] Historic Aerials. 1966-2014. Nationwide Environmental Title Research LLC. Electronically available at: https://www.historicaerials.com/viewer

(McLeod 2019) indicates' younger Quaternary Alluvium sedimentary materials, derived as alluvial fan deposits from the more elevated terrain to the north. These younger Quaternary Alluvium materials are underlain by older Quaternary deposits that extend into the Study Area at unknown depths.



Regional



Source: ESRI 2018

Vicinity

Project Location

N

Figure 1 Regional and Vicinity Map

Krameria Project, Moreno Valley, CA

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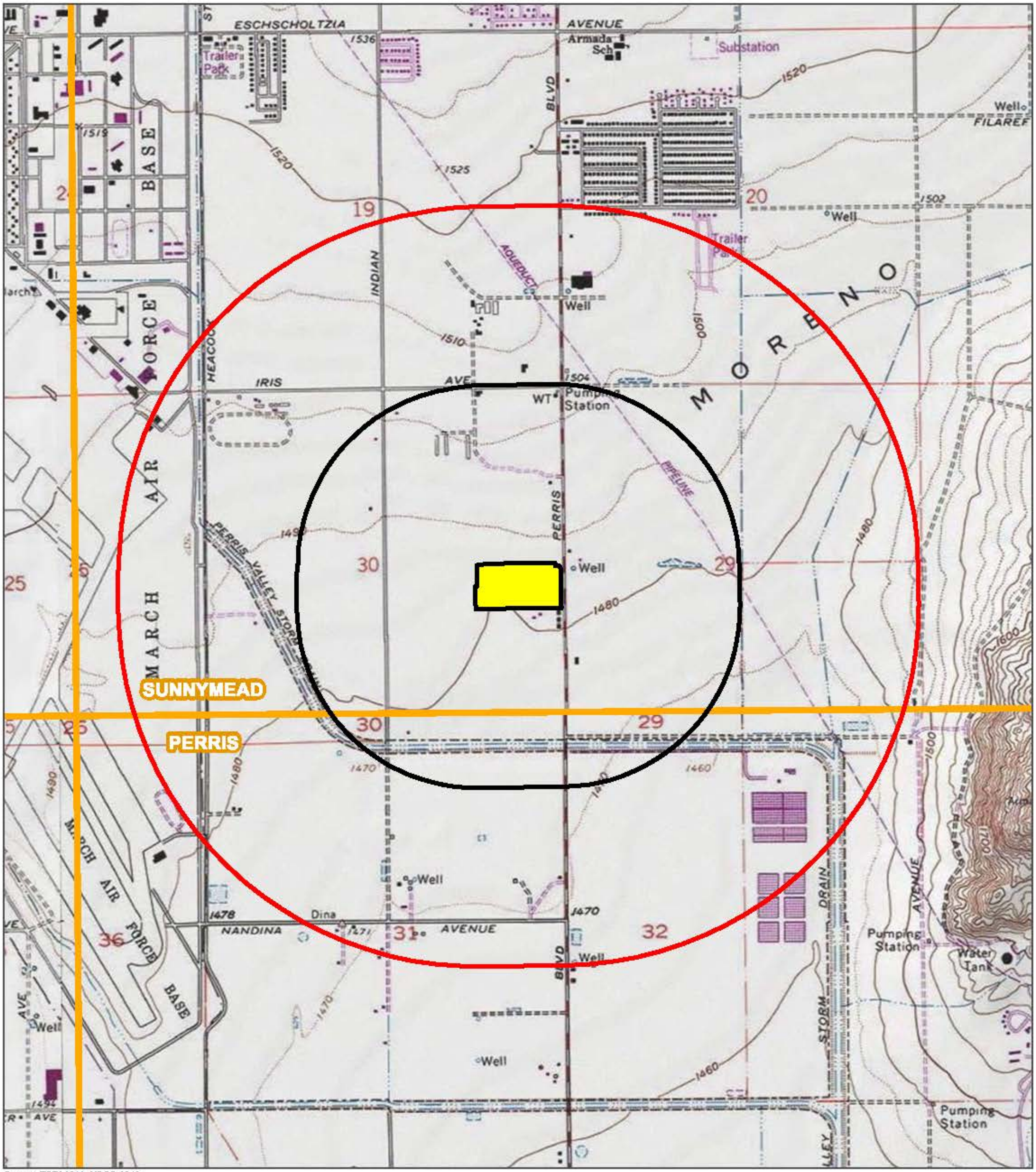

Source: ESRI 2018, USGS 2018

- Project Site Boundary (19.08 ac)
- Project Site Buffer: 0.5 mile
- Project Site Buffer: 1.0 mile

Sunnymead and Perris USGS 7.5" Quadrangle
Section: 30
Township: 3 South
Range: 3 West
Scale: 1:24,000

0 0.25 0.5 Miles

MIG

Figure 2 USGS Topographic Map

Krameria Project, Moreno Valley, CA

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3-REGULATORY SETTING

REGULATORY FRAMEWORK

Cultural resources are indirectly protected under the provisions of the Federal Antiquities Act of 1906 (16 U.S.C §§ 431 et seq.) and subsequent related legislation, regulations, policies, and guidance documents. The following is a summary of the applicable (federal, state, and local) regulatory framework related to the protection of cultural resources in California.

Numerous laws and regulations require federal, state, and local agencies to consider the effects of a proposed project on cultural resources. These laws and regulations establish a process for compliance, define the responsibilities of the various agencies proposing the action, and prescribe the relationship among other involved agencies (e.g., State Historic Preservation Office and the Advisory Council on Historic Preservation). The National Historic Preservation Act (NHPA) of 1966, as amended, CEQA, and Public Resources Code (PRC) 5024, are the primary federal and state laws governing and affecting preservation of cultural resources of national, state, regional, and local significance. Other relevant regulations and guidelines at the local level include the City's General Plan and Municipal Code. A description of the applicable laws, regulations, and guidelines are provided in the following paragraphs

3.1 FEDERAL LEVEL

3.1.1 – NATIONAL HISTORIC PRESERVATION ACT OF 1966

Enacted in 1966, the National Historic Preservation Act (NHPA) (16 U.S.C §§ 470 et seq.) declared a national policy of historic preservation and instituted a multifaceted program, administered by the Secretary of the Interior, to encourage the achievement of preservation goals at the federal, state, and local levels. The NHPA authorized the expansion and maintenance of the National Register of Historic Places (NRHP), established the position of State Historic Preservation Officer (SHPO), provided for the designation of State Review Boards, set up a mechanism to certify local governments to carry out the purposes of the NHPA, assist Native American tribes in preserving their cultural heritage, and created the Advisory Council on Historic Preservation (ACHP).

In summary, the NHPA establishes the nation's policy for historic preservation and sets in place a program for the preservation of historic properties by requiring federal agencies to consider effects to significant cultural resources (i.e. historic properties) prior to undertakings.

3.1.2 – SECTION 106 OF THE FEDERAL GUIDELINES

Section 106 of the NHPA states that federal agencies with direct or indirect jurisdiction over federally funded, assisted, or licensed undertakings must take into account the effect of the undertaking on any historic property that is included in, or eligible for inclusion in, the NRHP and that the ACHP and SHPO must be afforded an opportunity to comment, through a process outlined in the ACHP regulations at 36 Code of Federal Regulations (CFR) Part 800, on such undertakings.

3.1.3 – NATIONAL REGISTER OF HISTORIC PLACES

The NRHP was established by the NHPA of 1966 as "an authoritative guide to be used by federal, state, and local governments, private groups, and citizens to identify the Nation's cultural resources and to indicate what properties should be considered for protection from destruction or impairment." The NRHP recognizes properties that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess integrity of location, design, setting, materials, workmanship, feeling, or association. A property is eligible for the NRHP if it is significant under one or more of the following criteria:

Criterion A: It is associated with events that have made a significant contribution to the broad patterns of our history.

Criterion B: It is associated with the lives of persons who are significant in our past.

Criterion C: It embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction.

Criterion D: It has yielded, or may be likely to yield, information important in prehistory or history.

Cemeteries, birthplaces, or graves of historic figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; and properties that are primarily commemorative in nature are not considered eligible for the NRHP unless they satisfy certain conditions. In general, a resource must be at least 50 years of age to be considered for the NRHP, unless it satisfies a standard of exceptional importance.

3.1.4 – NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990

The Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 sets provisions for the intentional removal and inadvertent discovery of human remains and other cultural items from federal and tribal lands. It clarifies the ownership of human remains and sets forth a process for repatriation of human remains and associated funerary objects and sacred religious objects to the Native American groups claiming to be lineal descendants or culturally affiliated with the remains or objects. It requires any federally funded institution housing Native American remains or artifacts to compile an inventory of all cultural items within the museum or with its agency and to provide a summary to any Native American tribe claiming affiliation.

3.2 – STATE

3.2.1 – CALIFORNIA ENVIRONMENTAL QUALITY ACT

Pursuant to CEQA, a historical resource is a resource listed in, or eligible for listing in, the California Register of Historical Resources (CRHR). In addition, resources included in a local register of historic resources or identified as significant in a local survey conducted in accordance with state guidelines are also considered historic resources under CEQA, unless a preponderance of the facts demonstrates otherwise. According to CEQA, the fact that a resource is not listed in or determined eligible for listing in the CRHR or is not included in a local register or survey shall not preclude a Lead Agency, as defined by CEQA, from determining that the resource may be a historic resource as defined in California Public Resources Code (PRC) Section 5024.1.

CEQA applies to archaeological resources when (1) the archaeological resource satisfies the definition of a historical resource or (2) the archaeological resource satisfies the definition of a "unique archaeological resource." A unique archaeological resource is an archaeological artifact, object, or site that has a high probability of meeting any of the following criteria:

1. The archaeological resource contains information needed to answer important scientific research questions and there is a demonstrable public interest in that information.
2. The archaeological resource has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. The archaeological resource is directly associated with a scientifically recognized important prehistoric or historic event or person.

Appendix G of the State CEQA Guidelines provides a set of sample questions that guide the evaluation of potential impacts with regard to cultural resources:

Would the project:

a) Cause a substantial adverse change in the significance of an historical resource as defined in §15064.5?

b) Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

d) Disturb any human remains, including those interred outside of formal cemeteries?

3.2.2 – CALIFORNIA REGISTER OF HISTORICAL RESOURCES

Created in 1992 and implemented in 1998, the California Register of Historical Resources (CRHR) is "an authoritative guide in California to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate properties that are to be protected, to the extent prudent and feasible, from substantial adverse change."[4] Certain properties, including those listed in or formally determined eligible for listing in the NRHP and California Historical Landmarks (CHLs) numbered 770 and higher, are automatically included in the CRHR. Other properties recognized under the California Points of Historical Interest program, identified as significant in historic resources surveys, or designated by local landmarks programs may be nominated for inclusion in the CRHR. A resource, either an individual property or a contributor to a historic district, may be listed in the CRHR if the State Historical Resources Commission determines that it meets one or more of the following criteria, which are modeled on NRHP criteria[5]:

Criterion 1: It is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.

Criterion 2: It is associated with the lives of persons important in our past.

Criterion 3: It embodies the distinctive characteristics of a type, period, region, or method of construction; represents the work of an important creative individual; or possesses high artistic values.

[4] *California Public Resources Code § 5024.1(a).*
[5] *California Public Resources Code § 5024.1(b).*

Criterion 4: It has yielded, or may be likely to yield, information important in history or prehistory.

Resources nominated to the CRHR must retain enough of their historic character or appearance to be recognizable as historic resources and to convey the reasons for their significance. It is possible that a resource whose integrity does not satisfy NRHP criteria may still be eligible for listing in the CRHR. A resource that has lost its historic character or appearance may still have sufficient integrity for the CRHR if, under Criterion 4, it maintains the potential to yield significant scientific or historical information or specific data. Resources that have achieved significance within the past 50 years also may be eligible for inclusion in the CRHR, provided that enough time has lapsed to obtain a scholarly perspective on the events or individuals associated with the resource.

3.3 – OTHER STATE STATUTES AND REGULATIONS

3.3.1 – CALIFORNIA HISTORICAL LANDMARKS

California Historical Landmarks (CHLs) are buildings, structures, sites, or places that have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value and that have been determined to have statewide historical significance by meeting at least one of the criteria listed below. The resource must also be approved for designation by the County Board of Supervisors or the City or Town Council in whose jurisdiction it is located, be recommended by the State Historical Resources Commission, or be officially designated by the Director of California State Parks. The specific standards in use now were first applied in the designation of CHL No. 770. CHLs No. 770 and above are automatically listed in the CRHR.

To be eligible for designation as a Landmark, a resource must meet at least one of the following criteria:

1. The first, last, only, or most significant of its type in the state or within a large geographic region (Northern, Central, or Southern California)
2. Associated with an individual or group having a profound influence on the history of California
3. A prototype of, or an outstanding example of, a period, style, architectural movement or construction or one of the more notable works or the best surviving work in a region of a pioneer architect, designer, or master builder

3.3.2 – CALIFORNIA POINTS OF HISTORICAL INTEREST

California Points of Historical Interest are sites, buildings, features, or events that are of local (city or county) significance and have anthropological, cultural, military, political, architectural, economic, scientific or technical, religious, experimental, or other value. Points of Historical Interest (Points) designated after December 1997 and recommended by the State Historical Resources Commission are also listed in the CRHR. No historic resource may be designated as both a Landmark and a Point. If a Point is later granted status as a Landmark, the Point designation will be retired. In practice, the Point designation program is most often used in localities that do not have a locally enacted cultural heritage or preservation ordinance.

To be eligible for designation as a Point, a resource must meet at least one of the following criteria:

1. The first, last, only, or most significant of its type within the local geographic region (city or county)
2. Associated with an individual or group having a profound influence on the history of the local area
3. A prototype of, or an outstanding example of, a period, style, architectural movement or construction of one of the more notable works or the best surviving work in the local region of a pioneer architect, designer, or master builder

3.3.3 – NATIVE AMERICAN HERITAGE COMMISSION, PUBLIC RESOURCES CODE SECTIONS 5097.9–5097.991

Section 5097.91 of the Public Resources Code (PRC) established the Native American Heritage Commission (NAHC), whose duties include the inventory of places of religious or social significance to Native Americans and the identification of known graves and cemeteries of Native Americans on private lands. Under Section 5097.9 of the PRC, a state policy of noninterference with the free expression or exercise of Native American religion was articulated along with a prohibition of severe or irreparable damage to Native American sanctified cemeteries, places of worship, religious or ceremonial sites or sacred shrines located on public property. Section 5097.98 of the PRC specifies a protocol to be followed when the NAHC receives notification of a discovery of Native American human remains from a county coroner. Section 5097.5 defines as a misdemeanor the unauthorized disturbance or removal of archaeological, historic, or paleontological resources located on public lands.

3.3.4 – CALIFORNIA NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 2001

Codified in the California Health and Safety Code Sections 8010–8030, the California Native American Graves Protection Act (NAGPRA) is consistent with the federal NAGPRA. Intended to "provide a seamless and consistent state policy to ensure that all California Indian human remains, and cultural items be treated with dignity and respect," the California NAGPRA also encourages and provides a mechanism for the return of remains and cultural items to lineal descendants. Section 8025 established a Repatriation Oversight Commission to oversee this process. The act also provides a process for non–federally recognized tribes to file claims with agencies and museums for repatriation of human remains and cultural items.

3.3.5 – SENATE BILL 18

Senate Bill (SB) 18 (California Government Code, Section 65352.3) incorporates the protection of California traditional tribal cultural places into land use planning for cities, counties, and agencies by establishing responsibilities for local governments to contact, refer plans to, and consult with California Native American tribes as part of the adoption or amendment of any general or specific plan proposed on or after March 1, 2005. SB18 requires public notice to be sent to tribes listed on the Native American Heritage Commission's SB18 Tribal Consultation list within the geographical areas affected by the proposed changes. Tribes must respond to a local government notice within 90 days (unless a shorter time frame has been agreed upon by the tribe), indicating whether or not they want to consult with the local government. Consultations are for the purpose of preserving or mitigating impacts to places, features, and objects described in Sections 5097.9 and 5097.993 of the Public Resources Code that may be affected by the proposed adoption or amendment to a general or specific plan.

3.3.6 – ASSEMBLY BILL 52

Assembly Bill (AB) 52 specifies that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource, as defined, is a project that may have a significant effect on the environment. AB 52 requires a lead agency to begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project, if the tribe requested to the lead agency, in writing, to be informed by the lead agency of proposed projects in that geographic area and the tribe requests consultation, prior to determining whether a negative declaration, mitigated negative declaration, or environmental impact report is required for a project. AB 52 specifies examples of mitigation measures that may be considered to avoid or minimize impacts on tribal cultural resources. The bill makes the above provisions applicable to projects that have a notice of preparation or a notice of negative declaration filed or mitigated negative declaration on or after July 1, 2015. AB 52 amends Sections 5097.94 and adds Sections 21073, 21074, 2108.3.1., 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3 to the California Public Resources Code (PRC), relating to Native Americans.

3.3.7 – HEALTH AND SAFETY CODE, SECTIONS 7050 AND 7052

Health and Safety Code Section 7050.5 declares that, in the event of the discovery of human remains outside a dedicated cemetery, all ground disturbances must cease, and the county coroner must be notified. Section 7052 establishes a felony penalty for mutilating, disinterring, or otherwise disturbing human remains, except by relatives.

3.3.8 – PENAL CODE, SECTION 622.5

Penal Code Section 622.5 provides misdemeanor penalties for injuring or destroying objects of historic or archaeological interest located on public or private lands but specifically excludes the landowner.

3.5 – LOCAL LEVEL

3.5.1 – CITY OF MORENO VALLEY ELEMENT

The City of Moreno Valley has put forth numerous policies within the Conservation Element Objective section of the General Plan. These policies were created to identify and preserve the City's unique historical, archaeological, and paleontological resources for future generations (City of Moreno Valley General Plan 2006).

Policies:

7.6.1 Historical, cultural and archaeological resources shall be located and preserved, or mitigated consistent with their intrinsic value.

7.6.2 Implement appropriate mitigation measures to conserve cultural resources that are uncovered during excavation and construction activities.

7.6.3 Minimize damage to the integrity of historic structures when they are altered. 7.6.4 Encourage restoration and adaptive reuse of historical buildings worthy of preservation.

7.6.5 Encourage documentation of historic buildings when such buildings must be demolished.

4-CULTRAL SETTING

4.1 – PREHISTORIC CONTEXT

Prehistory is most easily discussed chronologically, in terms of environmental change and recognized cultural developments. Several chronologies have been proposed for inland Southern California, the most widely accepted of which is Wallace's four-part Horizon format (1955), which was later updated and revised by Claude Warren (1968). The advantages and weaknesses of Southern California chronological sequences are reviewed by Warren (in Moratto 1984), Chartkoff and Chartkoff (1984), and Heizer (1978). The following discussion is based on Warren's (1968) sequence, but the time frames have been adjusted to reflect more recent archaeological findings, interpretations, and advances in radiocarbon dating.

4.1.1 – PALEO-INDIAN PERIOD (CA. 13,000-11,000 YEARS BEFORE PRESENT [YBP])

Little is known of Paleo-Indian peoples in inland southern California, and the cultural history of this period follows that of North America in general. Recent discoveries in the Americas have challenged the theory that the first Americans migrated from Siberia, following a route from the Bering Strait into Canada and the Northwest Coast sometime after the Wisconsin Ice Sheet receded (ca. 14,000 YBP), and before the Bering Land Bridge was submerged (ca. 12,000 YBP). Based on new research from the Pacific Rim, it has been proposed that modern humans settled islands of the eastern Pacific between 40,000 and 15,000 years ago. Evidence of coastal migration has also come from sites on islands off Alta and Baja California. As a result, these sites are contemporary with Clovis and Folsom points found in North America's interior regions. All of these new findings have made the coastal migration theory gain credibility in recent times (Erlandson et al. 2007).

The timing, manner, and location of the Bering Strait crossing are a matter of debate among archaeologists, but the initial migration probably occurred as the Laurentide Ice Sheet melted along the Alaskan Coast and interior Yukon. The earliest radiocarbon dates from the Paleo-Indian Period in North America come from the Arlington Springs Woman site on Santa Rosa Island, which is located approximately 36 miles off the coast of California and is approximately 150 miles west-northwest of the Study Area. These human remains date to approximately 13,000 YBP (Johnson, et al. 2002). Other early Paleo-Indian sites include the Monte Verde Creek site in Chile (Meltzer, et al. 1997) and the controversial Meadowcroft Rockshelter in Pennsylvania. Both sites have early levels dated roughly at 12,000 YBP. Lifeways during the Paleo-Indian Period were characterized by highly mobile hunting and gathering. Prey included megafauna such as mammoth and technology included a distinctive flaked stone toolkit that has been identified across much of North America and into Central America. They likely used some plant foods, but the Paleo-Indian toolkit recovered archaeologically does not include many tools that can be identified as designed specifically for plant processing.

The megafauna that appear to have been the focus of Paleo-Indian life went extinct during a warming trend that began approximately 10,000 years ago, and both the extinction and climatic change (which included warmer temperatures in desert valleys and reduced precipitation in mountain areas) were factors in widespread cultural change. Subsistence and social practices continued to be organized around hunting and gathering, but the resource base was expanded to include a wider range of plant and game resources. Technological traditions also became more localized and included tools specifically for the processing of plants and other materials. This constellation of characteristics has been given the name "Archaic" and it was the most enduring of cultural adaptations to the North American environment throughout this time period.

4.1.2 – ARCHAIC PERIOD (CA. 11,000-3,500 YBP)

The earliest Archaic Period life in inland southern California has been given the name San Dieguito tradition, after the San Diego area where it was first identified and studied (Warren 1968). Characteristic artifacts include stemmed projectile points, crescents and leaf-shaped knives, which suggest a continued, focus on large game, although not megafauna of the earlier Paleo-Indian period. Milling equipment appears in the archaeological record at approximately 7,500 years ago (Moratto 1984:158). Artifact assemblages with this equipment include basin milling stones and unshaped manos, projectile points, flexed burials under cairns, and cogged stones, and have been given the name La Jolla Complex (7,500–3,000 YBP). The transition from San Dieguito life to La Jolla life appears to have been an adaptation to drying of the climate after 8,000 YBP, which may have stimulated movements of desert peoples to the coastal regions, bringing milling stone technology with them. Groups in the coastal regions focused on mollusks, while inland groups relied on wild-seed gathering and acorn collecting.

4.1.3 – LATE PREHISTORIC PERIOD (CA. 3,500 YBP-A.D. 1769)

Cultural responses to environmental changes around 4,000–3,000 YBP included a shift to more land-based gathering practices. This period was characterized by the increasing importance of acorn processing, which supplemented the resources from hunting and gathering. Meighan (1954) identified the period after A.D. 1400 as the San Luis Rey complex. San Luis Rey I (A.D. 1400–1750) is associated with bedrock mortars and milling stones, cremations, small triangular projectile points with concave bases and Olivella beads. The San Luis Rey II (A.D. 1750–1850) period is marked by the addition of pottery, red and black pictographs, cremation urns, steatite arrow straighteners, and non-aboriginal materials (Meighan 1954:223, Keller and McCarthy 1989:6). Work at Cole Canyon and other sites in southern California suggest that this complex, and the ethnographically described life of the native people of the region, were well established by at least 1,000 YBP (Keller and McCarthy 1989:80).

4.1.4 – ETHNOGRAPHIC CONTEXT

Information presented in the California volume of the Handbook of North American Indians (Heizer 1978:575) shows the Study Area is located near the traditional territory of the Serrano, Luiseño and Cahuilla. These ethnographic groups are described below.

4.1.5 – SERRANO

The Serrano people speak the Takic language, which is a similar to dialect spoken by the Luiseno, Cahuilla, and Garbrielino's (Bean and Smith 1978). The name Serrano comes from the Spanish word: "mountaineer or highlander" and refers to the indigenous people inhibiting the San Bernardino Mountains east of the Cajon Pass and may have settled along the Santa Ana River as early as 8,000 B.C. Their territory has been difficult to define, but it can be reliable characterized as from the San Bernardino Mountains extending northeast to the Mojave River region and southeast to the Tejon Creek area. The Serrano people were hunters-gathers and their diet consisted of small game such as rabbits, ground squirrels, and birds that was supplement by pinion nuts, acorns, agave, tuber-vegetables, and prickly pears. Villages were based on exogamous moieties (marriage outside of one's clan) and their size ranged between 25 to hundred people (Bean and Shipek 1978). The Yuhaviatam clan is known as the San Manuel Band of Mission Indians and the Maarenga' yam clan is known as the Morongo Band of Mission Indians, with a further, clan division for the Sobba Band of Luiseno Indians. The villagers lived in large communal dwellings made from tree branches that were covered with woven mats. Each family group had its own individual fireplace inside the dwelling, where they crafted mother-of-pearl inlay baskets and vessels that they trade with the Chumash and Tongvas. In 1771, the Serrano's' were subjugated and absorbed into the San Gabriel Mission system that resulted in the loss of their freedom, cultural and customs. In 1891, the United States created the "San Manuel" Indian Reservation after Chief Santos Manuel. From this date forward the Serrano Indians have been known as the San Manuel Band of Mission Indians (Boyd and Brown 1922 and San Manuel Band of Mission Indians 2010).

4.1.6 – LUISEÑO

The Luiseño are a Takic speaking people that are usually associated with coastal and inland areas of present day Orange and southern Riverside counties, with cultural and social behavioral characteristics similar to those of the Cahuilla, a tribal group generally linked with areas northeast of the San Jacinto Mountains. In fact, exchanges between the Luiseno and Cahuilla have been well documented. In context, the Study Area is considered a Luiseño area, though evidence of a Cahuilla presence may be identified (Robinson and Risher 1996:102-103). The term Luiseño derives from the mission named San Luis Rey and has been used in the region to refer to those Takic-speaking people associated with Mission San Luis Rey (Bean and Shipek 1978:550). The Luiseño shared boundaries with the Cahuilla, Cupeño, Gabrielino, and Kumeyaay groups on the east, north, and south, respectively. These different bands shared cultural and language traditions with the Luiseño. The Luiseño territory comprised from the coast to Agua Hedionda Creek on the south to near Aliso Creek on the northwest. The boundary extended inland to Santiago Peak, then across to the eastern side of Elsinore Fault Valley, then southward to the east of Palomar Mountain, then around the southern slope above the valley of San Jose (ibid.:550). Their habitat covered every ecological zone from the ocean, sandy beaches, shallow inlets, coastal chaparral, grassy valleys oak groves, among various other niches. The primary food source consisted of game animals such as deer, rabbit, jackrabbit, woodrat, mice, ground squirrels, antelope, and various species of birds. Next to game animals, acorns were the most single important staple, and six different species were utilized (ibid.:552). The Luiseño social structure is unclear; however, each village has a clan-tribelet-a group of people patrilineally related who owned an area in common and who were politically and economically autonomous from neighboring groups. The Luiseño were not organized into exogamous moieties such as were their neighbors, Cahuilla, Cupeño, and Serrano (Strong 1929:291). The hereditary village chief held an administrative position that combined and controlled religious, economic, and warfare powers (Boscana 1846:43). Marriage was arranged by the parents of children and important lineages were allied through marriage. Reciprocally useful alliances were arranged between groups in different ecological niches, and became springboards of territorial expansion, especially following warfare and truces (White 1963:130). The Luiseño material culture included an array of tools that were made from stone, wood, bone, and shell, and which served to procure and process the region's resources. Needs for shelter and clothing were minimal in the region's forgiving climate, but considerable attention was devoted to personal decoration in ornaments, painting, and tattooing. The local pottery was well made, although it was not elaborately decorated (Laylander and Pham 2012).

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4.1.7 – CAHUILLA

The Cahuilla occupied a large area in the geographic center of southern California that was bisected by the Cocopa-Maricopa Trail in addition to Santa Fe and Yuman Trails. They occupied an area from the summit of the San Bernardino Mountains in the north to Borrego Springs and the Chocolate Mountains in the south, portions of the Colorado Desert west of Orocopia Mountain to the east, and the San Jacinto Plain near Riverside and the eastern slopes of Palomar Mountain to the west (Bean 1978). The Cahuilla hunted with throwing sticks, clubs, nets, traps, dead falls with seed triggers, spring-poled snares, arrows (often poison-tipped) and self-backed and sinew-backed bows. They sometimes fired bush clumps to drive game out in the open, and flares to attract birds at night. Baskets of various kinds were used for winnowing, leaching, grinding, transporting, parching, storing, and cooking. Pottery vessels were used for carrying water, for storage, cooking, serving food and drink. Cahuilla tools included mortars and pestles, manos and metates, fire drills, awls, arrow-straighteners, flint knives, wood, horn, and bone spoons and stirrers, scrapers, and hammerstones. Woven rabbit skin blankets served to keep people warm in cold weather. Feathered costumes were worn for ceremonial events, and at these events the Cahuilla made music using rattles derived from insect cocoon, turtle and tortoise shell, and deer-hoofs, along with wood rasps, bone whistles, bull-roarers, and flutes, to make music. They wove bags, storage pouches, cords, and nets from the fibers of yucca.

4.1.8 – MORENO HILLS COMPLEX

The “Moreno Hills” is a small cluster of hills located just northwest of the Moreno town site. The hills extend northwest to an unnamed drainage which separates them from the southern end of the Reche Hills. Although the Moreno Hills are situated more or less in the middle of Moreno Valley, their prehistoric use appears to have been restricted to milling stations. Doubtless this is attributable to the absence of water. The nineteen recorded stations in the Moreno Hills were probably used at one time or another by individuals from various camps in the valley (City of Moreno Valley 2006).4

4.1.9 – WOLFSKILL RANCH NORTH COMPLEX

“Wolfskill Ranch North” comprises Mt. Russell and the surrounding hills as far west as the campground pass road (Via Del Lago). There are four habitation areas around Mt. Russell. The first site appears to be a major camp with milling features, midden, and pictographs located south of the peak in the reservoir valley. A midden deposit is an accumulation of refuse from a prehistoric settlement. The second, also an important camp, has both cupules and rock paintings accompanying its midden deposit. The site is located on the eastern flank of the hills south of Mt. Russell. Most of the milling stations within Moreno Valley jurisdiction would have been more accessible from this location. The third site is a rock shelter with accompanying milling station located at the foot of Mt. Russell east of the peak. Finally, the fourth habitation complex has midden deposits, milling features, cupules, and pictographs. It is the most centrally located habitation site relative to the bulk of milling stations on the north side of Mt. Russell. In addition to these habitation locations, there are seven lithic scatters (stone tools or projectiles) and thirty-six recorded milling stations in the Wolfskill Ranch North area (City of Moreno Valley General Plan 2006).

4.1.10 – WOLFSKILL RANCH WEST COMPLEX

Wolfskill Ranch West comprises the area west of the campground pass road (Via Del Lago). The habitation area appears to have been located at the southwestern end of the complex. Nineteen additional milling stations lie in the Wolfskill Ranch West area (City of Moreno Valley General Plan 2006).

4.1.11 – MORENO SCHOOL

This archaeological site comprises a rocky hill northwest of the Moreno School on Cottonwood Avenue. It consists of five milling stations (City of Moreno Valley General Plan 2006).

4.1.12 – LASSELLE & BRODIAEA

This archaeological site located near the intersection of Lasselle St. and Brodiaea Avenue is in an isolated rocky outcrop, consisting of five milling stations (City of Moreno Valley General Plan 2006).

4.1.13 – EUROPEAN CONTACT

European contact with the Native American groups that likely inhabited the Study Area and surrounding region began in 1542 when Spanish explorer, Juan Rodriguez Cabrillo, arrived by sea during his navigation of the California coast. Sebastian Vizcaino arrived in 1602 during his expedition to explore and map the western coast that Cabrillo visited 60 years earlier. In 1769, another Spanish explorer, Gaspar de Portola, passed through Luiseño/Kumeyaay territory and interacted with the local indigenous groups. In 1798, Mission San Luis Rey was established by the Spanish and it likely integrated the Native Americans from the surrounding region. Multiple epidemics took a great toll on Native American populations between approximately 1800 and the early 1860s (Porretta 1983), along with the cultural and political upheavals that came with European, Mexican, and American settlement (Goldberg 2001:50-52). In the beginning of the nineteenth century, some Spaniards who had worked at the missions began to set up what would later be known as the “Ranchos.” The Rancho era in California history was a period when the entire state was divided into large parcels of land equaling thousands of acres apiece. These large estates were ruled over in a semi-feudal manner by men who had been deeded the land by first the Spanish crown, and later the Mexican government. In 1821 Mexico won independence from Spain and began to dismantle the mission system in California. As the missions began to secularize, they were transformed into small towns and most Native Americans would later be marginalized into reservations or into American society. It was during this time that “Americans” began to enter California. Many of the American Californians married into the Rancho families, a development that would transform land ownership in Mexican California. By the time the United States annexed California after the Mexican-American War in 1850, much of the Rancho lands were already in the hands of Americans.

4.2– HISTORIC CONTEXT

4.2.1 – CITY OF MORENO VALLEY

By the mid-19th century, the area that comprises present-day Moreno Valley remained essentially uninhabited, despite its location on a grassy upland surrounded by several large Mexican Ranchos. When the U.S. government initiated its first official land survey in southern California in 1853-1855, the only manmade features in the Moreno Valley were a few roads including a wagon road from San Bernardino to Temecula, a second one leading to San Jacinto, and several unidentified roads and/or trails.

The area surrounding Moreno Valley remained unclaimed public land until 1870, when a large tract of 13,471 acres were purchased from the U.S. Government and with the expansion of the railroad in 1880’s a land boom soon brought settlers into the area, only to see the boom turn to bust for lack of a reliable water supply. In 1891, private developers brought water into new Haven, which was subsequently changed to Moreno and Midland also, known as Armada from the newly constructed Bear Valley reservoir, which got the economy moving again until a drought the following year stopped the water flow from the Bear Valley reservoir. As a result, the town of Moreno died again and many of its budding were either abandoned or were sold and moved to Riverside (Gunther 1984).

Moreno Valley's economic fortunes were severely hampered by the lack of water. Finally, in 1973, after the completion of the California Aqueduct and the construction of Lake Perris, Moreno Valley's economic fortunes began to change. A reliable water supply, coupled with the Interstate Freeway System and the construction of affordable housing brought an influx of commuters to the Moreno Valley area, setting off a period of rapid expansion and urbanization. By 1984, when residents in the communities of Moreno, Sunnymead, and Edgemont voted to incorporate as the City of Moreno Valley, the new city had already become the second most populous in Riverside County (Ibid.).

5-METHODS

5.1 – CULTURAL RESOURCES RECORDS SEARCH

On April 5, 2019, Mr. Purtell conducted a records search of the Study Area at the CHRIS-EIC. The records search included a review of all recorded archaeological and historical resources within a one-mile radius of the Study Area, as well as a review of cultural resource reports and historic topographic maps on file. In addition, MIG reviewed the California Points of Historical Interest (CPHI), the California Historical Landmarks (CHL), the California Register, the National Register, and the California State Historic Resources Inventory (HRI) listings. The purpose of the records search is to determine whether previously recorded archaeological or historical resources exist within the Study Area that require evaluation and treatment. The results also provide a basis for assessing the sensitivity of the Study Area for additional and buried cultural resources.

5.2 – SACRED LANDS FILE SEARCH AND NATIVE AMERICAN CONSULTATION

On April 4, 2019, Mr. Purtell commissioned a Sacred Lands File (SLF) records search of the Study Area through the NAHC. Results of the SLF records search provided information as to the nature and location of additional prehistoric or Native American resources to be incorporated in the assessment whose records may not be available at the CHRIS-EIC.

5.3 – PALEONTOLOGICAL RESOURCES RECORDS SEARCH

On April 4, 2019, Mr. Purtell commissioned a paleontological resources records search through the Vertebrate Paleontological Department of the Natural History Museum of Los Angeles County in Los Angeles, California. This institution maintains files of regional paleontological site records as well as supporting maps and documents. This records search entailed an examination of current geologic maps and known fossil localities inside and within the general vicinity of the Study Area. The objective of the records search was to determine the geological formations underlying the Study Area, whether any paleontological localities have previously been identified within the Study Area or in the same or similar formations near the Study Area, and the potential for excavations associated with the Study Area to encounter paleontological resources. The results also provide a basis for assessing the sensitivity of the Study Area for additional and buried paleontological resources.

5.4 – PEDESTRIAN SURVEY

On April 11, 2019, MIG (Mr. Purtell) conducted a pedestrian field survey of the Study Area to identify the presence or absence of archaeological, historical, or paleontological resources. Mr. Purtell surveyed 100-percent of the Study Area and detailed notes and digital photographs were also taken of the Study Area and surrounding vicinity.

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6-RESULTS

6.1 – CULTURAL RESOURCES RECORDS

Results of the records research conducted at the CHRIS-EIC indicate that no archaeological resources (prehistoric and historic) exist within the project boundaries. However, there are two historic trash refuse (P-33-028072 and P-33-028073) and one (1) historic structure: a concrete foundation and floor from a demolished grain milling facility (P-33-021503) located within a one-mile radius of the Study Area (see Table 1). None of these historic resources will be impacted by the proposed project.

Table 1
Previously Recorded Cultural Resources within the Study Area

Resource No.	Resource Type	Description	NRHP Eligibility	CRHR Eligibility	Distance from the Project Site
P-33-021503 CA-RIV-011291	Historic Building Foundation Site	This historic site consists of the remnants of an apparent former grain mill facility. The remains consist of three separate concrete constructed building foundations, a grain/seed dump, and separation basin. The facility is dated between 1914-1945. No date was given on when the facility was closed and demolished.	Not Evaluated. Appears to be Not Eligible.	Not Evaluated. Appears Not to be Eligible.	7/8 miles to the south
P-33-028072 CA-RIV-012673	Historic Site	This historic site consists of a historic-period refuse deposit discovered during archaeological construction monitoring. The site contains mainly food preparation and consumption containers and building materials. The artifacts date from the 1960’s to the 1970’s. The site measures approximately 70-feet n/s by 32-feet e/w and was discovered at a depth between 4 to 6 feet below construction grade.	Not Evaluated. Appears Not to be Eligible	Not Evaluated. Appears Not to be Eligible	¾ miles to the northwest
P-33-028073 CA-RIV-012674	Historic Site	This historic site consists of a historic-period refuse deposit discovered during archaeological construction monitoring. The site consists of two historic-period refuse deposits containing more than 1,800 artifacts that includes military and personal items. The artifacts date from the 1920's to 1950'S. However, there are several artifacts that date from the late 1800's to the early 1900's. The site measures approximately 950-feet n/s by 560-feet e/w and was discovered at a depth between 4 to 25 feet below construction grade.	Not Evaluated. Appears Not to be Eligible	Not Evaluated. Appears Not to be Eligible	¾ miles to the northwest

The results of the record search indicate that there are no cultural resource study/report previously conducted within proposed Study Area and there are twelve (12) cultural studies/reports that have been previously conducted within a one-mile radius of the Study Area (see Table 2, Previous Surveys within the Study Area). These studies were performed for four (4) cultural resource assessments, two (2) cell tower assessments, one (1) pipeline route evaluation, and one (1) school construction project, one (1) warehouse construction, one (1) commercial building project, one (1) historic site evaluation, and one (1) archaeological construction monitoring project. These studies were conducted between1983 and 2017.

Table 2
Previous Surveys within the Study Area

Report Number	Year	Report Title	Study	Authors
RI-01665	1983	Devers-Serrano-Villa Park Transmission System Supplement to the Cultural Resources Technical Report-Public Review Document and Confidential Appendices.	Cultural resources assessment	Wirth Associates
RI-01843	1984	Cultural Resources Survey Report on Wolfskill Ranch.	Cultural resources assessment	Scientific Resource Surveys, Inc.
RI-02171	1987	Cultural Resources Inventory for the City of Moreno Valley, Riverside County, California.	Cultural resources assessment	McCarthy, Daniel, F.
RI-03510	1996	An Intensive Survey of Approximately 2,500 Acres of March Air Force Base, Riverside County, California.	Cultural resources assessment	McDonald, Meg and Barb Giacomini
RI-03693	1991	Cultural Resources Investigation: Inland Feeder Project, Metropolitan Water District of Southern California.	Evaluating pipeline route alternatives	Foster, John M., James J. Schmidt, Carmen A. Weber, Gwendolyn, R., Romani and Roberta S. Greenwood
RI-05035	2005	Letter Report: Monitoring at the Site of the Proposed Indian Middle School in the City of Perris, Riverside County, California	New school construction	McKenna et. al
RI-06660	2006	Historical /Archaeological Resources Survey Report, Nandina Distribution 1 and 2, City of Moreno Valley, Riverside County, California	Warehouse construction	Tang, Bai, "Tom," Michael Hogan, Clarence Bodmer, Thomas Meltzer, and Laura H. Shaker
RI-08124	2008	Letter Report: Cultural Resources Records Search and Site Visit Results for Royal Street Communications Candidate IE24896A (Extra Space Storage), 16340 Perris Boulevard, Moreno Valley, Riverside County, California.	Construction of a new cell tower and facilities	Bonner, Wayne and Marine Aislin-Kay
RI-08272	1995	Historic Building Inventory and Evaluation, March Air Force Base, Riverside County, California.	Historic site evaluation	Manely, William, Consulting and Earth Tech
RI-09311	2014	Cultural Resources Record Search and Site Visit Results for Verizon Wireless Candidate 'Gentian' 16015 North Perris Boulevard, Moreno Valley, Riverside County, California.	Construction of a new cell tower and facilities	Willis, Carrie, D.
RI-09528	2015	Phase I Cultural Resources Survey for the Moreno Valley Logistics Center Project City of Moreno Valley, County of Riverside.	New commercial building construction	Lenich, Mary, M. and Brain F. Smith
RI-10277	2017	Cultural Resources Monitoring Report for the First Nandina Logistics Center Project, City of Moreno Valley, Riverside County, California.	Archaeological construction monitoring	Smith, Brian, F.

6.2 – SACRED LANDS FILE SEARCH AND NATIVE AMERICAN CONSULTATION

The NAHC SLF records search results (received April 15, 2019) revealed that no known "Native American cultural resources" in the SLF database are within the project site or within a one-mile radius of the Study Area. The NAHC records search results are provided in Appendix B of this report.

As per NAHC suggested procedure, follow-up letters were sent via first class mail on April 16, 2019 to the 10 Native American individuals and organizations identified by the NAHC as being affiliated with the vicinity of the Study Area. The letters requested any additional information they may have about Native American cultural resources that may be affected by the proposed project.

As of May 21, 2019, MIG has received three (3) tribal responses from the Agua Caliente Band of Cahuilla Indians on April 24, 2019, from the Morongo Band of Indians on May 3, 2019, and from the Augustine Band of Cahuilla Indians. The Agua Caliente Band of Cahuilla Indians deferred their comments to the Morongo Band of Indians and to the Pechanga Band of Luiseno Indians. The Morongo Band of Indians stated that the Tribe had no additional information to offer at this time and may provide other information to the lead agency during AB 52 Consultations. The Augustine Band of Cahuilla Indians stated that the Tribe is unaware of specific cultural resources that may be affected by the proposed project.

As of May 30, 2019, MIG has received no other responses from the Native American community concerning the proposed project. MIG will keep the Applicant apprised with the progress of this on-going Native American consultation. The NAHC SLF records search results, the Native American contact list, and the Native American Consultation Matrix are provided in Appendix B of this report.

6.3 – PALEONTOLOGICAL RESOURCES RECORDS SEARCH

Results of the paleontological resources records search through NHMLAC indicate that no vertebrate fossil localities from the NHMLAC records have been previously recorded within the Study Area or within a one-mile radius.[6] Moreover, no paleontological resources were identified by MIG during the pedestrian survey. Additionally. a review of the City of Moreno Valley's General Plan indicate that the Study Area is located within a vicinity of low paleontological potential, based on extensive field work (City of Moreno Valley 2006).[7]

6.4 – PEDESTRIAN SURVEY

On April 11, 2019, MIG Senior Archaeologist Christopher Purtell, M.A., RPA conducted a cultural resources field survey of 100-percent of the proposed project site. The results of the field survey indicated that there were no artifacts or cultural (prehistoric, historic, historic built environments or paleontological) resources discovered or recorded during the course of the field survey (see Photographs 1-4).

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[6] McLeod, Samuel, Natural History Museum of Los Angeles County, Vertebrate Paleontology Section. 10, April ,2019. Letter Report in support of the 69-Lot Single-Family Residential Subdivision Project to Chris Purtell, MIG, Inc. Riverside, CA.

[7] City of Moreno Valley. 2006. General Plan Final Program EIR; Chapter 5.10- Cultural Resources. Report on file at the City of Moreno Valley, City Hall.

Photograph 1: Project Site, view towards the north

Photograph 2: Project Site, view towards the south

Photograph 3: Project Site, View towards the east

Photograph 4: Project Site, view towards the west

6.4.1 – OTHER STUDY AREA CONDITIONS

The Project Site can be characterized as exhibiting dense vegetation, expect in the northeast corner, which consists of a flat, hard pack sediment, void of all vegetation except for a single Pepper Tree and measures approximately 213 feet north/south by 122 feet east-west (see Photograph 5). The Project Site's western boundary exhibits an ephemeral drainage ditch, whose width and depths varies from approximately 1-4 feet wide by 1-8 feet in depth. The drainage runs the entire length of the site in a north-south direction (see Photograph 6).

Approximately 95 percent of the Project Site consisted of tall ruderal plant species and wild grasses that are approximately 3 to 8–feet in height, in which shallow plowing/disking for possible weed abatement was only evident during pedestrian survey transects, due to dense ground cover (see Photograph 7). Ground surface visibility was zero to five percent and when visible, the soil exhibited a light tan to medium brown color sediment with a loamy-silty texture. Scant bioturbation was observed throughout the site, possible due to the dense ground cover. Sparse to moderate levels of modern-man-made trash consisting of, but not limited to, a discarded bed mattress and construction materials were observed along the Project's southern boundary at Kettenburg Lane (see Photograph 8). Plastic bottles, paper and plastic wrappers, glass bottles, and crushed aluminum cans were found adjacent to Perris Boulevard (north and south) and along Krameria Avenue (east and west).

Photograph 5: Project Site's northeast corner, view towards the south

Photograph 6: Project Site's ephemeral drainage ditch, view towards the south

Photograph 7: Project Site, dense vegetation, view towards the northeast

Photograph 8: Project Site, discarded mattress, closeup

7-EVALUATION

Evaluation of cultural resources is determined by conducting an “evaluation” of a resource’s eligibility for listing in the California Register; determining whether it qualifies as a “unique archaeological resource” and determining whether the resource retains integrity. This is achieved by applying the California Register criteria (including criteria for a “unique archaeological resource”) as defined in Chapter 2 of this report. If a resource is determined eligible for listing in the California Register or qualifies as a “unique archaeological resource” and retains integrity, then the resource is considered an archaeological resource or a historical resource pursuant to CEQA §15064.5 and any substantial adverse change to the resource is considered a significant impact on the environment. The CEQA guidelines do not provide criteria to evaluate paleontological resources.

7.1– ARCHAEOLOGICAL RESOURCES

As discussed previously in Section 6, no known archaeological resources from the EIC records were recorded within the project site or within a one-mile radius of the Study Area and there are two historic archaeological trash refuses (P-33-028072 and P-33-028073) located within a one-mile radius of the Study Area. These two historic archaeological resources will not be impacted by the proposed Project. There were no archaeological resources identified during the pedestrian survey; therefore, no evaluation of archaeological resources is necessary.

Nevertheless, a review of the City of Moreno Valley’s General Plan indicates that the Study Area is located within a one and one-half-mile radius from the Wolfskill Ranch West Complex, approximately four and one-half miles northeast from the Wolfskill Ranch North Complex and is approximately five miles southeast of the Moreno Hills Complex. These archaeological complexes are comprised of a series of hills and drainages that stretch into Moreno Valley and are characterized as prehistoric habitation areas consisting of bedrock milling stations, cupule rocks, petroglyphs, and pictographs. Additionally, the City’s General Plan has identified archaeological sites located at the Moreno School and at the intersection of Lassalle Street & Brodiaea Avenue (see Figure 3, City of Moreno Valley, Locations of Prehistoric Sites).[8] These archaeological sites are located approximately four and one-half miles northeast of the Study Area and have been classified as rocky outcrops containing bedrock milling stations (City of Moreno Valley General Plan 2006).[9] None of these archaeological resources will be impacted by the proposed Project.

Consequently. the Project Area has a moderately high sensitivity level to encounter subsurface archaeological resources during project implementation given the proven prehistoric occupation of the region, the identification of multiple surface archaeological resources within the vicinity of the Study Area and the favorable natural conditions (e.g., ephemeral drainages, natural spring, and vegetation communities) that would have attracted prehistoric inhabitants to the area. Therefore, despite the disturbances of the Study Area caused by plowing/dishing that may have displaced archaeological resources on the surface, it is possible that intact archaeological resources exist at depth. As a result, recommended mitigation measures are provided in Chapter 8 to reduce potentially significant impacts to previously undiscovered archaeological resources that may be accidentally encountered during project implementation to a less than significant level.

[8] City of Moreno Valley. 2006. General Plan Final Program EIR; Chapter 5.10- Cultural Resources. Report on file at the City of Moreno Valley, City Hall.

[9] City of Moreno Valley. 2006. General Plan Final Program EIR; Chapter 5.10- Cultural Resources. Report on file at the City of Moreno Valley, City Hall.

7.2 – HISTORICAL RESOURCES

As discussed previously in Section 6, the results from the CHRIS-EIC indicated that there were no previously recorded historical resources within the Study Area and no historical resources were identified during the pedestrian survey. However, there is one (1) historic structure: a concrete foundation and floor from a demolished grain milling facility (P-33-021503) that is located within a one-mile radius of the Study Area. This historic resource will not be impacted by the proposed Project; therefore, no impact analysis of historical resources is necessary.

7.3 – PALEONTOLOGICAL RESOURCES

As discussed previously in Chapter 6, the results of the paleontological resources records search through NHMLAC indicate that no vertebrate fossil localities from the NHMLAC records have been previously recorded within the Study Area or within a one-mile radius.[10] Moreover, no paleontological resources were identified by MIG during the pedestrian survey. The literature review and the search at the NHMLAC indicate that the Study Area is situated upon younger and older Quaternary alluvial fan deposits, derived from the more elevated terrain to the north. These sedimentary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but they may be underlain by older Quaternary deposits that do contain significant vertebrate fossils at unknown depths (McLeod 2019).[11] A review of the City of Moreno Valley's General Plan (see Figure 4. City of Moreno Valley, Locations Paleontologic Resources Sensitive Areas)[12] indicates that the Study Area is located within a vicinity of low paleontological potential, based on extensive field work (City of Moreno Valley 2006).

Consequently, the Project Site has moderately low sensitivity level to encounter subsurface paleontological fossils or unique geological features during project implementation. As a result, recommended mitigation measures are provided in Chapter 8 to reduce potentially significant impacts to previously undiscovered paleontological resources or unique geological features that may be accidentally encountered during project implementation to a less than significant level.

7.4 – HUMAN REMAINS

No known human remains have been identified from the database within a one-mile radius of the Study Area. No human remains were identified during the pedestrian survey of the Study Area. However, these findings do not preclude the existence of previously unknown human remains located below the ground surface, which may be encountered during construction excavations associated with the proposed project. Similar to the discussion regarding archaeological resources above, it is also possible to encounter buried human remains during construction given the proven prehistoric occupation of the region, the identification of multiple surface archaeological resources within two-miles of the Study Area, and the favorable natural conditions that would have attracted prehistoric inhabitants to the area. As a result, mitigation measures are recommended in the following chapter that would reduce potentially significant impacts to previously unknown human remains that may be unexpectedly discovered during project implementation to a less than significant level.

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[10] McLeod, Samuel, Natural History Museum of Los Angeles County, Vertebrate Paleontology Section. 10, April ,2019. Letter Report in support of the 69-Lot Single-Family Residential Subdivision Project to Chris Purtell, MIG, Inc. Riverside, CA.

[11] McLeod, Samuel, Natural History Museum of Los Angeles County, Vertebrate Paleontology Section. 10, April ,2019. Letter Report in support of the 69-Lot Single-Family Residential Subdivision Project to Chris Purtell, MIG, Inc. Riverside, CA.

[12] City of Moreno Valley. 2006. General Plan Final Program EIR; Chapter 5.10- Cultural Resources. Report on file at the City of Moreno Valley, City Hall.

7.5 – TRIBAL CULTURAL RESOURCES

As discussed in Section 6, the results of the records research compiled from the CHRIS-EIC, a Sacred Lands File Search commissioned through the NAHC, and a pedestrian field survey failed to indicate known TCR within the Study Area as specified in PRC Section 210741, 5020.1(k), or 5024.1. Despite the disturbances of the Study Area that may have displaced or submerged archaeological resources relating to TCRs on the surface, it is possible that intact tribal cultural resources exist at depth given the proven prehistoric occupation of the region and the favorable natural conditions that would have attracted prehistoric inhabitants to the area. As a result, recommended mitigation measures are provided in Section 8 to reduce potentially significant impacts to previously undiscovered archaeological resources relating to TCRs that may be accidentally encountered during project implementation to a less than significant level.

At the time that this report was prepared, no additional information had yet been provided by affected tribes on potential TRC's within the Study Area. It is anticipated that during the application process the Lead Agency will notify the tribes of the 69-Lot Single-Family Residential Subdivision Project (proposed) and will commence AB 52 Consultations as specified in the regulations.

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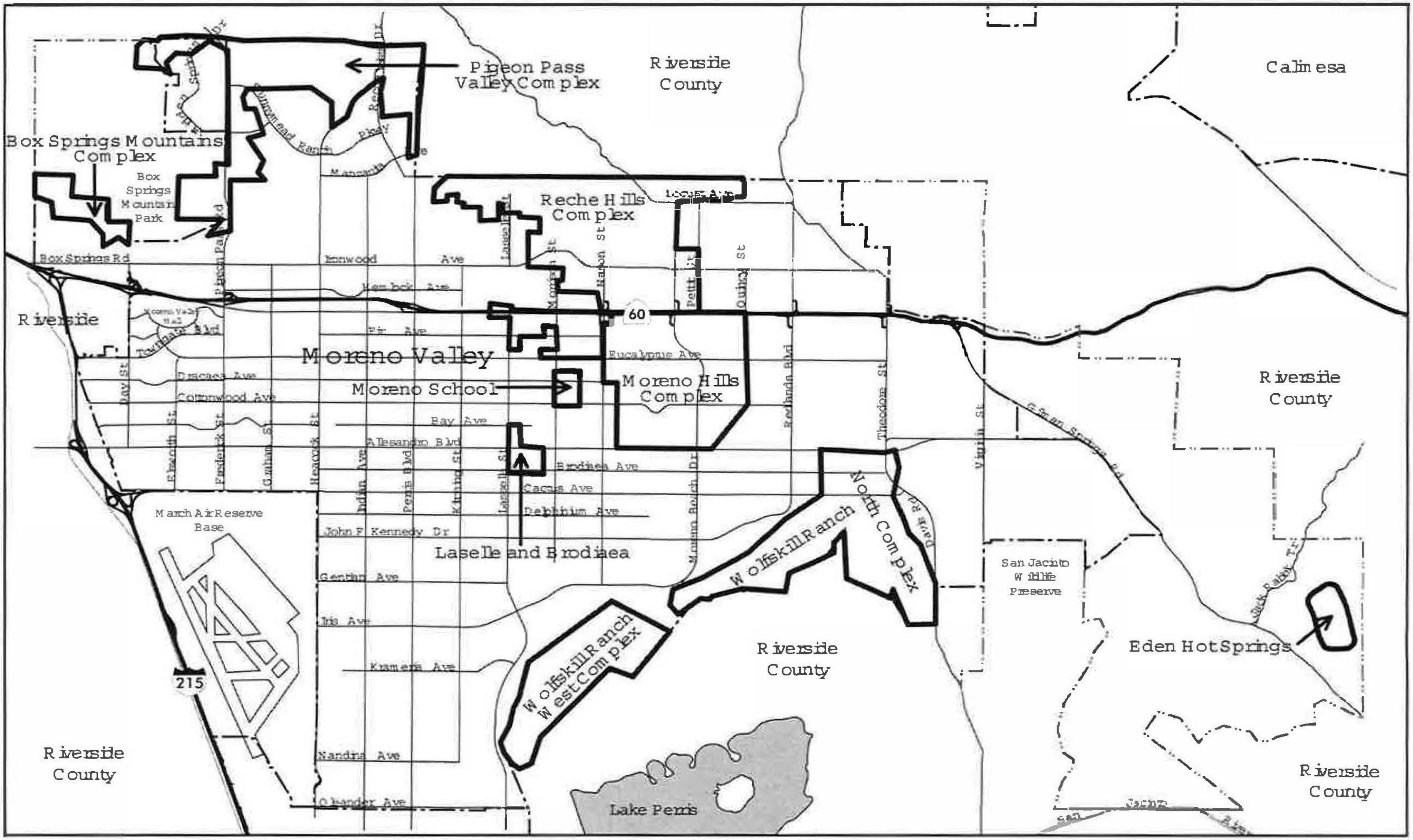

Source: CBA, Inc., August 2000

City Boundary

Sphere of Influence

Significant Prehistoric Sites

North 0 6,000 12,000 ft

Figure 3
City of Moreno Valley, Locations of Prehistoric Sites

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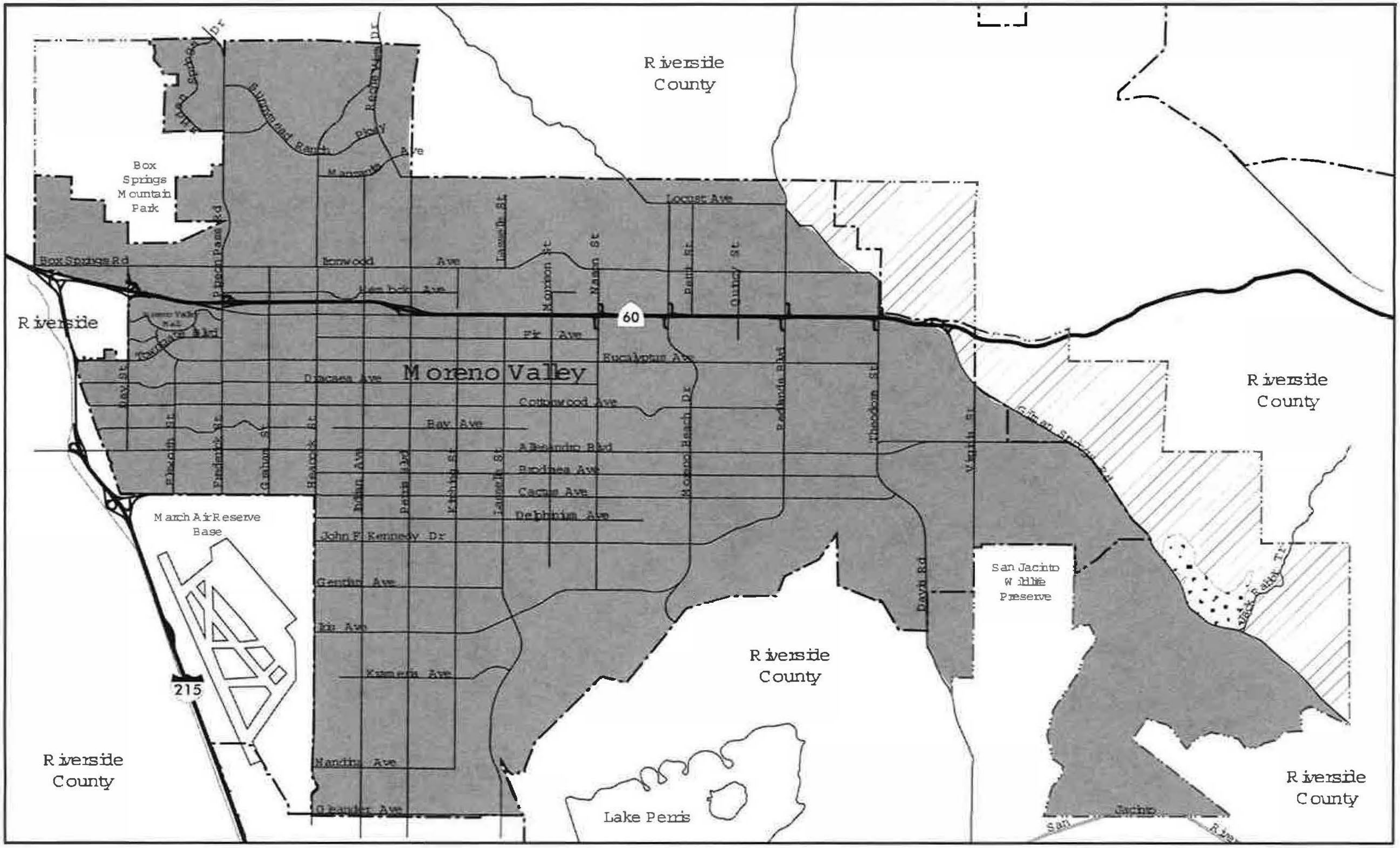

Source: CBA, Inc., August 2000

City Boundary | High Potential | Undetermined Potential | Low Potential

North 0 6,000 12,000 ft

Figure 4
City of Moreno Valley, Paleontologic Resources Sensitive Areas

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8-RECOMMENDED MITIGATION MEASURES

8.1- ARCHAEOLOGICAL RESOURCES

In the event of the unanticipated discovery of archaeological or cultural resources relating to TCRs during earthmoving operations, the following mitigation measures are recommended to reduce potentially significant impacts to archaeological resources that are accidentally discovered during implementation of the proposed project to a less than significant level.

Mitigation Measure CULT-1: **Conduct Archaeological Sensitivity Training for Construction Personnel.** The Applicant shall retain a qualified professional archaeologist who meets U.S. Secretary of the Interior's Professional Qualifications and Standards, to conduct an Archaeological Sensitivity Training for construction personnel prior to commencement of excavation activities. The training session shall be carried out by a cultural resource professional with expertise in archaeology, who meets the U.S. Secretary of the Interior's Professional Qualifications and Standards. The training session will include a handout and will focus on how to identify archaeological resources that may be encountered during earthmoving activities and the procedures to be followed in such an event, the duties of archaeological monitors, and the general steps a qualified professional archaeologist would follow in conducting a salvage investigation if one is necessary.

Mitigation Measure CULT-2: Cease Ground-Disturbing Activities and Implement Treatment Plan if Archaeological Resources Are Encountered. In the event that archaeological resources are unearthed during ground-disturbing activities, ground-disturbing activities shall be halted or diverted away from the vicinity of the find so that the find can be evaluated. A buffer area of at least 50 feet shall be established around the find where construction activities shall not be allowed to continue until a qualified archaeologist has examined the newly discovered artifact(s) and has evaluated the area of the find. Work shall be allowed to continue outside of the buffer area. All archaeological resources unearthed by project construction activities shall be evaluated by a qualified professional archaeologist, who meets the U.S. Secretary of the Interior's Professional Qualifications and Standards. Should the newly discovered artifacts be determined to be prehistoric, Native American Tribes/Individuals should be contacted and consulted, and Native American construction monitoring should be initiated. The Applicant and City shall coordinate with the archaeologist to develop an appropriate treatment plan for the resources. The plan may include implementation of archaeological data recovery excavations to address treatment of the resource along with subsequent laboratory processing and analysis.

Mitigation Measure CULT-3: Monitor Construction Excavations for Archeological Resources is required at all depths and strata. The Applicant shall retain a qualified archaeological monitor, who will work under the direction and guidance of a qualified professional archaeologist, who meets the U.S. Secretary of the Interior's Professional Qualifications and Standards. The archaeological monitor shall be present during all construction excavations (e.g., grading, trenching, or clearing/grubbing) into non-fill younger Quaternary alluvial sediments. The archaeological monitor will be required to complete a daily archaeological construction monitoring log that documents construction activities and observations that will be included as an appendix to the Final Archaeological Construction Monitoring Report as specified in Mitigation Measure CULT-4. Multiple earth-moving construction activities may require multiple archaeological monitors. The frequency of monitoring shall be based on the rate of excavation and grading activities, proximity to known archaeological resources, the materials being excavated (native versus artificial fill soils), and the depth of excavation, and if found, the abundance and type of archaeological resources encountered. Full-time monitoring can be reduced to part-time inspections if determined adequate by the project archaeologist.

Mitigation Measure CULT-4: Prepare Report Upon Completion of Monitoring Services. The project archaeologist who meets the U.S. Secretary of the Interior's Professional Qualifications and Standards, shall prepare a final report at the conclusion of archaeological monitoring. The report shall be submitted to the Applicant, the Eastern Information Center, the City, and representatives of other appropriate or concerned agencies to signify the satisfactory completion of the project and required mitigation measures. The report shall include a description of resources unearthed, if any, evaluation of the resources with respect to the California Register and CEQA, and treatment of the resources.

8.2 – HISTORICAL RESOURCES

The proposed project would not impact historical resources therefore no mitigation measures are recommended.

8.3 – PALEONTOLOGICAL RESOURCES

The following mitigation measures have been recommended to reduce potentially significant impacts to paleontological resources as recommended by the NHMLAC to a less than significant level.

Mitigation Measure CULT-5: Conduct Paleontological Sensitivity Training for Construction Personnel. The applicant shall retain a professional paleontologist, who meets the qualifications set forth by the Society of Vertebrate Paleontology and shall conduct a paleontological sensitivity training for construction personnel prior to commencement of excavation activities. The training will include a handout and will focus on how to identify paleontological resources that may be encountered during earthmoving activities and the procedures to be followed in such an event, the duties of paleontological monitors, notification and other procedures to follow upon discovery of resources, and the general steps a qualified professional paleontologist would follow in conducting a salvage investigation if one is necessary.

Mitigation Measure CULT-6: Conduct Periodic Paleontological Spot Checks during Grading and Earth-moving Activities. The applicant shall retain a professional paleontologist who meets the qualifications set forth by the Society of Vertebrate Paleontology and shall conduct periodic Paleontological Spot Checks beginning at depths below five feet to determine if construction excavations have extended into older Quaternary deposits. After the initial paleontological spot check, further periodic checks will be conducted at the discretion of the qualified paleontologist. If the qualified paleontologist determines that construction excavations have extended into the older Quaternary deposits, construction monitoring for paleontological resources will be required. The applicant shall retain a qualified paleontological monitor, who will work under the guidance and direction of a professional paleontologist, who meets the qualifications set forth by the Society of Vertebrate Paleontology. The paleontological monitor shall be present during all construction excavations (e.g., grading, trenching, or clearing/grubbing) into the older Pleistocene alluvial deposits. Multiple earth-moving construction activities may require multiple paleontological monitors. The frequency of monitoring shall be based on the rate of excavation and grading activities, proximity to known paleontological resources and/or unique geological features, the materials being excavated (native versus artificial fill soils), and the depth of excavation, and if found, the abundance and type of paleontological resources and/or unique geological features encountered. Full-time monitoring can be reduced to part-time inspections if determined adequate by the qualified professional paleontologist.

Mitigation Measure CULT-7: Cease Ground-Disturbing Activities and Implement Treatment Plan if Paleontological Resources Are Encountered. If paleontological resources and or unique geological features are unearthed during ground-disturbing activities, ground-disturbing activities shall be halted or diverted away from the vicinity of the find so that the find can be evaluated. A buffer area of at least 50 feet shall be established around the find where construction activities shall not be allowed to continue until appropriate paleontological treatment plan has been approved by the applicant and the City. Work shall be allowed to continue outside of the buffer area. The applicant and City shall coordinate with a professional paleontologist, who meets the qualifications set forth by the Society of Vertebrate Paleontology, to develop an appropriate treatment plan for the resources. Treatment may include implementation of paleontological salvage excavations to remove the resource along with subsequent laboratory processing and analysis or preservation in place. At the paleontologist's discretion and to reduce construction delay, the grading and excavation contractor shall assist in removing rock samples for initial processing.

Mitigation Measure CULT-8: Prepare Report Upon Completion of Paleontological Monitoring or Salvage Services. Upon completion of monitoring and/or salvage activities (if required by Mitigation Measures CULT 6 or CULT 7), the professional paleontologist shall prepare a report summarizing the results of the monitoring and salvaging efforts, the methodology used in these efforts, as well as a description of the fossils collected and their significance. The report shall be submitted to the applicant, the City, the Natural History Museum of Los Angeles County, and representatives of other appropriate or concerned agencies to signify the satisfactory completion of the project and required mitigation measures.

8.4 – HUMAN REMAINS

For components of the proposed project that require excavation activities, the following mitigation measure is recommended to reduce potentially significant impacts to human remains to a less than significant level:

Mitigation Measure CULT-9: **Cease Ground-Disturbing Activities and Notify County Coroner If Human Remains Are Encountered.** If human remains are unearthed during implementation of the proposed project, the City of Moreno Valley and the applicant shall comply with State Health and Safety Code Section 6050.5. The City of Moreno Valley and the applicant shall immediately notify the County Coroner and no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to PRC Section 5097.98. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission (NAHC). The NAHC shall then identify the person(s) thought to be the Most Likely Descendent (MLD). After the MLD has inspected the remains and the site, they have 48 hours to recommend to the landowner the treatment and/or disposal, with appropriate dignity, the human remains and any associated funerary objects. Upon the reburial of the human remains, the MLD shall file a record of the reburial with the NAHC and the project archaeologist shall file a record of the reburial with the CHRIS-EIC. If the NAHC is unable to identify a MLD, or the MLD identified fails to make a recommendation, or the landowner rejects the recommendation of the MLD and the mediation provided for in Subdivision (k) of Section 5097.94, if invoked, fails to provide measures acceptable to the landowner, the landowner or his or her authorized representative shall inter the human remains and items associated with Native American human remains with appropriate dignity on the property in a location not subject to further and future subsurface disturbance.

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10-APPENDIX MATERIALS

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APPENDIX A - RESUME

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Christopher W. Purtell, M.A., RPA

AREAS OF EXPERTISE

Cultural Resource Management /
Archaeological Investigations / Project Management

QUALIFICATIONS

As Director of MIG's Cultural Resources Group, Mr. Purtell has more than 13 years of professional experience in cultural resources project management, environmental compliance, subcontracting, archaeological survey, excavation, monitoring, data recovery, laboratory analysis, and in the development of mitigation and treatment plans; as well as over 10 years of experience in a decision-making capacity on cultural resources projects in California, Washington, and Oregon. He has undertaken and contributed to work efforts for prehistoric and historic archaeological, historic built environments, and paleontological investigations in the Great Basin, Mojave Desert, Southern and Northern California pursuant to the California Environmental Quality Act (CEQA), the National Environmental Policy Act (NEPA), and Sections 106 and 110 of the National Historic Preservation Act (NHPA).

Mr. Purtell has successfully directed and coordinated cultural resource mitigation recommendations with a variety of lead and regulatory agencies, including Los Angeles County, Riverside County, San Bernardino County, Ventura County, Orange County, Kern County, Inyo County, and he has obtained Field Permits under the Archaeological Resources Protection Act (ARPA) from the U.S. Department of Interior, Bureau of Indian Affairs (BIA), Cultural Field Permits and Field Authorizations, with the Bureau of Land Management (BLM), among others. Mr. Purtell is a Registered Professional Archaeologist (RPA) and his training and background meet the U.S. Secretary of the Interior's Professional Qualifications Standards as a Principle Investigator and Field Director for prehistoric and historic archaeology.

Currently, Mr. Purtell directs the Cultural Resources Group and his duties includes: profit and loss responsibilities, budget management, scope preparation, project task administration, AB 52 administrative support, Native American scoping/consultation, subcontractor evaluation and procurement, coordination with lead agencies, clients, and project result meetings with the public and stakeholders both in public and in private forms. His duties also include cultural resources staff management, review and oversight of cultural surveys results and site recordation to include GIS management and databases, preparation of technical reports and overseeing the quality control assurance of all deliverables.

EDUCATION

- Master of Arts, Anthropology (Emphasis in Archaeology), California State University Fullerton, Fullerton, CA
- Bachelor of Arts, Anthropology/Archaeology (Honors in the Major), Minor in Geography, California State University Dominguez Hills, Carson, CA

AWARDS

- 2007–2008 Professional Distinction Award for Field and Laboratory Analysis, California State University, Fullerton, Graduate School of Anthropology

TRAINING

- OSHA 8-hr Annual HazWaste Operations Refresher Certification, March 2017
- OSHA 40-hr HazWaste Operations Certification (Certification No. 10052), January 2014
- 5-Phase Project Management by the UCLA Extension, Department of Engineering, Information Systems, and Technical Management, 1 April 2008.
- World Class TQM 40-Hour Boot Camp Workshop, Toyota Motor Corporation and Taught by Technical Change Associates, Inc. (R.L. Smith, and G. L. Jensen, Training Coordinators), 1 August 2001.

AFFILIATIONS

- Register of Professional Archaeologist (ID No. 990027)
- Society for American Archaeology (SAA)
- Society for California Archaeology (SCA)

RELEVANT EXPERIENCE

Phase I Cultural Assessment of the Proposed Agua Mansa Commerce Park. City of Jurupa Valley, County of Riverside, California (2016-2017).
Role: Cultural Resources Director / Senior Archaeologist
Client: Viridian Partners
Project Description: Viridian Partners, proposes the Agua Mansa Commerce Park Project to clean up and redevelop the existing 297.3-acre Riverside Cement Plant site.
Responsible for a Phase I Cultural Resources Assessment and Technical Report of the Project Area to determine the potential impacts to cultural resources for the purpose of complying with the California Environmental Quality Act.

Phase 1 Cultural Resources Assessment of the Proposed Groundwater Production Well No. 204 Project. City of Perris, County of Riverside, California (2016).
Role: Cultural Resources Director / Senior Archaeologist
Client: Eastern Municipal Water District
Project Description: The new construction and operation of a new portable groundwater production facility identified as Well No. 204, on 2.3-arces of land that includes: well head facilities and appurtenances, a new field office, water supply line, water discharge pump, settling tanks, drill rig, dog house, mud tank, blow off pond, pipe trailer, material and cutting storage area, and laydown yards.
Responsible for a Phase I Cultural Resources Assessment and Technical Report of the Project Area to determine the potential impacts to cultural resources for the purpose of complying with the California Environmental Quality Act.

Pipeline Safety Enhancement Plan (PSEP) SL32-21 Pasadena Hydro-test Project. City of Pasadena, County of Los Angeles, California (2015)
Role: Archaeological Specialist
Client: Southern California Gas Company
Project Description: To pressure test natural gas transmission pipelines that have not been tested to modern standards.
Responsible for a Phase I Cultural Resources Assessment, Technical Report, and Archaeological Construction Monitoring of the Project Area to reduce potential impacts to unknow cultural resources for the purpose of complying with the California Environmental Quality Act.

Cultural Resources Assessment for the Proposed North San Diego County Recycled Water Project. San Diego County, California (2015).
Role: Senior Archaeologist / Project Manager for PCR Service, Inc.
Client: RMC Water and Environment, Inc.
Project Description: The Project consists of the development of a regional recycled water, infrastructure that includes interagency connections to increase the capacity and connectivity of the recycled water storage and distribution systems of the Coalition.
Responsible for a comprehensive Phase I Cultural Assessment and Technical Report to reduce potential impacts to unknow cultural resources for the purpose of complying with the California Environmental Quality Act.

Grounding Rods and Laterals Installation at San Fernando Substation. City of Los Angeles, California (2014).
Role: Archaeological Specialist for SWCA Environmental Consultants.
Client: Southern California Edison Company
Project Description: Grounding rods and laterals were installed to limit the voltage imposed by lightning, line surges, or unintentional contact with higher-voltage lines and to stabilize the voltage to earth during normal operations.
Responsible for a Phase I Cultural Resources Assessment, Technical Report, and Archaeological Construction Monitoring in-order to reduce potential impacts to unknow cultural resources for the purpose of complying with the California Environmental Quality Act.

Archaeological Survey Report California Street Off-Ramp Project. City of Ventura, Ventura County, California (2014).
Role: Senior Archaeologist / Project Manager for Duke Cultural Resources Management, LLC.
Client: California Department of Transportation District 7 (Caltrans).
Project Description: The California Department of Transportation (Caltrans) propose to relocate the existing U.S. Route 101 (US-101) northbound off-ramp at California Street to Oak Street, and to replace the California Street Overcrossing in Ventura County, California.
Responsible for a comprehensive Phase I Cultural Assessment and Archaeological Survey Report to reduce potential impacts to unknow cultural resources for the purpose of complying with the National Historic Preservation Act (Section 106) and the California Environmental Quality Act.

Catalina Renewable Energy Project. Kern County, California (2010-2012).
Role: Senior Archaeological Resource Coordinator for Sapphos Environmental, Inc.
Client: EDF Renewables (formerly enXco).
Project Description: The project is a renewable energy development that would generate up to 350 Megawatts (MW) of electricity from wind turbines generators (WTGs) and photovoltaic (PV) solar system blocks on a 6,739-acre site.
Responsible for a comprehensive Phase I Cultural Assessment, Technical Report, and Archaeological Construction Monitoring to reduce potential impacts to unknow cultural resources for the purpose of complying with the National Historic Preservation Act (Section 106) and the California Environmental Quality Act.

Avalon Wind Energy Project. Kern County, California (2010-2012).
Role: Senior Archaeological Resources Coordinator for Sapphos Environmental, Inc.
Client: EDF Renewables (formerly enXco).
Project Description: The project is a renewable energy development that would generate up to 300 megawatts (MW) of electricity through use of wind power and would include up to 127 wind turbine generators (WTGs), supported by service roads, a power collection system, communication cables, overhead transmission lines, electrical switchyards, project substations, meteorological towers, and operations and maintenance facilities.
Responsible for a comprehensive Phase I Cultural Assessment, Technical Report, and Archaeological Construction Monitoring to reduce potential impacts to unknow cultural resources for the purpose of complying with the National Historic Preservation Act (Section 106) and the California Environmental Quality Act.

APPENDIX B - NAHC SACRED LANDS FILE LETTER

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NATIVE AMERICAN HERITAGE COMMISSION
Cultural and Environmental Department
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
Phone: (916) 373-3710
Email: nahc@nahc.ca.gov
Website: http://www.nahc.ca.gov
Twitter: @CA_NAHC

April 15, 2019

Christopher Purtell
MIG

VIA Email to: cpurtell@migcom.com

RE: Krameria Avenue Project, Riverside County

Dear Mr. Purtell:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were negative. However, the absence of specific site information in the SLF does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify the NAHC. With your assistance, we can assure that our lists contain current information. If you have any questions or need additional information, please contact me at my email address: steven.quinn@nahc.ca.gov.

Sincerely,

Steven Quinn

Steven Quinn
Associate Governmental Program Analyst

Attachment

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Native American Consultation Record

Project Name: Krameria Avenue Project
Project Number: 13623
NAHC Contact Initiated: 3/27/2019
NAHC Letter Received: 4/15/2019

Results: The NAHC did not identify any Native American cultural resources in the Sacred Lands File (SLF). The NAHC recommended that we contact ten (10) Native American groups/individuals.

Matrix prepared by Chris Purtell

Group/Name	Date contact was initiated	Method of contact	Response
Agua Caliente Band of Cahuilla Indians Patricia Garica-Plotkin, Director 760-699-6907	4/16/2019	U.S. First Class Mail	Letter Response Received on April 24, 2019. The Tribe stated that they defer to the Soboba, Morongo Band of Mission Indians, and to the Pechanga Band of Luiseno Indians. This letter shall conclude our consultation efforts.
Augustine Band of Cahuilla Mission Indians Amanda Vance, Chairperson 760-398-4722	4/16/2019	U.S. First Class Mail	Letter Response Received on May 9, 2019. The Tribe stated at this time that they are unaware of specific cultural resources that may be affected by the proposed project. The Tribe encouraged Native American monitoring during project development and requested to be notified immediately should cultural resources be discovered during project implementation.
Cabzon Band of Mission Indians Doug Welmas, Chairpeson 760-342-2593	4/16/2019	U.S. First Class Mail	No Response as of May 30, 2019
Cahuilla Band of Indians Daniel Salgado, Chairperson 951-763-5549	4/16/2019	U.S. First Class Mail	No Response as of May 30, 2019
Los Coyotes Band of Cahuilla and Cupeno Indians Shane Chapparosa, Chairperson 760-782-0711	4/16/2019	U.S. First Class Mail	No Response as of May 30, 2019

Group/Name	Date contact was initiated	Method of contact	Response
Morongo Band of Mission Indians Denisa Torres, Cultural Resources Mgr. 951-849-8807	4/16/2019	U.S. First Class Mail	Email Response Received on April 25, 2019. The Tribe stated that they had no additional information to provide at this time, but may provide other information to the lead agency during AB 52 consultation process.
Ramona Band of Cahuilla John Gomez, Environmental Coordinator 951-763-4105	4/16/2019	U.S. First Class Mail	No Response as of May 30, 2019
Santa Rosa Band of Cahuilla Indians Steven Estrada, Chairperson 951-659-2700	4/16/2019	U.S. First Class Mail	No Response as of May 30, 2019
Soboba Band of Luiseno Indians Joseph Ontiveros, Cultural Resources Director 951-663-5279	**4/16/2019**	U.S. First Class Mail	No Response as of May 30, 2019
Michael Mirelez, Cultural Resources Director 760-397-8146	4/16/2019	U.S. First Class Mail	No Response as of May 30, 2019

APPENDIX C - PALEONTOLOGY LETTER

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Natural History Museum
of Los Angeles County
900 Exposition Boulevard
Los Angeles, CA 90007

tel 213.763.DINO
www.nhm.org

NATURAL HISTORY MUSEUM
LOS ANGELES COUNTY

Vertebrate Paleontology Section
Telephone: (213) 763-3325

e-mail: smcleod@nhm.org

10 April 2019

MIG / Hogle-Ireland
1500 Iowa Avenue, Suite 110
Riverside, CA 92507

Attn: Christopher W. Purtell, Director of Cultural Resources

re: Vertebrate Paleontology Records Check for paleontological resources for the proposed Krameria Avenue Project, in the City of Moreno Valley, Riverside County, project area

Dear Christopher:

I have conducted a thorough search of our paleontology collection records for the locality and specimen data for the proposed Krameria Avenue Project, in the City of Moreno Valley, Riverside County, project area as outlined on the portion of the Sunnymead USGS topographic quadrangle map that you sent to me via e-mail on 27 March 2018. We do not have any vertebrate fossil localities that lie directly within the proposed project area boundaries, but we do have localities somewhat nearby from sedimentary deposits similar to those that probably occur at depth in the proposed project area.

Surface deposits in the entire proposed project area consist of younger Quaternary Alluvium, derived as alluvial fan deposits from the more elevated terrain to the north. These sedimentary deposits typically do not contain significant vertebrate fossils, at least in the uppermost layers, but they may be underlain by older Quaternary deposits that do contain significant vertebrate fossils. Our closest vertebrate fossil locality from somewhat similar deposits is LACM 4540, from the gravel pits just west of Jack Rabbit Trail east-southeast of the proposed project area on the eastern side of the San Jacinto Valley, that produced a specimen of fossil horse, *Equus*.

Shallow excavations in younger Quaternary Alluvium in the proposed project area are unlikely to uncover significant vertebrate fossil remains. Deeper excavations in the proposed project area that extend down into older Quaternary deposits, however, may well encounter significant vertebrate fossils. Any substantial excavations in the proposed project area, therefore, should be monitored closely to quickly and professionally recover any fossil remains discovered while not impeding development. Also, sediment samples should be collected and processed to determine the small fossil potential in the proposed project area. Any fossils recovered during mitigation should be deposited in an accredited and permanent scientific institution for the benefit of current and future generations.

This records search covers only the vertebrate paleontology records of the Natural History Museum of Los Angeles County. It is not intended to be a thorough paleontological survey of the proposed project area covering other institutional records, a literature survey, or any potential on-site survey.

Sincerely,

Samuel A. McLeod

Samuel A. McLeod, Ph.D.
Vertebrate Paleontology

enclosure: invoice

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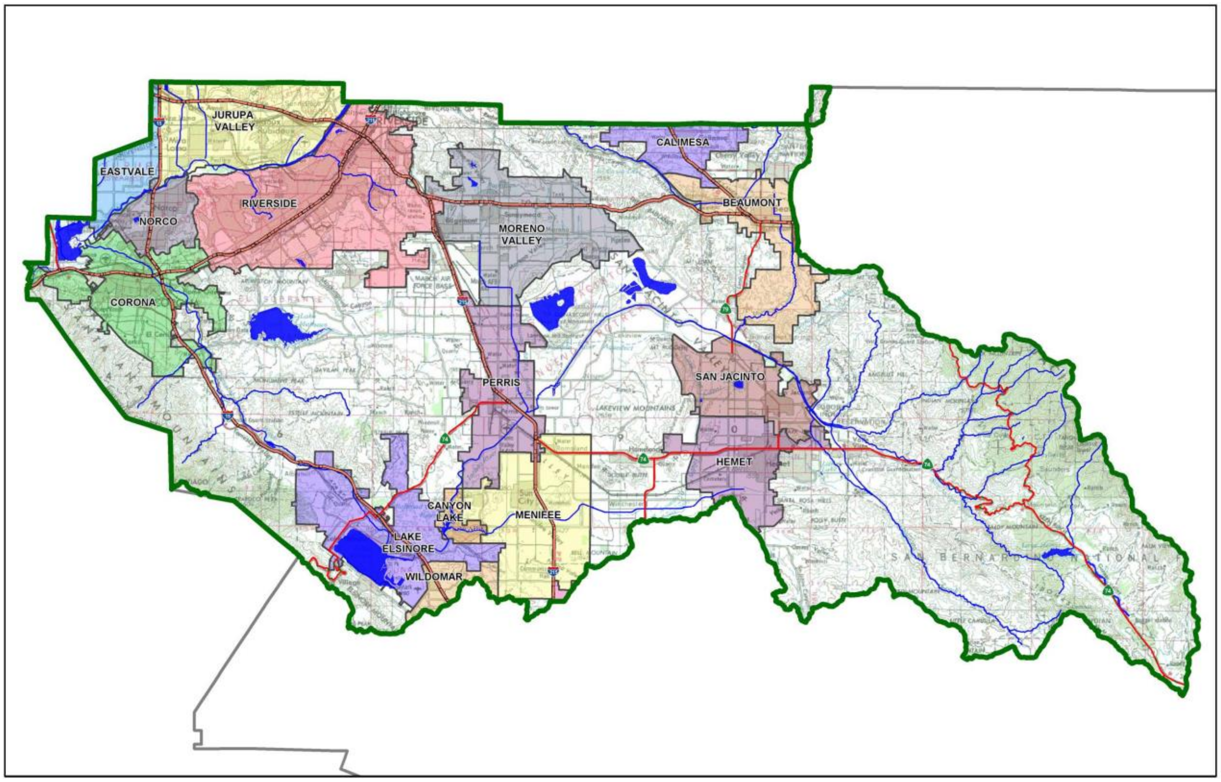
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Tentative Tract No. 37725

Development No: APN 316-110-005, 006, 022, 023 and 024

Design Review/Case No: PEN 19-0188 / LWQ19-0033



☒ **Preliminary**
☐ **Final**

Original Date Prepared: 1/27/19

Revision Date(s):

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

Contact Information:

Prepared for:
PI Properties No. 67 LLC
c/o Positive Investments
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610 North Santa Anita Ave.
Arcadia, CA 91006
(626) 321-4845

Prepared by:
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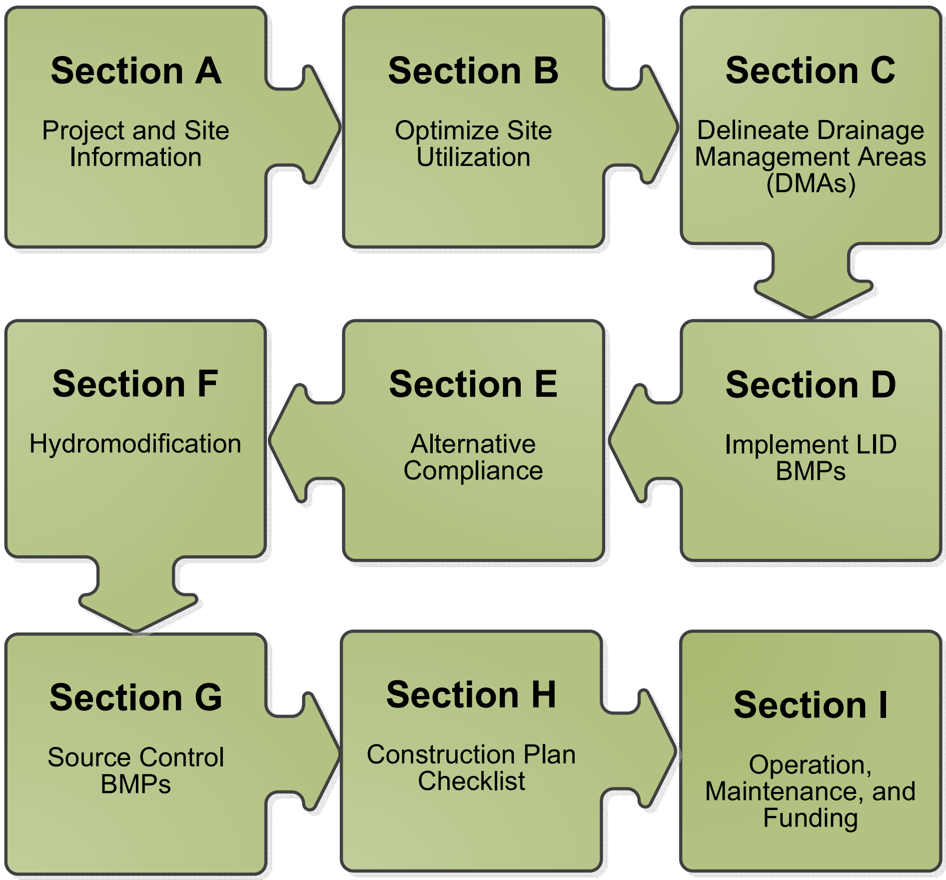
1461 Ford Street Suite 105
Redlands, CA 92373
(909) 748-7777

A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for PI Properties No. 67 LLC by Thatcher Engineering and Associates, Inc. for the Tentative Tract No. 37725 project.

This WQMP is intended to comply with the requirements of City of Moreno Valley for Water Quality Ordinance (Municipal code Section 9.10.080) which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Moreno Valley Water Quality Ordinance (Municipal Code Section9.10.080).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

[signature]	02/27/2020
Owner's Signature	Date
RAO R. YALAMANCHILI	Mgr
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

[signature]	03/02/2020
Preparer's Signature	Date
Patrick C. Flanagan Jr.	Professional Engineer
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure: REGISTERED PROFESSIONAL ENGINEER PATRICK C. FLANAGAN JR. C86046 EXP. 09/30/2020 CIVIL STATE OF CALIFORNIA

ALL CAPACITY ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF California

COUNTY OF Los Angeles

On February 27, 2020 before me, KARLA I. FRESNEDO, Notary Public,
(Date) (Name and title of the officer)

personally appeared RAO R. YALAMANCHILI,
(Name of person signing)

who proved to me on the basis of satisfactory evidence to be the person~~(s)~~ whose name~~(s)~~ is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity~~(ies)~~, and that by his/her/their signature~~(s)~~ on the instrument the person~~(s)~~, or the entity upon behalf of which the person~~(s)~~ acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

KARLA I. FRESNEDO
COMM. # 2302460
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
MY COMM. EXP. AUG. 22, 2023

Karla Fresnedo
Signature of officer

(Seal)

Rev. 01/01/2015

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List of Appendices

Section A: Project and Site Information

Project Information	
Type of Project:	Residential Tract
Planning Area:	N/A
Community Name:	N/A
Development Name:	Tentative Tract No. 37725
Project Location	
Latitude & Longitude (DMS): 33.880284, -117.228602	
Project Watershed and Sub-Watershed: San Jacinto River/ Lake Elsinore	
APN(s): 316-110-005, 006, 022, 023 and 024	
Map Book and Page No.: Book 8 Page 21	
Project Characteristics	
Proposed or Potential Land Use(s)	Single Family Residential
Proposed or Potential SIC Code(s)	
Area of Project Footprint (SF)	831,679 SF (Total area)
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	486,480 SF(assumes 50% impervious footprint on lots)
Does the project consist of offsite road improvements?	☒ Y ☐ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
Existing Site Characteristics	
Total area of existing Impervious Surfaces within the project limits (SF)	14,012 SF (Tarano Lane)
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	
Are there any natural hydrologic features on the project site?	☒ Y ☐ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	
What is the Water Quality Design Storm Depth for the project?	0.66

The project site is currently vacant, and consists of five parcels. The site is located at the southwest corner of Krameria Avenue and Perris Boulevard in the City of Moreno Valley. The site generally drains from the northeast corner to the southwest corner at approximately 0.7%. An unnamed, ephemeral drainage flows north to south along the western boundary of the project site.

The project proposes to develop the site as a 66-lot single family residential tract with related access and landscape improvements. The development will also include street improvements along Kramera Avenue and Tarano Lane. A bus turnout is also proposed along Perris Boulevard. Since Perris Boulevard is fully improved and existing street flows will comingle with flows from the bus turnout, requiring treatment of the bus turnout would result in an exorbitant treatment volume, well beyond the volume that would be generated by the bus turnout, therefore placing undue burden on the project. Therefore, no treatment is required or proposed for Perris Boulevard.

The total existing net area of the site is approximately 19.08 acres. After dedication, the proposed net area of the site is approximately 17.59 acres. The project area, including proposed offsite improvements, and existing offsite improvements tributary to the project's BMPs is 831,679 SF.

Drainage Area 1 includes the westerly portion of the Krameria Avenue frontage, adjacent parkway and landscape easement, totaling 31,446 SF. Bioretention Swale 1 is proposed to provide treatment of the area. Runoff from Krameria Avenue will be directed to the swale via curb openings. Once treated in the soil media, runoff will enter an underdrain, ultimately directing flows to the existing catch basin at the southeast corner of Krameria Avenue and Tarano Lane. From here, flows continue via City of Moreno Valley Storm Drain to Perris Valley Channel and Canyon Lake as they do historically.

Drainage Area 2 includes the center portion of the Krameria Avenue frontage, adjacent parkway and landscape easement, totaling 24,770 SF. Bioretention Swale 2 is proposed to provide treatment of the area. Runoff from Krameria Avenue will be directed to the swale via curb openings. Once treated in the soil media, runoff will enter an underdrain, ultimately directing flows to the existing storm drain structure in Krameria Avenue. From here, flows continue via City of Moreno Valley Storm Drain to Perris Valley Channel and Canyon Lake as they do historically.

Drainage Area 3 includes the easterly portion of Krameria Avenue frontage, adjacent parkway and landscape easement, 2,692 SF. Bioretention Swale 3 is proposed to provide treatment of the area. Runoff from Krameria Avenue will be directed to the swale via curb openings. Once treated in the soil media, runoff will enter an underdrain, ultimately directing flows to the existing catch basin at the southwest corner of Krameria Avenue and Perris Boulevard. From here, flows continue via City of Moreno Valley Storm Drain to Perris Valley Channel and Canyon Lake as they do historically.

Drainage Area 4 includes the northwest portion of the site, and the Tarano Lane frontage, totaling 435,267 SF. Bioretention Area 4 is proposed to provide treatment of the area. Runoff from onsite areas will enter one of two undersidewalk drains which will direct flows via storm drain to the bioretention area. Runoff from lots 1 through 8 and the Tarano Lane frontage will enter a proposed undersidewalk drain along Tarano and will enter the bioretention area. Once treated in the bioretention area media, flows will enter the underdrain and will outlet via storm drain to a proposed storm drain in Kettenburg Lane, which is proposed to be extended to Northern Dancer Drive. From here, flows continue via City of Moreno Valley Storm Drain to Perris Valley Channel and Canyon Lake as they do historically.

Drainage Area 5 includes the southeast portion of the site, totaling 337,504 SF. Bioretention Area 5 is proposed to provide treatment of the area. Runoff from onsite areas will enter one of two undersidewalk drains which will direct flows via storm drain to the bioretention area. Once treated in the bioretention area media, flows will enter the underdrain and will outlet via storm drain to a proposed storm drain in Kettenburg Lane, which is proposed to be extended to Northern Dancer Drive. From here, flows continue via City of Moreno Valley Storm Drain to Perris Valley Channel and Canyon Lake as they do historically.

The City will maintain the bioretention areas, and catch basins / storm drain signage. The HOA will maintain the offsite bioretention swales.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Perris Valley Channel	None	None	N/A
San Jacinto River (Reach 3)	None	MUN-AGR-GWR-REC1-REC2-WARM-WILD-RARE	Distance from project to nearest tributary RARE waterbody is over 8 miles
Canyon Lake (aka San Jacinto River Reach 2)	Nutrients, Pathogens	MUN-AGR-GWR-REC1-REC2-WARM-WILD	N/A
San Jacinto River (Reach 1)	None	MUN-AGR-GWR-REC1-REC2-WARM-WILD-RARE	Lake Elsinore to Canyon Lake
Lake Elsinore	Nutrients, Oxygen Demanding Substances, Sediments, Turbidity, Unknown Toxicity, Pesticides	REC1-REC2-WARM-WILD	N/A
Temescal Creek (Reach 5)	None	AGR-GWR-REC1-REC2-WARM-WILD-RARE	Mid-section line of Section 17 (downstream end of freeway cut) to Elsinore Ground-water Subbasin Boundary
Temescal Creek (Reach 4)	None	AGR-GWR-REC1-REC2-WARM-WILD-RARE	Lee Lake to Mid-Sec line of Sec. 17
Temescal Creek (Reach 3)	None	AGR-IND-GWR-REC1-	N/A

		REC2-WARM-WILD	
Temescal Creek (Reach 2)	None	AGR-IND-GWR-REC1-REC2-WARM-LWRM	N/A
Temescal Creek (Reach 1)	pH	REC1-REC2-WARM-WILD	N/A
Santa Ana River (Reach 3)	Copper, Lead, Pathogens	AGR-GWR-REC1-REC2-WARM-WILD-RARE-SPWN	Prado Dam to Mission Blvd. in Riverside
Prado Basin Management Zone	None	REC1-REC2-WARM-WILD-RARE	Prado Flood Control Basin
Santa Ana River (Reach 2)	Indicator Bacteria	AGR-GWR-REC1-REC2-WARM-WILD-RARE	17th Street in Santa Ana to Prado Dam
Santa Ana River (Reach 1)	None	REC1-REC2-WARM-WILD	N/A
Tidal Prism of Santa Ana River (to within 1000' of Victoria Street) and Newport Slough	None	None	At Tidal Prism

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☒ Y	☐ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☒ Y	☐ N
US Army Corps of Engineers, CWA Section 404 Permit	☒ Y	☐ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☒ Y	☐ N
Other *(please list in the space below as required)*	☐ Y	☒ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

Yes. Existing drainage patterns have been preserved to the maximum extent possible. The entire site and redeveloped / tributary area of Tarano Lane is directed to one of the bioretention areas for treatment, prior to exiting the site to the City storm drain as it does historically.

Did you identify and protect existing vegetation? If so, how? If not, why?

No. There is no significant vegetation onsite to preserve. The entire site will be mass graded to accommodate the development.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

No. The measured infiltration rates were too low to allow for the use of an infiltration BMP. Instead, biotreatement BMPs are proposed.

Did you identify and minimize impervious area? If so, how? If not, why?

Yes. Impervious areas are limited to required streets, sidewalks and ultimately homes and related hardscape. It is assumed that 50% of the private lots at ultimate build-out will be pervious.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes. The entire onsite will drain to one of the bioretention areas for treatment. Krameria Avenue runoff will be directed to bioretention swales for treatment.

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
1A	Concrete or Asphalt	24214	Type D
1B	Ornamental Landscaping	7232	Type D
2A	Concrete or Asphalt	20312	Type D
2B	Ornamental Landscaping	4458	Type D
3A	Concrete or Asphalt	2073	Type D
3B	Ornamental Landscaping	619	Type D
4A	Roofs / Concrete or Asphalt	234343 (assumes 50% coverage on private lots)	Type D
4B	Ornamental Landscaping	200924 (assumes 50% coverage on private lots)	Type D
5A	Roofs / Concrete or Asphalt	205538 (assumes 50% coverage on private lots)	Type D
5B	Ornamental Landscaping	131966 (assumes 50% coverage on private lots)	Type D

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
N/A	N/A	N/A	N/A

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet)	Storm Depth (inches)	DMA Name / ID	[C] from Table C.4 =	Required Retention Depth (inches)
		[A]	[B]		[C]	[D]
N/A	N/A	N/A	N/A	N/A	N/A	N/A

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					**Receiving Self-Retaining DMA**		
DMA Name/ ID	Area (square feet)	Post-project surface type	Runoff factor	Product	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
1A and 1B	Bioretention Swale 1
2A and 2B	Bioretention Swale 2
3A and 3B	Bioretention Swale 3
4A and 4B	Bioretention Area 4
5A and 5B	Bioretention Area 5

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?	X	
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

D.2 Harvest and Use Assessment

Please check what applies*:* None of the below apply. Therefore, Harvest and Use has been assessed.

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☐The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 7.92 acres

Type of Landscaping (Conservation Design or Active Turf): Conservation Design

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 11.17 acres

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: 1.104

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: 12.33

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	**Available Irrigated Landscape (Step 1)**
12.33	7.92

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 66 lots x 4 people = 264

Project Type: Residential

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 11.17 acres

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-1 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 110

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: 1,229

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	**Projected number of toilet users (Step 1)**
1,229	264

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand:

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces:

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-3:

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use:

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☒ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
1A	☐	☐	☒	☐	☐
1B	☐	☐	☒	☐	☐
2A	☐	☐	☒	☐	☐
2B	☐	☐	☒	☐	☐
3A	☐	☐	☒	☐	☐
3B	☐	☐	☒	☐	☐
4A	☐	☐	☒	☐	☐
4B	☐	☐	☒	☐	☐
5A	☐	☐	☒	☐	☐
5B	☐	☐	☒	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

All DMAs are treated using a LID BMP. No alternative compliance is required or proposed.

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First, calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second, design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	**DMA Area (square feet)** [A]	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f** [B]	**DMA Runoff Factor** [C]	**DMA Areas x Runoff Factor** [A] x [C]	***Bioretention Swale 1***		
1A	*24214*	*Asphalt*	*1*	*0.89*	*21598.9*			
1B	*7232*	*Landscaping*	*0.1*	*0.11*	*798.8*			
						Design Storm Depth (in)	*Design Capture Volume, **V_{BMP}** (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma$	***31446***			$\Sigma=$ ***22397.7***	***0.66***	***1231.9***	***1232***

DMA Type/ID	**DMA Area (square feet)** [A]	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f** [B]	**DMA Runoff Factor** [C]	**DMA Areas x Runoff Factor** [A] x [C]	***Bioretention Swale 2***		
2A	*20312*	*Asphalt*	*1*	*0.89*	*18118.3*			
2B	*4458*	*Landscaping*	*0.1*	*0.11*	*492.4*			
						Design Storm Depth (in)	*Design Capture Volume, **V_{BMP}** (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma$	***24770***			$\Sigma=$ ***18610.7***	***0.66***	***1023.6***	***1024***

DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	*Bioretention Swale 3*		
3A ***3B***	*2073* *619*	*Asphalt* *Landscaping*	*1* *0.1*	*0.89* *0.11*	*1849.1* *68.4*	*Design Storm Depth (in)*	*Design Capture Volume,* **V_{BMP}** *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma$	***2692***			$\Sigma =$ ***1917.5***	***0.66***	***105.5***	***106***

DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	*Bioretention Area 4*		
4A ***4B***	*234343* *200924*	*Roofs* *Landscaping*	*1* *0.1*	*0.89* *0.11*	*209034* *22193.7*	*Design Storm Depth (in)*	*Design Capture Volume,* **V_{BMP}** *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma$	***435267***			$\Sigma =$ ***231227.7***	***0.66***	***12717.5***	***12718***

DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	*Bioretention Area 5*		
5A ***5B***	*205538* *131966*	*Roofs* *Landscaping*	*1* *0.1*	*0.89* *0.11*	*183339.9* *14576.7*	*Design Storm Depth (in)*	*Design Capture Volume,* **V_{BMP}** *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	$A_T = \Sigma$	***337504***			$\Sigma =$ ***197916.6***	***0.66***	***10885.4***	***10886***

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

N/A

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☐ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☐ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☐	☐	☐	☐	☐	☐	☐	☐

P = Potential
N = Not Potential
(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected
(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected
(3) A potential Pollutant is land use involving animal waste
(4) Specifically petroleum hydrocarbons
(5) Specifically solvents
(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

N/A

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
Total Credit Percentage[1]	

[1]Cannot Exceed 50%

[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

N/A

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	**DMA Area (square feet)** [A]	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f** [B]	**DMA Runoff Factor** [C]	**DMA Area x Runoff Factor** [A] x [C]		***Enter BMP Name / Identifier Here***		
						Design Storm Depth (in)	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12

[H] is from the Total Credit Percentage as Calculated from Table E.2 above

[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

N/A

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☒ Y ☐ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	24.8	17.75	28.4
Volume (Cubic Feet)	34,413	26,266	23.7

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-site Storm Drain Inlets	The catch basins on Street 'A' will be marked with "Only Rain Down the Storm Drain" or similar.	Catch basin signage will be maintained by the City. Educational materials have been included in this document.

Landscape / Outdoor Pesticide Use	Drip irrigation shall be used for all common lot and front yard landscaping except where turf is proposed. Spray irrigation will not be used within 2' of hardscape. Fertilizer and pesticide use shall be minimized. The proposed plant palette will take into consideration environmental constraints including site soils, slopes, climate, sun, wind, rain, air movement, ecological consistency and plant interactions. Plant material proposed within the bioretention areas will be tolerant of periodic saturation and flooding.	Landscaping within Lots A and B will be maintained by the City. Landscaping within the public right of way and within the landscape easement will be maintained by the HOA. Landscaping within these areas shall be maintained using minimum pesticides. Educational materials have been included in this document and shall be provided to new homeowners by the HOA when lots are sold. Homeowners will maintain landscaping on private lots and within adjacent right of way.
Pools, Spas, Ponds, Decorative Fountains and Other Water Features		Educational materials have been included in this document and shall be provided to new homeowners by the HOA when lots are sold.
Roofing, Gutters, Trim	Roofing, gutters and trim made of copper or other unprotected metals will not be used.	

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
1	Bioretention Swale 1	Tentative Tract Map
2	Bioretention Swale 2	Tentative Tract Map
3	Bioretention Swale 3	Tentative Tract Map
4	Bioretention Basin 4	Tentative Tract Map
5	Bioretention Basin 5	Tentative Tract Map

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: The City will maintain the onsite bioretention areas while the HOA will maintain the offsite swales.

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☒ Y ☐ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Operation and Maintenance Plan and Maintenance Mechanism will be provided in the Final WQMP.

Appendix 1: Maps and Site Plans

WQMP Site Plan (includes Location Map) and Receiving Waters Map

PRELIMINARY WATER QUALITY MANAGEMENT PLAN

APN 316-110-005, 006, 022, 023 & 024
KRAMERIA AVENUE & PERRIS BOULEVARD
CITY OF MORENO VALLEY

TYPE D - AREAS DRAINING TO BMPS

Table Error! No text of specified style in document..1 DCV Calculations for LID BMPs

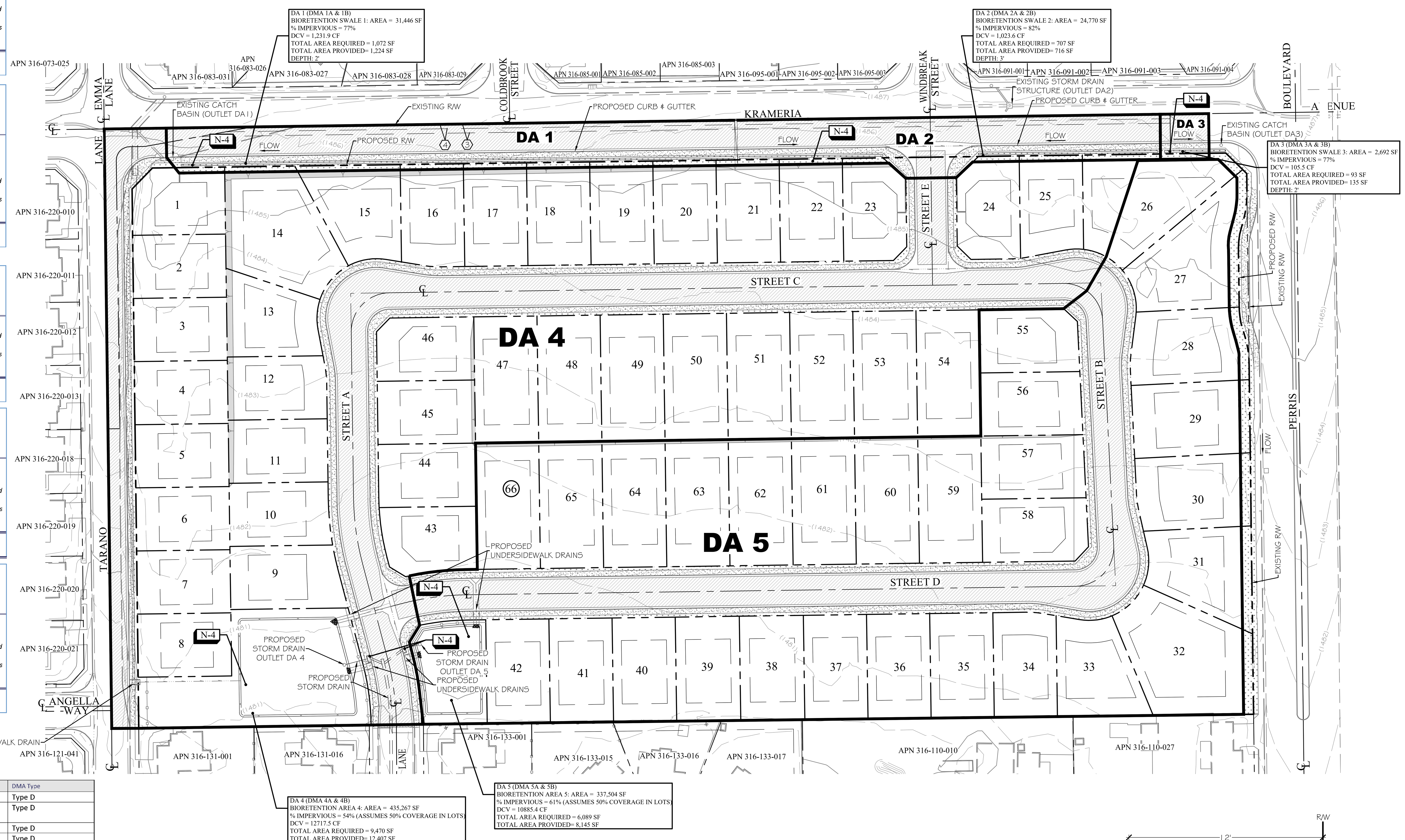
DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	Bioretention Swale 1		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
1A	24214	Asphalt	1	0.89	21598.9			
1B	7232	Landscaping	0.1	0.11	798.8			
	$A_T = \Sigma$	31446			$\Sigma=$ 22397.7	0.66	1231.9	1232

DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	Bioretention Swale 2		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
2A	20312	Asphalt	1	0.89	18118.3			
2B	4458	Landscaping	0.1	0.11	492.4			
	$A_T = \Sigma$	24770			$\Sigma=$ 18610.7	0.66	1023.6	1024

DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	Bioretention Swale 3		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
3A	2073	Asphalt	1	0.89	1849.1			
3B	619	Landscaping	0.1	0.11	68.4			
	$A_T = \Sigma$	2692			$\Sigma=$ 1917.5	0.66	105.5	106

DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	Bioretention Area 4		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
4A	234343	Roofs	1	0.89	209034			
4B	200924	Landscaping	0.1	0.11	22193.7			
	$A_T = \Sigma$	435267			$\Sigma=$ 231227.7	0.66	12717.5	12718

DMA Type/ID	DMA Area (square feet) [A]	Post-Project Surface Type	Effective Impervious Fraction, I_f [B]	DMA Runoff Factor [C]	DMA Areas x Runoff Factor [A] x [C]	Bioretention Area 5		
						Design Storm Depth (in)	Design Capture Volume, V_{BMP} (cubic feet)	Proposed Volume on Plans (cubic feet)
5A	205538	Roofs	1	0.89	183339.9			
5B	131966	Landscaping	0.1	0.11	14576.7			
	$A_T = \Sigma$	337504			$\Sigma=$ 197916.6	0.66	10885.4	10886



DMA CLASSIFICATIONS

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
1A	Concrete or Asphalt	24214	Type D
1B	Ornamental Landscaping	7232	Type D
2A	Concrete or Asphalt	20312	Type D
2B	Ornamental Landscaping	4458	Type D
3A	Concrete or Asphalt	2073	Type D
3B	Ornamental Landscaping	619	Type D
4A	Roofs / Concrete or Asphalt	234343 (assumes 50% coverage on private lots)	Type D
4B	Ornamental Landscaping	200924 (assumes 50% coverage on private lots)	Type D
5A	Roofs / Concrete or Asphalt	205538 (assumes 50% coverage on private lots)	Type D
5B	Ornamental Landscaping	131966 (assumes 50% coverage on private lots)	Type D

SCALE: 1"=60'

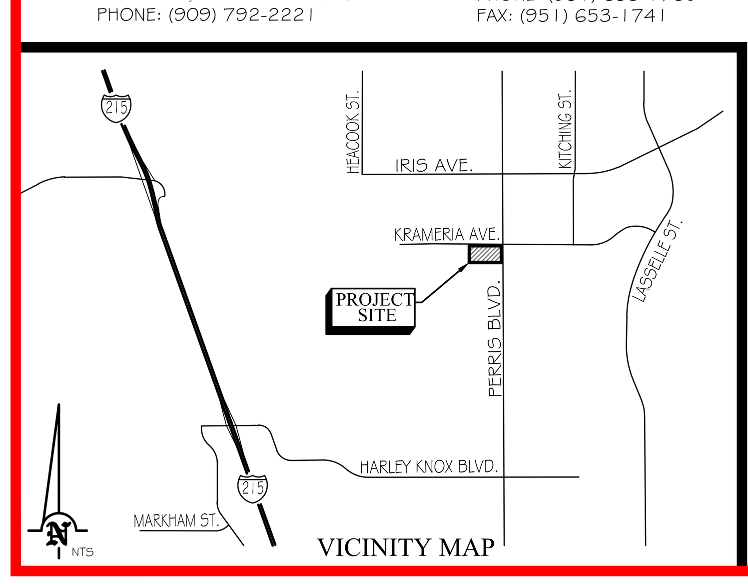
0 60 120 180

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED DECEMBER 2018
AS CONDUCTED BY
ON POINT LAND SURVEYING, INC.
1910 ORANGE TREE LANE, SUITE 344
REDLANDS, CALIFORNIA 92374
PHONE: (909) 792-2221

SOIL ENGINEER

LOR GEOTECHNICAL GROUP, INC.
6121 QUAIL VALLEY COURT
RIVERSIDE, CA 92507
PROJECT NO. 33529.1
DATED: APRIL 29, 2019
PHONE: (951) 653-1760
FAX: (951) 653-1741

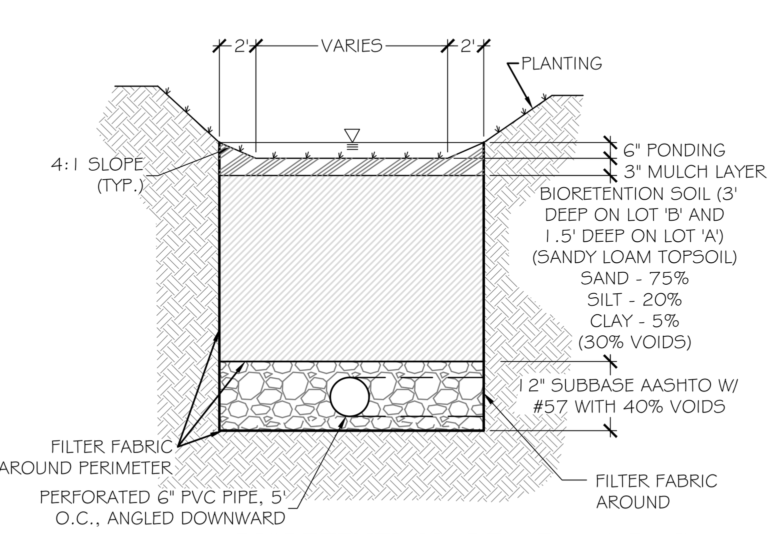


VICINITY MAP

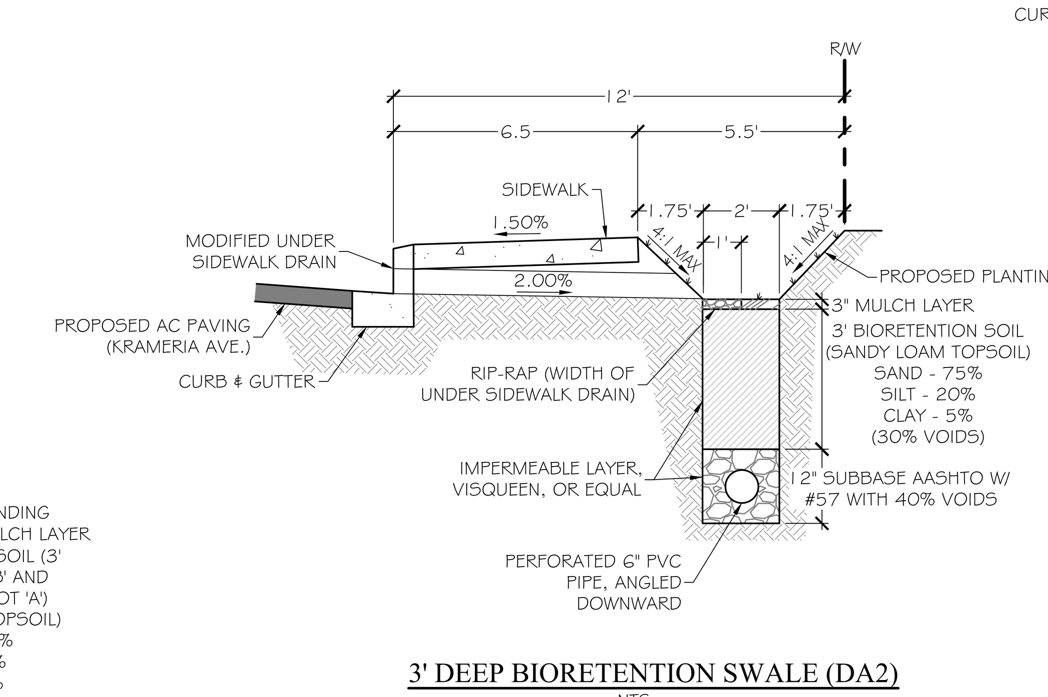
LEGEND

AC	ASPHALT CONCRETE
EX.	EXISTING
FH	FIRE HYDRANT
MH	MANHOLE
P.L.	PROPERTY LINE
PP	POWERPOLE
R/W	RIGHT-OF-WAY
TYP.	TYPICAL

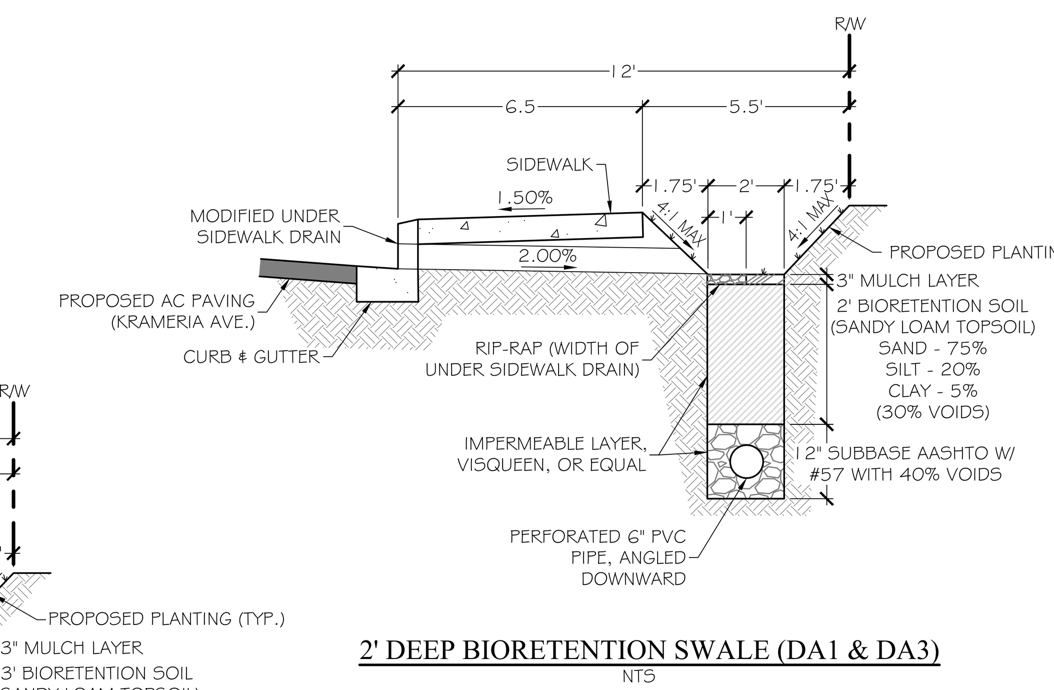
PROPOSED 2:1 SLOPE
PROPOSED AC PAVING
PROPOSED PCC PAVING
PROPOSED LANDSCAPING
DA TRIBUTARY BOUNDARY



BIORETENTION AREA (DA4 & DA5)
NTS



3' DEEP BIORETENTION SWALE (DA2)
NTS



2' DEEP BIORETENTION SWALE (DA1 & DA3)
NTS

LEGAL DESCRIPTION

THE LAND HEREINAFTER REFERRED TO IS SITUATED IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CA, AND IS DESCRIBED AS FOLLOWS:

PARCEL 1:

THE NORTH HALF OF THE NORTH HALF OF LOT 17 IN BLOCK 2 OF RIVERSIDE ALFALFA ACRES, AS SHOWN BY MAP ON FILE IN BOOK 8 PAGE 21 OF MAPS, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA.

EXCEPTING THAT PORTION OF LAND CONVEYED TO THE CITY OF MORENO VALLEY BY DEED RECORDED AUGUST 24, 1992 AS INSTRUMENT NO. 315033.

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EXCEPTING FROM BOTH PARCELS ALL MINERALS, OIL, GAS AND OTHER HYDROCARBON SUBSTANCES IN AND UNDER OR THAT MAY BE PRODUCED FROM A DEPTH OF 500 FEET BELOW THE SURFACE OF SAID LAND, WITHOUT RIGHT OF ENTRY UPON THE SURFACE OF SAID LAND FOR THE PURPOSE OF MINING, DRILLING, EXPLORING OR EXTRACTING SUCH OIL, GAS AND OTHER HYDROCARBON SUBSTANCES OR OTHER USE OR RIGHTS IN OR TO ANY POTION OF THE SURFACE OF SAID LAND TO A DEPTH OF 500 FEET BELOW THE SURFACE THEREOF, BUT WITH THE RIGHT TO DRILL INTO, LOCATE WELLS AND PRODUCE OIL, GAS AND OTHER HYDROCARBON SUBSTANCES FROM ANY PORTION OF SAID LAND, WHICH LIES BELOW 500 FEET FROM THE SURFACE THEREOF.

EASEMENTS

1 AN EASEMENT FOR ELECTRICAL SUPPLY SYSTEMS IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY, RECORDED APRIL 9, 1974, AS INSTRUMENT NO. 41210, OFFICIAL RECORDS.

THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

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THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

KEY NOTES:

BMP SYMBOL	DESCRIPTION	RESPONSIBLE PARTY
N-1	EDUCATION OF PROPERTY OWNERS, OPERATORS, TENANTS OCCUPANTS, OR EMPLOYEES	DEVELOPER/HOA
N-2	IRRIGATION AND LANDSCAPE MAINTENANCE	CITY(LOTS A / B) / HOA
N-3	COMMON AREA LITTER CONTROL	CITY(LOTS A / B) / HOA
N-4	DRAINAGE FACILITY INSPECTION AND MAINTENANCE	CITY(LOTS A / B) / HOA
N-5	LANDSCAPE AND IRRIGATION SYSTEM DESIGN	DEVELOPER
N-6	LANDSCAPE/OUTDOOR PESTICIDE USE	CITY(LOTS A / B) / HOA
N-7	ROOFING, GUTTERS, TRIM	DEVELOPER

SITE WIDE BMP'S

N-1
N-2
N-3
N-5
N-6
N-7

BENCHMARK

CITY OF MORENO VALLEY M-31 SET 3-1/4" ALUMINUM DISK STAMPED RIV. CO. SURVEYOR M-31 RESET APRIL 1996, FLUSH AT THE SW COR. OF BRIDGE ON TOP OF SIDEWALK NEAR FACE OF CURB LOCATED AT THE CROSSING OF PERRIS BLVD. AND RIV. CO. FLOOD CONTROL CHANNEL (PERRIS LATERAL "A"). 43' W OF THE CENTERLINE OF PERRIS BLVD. & 4.5' E OF CONCRETE BRIDGE BARRIER. (EDGE OF BRIDGE)
ELEVATION = 1474.674'

BASIS OF BEARING

CENTERLINE OF KRAMERIA STREET BETWEEN TARANO LN. AND PERRIS BLVD. BEARING BEING N89°12'04"E PER TRACT NO. 20404-1 MB 169/1-5.

OWNER/DEVELOPER/APPLICANT:

PI PROPERTIES NO. 67 LLC
C/O: POSITIVE INVESTMENTS
ATTN: MR. MOHAN KONDRAGUNTA
610 NORTH SANTA ANITA AVENUE
ARCADIA, CA 91006
PHONE: (626) 321-4845

PRELIMINARY WATER QUALITY MANAGEMENT PLAN
APN 316-110-005, 006, 022, 023 & 024
KRAMERIA AVE. & PERRIS BLVD.
CITY OF MORENO VALLEY

PLAN PREPARER:

- land planning
- civil engineering
- landscape architecture

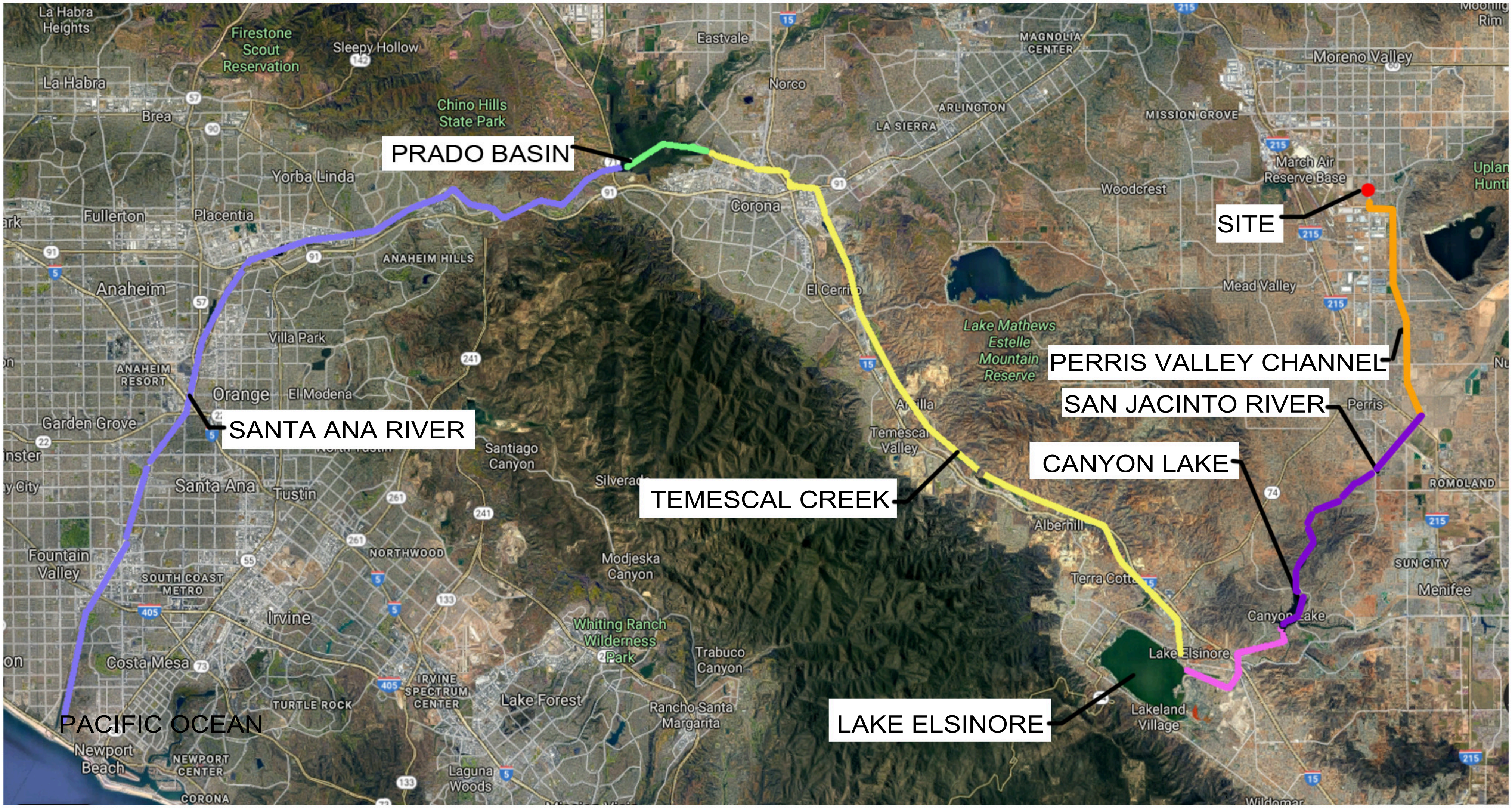
phone 909.748.7777
fax 909.748.7776
est. 1989
thatcher engineering & associates, inc.
1461 ford street, suite 105, redlands, ca 92373

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN, JR.
No. 86046
Exp. 9/30/20
CIVIL
STATE OF CALIFORNIA

Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2020

Job Number:	Date Prepared:	Drawn By:	Reference Number:
169801	1/28/20	RL	169801wq3

169801wq3



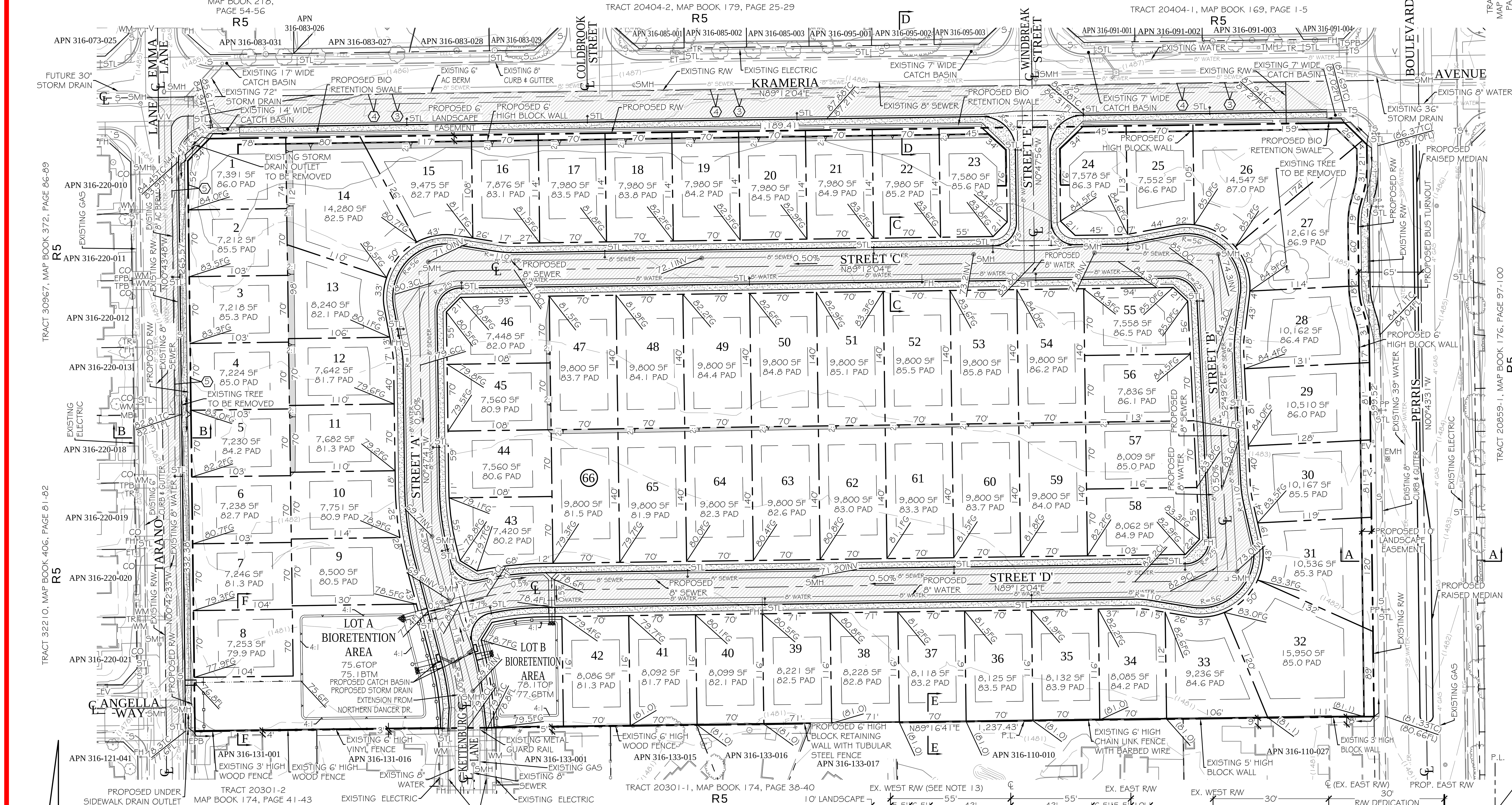
RECEIVING WATER BODIES EXHIBIT
N.T.S.

IN THE CITY OF MORENO VALLEY

TENTATIVE TRACT MAP NO. 37725

BEING A SUBDIVISION OF A PORTION OF LOT 17, IN BLOCKS 2 OF RIVERSIDE ALFALFA ACRES, AS SHOWN BY MAP ON FILE IN BOOK 8 PAGE 21 OF MAPS, RECORDS OF RIVERSIDE COUNTY CALIFORNIA

AUGUST 2019



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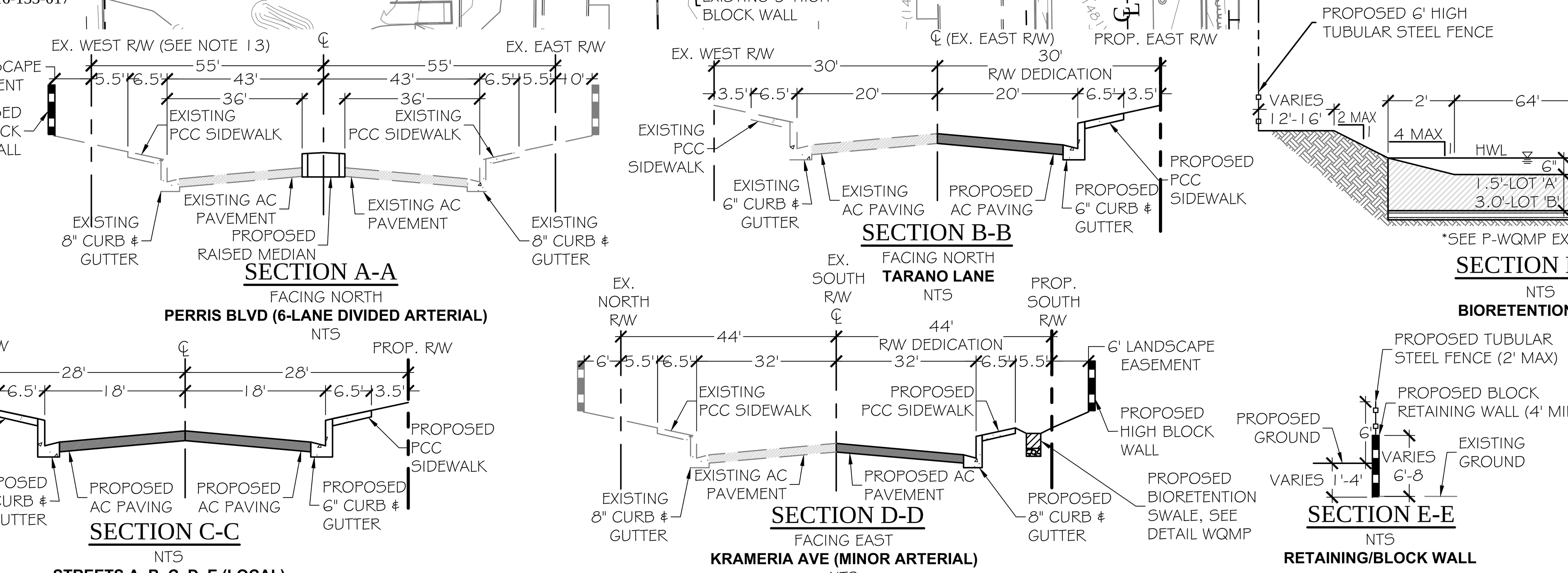
THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

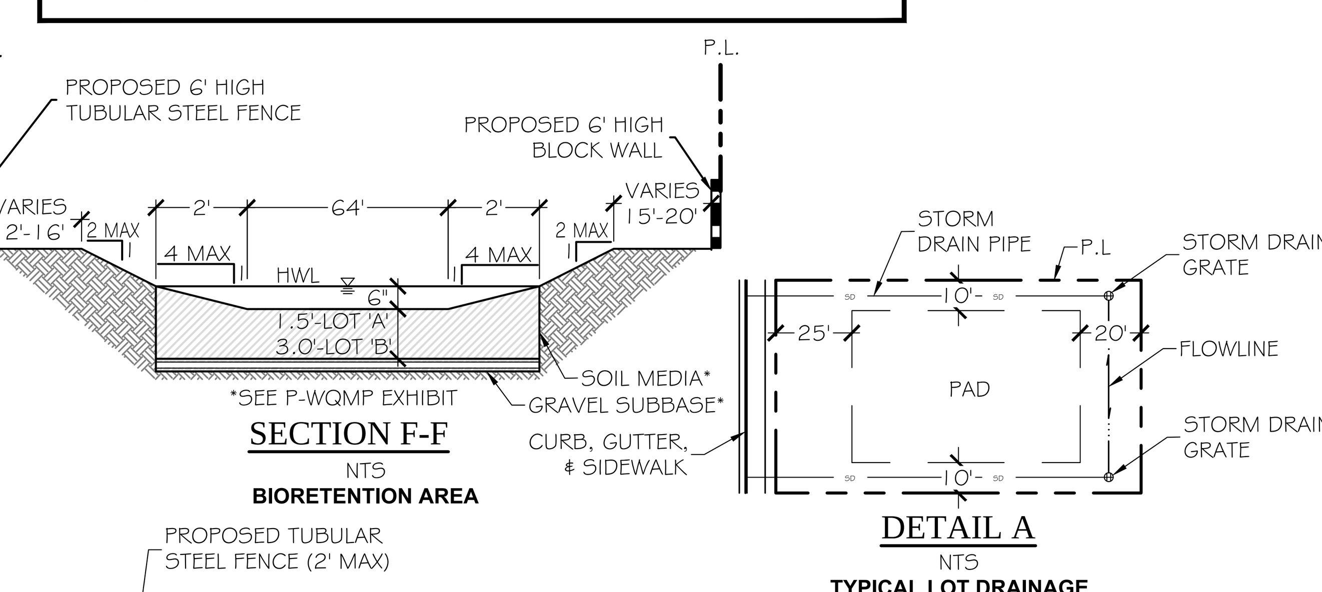
PROJECT NOTES

1. ASSESSORS PARCEL NUMBERS: 316-110-005, 006, 022, 023, & 024
2. GROSS AREA: 20.18 AC
   EXISTING NET AREA: 19.08 AC
   PROPOSED NET AREA: 17.59 AC
   AREA OF DEDICATION: 1.49 AC
3. EXISTING NUMBER OF LOTS: 5
4. PROPOSED NUMBER OF LOTS: 66 SINGLE FAMILY LOTS, & 1 COMMON LETTERED LOT
5. DRAINAGE AND GRADING SHOWN ON THIS PLAN IS CONCEPTUAL ONLY.
6. EXISTING/PROPOSED ZONING DESIGNATION: R5, SUBURBAN RESIDENTIAL.
7. EXISTING USE: VACANT
8. PROPOSED USE: SINGLE FAMILY RESIDENTIAL
9. PROJECT SITE IS LOCATED WITHIN FEMA ZONE 'X': AREA OF MINIMAL FLOOD HAZARD PER MAP PANEL NO. 06065C0765G, DATED AUGUST 28, 2008
10. THE TENTATIVE TRACT MAP INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE LAND DIVIDER.
11. NO EXISTING STRUCTURES ON SITE.
12. SLOPES GREATER THAN 2 FEET IN HEIGHT ARE SHOWN ON THIS PLAN.
13. ADDITIONAL R/W WILL BE DEDICATED ALONG PERRIS BOULEVARD TO ACCOMMODATE NEW BUS TURNOUT.
14. ALL EXISTING FENCING ON ADJACENT PROPERTY TO REMAIN.

Project Description

The project proposes to subdivide 20.18 gross acres (19.08 net acres) into sixty-six (66) single-family residential lots ranging in size from 7,212 SF to 15,950 SF, and one lettered lot.





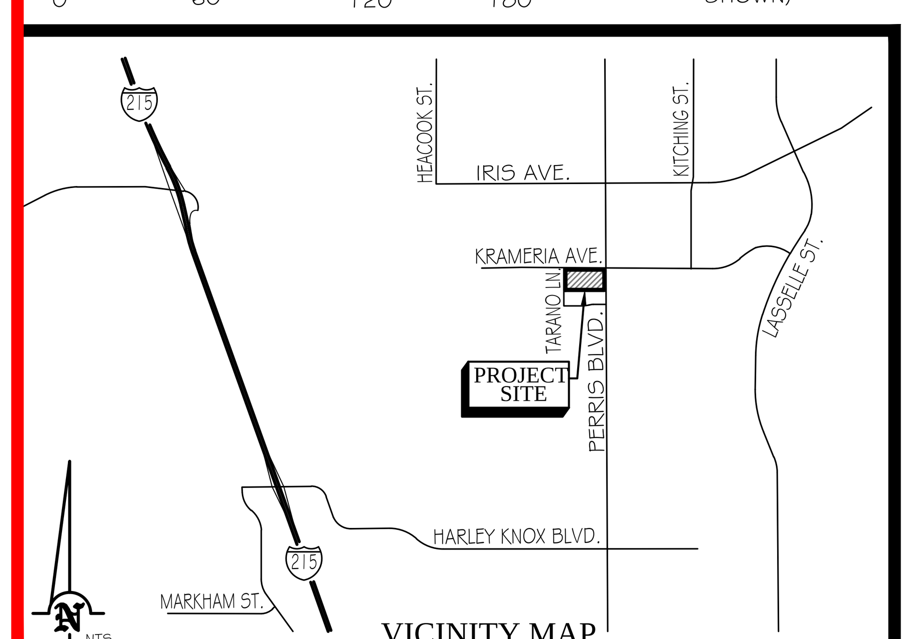
LEGEND

CC	COMMERCIAL
CO	SEWER CLEAN OUT
CPB	CABLE PULL BOX
ECAB	ELECTRIC CABINET
EPB	ELECTRIC PULL BOX
EMH	ELECTRIC MANHOLE
ET	ELECTRIC TRANSFORMER
EV	ELECTRIC VENT
FH	FIRE HYDRANT
MB	MAILBOX
PCC	PORTLAND CEMENT CONCRETE
P.L.	PROPERTY LINE
R/W	RIGHT-OF-WAY
R5	SUBURBAN RESIDENTIAL
S	SIGN
SD	STORM DRAIN PIPE
SDMH	STORM DRAIN MANHOLE
SMH	SEWER MANHOLE
STL	STREET LIGHT
TMH	TELEPHONE MANHOLE
TPB	TELEPHONE PULL BOX
TR	TELEPHONE RISER
TSPB	TRAFFIC SIGNAL PULL BOX
TYP	TYPICAL
V	WATER VALVE
WM	WATER METER

EXISTING PALM TREE
EXISTING TREE
EXISTING WALL
EXISTING CURB/GUTTER
(1200) EXISTING CONTOURS
FLOWLINES
CENTERLINE
EXISTING R/W
PROPERTY LINES
EXISTING BUILDING FOOTPRINT
2" GAS EXISTING UTILITY LINE
PROPOSED WALL
PROPOSED TUBULAR STEEL FENCE

PROPOSED PCC SIDEWALK
PROPOSED AC STREET
PROPOSED 2:1 SLOPE (SLOPES LESS THAN 2' IN HEIGHT ARE NOT SHOWN)

SCALE: 1"=60'
0 60 120 180



VICINITY MAP

PRELIMINARY EARTHWORK QUANTITIES

CUT	20,800 CY	(RAW/UNADJUSTED)
FILL	24,700 CY	(ANTICIPATED IMPORT IS 9,000 CY AFTER LOSSES)

NOTE: THE PROPOSED GRADING ON THIS PLAN IS STRICTLY CONCEPTUAL AND SHOULD ONLY BE USED FOR PLANNING PURPOSES.

UTILITIES:

ELECTRIC:
MORENO VALLEY ELECTRIC UTILITY
14177 FREDERICK STREET
MORENO VALLEY, CA 92552
(951) 413-3000

TELEPHONE:
VERIZON
9 SOUTH 4TH STREET
REDLANDS, CA 92373
(909) 748-6676

CABLE:
CHARTER COMMUNICATIONS
7337 CENTRAL AVENUE
RIVERSIDE, CA 92504
(951)406-1666

WATER/SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
PERRIS, CA 92570
(951) 928-3777

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
1981 WEST LUGONIA AVENUE
REDLANDS, CA 92373
(909) 335-7750

SCHOOL DISTRICT:
MORENO VALLEY UNIFIED SCHOOL DISTRICT
25634 ALESSANDRO BLVD
MORENO VALLEY, CA 92553
(951) 571-7500

SOIL ENGINEER

LOR GEOTECHNICAL GROUP, INC.
6121 QUAIL VALLEY COURT
RIVERSIDE, CA 92507
PROJECT NO. 33529.1
DATED: APRIL 29, 2019
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C/O: POSITIVE INVESTMENTS
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610 NORTH SANTA ANITA AVENUE
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PHONE: (626) 321-4845

TENTATIVE TRACT MAP NO. 37725

APN 316-110-005, 006, 022, 023 & 024
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CITY OF MORENO VALLEY

PLAN PREPARER:

• land planning
• civil engineering
• landscape architecture
phone 909.748.7777
fax 909.748.7776
est. 1989
thatcher engineering & associates, inc.
1461 ford street, suite 105, redlands, ca 92373

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN, JR.
No. 86046
Exp. 9/30/20
CIVIL
STATE OF CALIFORNIA

Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2020

Job Number:	Date Prepared:	Drawn By:	Reference Number:
169801	1/27/20	RL	169801TTM3

Appendix 2: Construction Plans

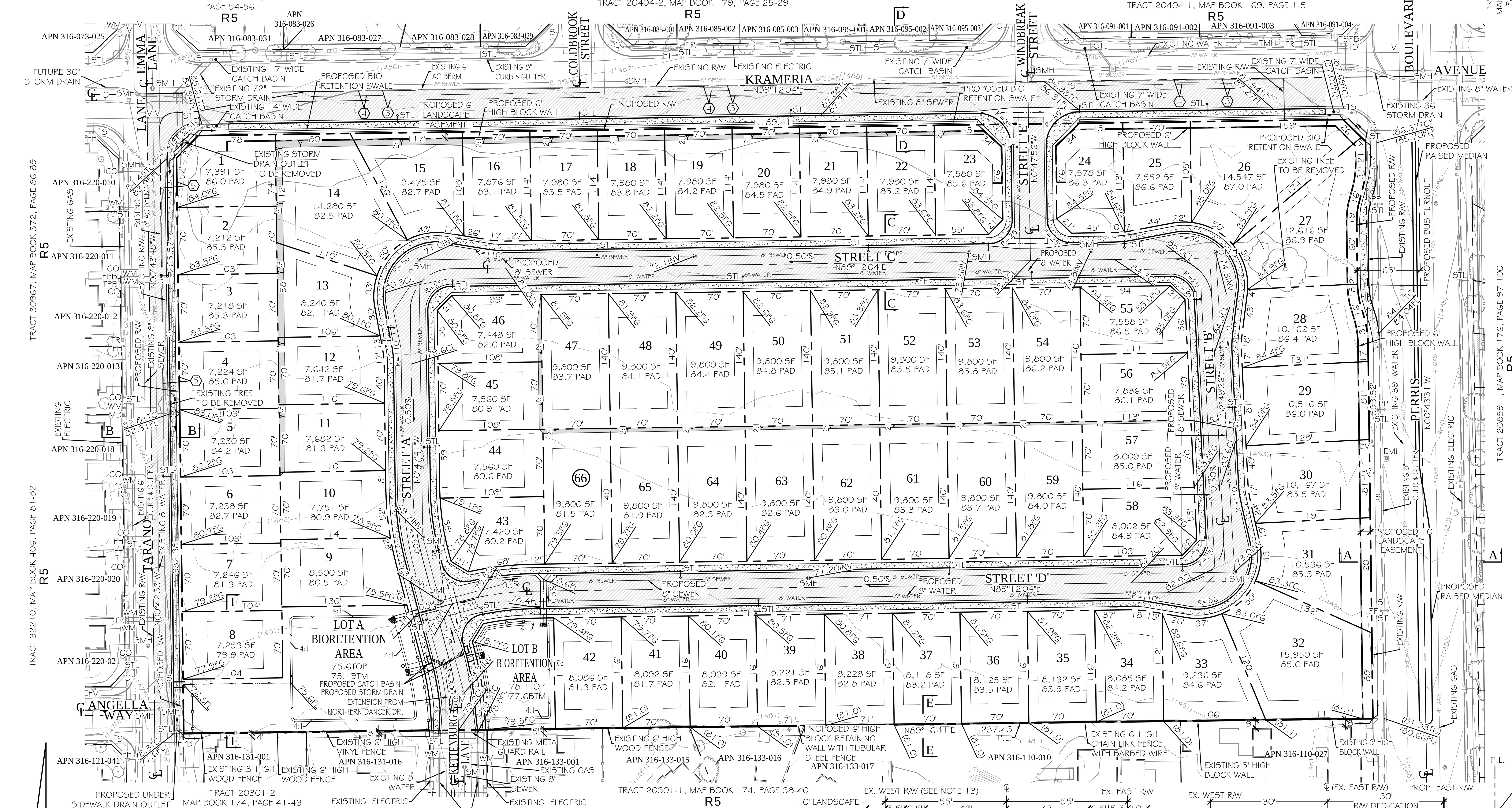
Tentative Tract Map (includes Conceptual Grading Information)

IN THE CITY OF MORENO VALLEY

TENTATIVE TRACT MAP NO. 37725

BEING A SUBDIVISION OF A PORTION OF LOT 17, IN BLOCKS 2 OF RIVERSIDE ALFALFA ACRES, AS SHOWN BY MAP ON FILE IN BOOK 8 PAGE 21 OF MAPS, RECORDS OF RIVERSIDE COUNTY CALIFORNIA

AUGUST 2019



LEGEND

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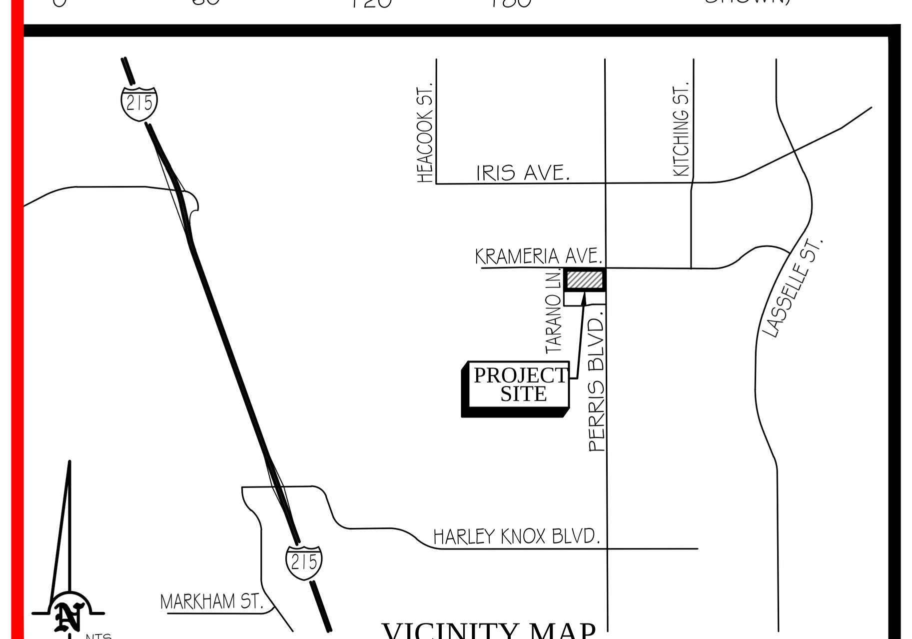

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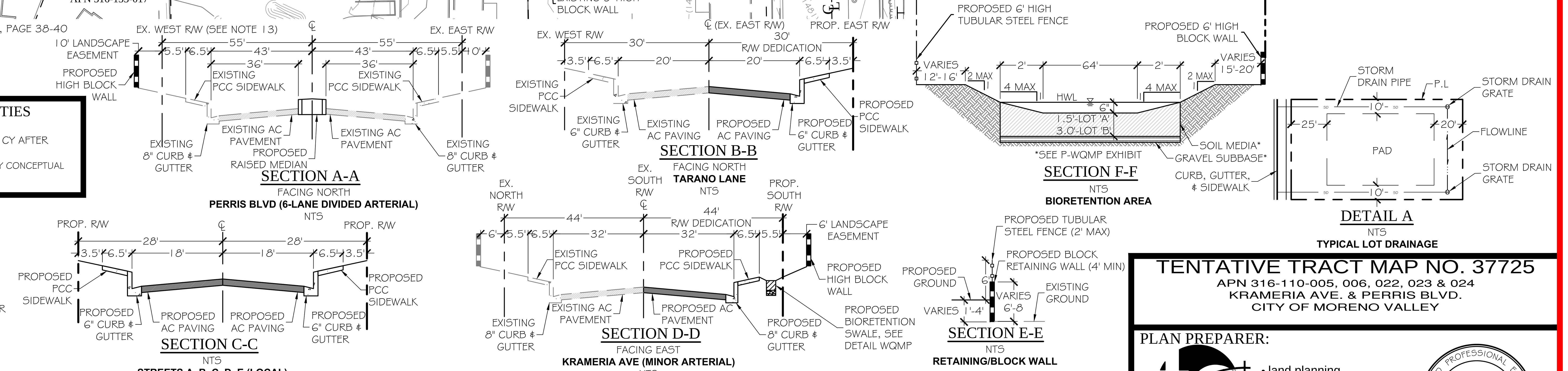

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PARCEL 3:

THE SOUTH HALF OF LOT 17 IN BLOCK 2 OF RIVERSIDE ALFALFA ACRES, AS SHOWN BY MAP ON FILE IN BOOK 8 PAGE 21 OF MAPS, RECORDS OF RIVERSIDE COUNTY CALIFORNIA;

EXCEPTING FROM BOTH PARCELS ALL MINERALS, OIL, GAS AND OTHER HYDROCARBON SUBSTANCES IN AND UNDER OR THAT MAY BE PRODUCED FROM A DEPTH OF 500 FEET BELOW THE SURFACE OF SAID LAND, WITHOUT RIGHT OF ENTRY UPON THE SURFACE OF SAID LAND FOR THE PURPOSE OF MINING, DRILLING, EXPLORING OR EXTRACTING SUCH OIL, GAS AND OTHER HYDROCARBON SUBSTANCES OR OTHER USE OR RIGHTS IN OR TO ANY POTION OF THE SURFACE OF SAID LAND TO A DEPTH OF 500 FEET BELOW THE SURFACE THEREOF, BUT WITH THE RIGHT TO DRILL INTO, LOCATE WELLS AND PRODUCE OIL, GAS AND OTHER HYDROCARBON SUBSTANCES FROM ANY PORTION OF SAID LAND, WHICH LIES BELOW 500 FEET FROM THE SURFACE THEREOF.

EASEMENTS

1 AN EASEMENT FOR ELECTRICAL SUPPLY SYSTEMS IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY, RECORDED APRIL 9, 1974, AS INSTRUMENT NO. 41210, OFFICIAL RECORDS.

THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

2 AN EASEMENT FOR ACCEPTANCE OF DRAINAGE WATER DISCHARGED FROM PERRIS BOULEVARD IN FAVOR OF THE CITY OF MORENO VALLEY, RECORDED MAY 19, 1987 AS INSTRUMENT NO. 140504, OF OFFICIAL RECORDS.

THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

3 AN EASEMENT FOR CONSTRUCTION AND MAINTENANCE OF SHOULDER AND SLOPE BANKS IN FAVOR OF OVERSEAS REALITY ENTERPRISES, INC. AND CITY OF MORENO VALLEY, RECORDED MAY 19, 1987 AS INSTRUMENT NO. 140505, OF OFFICIAL RECORDS.

4 AN EASEMENT FOR CONSTRUCTION AND MAINTENANCE OF SLOPE BANKS IN FAVOR OF OVERSEAS REALITY ENTERPRISES, INC. AND CITY OF MORENO VALLEY, RECORDED SEPTEMBER 29, 1987 AS INSTRUMENT NO. 281832, OF OFFICIAL RECORDS.

5 AN EASEMENT FOR DRAINAGE IN FAVOR OF THE CITY OF MORENO VALLEY, RECORDED SEPTEMBER 29, 1987 AS INSTRUMENT NO. 281833, OF OFFICIAL RECORDS.

6 AN EASEMENT FOR PUBLIC HIGHWAY PURPOSED, INCLUDING PUBLIC UTILITY AND PUBLIC SERVICE FACILITIES OVER, UNDER, UPON, AND ACROSS IN FAVOR OF THE CITY OF MORENO VALLEY, A MUNICIPAL CORPORATION, RECORDED AUGUST 24, 1992 AS INSTRUMENT NO. 315033, OF OFFICIAL RECORDS.

THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

PROJECT NOTES

1. ASSESSORS PARCEL NUMBERS: 316-110-005, 006, 022, 023, & 024
2. GROSS AREA: 20.18 AC
   EXISTING NET AREA: 19.08 AC
   PROPOSED NET AREA: 17.59 AC
   AREA OF DEDICATION: 1.49 AC
3. EXISTING NUMBER OF LOTS: 5
4. PROPOSED NUMBER OF LOTS: 66 SINGLE FAMILY LOTS, & 1 COMMON LETTERED LOT
5. DRAINAGE AND GRADING SHOWN ON THIS PLAN IS CONCEPTUAL ONLY.
6. EXISTING/PROPOSED ZONING DESIGNATION: R5, SUBURBAN RESIDENTIAL.
7. EXISTING USE: VACANT
8. PROPOSED USE: SINGLE FAMILY RESIDENTIAL
9. PROJECT SITE IS LOCATED WITHIN FEMA ZONE 'X': AREA OF MINIMAL FLOOD HAZARD PER MAP PANEL NO. 06065C0765G, DATED AUGUST 28, 2008
10. THE TENTATIVE TRACT MAP INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE LAND DIVIDER.
11. NO EXISTING STRUCTURES ON SITE.
12. SLOPES GREATER THAN 2 FEET IN HEIGHT ARE SHOWN ON THIS PLAN.
13. ADDITIONAL R/W WILL BE DEDICATED ALONG PERRIS BOULEVARD TO ACCOMMODATE NEW BUS TURNOUT.
14. ALL EXISTING FENCING ON ADJACENT PROPERTY TO REMAIN.

Project Description

The project proposes to subdivide 20.18 gross acres (19.08 net acres) into sixty-six (66) single-family residential lots ranging in size from 7,212 SF to 15,950 SF, and one lettered lot.

SOIL ENGINEER

LOR GEOTECHNICAL GROUP, INC.
6121 QUAIL VALLEY COURT
RIVERSIDE, CA 92507
PROJECT NO. 33529.1
DATED: APRIL 29, 2019
PHONE: (951) 653-1760
FAX: (951) 653-1741

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED DECEMBER 2018
AS CONDUCTED BY
ONPOINT LAND SURVEYING, INC.
1910 ORANGE TREE LANE, SUITE 344
REDLANDS, CALIFORNIA 92374
PHONE: (909) 792-2221

BENCHMARK

CITY OF MORENO VALLEY M-31 SET 3-1/4" ALUMINUM DISK STAMPED RIV. CO. SURVEYOR M-31 RESET APRIL 1996, FLUSH AT THE SW COR. OF BRIDGE ON TOP OF SIDEWALK NEAR FACE OF CURB LOCATED AT THE CROSSING OF PERRIS BLVD. AND RIV. CO. FLOOD CONTROL CHANNEL (PERRIS LATERAL "A"). 43' W OF THE CENTERLINE OF PERRIS BLVD. & 4.5' E OF CONCRETE BRIDGE BARRIER. (EDGE OF BRIDGE)

ELEVATION = 1474.674'

BASIS OF BEARING

CENTERLINE OF KRAMERIA STREET BETWEEN TARANO LN. AND PERRIS BLVD. BEARING BEING N89°12'04"E PER TRACT NO. 20404-1 MB 169/1-5.

OWNER/DEVELOPER/APPLICANT:

PI PROPERTIES
NO. 67 LLC
C/O: POSITIVE INVESTMENTS
ATTN: MR. MOHAN KONDRAGUNTA
610 NORTH SANTA ANITA AVENUE
ARCADIA, CA 91006
PHONE: (626) 321-4845

TENTATIVE TRACT MAP NO. 37725

APN 316-110-005, 006, 022, 023 & 024
KRAMERIA AVE. & PERRIS BLVD.
CITY OF MORENO VALLEY

PLAN PREPARER:

- land planning
- civil engineering
- landscape architecture

phone 909.748.7777
fax 909.748.7776
est. 1989

thatcher engineering & associates, inc.
1461 ford street, suite 105, redlands, ca 92373

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN, JR.
No. 86046
Exp. 9/30/20
CIVIL
STATE OF CALIFORNIA

Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2020

Job Number:	Date Prepared:	Drawn By:	Reference Number:
169801	1/27/20	RL	169801TTM3

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

PRELIMINARY GEOTECHNICAL AND INFILTRATION/PERCOLATION FEASIBILITY INVESTIGATION TENTATIVE TRACT MAP NO. 37725 MORENO VALLEY, CALIFORNIA

PROJECT NO. 33529.1
APRIL 29, 2019

Prepared For:

Positive Investments
610 North Santa Anita Avenue
Arcadia, California 91006

Attention: Mr. Mohan Kondragunta

April 30, 2019

Positive Investments
610 North Santa Anita Avenue
Arcadia, California 91006

Project No. 33529.1

Attention: Mr. Mahan Kondragunta

Subject: Preliminary Geotechnical and Infiltration/Percolation Feasibility Investigation, Tentative Tract Map No. 37725, Moreno Valley, California.

LOR Geotechnical Group, Inc., is pleased to present this report summarizing our geotechnical investigation for the above referenced project. In summary, it is our opinion that the proposed development is feasible from a geotechnical perspective, provided the recommendations presented in the attached report are incorporated into design and construction.

To provide adequate support for the proposed residential structures, we recommend that a compacted fill mat be constructed beneath footings and slabs. The compacted fill mat will provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils. All undocumented fill material and any loose alluvial materials should be removed from structural areas and areas to receive engineered compacted fill. The data developed during this investigation indicates that removals on the order of approximately 2 to 3 feet will be required within the currently planned development areas. The given removal depths are preliminary. The actual depths of the removals should be determined during the grading operation by observation and/or in-place density testing.

Very low expansion potential, fair R-value quality, poor infiltration and percolation characteristics, and a negligible soluble sulfate content generally characterize the onsite soil materials tested.

LOR Geotechnical Group, Inc.

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INTRODUCTION

During April of 2019, a Preliminary Geotechnical and Infiltration/Percolation Feasibility Investigation was performed by LOR Geotechnical Group, Inc. for proposed residential development of Tentative Tract Map No. 37725 in the City of Moreno Valley, California. The purpose of this investigation was to conduct a technical evaluation of the geologic setting of the site and to provide geotechnical design recommendations for the proposed improvements. The scope of our services included:

- Review of available pertinent geotechnical literature, reports, maps, and agency information pertinent to the study area;
- Interpretation of aerial photographs of the site and surrounding regions dated 1966 through 2018;
- Geologic field reconnaissance mapping to verify the areal distribution of earth units and significance of surficial features as compiled from documents, literature, and reports reviewed;
- A subsurface field investigation to determine the physical soil conditions pertinent to the proposed development;
- Percolation testing via the falling head test method was conducted at three locations proposed for dry wells;
- Infiltration testing via the double ring infiltrometer test method at two locations within the approximate area proposed for the infiltration of onsite runoff waters;
- Laboratory testing of selected soil samples obtained during the field investigation;
- Development of geotechnical recommendations for site grading and foundation design; and
- Preparation of this report summarizing our findings, and providing conclusions and recommendations for site development.

The approximate location of the site is shown on the attached Index Map, Enclosure A-1, within Appendix A.

To orient our investigation at the site, you provided us with Tentative Tract Map No. 37725, prepared by Thatcher Engineering & Associates, Inc., dated March 25, 2019, that showed the existing site conditions as well as the proposed development. As noted on that map, the site will be developed with 66 single-family residential lots and the associated interior streets. Dry wells and an infiltration basin are also proposed. The Site Plan was utilized as a base map for our field investigation and is presented as Enclosure A-2, within Appendix A.

PROJECT CONSIDERATIONS

Information furnished to this firm indicates that the proposed project will consist of the construction of 66 single-family residences. These will likely be one or two stories in height and are anticipated to be of wood frame construction with an exterior plaster veneer. Light to moderate foundation loads are anticipated with such structures. Cuts and fills on the order of a few feet are proposed to create the planar building pads.

Three dry wells are proposed along the south side of Krameria Avenue and an infiltration basin is proposed in the southwest corner of the site.

EXISTING SITE CONDITIONS

The subject site consists of a rectangular shaped, relatively flat, vacant area of land that is approximately 20 acres in size. At the time of our investigation, vegetation on the site consisted of a moderate growth of weeds and one tree was present in the northeast corner of the site. The topography of the site is planar, with a very gentle fall towards the south-southwest.

Krameria Avenue, a partially improved roadway, bounds the site on the north followed by a tract of single family residences. Perris Boulevard, an improved roadway, bounds the site on the east followed by a tract of single family residences. Tarano Lane, a partially improved roadway, bounds the site on the west followed by a tract of single family residences. A tract of single-family homes is present to the south of the site.

AERIAL PHOTOGRAPH ANALYSIS

The aerial photographs reviewed consisted of vertical aerial stereoscopic photographs of varying scales. We reviewed imagery available from Google Earth (2018) and from Historic Aerials (2018).

The site consisted of vacant land in all of the photographs reviewed.

Our review of the aerial photographs did not reveal any adverse geologic conditions, such as possible faults or landslides, as being present at or within close proximity to the site.

FIELD EXPLORATION PROGRAM

Our subsurface field exploration program was conducted on April 18, 2019 and consisted of drilling 6 exploratory borings with a truck-mounted Mobile B-61 drill rig equipped with 8-inch diameter hollow stem augers. The borings were drilled to depths of approximately 21 to 51.5 feet below the existing ground surface. The approximate locations of our exploratory borings are presented on the attached Site Plan, Enclosure A-2 within Appendix A.

The subsurface conditions encountered in the exploratory borings were logged by a geologist from this firm. Relatively undisturbed and bulk samples were obtained at a maximum depth interval of 5 feet and returned to our geotechnical laboratory in sealed containers for further testing and evaluation. A detailed description of the field exploration program and the boring logs are presented in Appendix B.

LABORATORY TESTING PROGRAM

Selected soil samples obtained during the field investigation were subjected to laboratory testing to evaluate their physical and engineering properties. Laboratory testing included in-place moisture content and dry density, laboratory compaction characteristics, direct shear, expansion index, sieve analysis, sand equivalent, R-value, and soluble sulfate content. A detailed description of the laboratory testing program and the test results are presented in Appendix C.

GEOLOGIC CONDITIONS

Regional Geologic Setting

The site is located within the south-central portion of Moreno Valley which lies within the northern end of Perris Valley. This area is located on the Perris block, within the northern Peninsular Ranges geologic province of southern California. While the Perris block is considered to be a relatively stable structural block, it is bounded by active faults. The Perris block is underlain predominately by a very large mass of crystalline igneous rocks of Cretaceous age and older metasedimentary and metavolcanic rocks.

The Perris block has a series of erosional surfaces, marked by low topographic relief and capped with unconsolidated alluvial sediments stripped from the surrounding highlands, such as the Box Spring Mountains and the hills around Lake Perris located east of the site.

These were mapped by the California Division of Mines and Geology as being underlain by deposits of relatively unconsolidated, but weakly to moderately indurated younger to older alluvium (Morton and Matti, 2001 and Morton, 2003).

The nearest known active fault zone is the San Jacinto fault zone located approximately 10.6 kilometers (6.6 miles) to the northeast. Other major faults within the region include the Elsinore fault zone located approximately 25 kilometers (16.5 miles) to the southwest, and San Andreas fault zone located approximately 26.7 kilometers (16.5 miles) to the northeast. The site and the regional geologic setting are shown on Enclosure A-3 within Appendix A.

Site Geologic Conditions

Fill: As encountered within our exploratory borings, fill materials on the order of 2 feet are present. The fill materials were noted to be red brown, dry, and loose silty sand. These materials are most likely the result of weed abatement practices (discing).

Older Alluvium: Underlying the fill materials at the site, older alluvial materials were encountered within all of our exploratory borings to the maximum depths explored. These units were noted to consist of silty sand and lean clay with sand, and a minor unit of sandy silt/lean clay with sand. The older alluvial materials were in a relatively medium dense/ stiff state upon first encounter, becoming dense/very stiff to very dense/hard quickly with depth based on our equivalent Standard Penetration Test (SPT) data and in-place density testing.

A detailed description of the subsurface soil conditions as encountered within our exploratory borings, is presented on the Boring Logs within Appendix B.

Groundwater Hydrology

Groundwater was encountered within our exploratory borings B-1 at a depth of approximately 32 feet below the existing ground surface and within our exploratory boring B-6 at a depth of approximately 29.5 feet below the existing ground surface.

Records for nearby wells which were readily available from the State of California Department of Water Resources online database (CDWR, 2019) and the Western Municipal Water District Cooperative Well Measurement Program (WMWD, 2019) were reviewed as a part of this investigation. In addition, historic groundwater level data was reviewed from a groundwater contour map prepared by the U.S.G.S. (Carson and Matti, 1985).

According to the State of California Department for Water resources online database, the nearest well with available data is State Well Number 03S03W32B001S located to the southeast, approximately 1.1 kilometers (0.7 miles). In this well, groundwater was last measured at a depth of 25 feet below the ground surface on November 27, 2018. The depth to groundwater in the past was noted to vary sightly over time, with the water at a high of approximately 24 feet below the surface in 2017. Data for this well was presented from 2011 to 2018. The elevation for this well was listed as 1,476 feet above mean sea level.

Groundwater well data from the Cooperative Well Measuring Program, Fall 2018 indicates the nearest well is that well noted above.

Based on the information above, groundwater is anticipated to lie approximately 25 to 30 feet in the general site area.

Surface Runoff

Current surface runoff of precipitation waters across the site is generally as sheet flow to the south-southwest.

Mass Movement

Mass movement features such as landslides, rockfalls, or debris flows within the site vicinity are not known to exist and no evidence of mass movement was observed on the site or in the vicinity during our review of aerial photographs or reconnaissance.

Faulting

No active or potentially active faults are known to exist at the subject site. In addition, the subject site does not lie within a current State of California Earthquake Fault Zone (Hart and Bryant, 2003).

As previously mentioned, the closest known active fault is the San Jacinto Valley segment of the San Jacinto fault zone, located approximately 10.9 kilometers (6.8 miles) to the northeast. In addition, other relatively close active faults include the Glen Ivy segment of the Elsinore fault zone, located approximately 25 kilometers (15.5 miles) to the southwest, and the San Bernardino segment of the San Andreas fault zone located approximately 26.7 kilometers (16.7 miles) to the northeast.

The San Jacinto fault zone is a sub-parallel branch of the San Andreas fault zone, extending from the northwestern San Bernardino area, southward into the El Centro region. This fault has been active in recent times with several large magnitude events. It is believed that the San Jacinto fault is capable of producing an earthquake magnitude on the order of 6.5 or greater.

The Elsinore fault zone is one of the largest in southern California. At its northern end it splays into two segments and at its southern end it is cut by the Yuba Wells fault. The primary sense of slip along the Elsinore fault is right lateral strike-slip. It is believed that the Elsinore fault zone is capable of producing an earthquake magnitude on the order of 6.5 to 7.5.

The San Andreas fault is considered to be the major tectonic feature of California, separating the Pacific Plate and the North American Plate. While estimates vary, the San Andreas fault is generally thought to have an average slip rate on the order of 24mm/yr and capable of generating large magnitude events on the order of 7.5 or greater.

Current standards of practice often include a discussion of all potential earthquake sources within a 100 kilometer (62 mile) radius. However, while there are other large earthquake faults within a 100 kilometer (62 mile) radius of the site, none of these are considered as relevant to the site due to their greater distance and/or smaller anticipated magnitudes.

Historical Seismicity

In order to obtain a general perspective of the historical seismicity of the site and surrounding region, a search was conducted for seismic events at and around the area within various radii. This search was conducted utilizing the historical seismic search program by EPI Software, Inc. (Reeder, 2000). This program conducts a search of a user selected cataloged seismic events database, within a specified radius and selected magnitudes, and then plots the events onto an overlay map of known faults. For this investigation the database of seismic events utilized by the EPI program was obtained from the Southern California Seismic Network (SCSN) available from the Southern California Earthquake Center. At the time of our search the data base contained data from January 1, 1932 through December 31, 2010.

In our first search, the general seismicity of the region was analyzed by selecting an epicenter map listing all events of magnitude 4.0 and greater, recorded since 1932, within a 100 kilometer (62 mile)radius of the site, in accordance with guidelines of the California Division of Mines and Geology. This map illustrates the regional seismic history of moderate to large events.

As depicted on Enclosure A-4, within Appendix A, the site lies within a relatively active region associated with the San Andreas fault trending northwest and the northwest trending faulting of the Mojave Desert geomorphic province. Of these events, the closest was a magnitude 4.1 located approximately 15 kilometers (9 miles) to the north of the site.

In the second search, the micro seismicity of the area lying within a 15 kilometer (9 mile) radius of the site was examined by selecting an epicenter map listing events on the order of 1.0 and greater since 1978. In addition, only the “A” events, or most accurate events were selected. Caltech indicates the accuracy of the “A” events to be approximately 1 km. The results of this search is a map that presents the seismic history around the area of the site with much greater detail, not permitted on the larger map. The reason for limiting the events to the last 40± years on the detail map is to enhance the accuracy of the map. Events recorded prior the mid 1970's are generally considered to be less accurate due to advancements in technology. As depicted on this map, Enclosure A-5, the San Jacinto fault zone appear to be the source of numerous events.

In summary, the historical seismicity of the site entails numerous small to medium magnitude earthquake events occurring around the subject site, predominately associated with the presence of the San Jacinto fault zone. Any future developments at the subject site should anticipate that moderate to large seismic events could occur very near the site.

Secondary Seismic Hazards

Other secondary seismic hazards generally associated with severe ground shaking during an earthquake include liquefaction, seiches and tsunamis, earthquake induced flooding, landsliding and rockfalls, and seismic-induced settlement.

Liquefaction: The potential for liquefaction generally occurs during strong ground shaking within loose granular sediments where the depth to groundwater is usually less than 50 feet. Although groundwater can be present at an historical depth of approximately 25 feet beneath the site, the site is underlain by dense/very stiff to dense/very hard older alluvial soils. The near surface loose soils will be removed and replaced with compacted fill during site grading. Therefore, the possibility for liquefaction to occur at the site is considered very low.

Seiches/Tsunamis: The potential for the site to be affected by a seiche or tsunami (earthquake generated wave) is considered nil due to absence of any large bodies of water near the site.

Flooding (Water Storage Facility Failure): There are no large water storage facilities located on or near the site which could possibly rupture during an earthquake and affect the site by flooding.

Seismically-Induced Landsliding: Our research, site reconnaissance and review of aerial imagery of the site and vicinity indicates that there are no known or suspected landslides at the site or in close proximity to the site and, therefore, the potential for seismically-induced landslides occurring at the site is considered very low.

Rockfalls: No large, exposed, loose or unrooted boulders that could affect the integrity of the site are present above the site.

Seismically-Induced Settlement: Settlement generally occurs within areas of loose, granular soils with relatively low density. Since the site is underlain by dense/very stiff to dense/very hard older alluvial materials, the potential for settlement is considered low. In addition, the earthwork operations recommended to be conducted during the development of the site will mitigate any near surface loose soil conditions.

SOILS AND SEISMIC DESIGN CRITERIA (California Building Code 2016)

Section 1613 of Chapter 16 of the 2016 California Building Code (CBC) contains the procedures and definitions for the calculations of the earthquake loads on structures and non structural components that are permanently attached to structures and their supports and attachments.

It should be noted that the classification of use and occupancy of all proposed structures at the site, and thus design requirements, shall be the responsibility of the structural engineer and the building official.

CBC Earthquake Design Summary

The following earthquake design criteria have been formulated for the site utilizing the source referenced above. However, these values should be reviewed and the final design should be performed by a qualified structural engineer familiar with the region.

CBC 2016 SEISMIC DESIGN SUMMARY* Site Location (WGS 84) 33.88001, -117.22842, Occupancy Category II	
Site Class Definition Chapter 20 ASCE 7	D
S_s Mapped Spectral Response Acceleration at 0.2s Period, (Figure 1613.3.1(1))	1.500
S_1 Mapped Spectral Response Acceleration at 1s Period, (Figure 1613.3.3(2))	0.600
F_a Short Period Site Coefficient at 0.2s Period, (Table 1613.3.3(1))	1.0
F_v Long Period Site Coefficient at 1s Period,(Table 1613.3.3(2))	1.5
S_{MS} Adjusted Spectral Response Acceleration at 0.2s Period, (eq .16-37)	1.500
S_{M1} Adjusted Spectral Response Acceleration at 1s Period, (eq .16-38)	0.900
S_{DS} Design Spectral Response Acceleration at 0.2s Period,(eq .16-39)	1.000
S_{D1} Design Spectral Response Acceleration at 1s Period, (eq .16-40)	0.600
Seismic Design Category - Short Period (Table 1613.3.5(1))	D
Seismic Design Category - Long Period (Table 1613.3.5(2))	D
*Values obtained from OSHPD online U.S. Seismic Design Maps tool	

PERCOLATION AND INFILTRATION TESTING AND TEST RESULTS

Percolation Testing - Dry Wells

Three test holes were advanced in the areas requested to a depth of approximately 15 feet below the existing ground surface. This depth was chosen in order to maintain a 10-foot separation between the bottom of the proposed dry wells and historic high groundwater. Immediately after drilling the test holes on April 18, 2019, a 3-inch diameter perforated plastic pipe wrapped with filter fabric was inserted to the total depth drilled of 15 feet. The annular space between the pipe and the boring wall was filed with 3/4-inch gravel. The void ratio for the gravel used was tested in our laboratory in general accordance with ASTM C29. The results of this test are provided Appendix D. The depths of the boreholes were measured prior to and upon the completion of testing. Testing consisted of filling the test hole to approximately 5 feet below the existing ground and the drop in water was measured in 30-minute intervals, refilling after every 30-minutes, for 11 readings. No water was added during the final reading. Prior to conducting the 30-minute readings, two, 25-minute readings were conducted in order to determine the testing interval (ie 30-minutes versus 10- minutes). The total number of readings for each hole was 13.

Test holes were found to have the following clear water rates:

Test No.	Clear Water Rates*	
	Percolation Rate (gal/sf/day)	Infiltration Rate** in/hr
P-1	9.1	0.3
P-2	22.3	0.8
P-3	4.5	0.2

*Final refilled reading
**Porchet Method, rounded to the nearest tenth of an inch

The test results are provided on the attached Falling Head Percolation Test Results, Enclosures D-1 through D-3. The test results indicate poor percolation characteristics for the soils tested.

Infiltration Testing - Infiltration Basin

Two double ring infiltration tests were conducted at the general locations requested and as illustrated on Enclosure A-2. Test pits were excavated to depths of approximately 8 feet below the existing ground surface and a 12-inch diameter casing was installed within the center of the test locations with a 24-inch diameter casing centered around it. Each 20-inch tall casing was imbedded to a depth of approximately 3-inches. The test locations were tested immediately after the casings were installed by filling both the inside and outside casings and maintaining a water level to a depth of approximately 1-inch.

The testing procedure was as follows:

Both the inside and outside areas of the casings were filled with water to a level of approximately 3-inches above the ground surface. Water was then metered to maintain this water level within both rings. The volume of water use in a given time period was recorded at various time intervals to establish the infiltration rate of the water within the inner ring. See the attached Infiltration Test Data sheets, Enclosures D-4 and D-5 within Appendix D for the test information and measurements.

The infiltration rate is measured as the drop in water level compared to the permeability of the bottom surface area soils in the bottom of the test hole.

If casing is not used, the water column in the test hole is allowed to seep into both the bottom and sidewalls of the hole, for which the drop in water level must be corrected and reduced for the volume of water seeping into the sidewall and for the diameter of the test hole. As described above, the tests described herein were conducted using a 12-inch diameter inner casing and 24-inch diameter outer casing.

The test holes were found to have the following measured clear water infiltration rates:

Test No.	Depth (ft)*	Elevation (msl)	Infiltration Rate** in/hr
DRI-1	8	1,473	0.4
DRI-2	8	1,473	0.4
* depth measured below existing ground surface ** average of final two readings			

The results of our infiltration testing are attached as Enclosures D-4 and D-5. The test results indicate poor infiltration characteristics for the soils tested.

CONCLUSIONS

General

This investigation provides a broad overview of the geotechnical and geologic factors which are expected to influence future site planning and development. On the basis of our field investigation and testing program, it is the opinion of LOR Geotechnical Group, Inc., that the proposed development is feasible from a geotechnical standpoint, provided the recommendations presented in this report are incorporated into design and implemented during grading and construction.

The subsurface conditions encountered in our exploratory borings are indicative of the locations explored. The subsurface conditions presented here are not to be construed as being present the same everywhere on the site. If conditions are encountered during the construction of the project which differ significantly from those presented in this report, this firm should be notified immediately so we may assess the impact to the recommendations provided.

Foundation Support

Based upon the field investigation and test data, it is our opinion that the existing fill soils will not, in their present condition, provide uniform and/or adequate support for the proposed improvements.

Left as is, this condition could cause unacceptable differential and/or overall settlements upon application of the anticipated foundation loads.

To provide adequate support for the proposed structural improvements, we recommend that a compacted fill mat be constructed beneath footings and slabs. This compacted fill mat will provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils. In addition, the construction of this compacted fill mat will allow for the removal of any undocumented fill soils that are present within the proposed building areas. Conventional foundation systems, using either individual spread footings and/or continuous wall footings, will provide adequate support for the anticipated downward and lateral loads when utilized in conjunction with the recommended fill mat.

Soil Expansiveness

Our laboratory testing found the soils tested to have a very low expansion potential. For very low expansive soils, no specialized construction procedures to resist expansive soil activity are necessary.

Careful evaluation of on-site soils and any import fill for their expansion potential should be conducted during the grading operation.

Sulfate Protection

The results of the soluble sulfate tests conducted on selected subgrade soils expected to be encountered at foundation levels indicate that there is a negligible sulfate exposure to concrete elements in contact with the on site soils per the 2016 CBC. Therefore, no specific recommendations are given for concrete elements to be in contact with the onsite soils.

Infiltration / Percolation

The results of our field investigation and test data indicates the site soils are not conducive to infiltration or percolation.

Therefore water quality storm water systems should not incorporate on-site infiltration/percolation when determining storm water treatment capacity.

Geologic Mitigations

No special geologic recommendation methods are deemed necessary at this time, other than the geotechnical recommendations provided in the following sections.

Seismicity

Seismic ground rupture is generally considered most likely to occur along pre-existing active faults. Since no known faults are known to exist at, or project into the site, the probability of ground surface rupture occurring at the site is considered nil.

Due to the site’s close proximity to the faults described above, it is reasonable to expect a strong ground motion seismic event to occur during the lifetime of the proposed development on the site. Large earthquakes could occur on other faults in the general area, but because of their lesser anticipated magnitude and/or greater distance, they are considered less significant than the faults described above from a ground motion standpoint.

The effects of ground shaking anticipated at the subject site should be mitigated by the seismic design requirements and procedures outlined in Chapter 16 of the California Building Code. However, it should be noted that the current building code requires the minimum design to allow a structure to remain standing after a seismic event, in order to allow for safe evacuation. A structure built to code may still sustain damage which might ultimately result in the demolishing of the structure (Larson and Slosson, 1992).

RECOMMENDATIONS

Geologic Recommendations

No special geologic recommendation methods are deemed necessary at this time, other than the geotechnical recommendations provided in the following sections.

General Site Grading

It is imperative that no clearing and/or grading operations be performed without the presence of a qualified geotechnical engineer.

An on-site, pre-job meeting with the owner, the developer, the contractor, and geotechnical engineer should occur prior to all grading related operations. Operations undertaken at the site without the geotechnical engineer present may result in exclusions of affected areas from the final compaction report for the project.

Grading of the subject site should be performed in accordance with the following recommendations as well as applicable portions of the California Building Code, and/or applicable local ordinances.

All areas to be graded should be stripped of significant vegetation and other deleterious materials.

It is our recommendation that any existing fills under any proposed flatwork and/or paved areas be removed and replaced with engineered compacted fill. If this is not done, premature structural distress (settlement) of the flatwork and pavement may occur. Any undocumented fills encountered during grading should be completely removed and cleaned of significant deleterious materials. These may then be reused as compacted fill.

Cavities created by removal of undocumented fill soils and/or subsurface obstructions should be thoroughly cleaned of loose soil, organic matter and other deleterious materials, shaped to provide access for construction equipment, and backfilled as recommended in the following Engineered Compacted Fill section of this report.

Initial Site Preparation

Any and all existing uncontrolled fills and any loose/soft native alluvial soils should be removed from structural areas and areas to receive structural fills. The data developed during this investigation indicates that removals on the order of 2 to 3 feet will be required to encounter competent older alluvium. However, deeper removals may be required locally. Removals should extend horizontally at a distance equal to the depth of the removals plus proposed fill and at least a minimum of 5 feet. The actual depths of removals should be determined during the grading operation by observation and/or by in-place density testing.

Preparation of Fill Areas

After the removals described above and prior to placing fill, the surfaces of all areas to receive fill should be scarified to a depth of at least 6 inches. The scarified soil should be brought to near optimum moisture content and compacted to a relative compaction of at least 90 percent (ASTM D 1557).

Preparation of Foundation Areas

All footings should rest upon a minimum of 24 inches of properly compacted fill material placed over competent natural alluvial soils. In areas where the required fill thickness is not accomplished by the removal of unsuitable soils, the footing areas should be further subexcavated to a depth of at least 24 inches below the proposed footing base grade, with the subexcavation extending at least 5 feet beyond the footing lines. The bottom of this excavation should then be scarified to a depth of at least 6 inches, brought to near optimum moisture content, and recompacted to at least 90 percent relative compaction (ASTM D 1557) prior to refilling the excavation to grade as properly compacted fill. Fill areas should not be constructed so as to place structures across any area where the maximum depth of fill to minimum depth of fill is greater than a 3:1 ratio.

To provide adequate support, concrete slabs-on-grade should bear on a minimum of 24 inches of compacted soil. The final pad surfaces should be rolled to provide smooth, dense surfaces upon which to place the concrete.

Engineered Compacted Fill

The on-site soils should provide adequate quality fill material, provided they are free from organic matter and other deleterious materials. Unless approved by the geotechnical engineer, rock or similar irreducible material with a maximum dimension greater than 6 inches should not be buried or placed in fills.

Import fill, if required, should be inorganic, non-expansive granular soils free from rocks or lumps greater than 6 inches in maximum dimension. Sources for import fill should be approved by the geotechnical engineer prior to their use.

Fill should be spread in maximum 8-inch uniform, loose lifts, with each lift brought to near optimum moisture content prior to, during and/or after placement, and compacted to a relative compaction of at least 90 percent in accordance with ASTM D 1557.

Based upon the relative compaction of the near surface soils determined during this investigation and the relative compaction anticipated for compacted fill soil, we estimate a compaction shrinkage factor of approximately 10 to 15 percent. Therefore, 1.10 to 1.15 cubic yards of in-place materials would be necessary to yield one cubic yard of properly compacted fill material. Subsidence is anticipated to be 0.10 feet. These values are for estimating purposes only, and are exclusive of losses due to stripping or the removal of subsurface obstructions.

These values may vary due to differing conditions within the project boundaries and the limitations of this investigation. Shrinkage should be monitored during construction. If percentages vary, provisions should be made to revise final grades or adjust quantities of borrow or export.

Short-Term Excavations

Following the California Occupational and Safety Health Act (CAL-OSHA) requirements, excavations 5 feet deep and greater should be sloped or shored. All excavations and shoring should conform to CAL-OSHA requirements.

Short-term excavations 5-feet deep and greater shall conform to Title 8 of the California Code of Regulations, Construction Safety Orders, Section 1504 and 1539 through 1547. Based on our exploratory borings, it appears that Type C soil is the predominant type of soil on the project and all short-term excavations should be based on this type of soil. Deviation from the standard short-term slopes are permitted using Option 4, Design by a Registered Professional Engineer (Section 1541.1).

Short-term slope construction and maintenance are the responsibility of the contractor, and should be a consideration of his methods of operation and the actual soil conditions encountered.

Slope Construction

Preliminary data indicates that cut and fill slopes should be constructed no steeper than two horizontal to one vertical. Fill slopes should be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction, then roll the final slopes to provide dense, erosion-resistant surfaces.

Slope Protection

Since the site soils are susceptible to erosion by running water, measures should be provided to prevent surface water from flowing over slope faces. Slopes at the project should be planted with a deep rooted ground cover as soon as possible after completion. The use of succulent ground covers such as iceplant or sedum is not recommended. If watering is necessary to sustain plant growth on slopes, the watering system should be monitored to assure proper operation and to prevent over watering.

Foundation Design

If the site is prepared as recommended, the proposed structure may be safely founded on conventional shallow foundations, either individual spread footings and/or continuous wall footings, bearing on a minimum of 24 inches of engineered compacted fill.

All foundations should have a minimum width of 12 inches and should be established a minimum of 12 inches below lowest adjacent grade.

For the minimum width and depth, spread foundations may be designed using an allowable bearing pressure of 1,800 psf. This bearing pressure may be increased by 400 psf for each additional foot of width, and by 400 psf for each additional foot of depth, up to a maximum of 4,000 psf. For example, a footing 3 feet wide and embedded 2 feet will have an allowable bearing pressure of 3,000 psf.

The above values are net pressures; therefore, the weight of the foundations and the backfill over the foundations may be neglected when computing dead loads. The values apply to the maximum edge pressure for foundations subjected to eccentric loads or overturning. The recommended pressures apply for the total of dead plus frequently applied live loads, and incorporate a factor of safety of at least 3.0. The allowable bearing pressures may be increased by one-third for temporary wind or seismic loading. The resultant of the combined vertical and lateral seismic loads should act within the middle one-third of the footing width. The maximum calculated edge pressure under the toe of foundations subjected to eccentric loads or overturning should not exceed the increased allowable pressure. Buildings should be setback from slopes in accordance with the California Building Code.

Resistance to lateral loads will be provided by passive earth pressure and base friction. For footings bearing against compacted fill, passive earth pressure may be considered to be developed at a rate of 300 pounds per square foot per foot of depth. Base friction may be computed at 0.30 times the normal load. Base friction and passive earth pressure may be combined without reduction. These values are for dead load plus live load and may be increased by one-third for wind or seismic loading.

Settlement

Total settlement of individual foundations will vary depending on the width of the foundation and the actual load supported. Maximum settlement of shallow foundations designed and constructed in accordance with the preceding recommendations are estimated to be on the order of 0.5 inch.

Differential settlements between adjacent footings should be about one-half of the total settlement. Settlement of all foundations is expected to occur rapidly, primarily as a result of elastic compression of supporting soils as the loads are applied, and should be essentially completed shortly after initial application of the loads.

Building Area Slab-On-Grade

Concrete floor slabs should bear on a minimum of 24 inches of engineered compacted fill placed over competent native materials. The final pad surfaces should be rolled to provide smooth, dense surfaces upon which to place the concrete.

Slabs to receive moisture-sensitive coverings should be provided with a moisture vapor barrier. This barrier may consist of an impermeable membrane. Two inches of sand over the membrane will reduce punctures and aid in obtaining a satisfactory concrete cure. The sand should be moistened just prior to placing of concrete. The slabs should be protected from rapid and excessive moisture loss which could result in slab curling. Careful attention should be given to slab curing procedures, as the site area is subject to large temperature extremes, humidity, and strong winds.

Exterior Flatwork

To provide adequate support, exterior flatwork improvements should rest on a minimum of 12 inches of soil compacted to at least 90 percent (ASTM D 1557).

Flatwork surface should be sloped a minimum of 1 percent away from buildings and slopes, to approved drainage structures.

Wall Pressures

The design of footings for retaining structures should be performed in accordance with the recommendations described earlier under Preparation of Foundation Areas and Foundation Design. For design of retaining wall footings, the resultant of the applied loads should act in the middle one-third of the footing, and the maximum edge pressure should not exceed the basic allowable value without increase.

For design of retaining walls unrestrained against movement at the top, we recommend an equivalent fluid density of 50 pounds per cubic foot (pcf) be used. This assumes level backfill consisting of recompacted, non-expansive, native soils placed against the structures and with the backcut slope extending upward from the base of the stem at 35 degrees from the vertical or flatter.

To avoid overstressing or excessive tilting during placement of backfill behind walls, heavy compaction equipment should not be allowed within the zone delineated by a 45 degree line extending from the base of the wall to the fill surface.

The backfill directly behind the walls should be compacted using light equipment such as hand operated vibrating plates and rollers. No material larger than 3-inches in diameter should be placed in direct contact with the wall.

Wall pressures should be verified prior to construction, when the actual backfill materials and conditions have been determined. Recommended pressures are applicable only to level, non-expansive, properly drained backfill (with no additional surcharge loadings). If inclined backfills are proposed, this firm should be contacted to develop appropriate active earth pressure parameters. Toe bearing pressure for non-structural walls on soils, not prepared as described earlier under Preparation of Foundation Areas, should not exceed California Building Code values.

Sulfate Protection

The results of the soluble sulfate tests conducted on selected subgrade soils expected to be encountered at foundation levels are presented on Enclosure C.

Based on the test results it appears that there is a negligible sulfate exposure to concrete elements in contact with on site soils. The CBC, therefore, does not recommend special design criteria for concrete elements in conduct with such materials.

Preliminary Pavement Design

Testing and design for preliminary on-site pavement was conducted in accordance with the California Highway Design Manual. Based upon our preliminary sampling and testing, and upon Traffic Index indicated by the City of Moreno Valley Standard Plans (2018), it appears that the structural sections tabulated below should provide satisfactory pavements for the subject pavement improvements:

AREA	T.I.	DESIGN R-VALUE	PRELIMINARY SECTION
Local Street	6.0	30	0.35' AC*/0.70' CAB
AC - Asphalt Concrete CAB - Crushed Aggregate Base * City of Moreno Valley minimum			

The above structural sections are predicated upon 90 percent relative compaction (ASTM D 1557) of all utility trench backfills and 95 percent relative compaction (ASTM D 1557) of the upper 12 inches of pavement subgrade soils and of any aggregate base utilized.

In addition, the aggregate base should meet specifications for Crushed Aggregate Base.

In areas of the pavement which will receive high abrasion loads due to start-ups and stops, or where trucks will move on a tight turning radius, consideration should be given to installing concrete pads. Such pads should be a minimum of 0.5-foot thick concrete, with a 0.35-foot thick aggregate base. Concrete pads are also recommended in areas adjacent to trash storage areas where heavier loads will occur due to operation of trucks lifting trash dumpsters.

It should be noted that all of the above pavement design was based upon the results of preliminary sampling and testing, and should be verified by additional sampling and testing during construction when the actual subgrade soils are exposed.

Infiltration / Percolation

Based upon our field investigation and infiltration test data, the site soils are not considered suitable for infiltration or percolation. Therefore water quality storm water systems should not incorporate on-site infiltration/percolation when determining storm water treatment capacity.

Construction Monitoring

Post investigative services are an important and necessary continuation of this investigation. Project plans and specifications should be reviewed by the project geotechnical consultant prior to construction to confirm that the intent of the recommendations presented herein have been incorporated into the design.

Additional expansion index and soluble sulfate testing may be required after the site is rough graded.

During construction, sufficient and timely geotechnical observation and testing should be provided to correlate the findings of this investigation with the actual subsurface conditions exposed during construction. Items requiring observation and testing include, but are not necessarily limited to, the following:

1. Site preparation-stripping and removals.

2. Excavations, including approval of the bottom of excavation prior to filling.

3. Scarifying and recompacting prior to fill placement.

4. Subgrade preparation for pavements and slabs-on-grade.

5. Placement of engineered compacted fill and backfill, including approval of fill materials and the performance of sufficient density tests to evaluate the degree of compaction being achieved.

6. Foundation excavations.

LIMITATIONS

This report contains geotechnical conclusions and recommendations developed solely for use by Positive Investments, and their design consultants, for the purposes described earlier. It may not contain sufficient information for other uses or the purposes of other parties. The contents should not be extrapolated to other areas or used for other facilities without consulting LOR Geotechnical Group, Inc.

The recommendations are based on interpretations of the subsurface conditions concluded from information gained from subsurface explorations and a surficial site reconnaissance. The interpretations may differ from actual subsurface conditions, which can vary horizontally and vertically across the site. If conditions are encountered during the construction of the project which differ significantly from those presented in this report, this firm should be notified immediately in order that we may assess the impact to the recommendations provided. Due to possible subsurface variations, all aspects of field construction addressed in this report should be observed and tested by the project geotechnical consultant.

If parties other than LOR Geotechnical Group, Inc. provide construction monitoring services, they must be notified that they will be required to assume responsibility for the geotechnical phase of the project being completed by concurring with the recommendations provided in this report or by providing alternative recommendations.

The report was prepared using generally accepted geotechnical engineering practices under the direction of a state licensed geotechnical engineer. No warranty, expressed or implied, is made as to conclusions and professional advice included in this report. Any persons using this report for bidding or construction purposes should perform such independent investigations as deemed necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Governmental Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a significant amount of time without a review by LOR Geotechnical Group, Inc. verifying the suitability of the conclusions and recommendations.

CLOSURE

It has been a pleasure to assist you with this project. We look forward to being of further assistance to you as construction begins. Should conditions be encountered during construction that appear to be different than indicated by this report, please contact this office immediately in order that we might evaluate their effect.

Should you have any questions regarding this report, please do not hesitate to contact our office at your convenience.

Respectfully submitted,
LOR Geotechnical Group, Inc.

Andrew A. Tardie
Staff Geologist

Robert M. Markoff, CEG
Engineering Geologist

John P. Leuer, GE 2030
President

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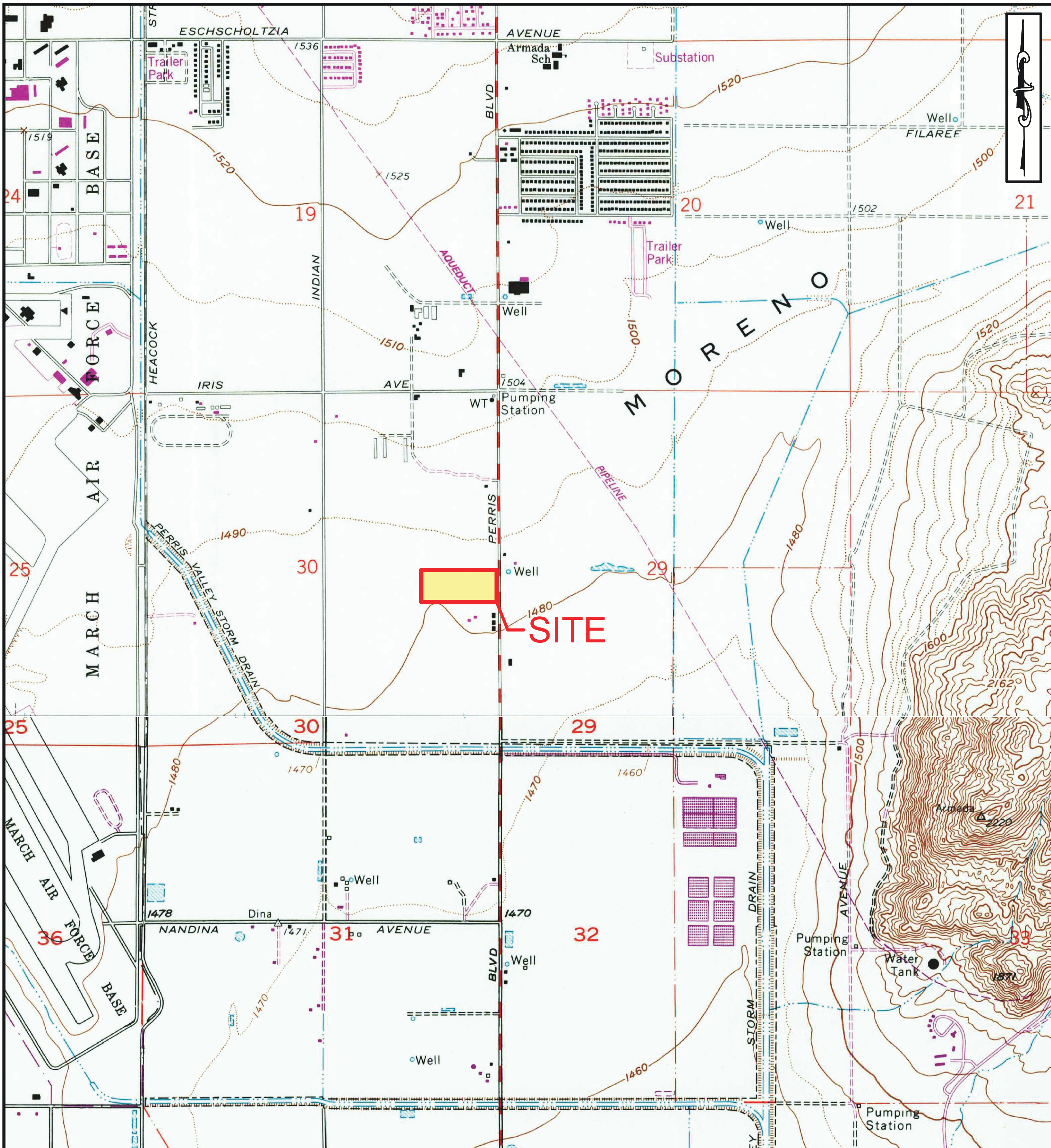
Western Municipal Water District, 2019, Cooperative Well Measuring Program Fall 2018, Final.

APPENDIX A

Index Map, Site Plan, Regional Geologic Map, and Seismicity Maps



INDEX MAP

PROJECT:	TENTATIVE TRACT MAP NO. 37725, MORENO VALLEY, CALIFORNIA	**PROJECT NO:**	33529.1
CLIENT:	POSITIVE INVESTMENTS	**ENCLOSURE:**	A-1
LOR Geotechnical Group, Inc.		**DATE:**	APRIL 2019
		SCALE:	1" = 2,000'

Legend

(Locations Approximate)

Map Symbols

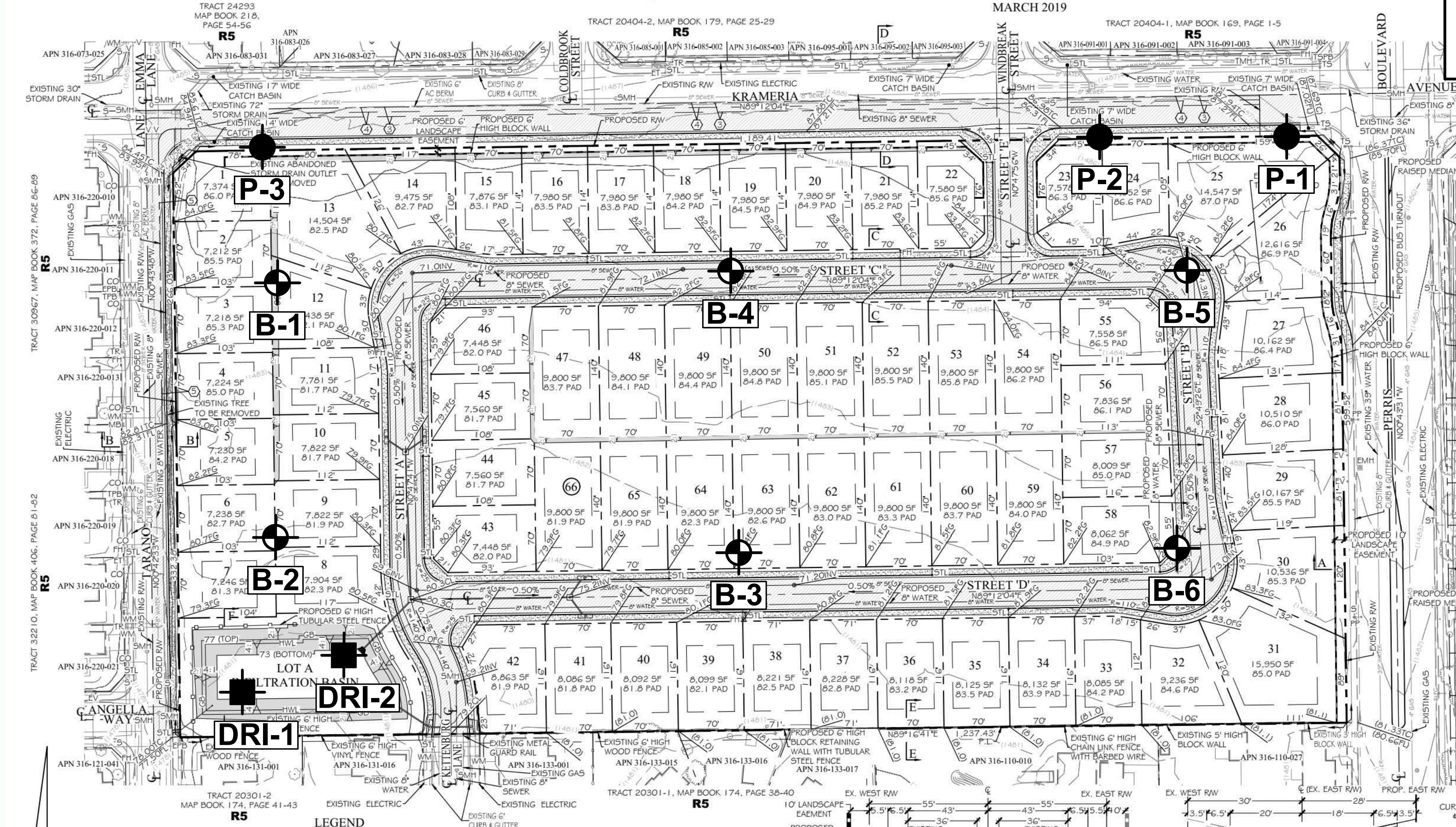
- **B-6** - Exploratory Boring Location
- **DRI-2** - Double-Ring Infiltrometer Test Location
- **P-3** - Percolation Test Location

IN THE CITY OF MORENO VALLEY

TENTATIVE TRACT MAP NO. 37725

BEING A SUBDIVISION OF A PORTION OF LOT 17, IN BLOCKS 2 OF RIVERSIDE ALFALFA ACRES, AS SHOWN BY MAP ON FILE IN BOOK 8 PAGE 21 OF MAPS, RECORDS OF RIVERSIDE COUNTY CALIFORNIA

MARCH 2019



THE SOUTH HALF OF LOT 17 IN BLOCK 2 OF RIVERSIDE ALFALFA ACRES, AS SHOWN BY MAP ON FILE IN BOOK 8 PAGE 21 OF MAPS, RECORDS OF RIVERSIDE COUNTY CALIFORNIA;

EXCEPTING FROM BOTH PARCELS ALL MINERALS, OIL, GAS AND OTHER HYDROCARBON SUBSTANCES IN AND UNDER OR THAT MAY BE PRODUCED FROM A DEPTH OF 500 FEET BELOW THE SURFACE OF SAID LAND, WITHOUT RIGHT OF ENTRY UPON THE SURFACE OF SAID LAND FOR THE PURPOSE OF MINING, DRILLING, EXPLORING OR EXTRACTING SUCH OIL, GAS AND OTHER HYDROCARBON SUBSTANCES OR OTHER USE OR RIGHTS IN OR TO ANY POTION OF THE SURFACE OF SAID LAND TO A DEPTH OF 500 FEET BELOW THE SURFACE THEREOF, BUT WITH THE RIGHT TO DRILL INTO, LOCATE WELLS AND PRODUCE OIL, GAS AND OTHER HYDROCARBON SUBSTANCES FROM ANY PORTION OF SAID LAND, WHICH LIES BELOW 500 FEET FROM THE SURFACE THEREOF.

EASEMENTS

1 AN EASEMENT FOR ELECTRICAL SUPPLY SYSTEMS IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY, RECORDED APRIL 9, 1974, AS INSTRUMENT NO. 41210, OFFICIAL RECORDS.

THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

2 AN EASEMENT FOR ACCEPTANCE OF DRAINAGE WATER DISCHARGED FROM PERRIS BOULEVARD IN FAVOR OF THE CITY OF MORENO VALLEY, RECORDED MAY 19, 1987 AS INSTRUMENT NO. 140504, OF OFFICIAL RECORDS.

THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

3 AN EASEMENT FOR CONSTRUCTION AND MAINTENANCE OF SHOULDER AND SLOPE BANKS IN FAVOR OF OVERSEAS REALITY ENTERPRISES, INC. AND CITY OF MORENO VALLEY, RECORDED MAY 19, 1987 AS INSTRUMENT NO. 140505, OF OFFICIAL RECORDS.

4 AN EASEMENT FOR CONSTRUCTION AND MAINTENANCE OF SLOPE BANKS IN FAVOR OF OVERSEAS REALITY ENTERPRISES, INC. AND CITY OF MORENO VALLEY, RECORDED SEPTEMBER 29, 1987 AS INSTRUMENT NO. 281832, OF OFFICIAL RECORDS.

5 AN EASEMENT FOR DRAINAGE IN FAVOR OF THE CITY OF MORENO VALLEY, RECORDED SEPTEMBER 29, 1987 AS INSTRUMENT NO. 281833, OF OFFICIAL RECORDS.

6 AN EASEMENT FOR PUBLIC HIGHWAY PURPOSED, INCLUDING PUBLIC UTILITY AND PUBLIC SERVICE FACILITIES OVER, UNDER, UPON, AND ACROSS IN FAVOR OF THE CITY OF MORENO VALLEY, A MUNICIPAL CORPORATION, RECORDED AUGUST 24, 1992 AS INSTRUMENT NO. 315033, OF OFFICIAL RECORDS.

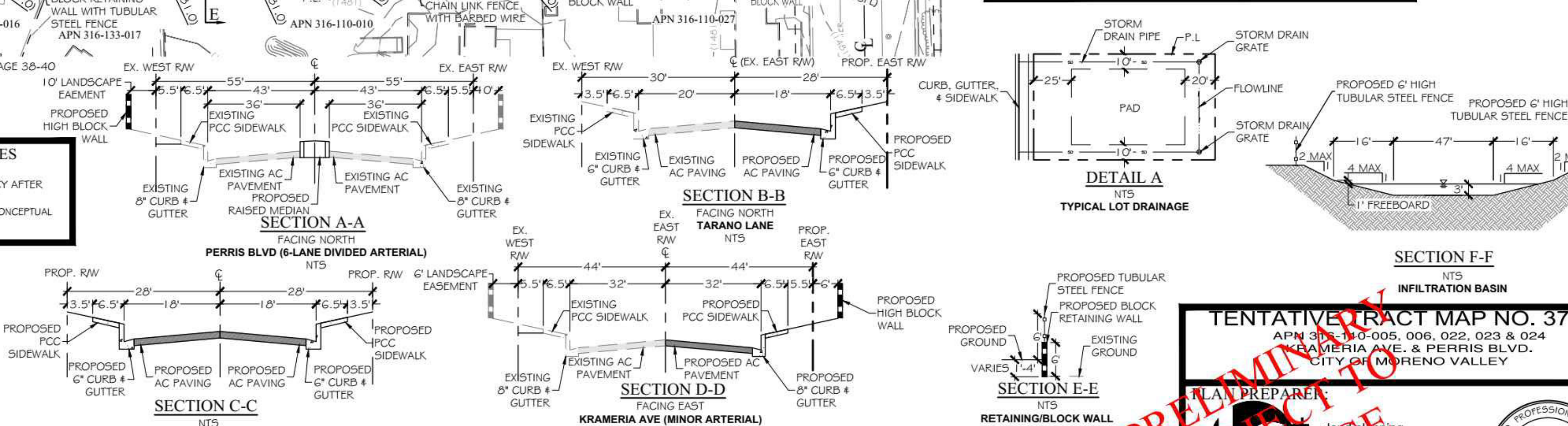
THE LOCATION OF SAID EASEMENT LIES WITHIN PERRIS BOULEVARD RIGHT-OF-WAY.

PROJECT NOTES

1. ASSESSORS PARCEL NUMBERS: 316-110-005, 006, 022, 023, & 024
2. GROSS AREA: 20.18 AC
   EXISTING NET AREA: 19.08 AC
   PROPOSED NET AREA: 17.62 AC
   AREA OF DEDICATION: 1.46 AC
3. EXISTING NUMBER OF LOTS: 5
4. PROPOSED NUMBER OF LOTS: 66 SINGLE FAMILY LOTS, & 1 COMMON LETTERED LOT
5. DRAINAGE AND GRADING SHOWN ON THIS PLAN IS CONCEPTUAL ONLY.
6. EXISTING/PROPOSED ZONING DESIGNATION: R5, SUBURBAN RESIDENTIAL.
7. EXISTING USE: VACANT
8. PROPOSED USE: SINGLE FAMILY RESIDENTIAL
9. PROJECT SITE IS LOCATED WITHIN ZONE 'X': AREA OF MINIMAL FLOOD HAZARD PER MAP PANEL NO. 06065C0765G, DATED AUGUST 28, 2008
10. THE TENTATIVE TRACT MAP INCLUDES THE ENTIRE CONTIGUOUS OWNERSHIP OF THE LAND DIVIDER.
11. NO EXISTING STRUCTURES ON SITE.
12. SLOPES GREATER THAN 2 FEET IN HEIGHT ARE SHOWN ON THIS PLAN.

Project Description

The project proposes to subdivide 20.18 gross acres (19.08 net acres) into sixty-six (66) single-family residential lots ranging in size from 7,212 SF to 15,950 SF, and one lettered lot.



PRELIMINARY EARTHWORK QUANTITIES

CUT	20,200 CY	(RAW/UNADJUSTED)
FILL	24,700 CY	(ANTICIPATED IMPORT IS 14,000 CY AFTER LOSSES)

NOTE: THE PROPOSED GRADING ON THIS PLAN IS STRICTLY CONCEPTUAL AND SHOULD ONLY BE USED FOR PLANNING PURPOSES.

LEGEND

CC COMMERCIAL
CO SEWER CLEAN OUT
CPB CABLE PULL BOX
ECAB ELECTRIC CABINET
EPB ELECTRIC PULL BOX
EMH ELECTRIC MANHOLE
ET ELECTRIC TRANSFORMER
EV ELECTRIC VENT
FH FIRE HYDRANT
MB MAILBOX
PCC PORTLAND CEMENT CONCRETE
P.L. PROPERTY LINE
RW RIGHT-OF-WAY
R5 SUBURBAN RESIDENTIAL
S SIGN
SDMH STORM DRAIN MANHOLE
SMH SEWER MANHOLE
STL STREET LIGHT
TMH TELEPHONE MANHOLE
TPB TELEPHONE PULL BOX
TR TELEPHONE RISER
TSPB TRAFFIC SIGNAL PULL BOX
V WATER VALVE
WM WATER METER

PROPOSED PCC SIDEWALK
PROPOSED AC STREET
PROPOSED 2:1 SLOPE (SLOPES LESS THAN 2' IN HEIGHT ARE NOT SHOWN)

EXISTING PALM TREE
EXISTING TREE
EXISTING WALL
EXISTING CURB/GUTTER
EXISTING CONTOURS
FLOWLINES
CENTERLINE
EXISTING R/W
PROPERTY LINES
EXISTING BUILDING FOOTPRINT
EXISTING UTILITY LINE
PROPOSED WALL
PROPOSED TUBULAR STEEL FENCE

UTILITIES:

ELECTRIC:
MORENO VALLEY ELECTRIC UTILITY
14177 FREDERICK STREET
MORENO VALLEY, CA 92552
(951) 413-3000

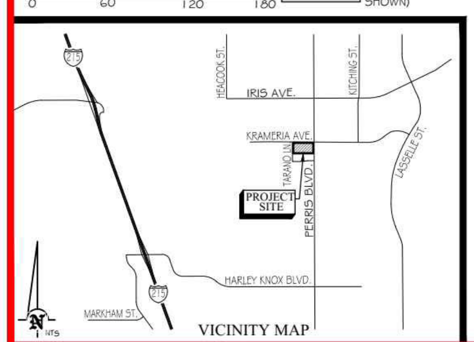
WATER/SEWER:
EASTERN MUNICIPAL WATER DISTRICT
2270 TRUMBLE ROAD
PERRIS, CA 92570
(951) 928-3777

TELEPHONE:
VERIZON
9 SOUTH 4TH STREET
REDLANDS, CA 92373
(909) 748-6676

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
1981 WEST LUGONIA AVENUE
REDLANDS, CA 92373
(909) 335-7750

CABLE:
CHARTER COMMUNICATIONS
7337 CENTRAL AVENUE
RIVERSIDE, CA 92504
(951)406-1666

SCHOOL DISTRICT:
MORENO VALLEY UNIFIED SCHOOL DISTRICT
25634 ALESSANDRO BLVD
MORENO VALLEY, CA 92553
(951) 571-7500



VICINITY MAP

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED DECEMBER 2018
AS CONDUCTED BY
ONPOINT LAND SURVEYING, INC.
1910 ORANGE TREE LANE, SUITE 344
REDLANDS, CALIFORNIA 92374
PHONE: (909) 792-2221

BENCHMARK

CITY OF MORENO VALLEY M-31 SET 3-1/4" ALUMINUM DISK STAMPED RIV. CO. SURVEYOR M-31 RESET APRIL 1996, FLUSH AT THE SW COR. OF BRIDGE ON TOP OF SIDEWALK NEAR FACE OF CURB LOCATED AT THE CROSSING OF PERRIS BLVD. AND RIV. CO. FLOOD CONTROL CHANNEL (PERRIS LATERAL "A"). 43' W OF THE CENTERLINE OF PERRIS BLVD. & 4.5' E OF CONCRETE BRIDGE BARRIER. (EDGE OF BRIDGE)
ELEVATION = 1474.674'

BASIS OF BEARING

CENTERLINE OF KRAMERIA STREET BETWEEN TARANO LN. AND PERRIS BLVD. BEARING BEING N89°12'04"E PER TRACT NO. 20404-1 MB 169/1-5.

OWNER/DEVELOPER/APPLICANT:

PI PROPERTIES NO. 67 LLC
CO: POSITIVE INVESTMENTS
ATTN: MR. MOHAN KONDRAGUNTA
610 NORTH SANTA ANITA AVENUE
ARCADIA, CA 91006
PHONE: (626) 321-4845

TENTATIVE TRACT MAP NO. 37725
APN 316-110-005, 006, 022, 023 & 024
KRAMERIA AVE. & PERRIS BLVD.
CITY OF MORENO VALLEY

PLAT PREPARER:
thatcher engineering & associates, inc.
land planning, civil engineering, landscape architecture

PRELIMINARY SUBJECT TO CHANGE

Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2020

Job Number:	Date Prepared:	Drawn By:	Reference Number:
169801	3/25/19	RL	169801TTM

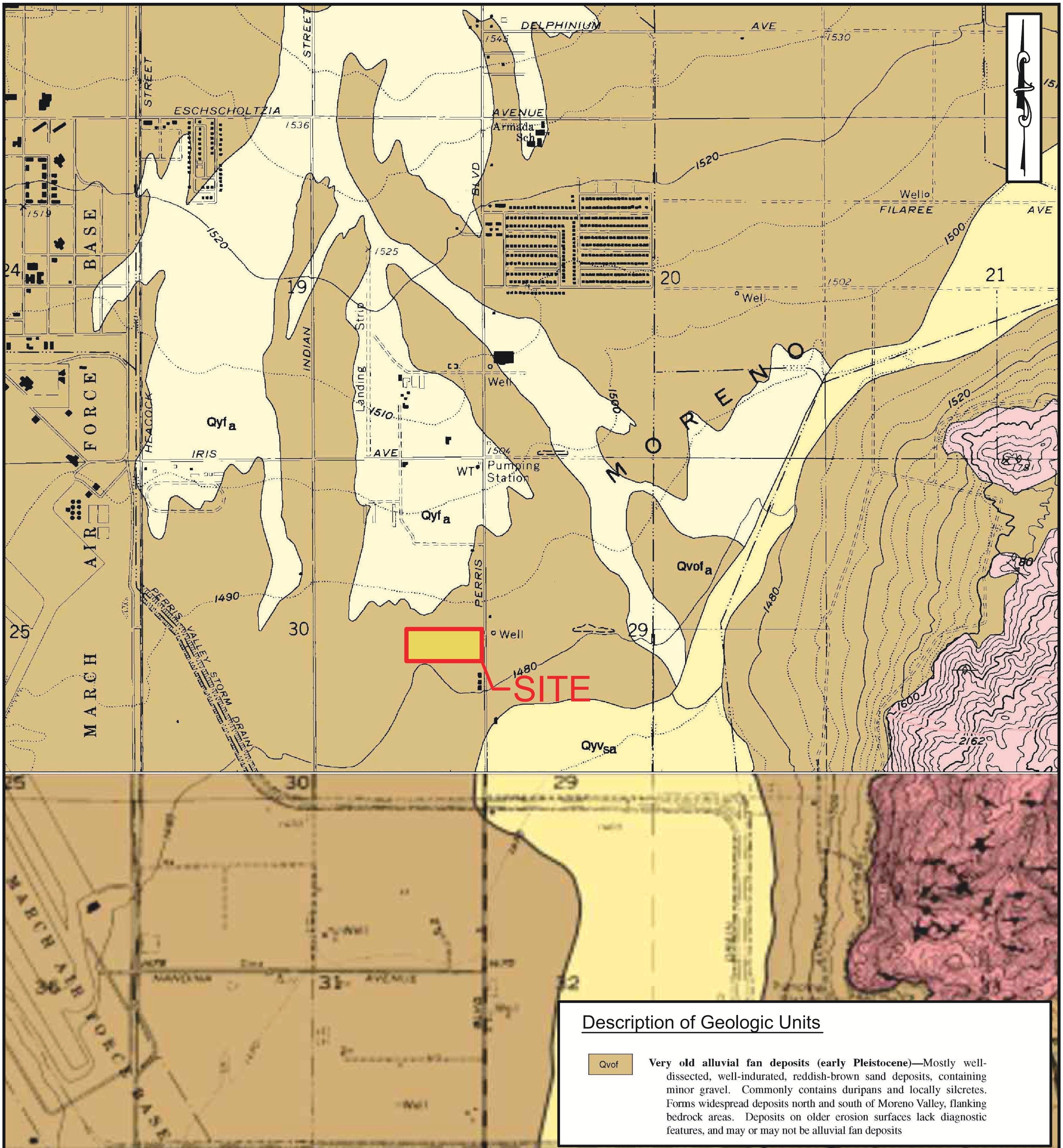
SITE PLAN

TENTATIVE TRACT MAP NO. 37725, MORENO VALLEY, CALIFORNIA

POSITIVE INVESTMENTS

LOR Geotechnical Group, Inc.

PROJECT NO:	33529.1
ENCLOSURE:	A-2
DATE:	APRIL 2019
SCALE:	1" ≈ 140'
PROJECT:	TENTATIVE TRACT MAP NO. 37725, MORENO VALLEY, CALIFORNIA
CLIENT:	POSITIVE INVESTMENTS



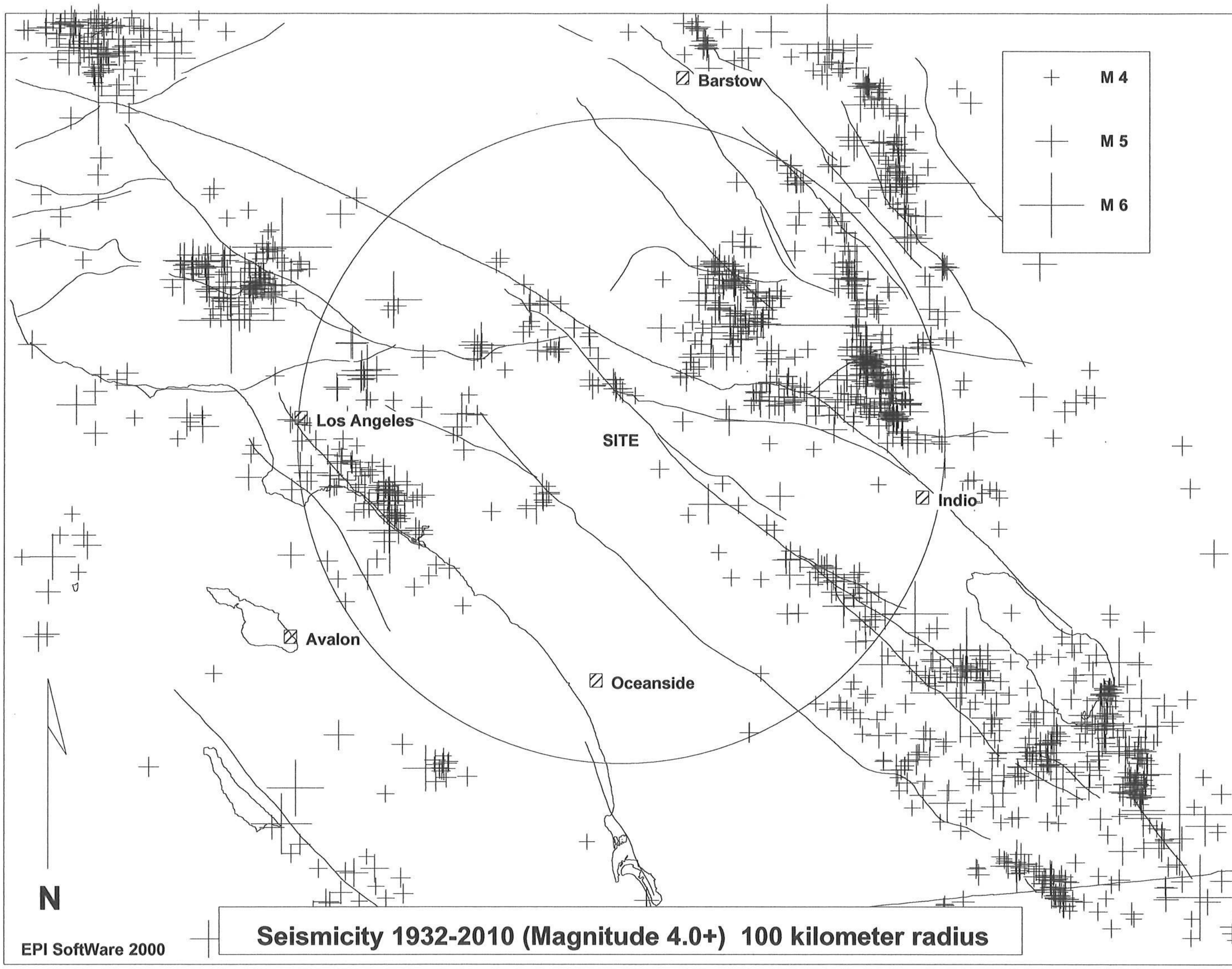
Description of Geologic Units

Qvof — **Very old alluvial fan deposits (early Pleistocene)**—Mostly well-dissected, well-indurated, reddish-brown sand deposits, containing minor gravel. Commonly contains duripans and locally silcretes. Forms widespread deposits north and south of Moreno Valley, flanking bedrock areas. Deposits on older erosion surfaces lack diagnostic features, and may or may not be alluvial fan deposits

REGIONAL GEOLOGIC MAP

(Morton & Matti, 2001 & Morton, 2003)

PROJECT:	TENTATIVE TRACT MAP NO. 37725, MORENO VALLEY, CALIFORNIA	**PROJECT NO:**	33529.1
CLIENT:	POSITIVE INVESTMENTS	**ENCLOSURE:**	A-3
LOR Geotechnical Group, Inc.		**DATE:**	APRIL 2019
		SCALE:	1" = 2,000'



SITE LOCATION: 33.88001 LAT. -117.22842 LONG.

MINIMUM LOCATION QUALITY: C

TOTAL # OF EVENTS ON PLOT: 1498

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 600

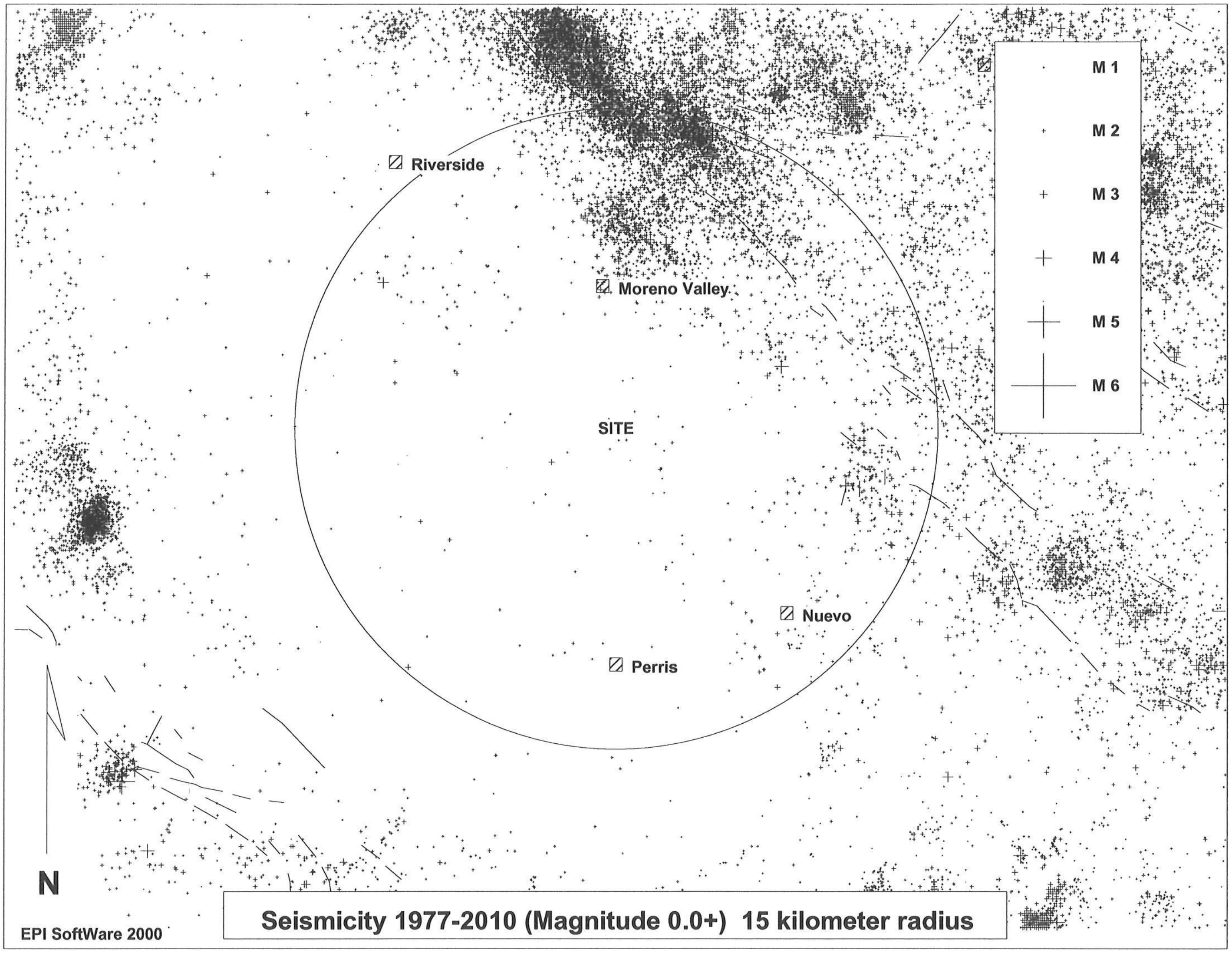
MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

4.0- 4.9 : 539
5.0- 5.9 : 56
6.0- 6.9 : 4
7.0- 7.9 : 1
8.0- 8.9 : 0

CLOSEST EVENT: 4.1 ON SATURDAY, FEBRUARY 13, 201(LOCATED APPROX. 15 KILOMETERS NORTH OF THE SITE

LARGEST 5 EVENTS:

7.3 ON SUNDAY, JUNE 28, 1992 LOCATED APPROX. 81 KILOMETERS NORTHEAST OF THE SITE
6.4 ON SATURDAY, MARCH 11, 193: LOCATED APPROX. 76 KILOMETERS SOUTHWEST OF THE SITE
6.3 ON SUNDAY, JUNE 28, 1992 LOCATED APPROX. 51 KILOMETERS NORTHEAST OF THE SITE
6.1 ON THURSDAY, APRIL 23, 199: LOCATED APPROX. 84 KILOMETERS EAST OF THE SITE
6.0 ON SATURDAY, DECEMBER 04, 194ε LOCATED APPROX. 83 KILOMETERS EAST OF THE SITE



SITE LOCATION: 33.88001 LAT. -117.22842 LONG.

0 7 15
KILOMETERS

MINIMUM LOCATION QUALITY: A

TOTAL # OF EVENTS ON PLOT: 20316

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 4224

MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

0.0- .9 : 509
1.0- 1.9 : 3174
2.0- 2.9 : 518
3.0- 3.9 : 22
4.0- 4.9 : 1
5.0- 5.9 : 0
6.0- 6.9 : 0
7.0- 7.9 : 0
8.0- 8.9 : 0

CLOSEST EVENT: 0.0 ON FRIDAY, NOVEMBER 16, 1979 LOCATED APPROX. .4 KILOMETER OF THE SITE

LARGEST 5 EVENTS:

4.1 ON SATURDAY, FEBRUARY 13, 2010 LOCATED APPROX. 14 KILOMETERS NORTH OF THE SITE
3.8 ON MONDAY, JULY 10, 2006 LOCATED APPROX. 11 KILOMETERS EAST OF THE SITE
3.8 ON THURSDAY, SEPTEMBER 12, 1996 LOCATED APPROX. 8 KILOMETERS NORTHEAST OF THE SITE
3.8 ON SATURDAY, MARCH 20, 1993 LOCATED APPROX. 14 KILOMETERS NORTH OF THE SITE
3.5 ON TUESDAY, JANUARY 24, 1995 LOCATED APPROX. 12 KILOMETERS NORTHWEST OF THE SITE

Enclosure A-5

APPENDIX B

Field Investigation Program and Boring Logs

APPENDIX B
FIELD INVESTIGATION

Subsurface Exploration

The site was investigated on April 18, 2019 and consisted of advancing 6 exploratory borings to depths between 21 feet and 51.5 feet below the existing ground surface. The approximate locations of the borings are shown on Enclosure A-2, within Appendix A.

The drilling exploration was conducted using a truck-mounted Mobile B61 drill rig equipped with 8-inch diameter hollow stem augers. The soils were continuously logged by our geologist who inspected the site, created detailed logs of the borings, obtained undisturbed, as well as disturbed, soil samples for evaluation and testing, and classified the soils by visual examination in accordance with the Unified Soil Classification System.

Relatively undisturbed samples of the subsoils were obtained at a maximum interval of 5 feet. The samples were recovered by using a California split barrel sampler of 2.50 inch inside diameter and 3.25 inch outside diameter from the ground surface to the total depth explored. The samplers were driven by a 140 pound automatic trip hammer dropped from a height of 30 inches. The number of hammer blows required to drive the sampler into the ground the final 12 inches were recorded and further converted to an equivalent SPT N-value. Factors such as efficiency of the automatic trip hammer used during this investigation (80%), borehole diameter (8"), and rod length at the test depth were considered for further computing of equivalent SPT N-values corrected for field procedures (N60) which are included in the boring logs, Enclosures B-1 through B-3.

The undisturbed soil samples were retained in brass sample rings of 2.42 inches in diameter and 1.00 inch in height, and placed in sealed containers. Disturbed soil samples were obtained at selected levels within the borings and placed in sealed containers for transport to the laboratory.

All samples obtained were taken to our geotechnical laboratory for storage and testing. Detailed logs of the borings are presented on the enclosed Boring Logs, Enclosures B-1 through B-6. A Boring Log Legend and Soil Classification Chart are presented on Enclosures B-I and B-ii, respectively.

LOG OF BORING B-1

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0	24	9, 10	7.4		120.1			SM	@ 0 feet, <u>FILL:</u> SILTY SAND, approximately 10% coarse grained sand, 30% medium grained sand, 35% fine grained sand, 25% silty fines, brown, dry, loose. @ 2 feet, <u>OLDER ALLUVIUM:</u> SILTY SAND, approximately 20% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 30% silty fines with trace clay, red-brown, damp.
5	30		12.3		111.0			ML	@ 5 feet, SANDY SILT, trace gravel to 1/2", approximately 5% coarse grained sand, 10% medium grained sand, 30% fine grained sand, 55% silty fines, red-brown, damp, some thin calcite stringers, some pinhole porosity.
10	75 for 11"		7.5		121.9				@ 10 feet, becomes slightly finer grained, no visible porosity, no secondary calcite, dry.
15	45		10.4		126.0				@ 15 feet, trace secondary calcite as nodules.
20	81 for 11"		7.9		130.1			ML SM	@ 20 feet, SANDY SILT/SILTY SAND, approximately 15% coarse grained sand, 15% medium grained sand, 20% fine grained sand, 50% silty fines, red-brown, damp.
25	35		15.7		114.3			SM	@ 25 feet, SILTY SAND, approximately 20% coarse grained sand, 20% medium grained sand, 30% fine grained sand, 30% silty fines with trace clay, red-brown, moist.
30	38		12.3		117.8	▽		CL	@ 30 feet, LEAN CLAY with SAND, approximately 5% coarse grained sand, 15% medium grained sand, 20% fine grained sand, 60% clayey fines of low plasticity, moist. @ 32 feet, groundwater.
35	43		13.4		118.9				
40	40		13.0		121.1				
45	38		14.8		118.0				
50	43		19.9		108.6				END OF BORING @ 51.5'
55									Fill to 2' Groundwater @ 32' No bedrock

PROJECT:	Tentative Tract Map No. 37725	PROJECT NUMBER:	33529.1
CLIENT:	Positive Investments	ELEVATION:	1484
		DATE DRILLED:	April 18, 2019
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	Mobile B-61
		HOLE DIA.: 8"	ENCLOSURE: B-1

LOG OF BORING B-2

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, FILL: SILTY SAND, approximately 10% coarse grained sand, 25% medium grained sand, 30% fine grained sand, 30% silty fines with trace clay, brown, dry, loose.
	13	3, 4, 7, 11	4.5		114.6			ML CL	@ 2 feet, OLDER ALLUVIUM: SANDY SILT/LEAN CLAY with SAND, approximately 15% coarse grained sand, 15% medium grained sand, 20% fine grained sand, 50% silty and clayey fines, red-brown, dry, some pinhole porosity.
5	66 for 11"		5.3		111.7				@ 5 feet, becomes dry, pinhole porosity remains, some thin calcite stringers.
	66 for 11"		6.4		113.6			SM	@ 7 feet, SILTY SAND, approximately 25% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 15% silty fines, red-brown, dry.
10	68		7.2		124.3				@ 10 feet, becomes finer grained, approximately 15% coarse grained sand, 25% medium grained sand, 30% fine grained sand, 30% silty fines, red-brown, dry.
15	38		11.8		122.3			CL	@ 15 feet, LEAN CLAY with SAND, approximately 5% coasre grained sand, 15% medium grained sand, 20% fine grained sand, 60% clayey fines of low plasticity, red-brown, damp, some calcite nodules.
20	69		8.9		128.2				@ 20 feet, contains some pinhole porosity, no calcite.
									END OF BORING @ 21.5' Fill to 2' No groundwater No bedrock
25									

PROJECT:	Tentative Tract Map No. 37725	PROJECT NUMBER:	33529.1
CLIENT:	Positive Investments	ELEVATION:	1482
		DATE DRILLED:	April 18, 2019
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	Mobile B-61
		HOLE DIA.: 8"	ENCLOSURE: B-2

LOG OF BORING B-3

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0		3, 7, 8 9, 10, 11						SM	@ 0 feet, FILL: SILTY SAND, approximately 20% coarse grained sand, 20% medium grained sand, 40% fine grained sand, 30% silty fines, brown, dry, loose.
	24		14.0		108.9			CL	@ 2 feet, OLDER ALLUVIUM: LEAN CLAY with SAND, approximately 5% coarse grained sand, 10% medium grained sand, 30% fine grained sand, 65% clayey fines of low plasticity, red-brown, damp, some pinhole porosity, some thin calcite stringers.
5	23		14.2		110.5				@ 5 feet, becomes strong brown, no visible porosity.
10	28		6.2		118.9			SM	@ 10 feet, SILTY SAND, approximately 25% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 15% silty fines with trace clay, red-brown, damp, some pinhole porosity.
15	54		5.1		123.7				
20	63		7.7		126.5				@ 20 feet, slight increase in silty fines with trace clay.
25	25		15.0		112.9			CL	@ 25 feet, LEAN CLAY with SAND, approximately 15% coarse grained sand, 20% medium grained sand, 20% fine grained sand, 55% clayey fines of low plasticity, red-brown, damp.
									END OF BORING @ 26.5'
									Fill to 2' No groundwater No bedrock
30									

PROJECT:	Tentative Tract Map No. 37725	PROJECT NUMBER:	33529.1
CLIENT:	Positive Investments	ELEVATION:	1482
		DATE DRILLED:	April 18, 2019
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	Mobile B-61
		HOLE DIA.: 8"	ENCLOSURE: B-3

LOG OF BORING B-4

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, <u>FILL:</u> SILTY SAND, approximately 10% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 30% silty fines, brown, dry, loose.
	19		3.1		117.1				@ 2 feet, <u>OLDER ALLUVIUM:</u> SILTY SAND, approximately 25% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 15% silty fines, red-brown, dry.
5	28		7.1		115.9			CL	@ 5 feet, LEAN CLAY with SAND, approximately 10% coarse grained sand, 15% medium grained sand, 15% fine grained sand, 60% clayey fines of low plasticity, red-brown, dry, some pinhole porosity, some thin calcite stringers.
10	48		9.4		125.7				@ 10 feet, calcite stringers no longer present.
15	36		4.7		118.6			SM	@ 15 feet, SILTY SAND, approximately 25% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 15% silty fines, strong brown, dry.
20	74		5.8		120.7				@ 20 feet, SILTY SAND, approximately 20% coarse grained sand, 20% medium grained sand, 25% fine grained sand, 35% silty fines, red-brown, dry.
									END OF BORING @ 21' Fill to 2' No groundwater No bedrock
25									

PROJECT:	Tentative Tract Map No. 37725	PROJECT NUMBER:	33529.1
CLIENT:	Positive Investments	ELEVATION:	1484
		DATE DRILLED:	April 18, 2019
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	Mobile B-61
		HOLE DIA.: 8"	ENCLOSURE: B-4

LOG OF BORING B-5

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, FILL: SILTY SAND, approximately 15% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 25% silty fines, brown, dry, loose.
	14		3.1		117.0				@ 2 feet, OLDER ALLUVIUM: SILTY SAND, approximately 20% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 30% silty fines, strong brown, damp, trace pinhole porosity.
5	18		3.3		113.1				@ 5 feet, becomes yellowish-brown, dry.
10	26		7.8		119.6			CL	@ 10 feet, LEAN CLAY with SAND, approximately 15% coarse grained sand, 15% medium grained sand, 15% fine grained sand, 55% clayey fines of low plasticity, red-brown, damp, some pinhole porosity.
15	33		10.7		118.2				@ 15 feet, becomes slightly finer grained.
20	61		6.6		122.7				
25	24		12.4		115.8				@ 25 feet, becomes moist, some secondary calcite, light red-brown.
									END OF BORING @ 26.5' Fill to 2' No groundwater No bedrock
30									

PROJECT:	Tentative Tract Map No. 37725	PROJECT NUMBER:	33529.1
CLIENT:	Positive Investments	ELEVATION:	1485
		DATE DRILLED:	April 18, 2019
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	Mobile B-61
		HOLE DIA.: 8"	ENCLOSURE: B-5

LOG OF BORING B-6

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0	10	9, 10	4.2		109.6			SM	@ 0 feet, FILL: SILTY SAND, approximately 15% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 35% silty fines, brown, dry, loose. @ 2 feet, OLDER ALLUVIUM: SLTY SAND, approximately 20% coarse grained sand, 25% medium grained sand, 30% fine grained sand, 25% silty fines, strong brown, dry, some pinhole porosity.
5	18		14.8		110.1			CL	@ 5 feet, LEAN CLAY with SAND, approximately 5% coarse grained sand, 10% medium grained sand, 20% fine grained sand, 65% clayey fines of low pasticity, strong brown, damp, some pinhole porosity, some thin calcite stringers.
10	47		7.8		121.9				@ 10 feet, becomes red-brown, no visible porosity, no secondary calcite.
15	54		2.5		120.4			SM	@ 16 feet, SILTY SAND, approximately 25% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 15% silty fines, strong brown, dry.
20	42		7.5		123.1			CL	@ 20 feet, LEAN CLAY with SAND, approximately 10% coarse grained sand, 15% medium grained sand, 20% fine grained sand, 55% clayey fines of low plasticity, red-brown, damp, trace pinhole porosity.
25	31		14.0		114.4				@ 25 feet, becomes moist.
						∇			@ 29.5 feet, groundwater.
30	32		16.3		111.8				END OF BORING @ 31.5' Fill to 2' Groundwater @ 29.5' No bedrock
35									

PROJECT:	Tentative Tract Map No. 37725	PROJECT NUMBER:	33529.1
CLIENT:	Positive Investments	ELEVATION:	1483
		DATE DRILLED:	April 18, 2019
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	Mobile B-61
		HOLE DIA.: 8"	ENCLOSURE: B-6

CONSISTENCY OF SOIL

SANDS

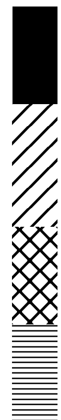
SPT BLOWS	CONSISTENCY
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
Over 50	Very Dense

COHESIVE SOILS

SPT BLOWS	CONSISTENCY
0-2	Very Soft
2-4	Soft
4-8	Medium
8-15	Stiff
15-30	Very Stiff
30-60	Hard
Over 60	Very Hard

SAMPLE KEY

Symbol **Description**



INDICATES CALIFORNIA SPLIT SPOON SOIL SAMPLE

INDICATES BULK SAMPLE

INDICATES SAND CONE OR NUCLEAR DENSITY TEST

INDICATES STANDARD PENETRATION TEST (SPT) SOIL SAMPLE

TYPES OF LABORATORY TESTS

1	Atterberg Limits
2	Consolidation
3	Direct Shear (undisturbed or remolded)
4	Expansion Index
5	Hydrometer
6	Organic Content
7	Proctor (4", 6", or Cal216)
8	R-value
9	Sand Equivalent
10	Sieve Analysis
11	Soluble Sulfate Content
12	Swell
13	Wash 200 Sieve

BORING LOG LEGEND

PROJECT:	TENTATIVE TRACT MAP NO. 37725, MORENO VALLEY, CALIFORNIA	PROJECT NO.:	33529.1
CLIENT:	POSITIVE INVESTMENTS	ENCLOSURE:	B-i
LOR Geotechnical Group, Inc.		DATE:	APRIL 2019

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

PARTICLE SIZE LIMITS

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" No. 4 No. 10 No. 40 200

(U.S. STANDARD SIEVE SIZE)

SOIL CLASSIFICATION CHART

PROJECT	TENTATIVE TRACT MAP NO. 37725, MORENO VALLEY, CALIFORNIA	PROJECT NO.	33529.1
CLIENT:	POSITIVE INVESTMENTS	ENCLOSURE:	B-ii
LOR Geotechnical Group, Inc.		DATE:	APRIL 2019

APPENDIX C

Laboratory Testing Program and Test Results

APPENDIX C
LABORATORY TESTING

General

Selected soil samples obtained from our borings were tested in our geotechnical laboratory to evaluate the physical properties of the soils affecting foundation design and construction procedures. The laboratory testing program performed in conjunction with our investigation included in-place moisture content and dry density, laboratory compaction characteristics, direct shear, expansion index, sieve analysis, sand equivalent, R-value, and soluble sulfate content. Descriptions of the laboratory tests are presented in the following paragraphs:

Moisture Density Tests

The moisture content and dry density information provides an indirect measure of soil consistency for each stratum, and can also provide a correlation between soils on this site. The dry unit weight and field moisture content were determined for selected undisturbed samples, in accordance with ASTM D 2922 and ASTM D 2216, respectively, and the results are shown on the Boring Logs, Enclosures B-1 through B-6 for convenient correlation with the soil profile.

Laboratory Compaction

Selected soil samples were tested in the laboratory to determine compaction characteristics using the ASTM D 1557 compaction test method. The results are presented in the following table:

LABORATORY COMPACTION				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.G.S.)**	**Maximum Dry Density (pcf)**	**Optimum Moisture Content (percent)**
B-2	2-4	(ML/CL) Sandy Silt/Lean Clay with Sand	131.5	8.0
B-3	0-3	(SM) Silty Sand	134.5	7.5

Direct Shear Tests

Shear tests are performed with a direct shear machine in general accordance with ASTM D 3080 at a constant rate-of-strain (usually 0.04 inches/minute). The machine is designed to test a sample partially extruded from a sample ring in single shear. Samples are tested at varying normal loads in order to evaluate the shear strength parameters, angle of internal friction and cohesion. Samples are tested in a remolded condition (90 percent relative compaction per ASTM D 1557) and soaked, to represented the worse case conditions expected in the field.

The results of the shear tests are presented in the following table:

DIRECT SHEAR TESTS				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.G.S.)**	**Angle of Internal Friction (degrees)**	**Apparent Cohesion (psf)**
B-2	2-4	(ML/CL) Sandy Silt/Lean Clay with Sand	25	400
B-3	0-3	(SM) Silty Sand	25	400

Expansion Index Tests

Remolded samples are tested to determine their expansion potential in accordance with the Expansion Index (EI) test. The test is performed in accordance with the Uniform Building Code Standard 18-2. The test results are presented in the following table:

EXPANSION INDEX TESTS				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.C.S.)**	**Expansion Index (EI)**	**Expansion Potential**
B-3	0-3	(SM) Silty Sand	15	Very Low

Sieve Analysis

A quantitative determination of the grain size distribution was performed for selected samples in accordance with the ASTM D 422 laboratory test procedure. The determination is performed by passing the soil through a series of sieves, and recording the weights of retained particles on each screen. The results of the sieve analyses are presented graphically on Enclosure C-1.

Sand Equivalent

The sand equivalent of selected soils were evaluated using the California Sand Equivalent Test Method, Caltrans Number 217. The results of the sand equivalent tests are presented with the grain size distribution analyses on Enclosure C-1.

R-Value Test

Soil samples were obtained at probable pavement subgrade level and was tested to determine its R-value using the California R-Value Test Method, Caltrans Number 301.The results of the R-value test is presented on Enclosure C-1.

Soluble Sulfate Content Tests

The soluble sulfate content of selected subgrade soils was evaluated and the concentration of soluble sulfates in the soils was determined by measuring the optical density of a barium sulfate precipitate. The precipitate results from a reaction of barium chloride with water extractions from the soil samples. The measured optical density is correlated with readings on precipitates of known sulfate concentrations. The test results are presented on the following table:

SOLUBLE SULFATE CONTENT TESTS			
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.G.S.)**	**Sulfate Content (percent by weight)**
B-2	2-4	(ML/CL) Sandy Silt/Lean Clay with Sand	< 0.005
B-3	0-3	(SM) Silty Sand	< 0.005

APPENDIX D

Percolation and Infiltration Test Results

FALLING HEAD PERCOLATION TEST RESULTS

PROJECT NO.: 33529.1

DATE TESTED: 04/18/19

PROJECT: Tentative Tract Map No. 37725

HOLE DIAMETER: 8 in

LOCATION: Moreno Valley, California

PIPE DIAMETER: 3 in

TESTED BY: A.L.

% VOIDS IN GRAVEL / 100 0.5

TEST NO: P-1

GRAVEL CORRECTION FACTOR: 0.570

DATE DRILLED: 04/18/19

READING	TIME START	TIME STOP	TIME INTERVAL		TOTAL TIME	INITIAL WATER LEVEL		FINAL WATER LEVEL		INITIAL HOLE DEPTH		FINAL HOLE DEPTH		CHANGE IN WATER LEVEL	AVERAGE WETTED DEPTH	Q*	
			min	hr.	hr.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	ft.	gal/sq.ft./day	in/hr**
TEST PERIOD																	
1	9:13	9:38	25	0.42	0.42	5	0	5	7	15	0	15	0	0.58	9.71	7.6	0.28
2	9:40	10:05	25	0.42	0.83	5	0	5	8	15	0	15	0	0.67	9.67	8.7	0.33
3	10:06	10:36	30	0.50	1.33	5	0	5	9	15	0	15	0	0.75	9.63	8.2	0.31
4	10:39	11:09	30	0.50	1.83	5	0	5	8	15	0	15	0	0.67	9.67	7.3	0.27
5	11:10	11:40	30	0.50	2.33	5	1	5	10	15	0	15	0	0.75	9.54	8.3	0.31
6	11:41	12:11	30	0.50	2.83	5	0	5	9	15	0	15	0	0.75	9.63	8.2	0.31
7	12:12	12:42	30	0.50	3.33	5	0	5	10	15	0	15	0	0.83	9.58	9.1	0.34
8	12:43	13:13	30	0.50	3.83	5	0	5	10	15	0	15	0	0.83	9.58	9.1	0.34
9	13:14	13:43	29	0.48	4.32	5	1	5	10	15	0	15	0	0.75	9.54	8.6	0.32
10	13:44	14:14	30	0.50	4.82	5	0	5	9	15	0	15	0	0.75	9.63	8.2	0.34
11	14:15	14:45	30	0.50	5.32	5	0	5	10	15	0	15	0	0.83	9.58	9.1	0.34
12	14:46	15:16	30	0.50	5.82	5	0	5	10	15	0	15	0	0.83	9.58	9.1	0.34
13	15:16	15:46	30	0.50	6.32	5	10	6	6	15	0	15	0	0.67	8.83	7.9	0.30

BORING DEPTH: 15.0 ft

INITIAL TEST HOLE DEPTH: 15.0 ft

FINAL TEST HOLE DEPTH: 15.0 ft

* = clear water rate

** = Porchet Method

FALLING HEAD PERCOLATION TEST RESULTS

PROJECT NO.:	33529.1	DATE TESTED:	04/18/19
PROJECT:	Tentative Tract Map No. 37725	HOLE DIAMETER:	8 in
LOCATION:	Moreno Valley, California	PIPE DIAMETER:	3 in
TESTED BY:	A.L.	% VOIDS IN GRAVEL / 100	0.5
TEST NO:	P-2	GRAVEL CORRECTION FACTOR:	0.570
DATE DRILLED:	04/18/19		

READING	TIME START	TIME STOP	TIME INTERVAL		TOTAL TIME	INITIAL WATER LEVEL		FINAL WATER LEVEL		INITIAL HOLE DEPTH		FINAL HOLE DEPTH		CHANGE IN WATER LEVEL	AVERAGE WETTED DEPTH	Q*	
			min	hr.	hr.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	ft.	gal/sq.ft./day	in/hr**
TEST PERIOD																	
1	9:12	9:37	25	0.42	0.42	5	0	7	1	15	0	15	0	2.08	8.96	29.4	1.10
2	9:38	10:03	25	0.42	0.83	4	9	6	9	15	0	15	0	2.00	9.25	27.3	1.02
3	10:04	10:34	30	0.50	1.33	5	1	7	1	15	0	15	0	2.00	8.92	23.6	0.88
4	10:36	11:06	30	0.50	1.83	5	0	7	0	15	0	15	0	2.00	9.00	23.4	0.87
5	11:07	11:37	30	0.50	2.33	5	0	7	0	15	0	15	0	2.00	9.00	23.4	0.87
6	11:39	12:09	30	0.50	2.83	5	0	7	0	15	0	15	0	2.00	9.00	23.4	0.87
7	12:10	12:40	30	0.50	3.33	5	0	7	0	15	0	15	0	2.00	9.00	23.4	0.87
8	12:41	13:11	30	0.50	3.83	5	3	7	2	15	0	15	0	1.92	8.79	22.9	0.86
9	13:11	13:41	30	0.50	4.33	5	0	6	11	15	0	15	0	1.92	9.04	22.3	0.83
10	13:42	14:12	30	0.50	4.83	5	0	7	0	15	0	15	0	2.00	9.00	23.4	0.87
11	14:13	14:43	30	0.50	5.33	5	0	7	0	15	0	15	0	2.00	9.00	23.4	0.87
12	14:44	15:14	30	0.50	5.83	5	0	6	11	15	0	15	0	1.92	9.04	22.3	0.83
13	15:14	15:44	30	0.50	6.33	6	11	7	9	15	0	15	0	0.83	7.67	11.4	0.43

BORING DEPTH:	15.0	ft
INITIAL TEST HOLE DEPTH:	15.0	ft
FINAL TEST HOLE DEPTH:	15.0	ft

* = clear water rate

** = Porchet Method

FALLING HEAD PERCOLATION TEST RESULTS

PROJECT NO.: 33529.1

DATE TESTED: 04/18/19

PROJECT: Tentative Tract Map No. 37725

HOLE DIAMETER: 8 in

LOCATION: Moreno Valley, California

PIPE DIAMETER: 3 in

TESTED BY: A.L.

% VOIDS IN GRAVEL / 100 0.5

TEST NO: P-3

GRAVEL CORRECTION FACTOR: 0.570

DATE DRILLED: 04/18/19

READING	TIME START	TIME STOP	TIME INTERVAL		TOTAL TIME	INITIAL WATER LEVEL		FINAL WATER LEVEL		INITIAL HOLE DEPTH		FINAL HOLE DEPTH		CHANGE IN WATER LEVEL	AVERAGE WETTED DEPTH	Q*	
			min	hr.	hr.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	ft.	gal/sq.ft./day	in/hr**
TEST PERIOD																	
1	9:28	9:53	25	0.42	0.42	4	10	5	0	15	0	15	0	0.17	10.08	2.1	0.08
2	9:53	10:18	25	0.42	0.83	5	0	5	2	15	0	15	0	0.17	9.92	2.1	0.08
3	10:18	10:48	30	0.50	1.33	5	0	5	3	15	0	15	0	0.25	9.88	2.7	0.10
4	10:48	11:18	30	0.50	1.83	5	0	5	5	15	0	15	0	0.42	9.79	4.5	0.17
5	11:18	11:48	30	0.50	2.33	5	0	5	7	15	0	15	0	0.58	9.71	6.3	0.24
6	11:48	12:18	30	0.50	2.83	5	0	5	5	15	0	15	0	0.42	9.79	4.5	0.17
7	12:18	12:48	30	0.50	3.33	5	0	5	7	15	0	15	0	0.58	9.71	6.3	0.24
8	12:48	13:18	30	0.50	3.83	5	0	5	5	15	0	15	0	0.42	9.79	4.5	0.17
9	13:20	13:50	30	0.50	4.33	4	11	5	6	15	0	15	0	0.58	9.79	6.3	0.23
10	13:51	14:22	31	0.52	4.85	5	0	5	5	15	0	15	0	0.42	9.79	4.3	0.16
11	14:23	14:53	30	0.50	5.35	5	0	5	5	15	0	15	0	0.42	9.79	4.5	0.17
12	14:54	15:24	30	0.50	5.85	5	0	5	5	15	0	15	0	0.42	9.79	4.5	0.17
13	15:24	15:54	30	0.50	6.35	5	5	5	10	15	0	15	0	0.42	9.38	4.7	0.17

BORING DEPTH: 15.0 ft

INITIAL TEST HOLE DEPTH: 15.0 ft

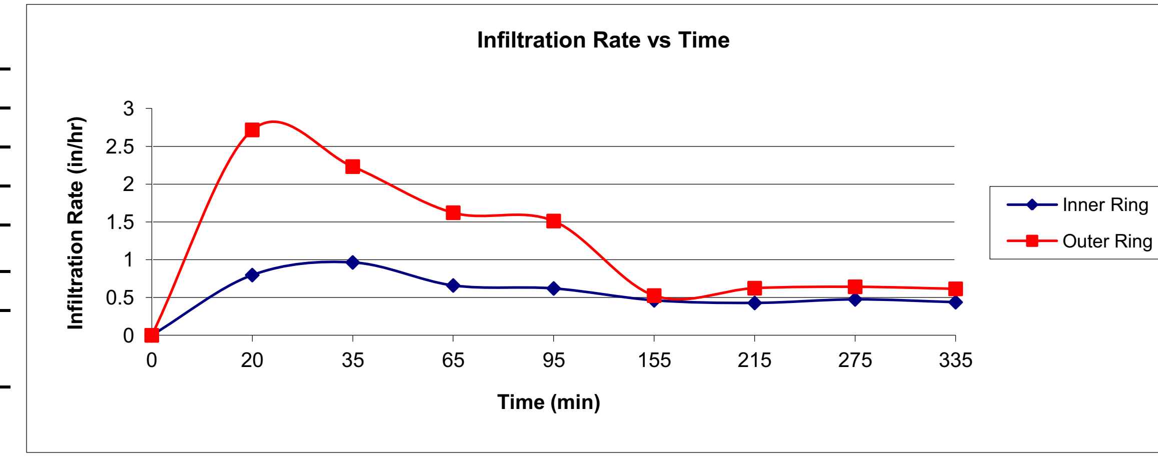
FINAL TEST HOLE DEPTH: 15.0 ft

* = clear water rate

** = Porchet Method

DOUBLE RING INFILTROMETER TEST DATA

Project:	Tentative Tract Map No. 37725	**Client:**	Positive Investments
Project No.:	33529.1	**Test Date:**	April 22, 2019
Soil Classification:	(SM) Silty Sand	**Test Hole No.:**	DRI-1
Depth of Test Hole:	8 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	April 22, 2019
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	A.L.	**Depth of Water in Rings:**	3 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3 in
Depth to Water Table:	25 ft		

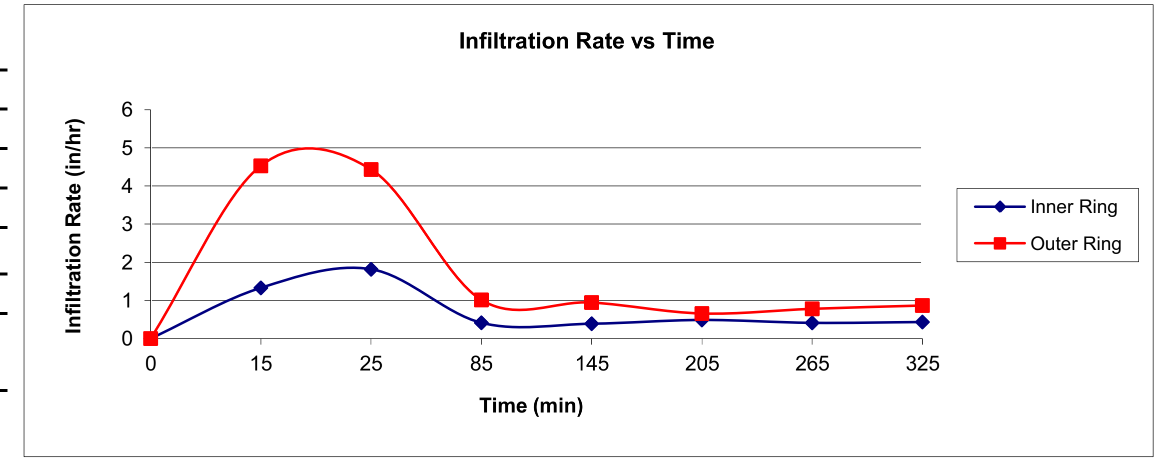


TEST PERIOD

TRIAL NO.	INNER				ANNULAR SPACE			WATER USED (lbs.)		WATER USED (gal)		INFILTRATION RATE (gal/sf.day)		INFILTRATION RATE (in/hr)		LIQUID TEMP (°F)	REMARKS
	TIME		TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	TIME	TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	inner	annular space	inner	annular space	inner	annular space	inner	annular space		
1	S	8:55	20	20	8:55	20	20	1.08	11.07	0.130	1.329	11.9	40.5	0.8	2.7	68	outer ring slight leak
	E	9:15			9:15											68	
2	S	9:15	15	35	9:15	15	35	0.98	6.82	0.118	0.819	14.4	33.3	1.0	2.2	68	outer ring slight leak
	E	9:30			9:30											69	
3	S	9:30	30	65	9:30	30	65	1.34	9.91	0.161	1.190	9.8	24.2	0.7	1.6	69	outer ring slight leak
	E	10:00			10:00											71	
4	S	10:00	30	95	10:00	30	95	1.26	9.24	0.151	1.109	9.2	22.6	0.6	1.5	71	outer ring no longer leaking
	E	10:30			10:30											72	
5	S	10:35	60	155	10:35	60	155	1.88	6.42	0.226	0.771	6.9	7.8	0.5	0.5	72	refilled outer
	E	11:35			11:35											73	
6	S	11:35	60	215	11:35	60	215	1.74	7.62	0.209	0.915	6.4	9.3	0.4	0.6	73	
	E	12:35			12:35											75	
7	S	12:35	60	275	12:35	60	275	1.93	7.84	0.232	0.941	7.1	9.6	0.5	0.6	75	
	E	13:35			13:35											77	
8	S	13:35	60	335	13:35	60	335	1.78	7.51	0.214	0.902	6.5	9.2	0.4	0.6	77	
	E	14:35			14:35											78	

DOUBLE RING INFILTROMETER TEST DATA

Project:	Tentative Tract Map No. 37725	**Client:**	Positive Investments
Project No.:	33529.1	**Test Date:**	April 22, 2019
Soil Classification:	(SM) Silty Sand	**Test Hole No.:**	DRI-2
Depth of Test Hole:	8 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	April 22,2019
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	A.L.	**Depth of Water in Rings:**	3.5 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3 in
Depth to Water Table:	25 ft		



TEST PERIOD

TRIAL NO.	INNER				ANNULAR SPACE			WATER USED (lbs.)		WATER USED (gal)		INFILTRATION RATE (gal/sf.day)		INFILTRATION RATE (in/hr)		LIQUID TEMP (°F)	REMARKS
	TIME		TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	TIME	TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	inner	annular space	inner	annular space	inner	annular space	inner	annular space		
1	S	9:08	15	15	9:08	15	15	1.35	13.84	0.162	1.661	19.8	67.6	1.3	4.5	68	outer ring slight leak
	E	9:23			9:23											68	
2	S	9:23	10	25	9:23	10	25	1.23	9.03	0.148	1.084	27.1	66.1	1.8	4.4	68	outer ring no longer leaking
	E	9:33			9:33											69	
3	S	9:36	60	85	9:36	60	85	1.68	12.39	0.202	1.487	6.2	15.1	0.4	1.0	69	refilled outer
	E	10:36			10:36											71	
4	S	10:36	60	145	10:36	60	145	1.58	11.55	0.190	1.387	5.8	14.1	0.4	0.9	71	
	E	11:36			11:36											72	
5	S	11:36	60	205	11:36	60	205	1.98	8.03	0.238	0.964	7.3	9.8	0.5	0.7	72	
	E	12:36			12:36											73	
6	S	12:36	60	265	12:36	60	265	1.67	9.53	0.200	1.144	6.1	11.6	0.4	0.8	73	
	E	13:36			13:36											75	
7	S	13:36	60	325	13:36	60	325	1.76	10.59	0.211	1.271	6.5	12.9	0.4	0.9	75	
	E	14:36			14:36											77	

BULK DENSITY & VOIDS IN AGGREGATE TEST DATA

ASTM C29

Project No.:	33529.1	Sample No.	N/A
Project:	Tentative Tract Map No. 37725	Produced By:	Quikcrete
Sample Date:	4/18/2019	Aggregate Size:	3/4"
Sample Location:	N/A	Wt. Of Sample:	50 lbs
Sampled By:	Andrew	Tested By:	Mark

Water Temperature (celcius)	25.5
Water Density (kg/m3)	996.91848
Water & Tare (kg)	4.6931
Tare (kg)	1.8973
Volume (m3)	0.002804
Factor (m-3)	356.577
Aggregate & Tare (kg)	5.984
Tare (kg)	1.8973
Bulk Density (kg/m3)	1457.224
Aggregate in Air (g)	433.5
Aggregate in Water (g)	285.7
Specific Gravity (kg/m3)	2.933
Voids in Aggregate (%)	50.163

LOR Geotechnical Group Inc.

Appendix 4: Historical Site Conditions

Not applicable

Appendix 5: LID Infeasibility

Not applicable

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thatcher Engineering — Date: 8/12/2019

Designed by: Kristin Tissot — Case No: TTM 37725

Company Project Number/Name: 169801

BMP Identification

BMP NAME / ID: Bioretention Swale 1

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
1A	*24214*	*Concrete or Asphalt*	*1*	*0.89*	*21598.9*			
1B	*7232*	*Ornamental Landscaping*	*0.1*	*0.11*	*798.8*			
	31446	***Total***			**22397.7**	**0.66**	***1231.9***	***1232***

Notes:

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries
	Bio Swale 1		Calculated Cells

Company Name:	Thatcher Engineering	Date:	8/12/2019
Designed by:	Kristin Tissot	County/City Case No.:	TTM 37725

Design Volume

Enter the area tributary to this feature	A_T=	0.72	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	1,232	ft^3

Type of Bioretention Facility Design

- (◉) Side slopes required (parallel to parking spaces or adjacent to walkways)
- ( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	2.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	2.0	ft

ERROR, the minimum width for the Bioretention Facility design selected has not been met

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ $\qquad d_E$ = 1.15 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 1,072 ft^2

Proposed Surface Area $\qquad$ A= 1,224 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0.47	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Thatcher Engineering	Date	8/12/2019
Designed by	Kristin Tissot	Case No	TTM 37725
Company Project Number/Name	169801		

BMP Identification

BMP NAME / ID: Bioretention Swale 2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
2A	*20312*	*Concrete or Asphalt*	*1*	*0.89*	*18118.3*			
2B	*4458*	*Ornamental Landscaping*	*0.1*	*0.11*	*492.4*			
	24770	**Total**			**18610.7**	**0.66**	**1023.6**	**1024**

Notes:

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries
	Bio Swale 2		Calculated Cells

Company Name: Thatcher Engineering — Date: 8/12/2019

Designed by: Kristin Tissot — County/City Case No.: TTM 37725

Design Volume

Enter the area tributary to this feature — A_T= 0.56 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 1,024 ft^3

Type of Bioretention Facility Design

- (●) Side slopes required (parallel to parking spaces or adjacent to walkways)
- ( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 3.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 2.0 ft

ERROR, the minimum width for the Bioretention Facility design selected has not been met

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.45 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 707 ft^2

Proposed Surface Area — A= 716 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0.47 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

<u>Santa Ana Watershed</u> - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thatcher Engineering
Date: 8/12/2019
Designed by: Kristin Tissot
Case No: TTM 37725
Company Project Number/Name: 169801

BMP Identification

BMP NAME / ID: Bioretention Swale 3

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
3A	*2073*	*Concrete or Asphalt*	*1*	*0.89*	*1849.1*			
3B	*619*	*Ornamental Landscaping*	*0.1*	*0.11*	*68.4*			
	2692	***Total***			**1917.5**	**0.66**	***105.5***	***106***

Notes:

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries
	Bio Swale 3		Calculated Cells

Company Name: Thatcher Engineering — Date: 8/12/2019

Designed by: Kristin Tissot — County/City Case No.: TTM 37725

Design Volume

Enter the area tributary to this feature — A_T= 0.06 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 106 ft^3

Type of Bioretention Facility Design

◉ Side slopes required (parallel to parking spaces or adjacent to walkways)

○ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 2.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 2.0 ft

ERROR, the minimum width for the Bioretention Facility design selected has not been met

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.15 ft

Minimum Surface Area, A_m

$$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$$

A_M = 93 ft^2

Proposed Surface Area — A= 135 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0.47 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thatcher Engineering — Date: 1/27/2020
Designed by: Kristin Tissot — Case No: TTM 37725
Company Project Number/Name: 169801

BMP Identification

BMP NAME / ID: Bioretention Area 4

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E — D_{85}= 0.66 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
4A	*234343*	*Roofs*	*1*	*0.89*	*209034*			
4B	*200924*	*Ornamental Landscaping*	*0.1*	*0.11*	*22193.7*			
	435267	***Total***			**231227.7**	**0.66**	**12717.5**	**12718**

Notes:

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries
	Bio Basin 4		Calculated Cells

Company Name: Thatcher Engineering | Date: 1/27/2020

Designed by: Kristin Tissot | County/City Case No.: TTM 37725

Design Volume

Enter the area tributary to this feature A_T= 9.99 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook V_{BMP}= 12,718 ft^3

Type of Bioretention Facility Design

◉ Side slopes required (parallel to parking spaces or adjacent to walkways)

○ No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb w_T = 100.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ d_E = 1.34 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 9,470 ft^2

Proposed Surface Area A= 12,407 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility z = 4 :1

Diameter of Underdrain 6 inches

Longitudinal Slope of Site (3% maximum) 0 %

6" Check Dam Spacing 0 feet

Describe Vegetation:

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Thatcher Engineering
Date: 1/27/2020
Designed by: Kristin Tissot
Case No: TTM 37725
Company Project Number/Name: 169801

BMP Identification

BMP NAME / ID: Bioretention Area 5

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth,
from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.66 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
5A	*205538*	*Roofs*	*1*	*0.89*	*183339.9*			
5B	*131966*	*Ornamental Landscaping*	*0.1*	*0.11*	*14576.7*			
	337504	**Total**			**197916.6**	**0.66**	**10885.4**	**10886**

Notes:

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries
	Bio Basin 5		Calculated Cells

Company Name: Thatcher Engineering — Date: 1/27/2020

Designed by: Kristin Tissot — County/City Case No.: TTM 37725

Design Volume

Enter the area tributary to this feature	A_T=	7.75	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	10,886	ft^3

Type of Bioretention Facility Design

- (●) Side slopes required (parallel to parking spaces or adjacent to walkways)
- ( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	58.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.79	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \dfrac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	6,089	ft^2
Proposed Surface Area	A=	8,145	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

```
****************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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           Ver. 23.0  Release Date: 07/01/2016  License ID 1533

                         Analysis prepared by:

               THATCHER ENGINEERING & ASSOCIATES, INC.
                     1461 FORD STREET, SUITE 105
                          REDLANDS, CA 92373
              PHONE: (909) 748-7777   FAX: (909) 748-7776

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  169801 - APN 316-110-005, 006, 022, 023, 024
  PRE-DEVELOPMENT LOW LOSS
  2-YEAR STORM EVENT
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     1.90 (inches)

    SOIL-COVER     AREA      PERCENT OF     SCS CURVE    LOSS RATE
       TYPE       (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)     YIELD
        1          17.62       100.00       91.(AMC II)    0.370        0.265

    TOTAL AREA (Acres) =      17.62

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.370

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.735
============================================================================
```

```
****************************************************************************
     NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
              AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
```


Analysis prepared by:

THATCHER ENGINEERING & ASSOCIATES, INC.
1461 FORD STREET, SUITE 105
REDLANDS, CA 92373
PHONE: (909) 748-7777 FAX: (909) 748-7776

```
****************************************************************************
----------------------------------------------------------------------------
```

Problem Descriptions:
169801 - APN 316-110-005, 006, 022, 023, 024
POST-DEVELOPMENT LOW LOSS
2-YEAR STORM EVENT

```
============================================================================
```

*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 1.90 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	7.75	100.00	69.(AMC II)	0.812	0.000
2	9.87	0.00	98.(AMC II)	0.000	0.882

TOTAL AREA (Acres) = 17.62

AREA-AVERAGED LOSS RATE, $\overline{Fm}$ (in./hr.) = 0.357

AREA-AVERAGED LOW LOSS FRACTION, $\overline{Y}$ = 0.506

```
============================================================================
```

```
****************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
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           Ver. 23.0  Release Date: 07/01/2016  License ID 1533

                         Analysis prepared by:

               THATCHER ENGINEERING & ASSOCIATES, INC.
                     1461 FORD STREET, SUITE 105
                          REDLANDS, CA 92373
             PHONE: (909) 748-7777    FAX: (909) 748-7776

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  169801 - APN 316-110-005, 006, 022, 023, 024
  PRE-DEVELOPMENT HYDRO
  2-YEAR STORM EVENT
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =    17.62
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.370
    LOW LOSS FRACTION = 0.735
    TIME OF CONCENTRATION(MIN.) = 24.80
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.12
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.38
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.47
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.82
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.14
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  1.90

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.79
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     2.00

****************************************************************************
  TIME      VOLUME       Q     0.        2.5       5.0       7.5      10.0
 (HOURS)     (AF)      (CFS)
----------------------------------------------------------------------------
  0.29      0.0021      0.12  Q         .         .         .         .
  0.71      0.0063      0.12  Q         .         .         .         .
  1.12      0.0106      0.13  Q         .         .         .         .
  1.53      0.0150      0.13  Q         .         .         .         .
  1.95      0.0194      0.13  Q         .         .         .         .
  2.36      0.0239      0.13  Q         .         .         .         .
  2.77      0.0285      0.14  Q         .         .         .         .
  3.19      0.0332      0.14  Q         .         .         .         .
  3.60      0.0380      0.14  Q         .         .         .         .
```

```
  4.01     0.0429     0.15  Q      .      .      .      .
  4.43     0.0479     0.15  Q      .      .      .      .
  4.84     0.0530     0.15  Q      .      .      .      .
  5.25     0.0582     0.15  Q      .      .      .      .
  5.67     0.0635     0.16  Q      .      .      .      .
  6.08     0.0690     0.16  Q      .      .      .      .
  6.49     0.0746     0.17  Q      .      .      .      .
  6.91     0.0804     0.17  Q      .      .      .      .
  7.32     0.0863     0.18  Q      .      .      .      .
  7.73     0.0924     0.18  Q      .      .      .      .
  8.15     0.0987     0.19  Q      .      .      .      .
  8.56     0.1052     0.19  Q      .      .      .      .
  8.97     0.1119     0.20  Q      .      .      .      .
  9.39     0.1189     0.21  Q      .      .      .      .
  9.80     0.1261     0.22  Q      .      .      .      .
 10.21     0.1336     0.22  Q      .      .      .      .
 10.63     0.1415     0.24  Q      .      .      .      .
 11.04     0.1497     0.24  Q      .      .      .      .
 11.45     0.1583     0.26  .Q     .      .      .      .
 11.87     0.1674     0.27  .Q     .      .      .      .
 12.28     0.1779     0.34  .Q     .      .      .      .
 12.69     0.1904     0.39  .Q     .      .      .      .
 13.11     0.2044     0.43  .Q     .      .      .      .
 13.52     0.2194     0.45  .Q     .      .      .      .
 13.93     0.2357     0.50  . Q    .      .      .      .
 14.35     0.2536     0.55  . Q    .      .      .      .
 14.76     0.2744     0.67  . Q    .      .      .      .
 15.17     0.2985     0.74  . Q    .      .      .      .
 15.59     0.3249     0.81  .  Q   .      .      .      .
 16.00     0.3567     1.05  .   Q  .      .      .      .
 16.41     0.4975     7.19  .      .      .     Q.      .
 16.83     0.6345     0.84  .  Q   .      .      .      .
 17.24     0.6594     0.62  . Q    .      .      .      .
 17.65     0.6780     0.47  .Q     .      .      .      .
 18.07     0.6931     0.41  .Q     .      .      .      .
 18.48     0.7050     0.28  .Q     .      .      .      .
 18.89     0.7141     0.25  .Q     .      .      .      .
 19.31     0.7223     0.23  Q      .      .      .      .
 19.72     0.7299     0.21  Q      .      .      .      .
 20.13     0.7368     0.20  Q      .      .      .      .
 20.55     0.7433     0.18  Q      .      .      .      .
 20.96     0.7494     0.17  Q      .      .      .      .
 21.37     0.7552     0.16  Q      .      .      .      .
 21.79     0.7607     0.16  Q      .      .      .      .
 22.20     0.7659     0.15  Q      .      .      .      .
 22.61     0.7709     0.14  Q      .      .      .      .
 23.03     0.7757     0.14  Q      .      .      .      .
 23.44     0.7803     0.13  Q      .      .      .      .
 23.85     0.7847     0.13  Q      .      .      .      .
 24.27     0.7890     0.12  Q      .      .      .      .
 24.68     0.7911     0.00  Q      .      .      .      .
---------------------------------------------------------
-----------------------------------------------------------

  TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
  (Note: 100% of Peak Flow Rate estimate assumed to have
  an instantaneous time duration)
```

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1463.2
10%	124.0
20%	24.8
30%	24.8
40%	24.8
50%	24.8
60%	24.8
70%	24.8
80%	24.8
90%	24.8

```
****************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
============================================================================
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           Ver. 23.0  Release Date: 07/01/2016  License ID 1533

                         Analysis prepared by:

                THATCHER ENGINEERING & ASSOCIATES, INC.
                      1461 FORD STREET, SUITE 105
                           REDLANDS, CA 92373
              PHONE: (909) 748-7777   FAX: (909) 748-7776

****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  169801 - APN 316-110-005, 006, 022, 023, 024
  POST-DEVELOPMENT HYDRO
  2-YEAR STORM EVENT
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
    TOTAL CATCHMENT AREA(ACRES) =   17.62
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.357
    LOW LOSS FRACTION = 0.506
    TIME OF CONCENTRATION(MIN.) = 17.75
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =    2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.12
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.38
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.47
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.82
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.14
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  1.90

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.28
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     1.51

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.03     0.0000      0.00  Q         .         .         .         .
  0.32     0.0028      0.23  Q         .         .         .         .
  0.62     0.0084      0.23  Q         .         .         .         .
  0.91     0.0141      0.24  Q         .         .         .         .
  1.21     0.0199      0.24  Q         .         .         .         .
  1.50     0.0258      0.24  Q         .         .         .         .
  1.80     0.0317      0.24  Q         .         .         .         .
  2.10     0.0377      0.25  Q         .         .         .         .
  2.39     0.0438      0.25  Q         .         .         .         .
```

```
  2.69      0.0499      0.25  .Q        .         .         .         .
  2.98      0.0562      0.26  .Q        .         .         .         .
  3.28      0.0625      0.26  .Q        .         .         .         .
  3.58      0.0689      0.26  .Q        .         .         .         .
  3.87      0.0755      0.27  .Q        .         .         .         .
  4.17      0.0821      0.27  .Q        .         .         .         .
  4.46      0.0888      0.28  .Q        .         .         .         .
  4.76      0.0956      0.28  .Q        .         .         .         .
  5.05      0.1026      0.29  .Q        .         .         .         .
  5.35      0.1096      0.29  .Q        .         .         .         .
  5.65      0.1168      0.30  .Q        .         .         .         .
  5.94      0.1241      0.30  .Q        .         .         .         .
  6.24      0.1316      0.31  .Q        .         .         .         .
  6.53      0.1392      0.31  .Q        .         .         .         .
  6.83      0.1469      0.32  .Q        .         .         .         .
  7.12      0.1548      0.32  .Q        .         .         .         .
  7.42      0.1628      0.33  .Q        .         .         .         .
  7.72      0.1711      0.34  .Q        .         .         .         .
  8.01      0.1795      0.35  .Q        .         .         .         .
  8.31      0.1881      0.35  .Q        .         .         .         .
  8.60      0.1969      0.37  .Q        .         .         .         .
  8.90      0.2059      0.37  .Q        .         .         .         .
  9.20      0.2152      0.39  .Q        .         .         .         .
  9.49      0.2247      0.39  .Q        .         .         .         .
  9.79      0.2344      0.41  .Q        .         .         .         .
 10.08      0.2445      0.42  .Q        .         .         .         .
 10.38      0.2549      0.43  .Q        .         .         .         .
 10.68      0.2656      0.44  .Q        .         .         .         .
 10.97      0.2766      0.46  .Q        .         .         .         .
 11.27      0.2881      0.47  .Q        .         .         .         .
 11.56      0.3000      0.50  .Q        .         .         .         .
 11.86      0.3124      0.51  . Q       .         .         .         .
 12.15      0.3259      0.59  . Q       .         .         .         .
 12.45      0.3419      0.72  . Q       .         .         .         .
 12.75      0.3601      0.76  .  Q      .         .         .         .
 13.04      0.3791      0.79  .  Q      .         .         .         .
 13.34      0.3990      0.84  .  Q      .         .         .         .
 13.63      0.4201      0.88  .  Q      .         .         .         .
 13.93      0.4424      0.95  .  Q      .         .         .         .
 14.23      0.4664      1.01  .   Q     .         .         .         .
 14.52      0.4932      1.18  .   Q     .         .         .         .
 14.82      0.5231      1.26  .    Q    .         .         .         .
 15.11      0.5564      1.47  .    Q    .         .         .         .
 15.41      0.5942      1.62  .     Q   .         .         .         .
 15.70      0.6312      1.40  .    Q    .         .         .         .
 16.00      0.6901      3.42  .         .  Q      .         .         .
 16.30      0.8403      8.87  .         .         .         .    Q    .
 16.59      0.9678      1.56  .     Q   .         .         .         .
 16.89      1.0033      1.35  .    Q    .         .         .         .
 17.18      1.0336      1.12  .   Q     .         .         .         .
 17.48      1.0584      0.91  .  Q      .         .         .         .
 17.77      1.0795      0.81  .  Q      .         .         .         .
 18.07      1.0986      0.74  . Q       .         .         .         .
 18.37      1.1141      0.53  . Q       .         .         .         .
 18.66      1.1265      0.49  .Q        .         .         .         .
 18.96      1.1380      0.45  .Q        .         .         .         .
 19.25      1.1487      0.42  .Q        .         .         .         .
```

19.55	1.1588	0.40	.Q	.	.	.	.
19.85	1.1683	0.38	.Q	.	.	.	.
20.14	1.1773	0.36	.Q	.	.	.	.
20.44	1.1859	0.34	.Q	.	.	.	.
20.73	1.1942	0.33	.Q	.	.	.	.
21.03	1.2020	0.32	.Q	.	.	.	.
21.33	1.2096	0.30	.Q	.	.	.	.
21.62	1.2170	0.29	.Q	.	.	.	.
21.92	1.2240	0.28	.Q	.	.	.	.
22.21	1.2308	0.28	.Q	.	.	.	.
22.51	1.2375	0.27	.Q	.	.	.	.
22.80	1.2439	0.26	.Q	.	.	.	.
23.10	1.2501	0.25	.Q	.	.	.	.
23.40	1.2562	0.25	Q	.	.	.	.
23.69	1.2622	0.24	Q	.	.	.	.
23.99	1.2679	0.23	Q	.	.	.	.
24.28	1.2736	0.23	Q	.	.	.	.
24.58	1.2764	0.00	Q	.	.	.	.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1455.5
10%	230.8
20%	35.5
30%	35.5
40%	17.8
50%	17.8
60%	17.8
70%	17.8
80%	17.8
90%	17.8

```
****************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                 (RCFC&WCD) 1978 HYDROLOGY MANUAL
       (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                 (Rational Tabling Version 23.0)
              Release Date: 07/01/2016  License ID 1533

                        Analysis prepared by:

                THATCHER ENGINEERING & ASSOCIATES, INC.
                      1461 FORD STREET, SUITE 105
                           REDLANDS, CA 92373
              PHONE: (909) 748-7777   FAX: (909) 748-7776

************************** DESCRIPTION OF STUDY **************************
* 169801 - APN 316-110-005, 006, 022, 023, 024                            *
* PRE-DEVELOPMENT DRAINAGE STUDY                                           *
* 2-YEAR STORM EVENT                                                       *
**************************************************************************

  FILE NAME: 169801PR.DAT
  TIME/DATE OF STUDY: 16:02 08/12/2019
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.010
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.820
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.940
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5003939
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5001161
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =    0.554
  SLOPE OF INTENSITY DURATION CURVE = 0.5004
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:  CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN- / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE   FACTOR
NO.  (FT)     (FT)     SIDE / SIDE/ WAY   (FT)   (FT)  (FT)   (FT)    (n)
===  =====  =========  ================= ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020  0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
 OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
 FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =  1125.00
 UPSTREAM ELEVATION(FEET) =      86.50
 DOWNSTREAM ELEVATION(FEET) =      80.00
 ELEVATION DIFFERENCE(FEET) =       6.50
 TC = 0.533*[( 1125.00**3)/(      6.50)]**.2 =   24.803
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.863
 UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .5311
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      8.07
 TOTAL AREA(ACRES) =     17.62   TOTAL RUNOFF(CFS) =       8.07
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)       =        17.6  TC(MIN.) =     24.80
 PEAK FLOW RATE(CFS)     =        8.07
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                   (RCFC&WCD) 1978 HYDROLOGY MANUAL
        (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1533

                         Analysis prepared by:

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                     1461 FORD STREET, SUITE 105
                          REDLANDS, CA 92373
               PHONE: (909) 748-7777   FAX: (909) 748-7776

 ************************** DESCRIPTION OF STUDY **************************
 * 169801 - APN 316-110-005, 006, 022, 023, 024                            *
 * POST-DEVELOPMENT DRAINAGE STUDY                                         *
 * 2-YEAR STORM EVENT                                                      *
 **************************************************************************

  FILE NAME: 169801PO.DAT
  TIME/DATE OF STUDY: 14:54 01/27/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.96
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.010
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.820
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.940
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5003939
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5001161
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.554
  SLOPE OF INTENSITY DURATION CURVE = 0.5004
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF- CROWN TO  STREET-CROSSFALL:  CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH CROSSFALL IN- / OUT-/PARK-  HEIGHT WIDTH  LIP   HIKE  FACTOR
NO.  (FT)    (FT)    SIDE / SIDE/ WAY   (FT)   (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020  0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
  OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
 FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
       ASSUMED INITIAL SUBAREA UNIFORM
       DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =  1310.00
 UPSTREAM ELEVATION(FEET) =     87.00
 DOWNSTREAM ELEVATION(FEET) =     75.10
 ELEVATION DIFFERENCE(FEET) =     11.90
 TC = 0.393*[( 1310.00**3)/(    11.90)]**.2 =   17.750
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.020
 SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .7335
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      7.46
 TOTAL AREA(ACRES) =      9.97   TOTAL RUNOFF(CFS) =      7.46

****************************************************************************
 FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
       ASSUMED INITIAL SUBAREA UNIFORM
       DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
 TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
 INITIAL SUBAREA FLOW-LENGTH(FEET) =  1165.00
 UPSTREAM ELEVATION(FEET) =     86.90
 DOWNSTREAM ELEVATION(FEET) =     77.60
 ELEVATION DIFFERENCE(FEET) =      9.30
 TC = 0.393*[( 1165.00**3)/(     9.30)]**.2 =   17.380
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.031
 SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .7346
 SOIL CLASSIFICATION IS "C"
 SUBAREA RUNOFF(CFS) =      5.87
 TOTAL AREA(ACRES) =      7.75   TOTAL RUNOFF(CFS) =      5.87
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        7.8  TC(MIN.) =     17.38
 PEAK FLOW RATE(CFS)   =      5.87
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ A. **On-site storm drain inlets**	☒ **Locations of inlets.**	☒ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☐ **Maintain and periodically repaint or replace inlet markings.** ☒ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☒ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☐ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☐ B. **Interior floor drains and elevator shaft sump pumps**		☐ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**
☐ C. **Interior parking garages**		☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ D1. **Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☐ **Show self-retaining landscape areas, if any.** ☒ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☐ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☒ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☒ **Consider using pest-resistant plants, especially adjacent to hardscape.** ☒ **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ☒ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☒ **Provide IPM information to new owners, lessees and operators.**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ E. **Pools, spas, ponds, decorative fountains, and other water features.**	❑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	☒ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
❑ F. **Food service**	❑ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ❑ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	❑ **Describe the location and features of the designated cleaning area.** ❑ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	❑ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
❑ G. **Refuse areas**	❑ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ❑ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ❑ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	❑ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ❑ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	❑ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

S T O R M W A T E R   P O L L U T A N T   S O U R C E S / S O U R C E   C O N T R O L   C H E C K L I S T

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑**Car dealerships and similar may rinse cars with water only.**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ M. **Loading Docks**	❑ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		❑ **Move loaded and unloaded items indoors as soon as possible.** ❑ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ N. **Fire Sprinkler Test Water**		❑ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	❑ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ❑ **Boiler drain lines** ❑ **Condensate drain lines** ❑ **Rooftop equipment** ❑ **Drainage sumps** ☒ **Roofing, gutters, and trim.** ❑ **Other sources**		❑ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ❑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ❑ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ❑ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ❑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** ☒ **Include controls for other sources as specified by local reviewer.**	

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ P. **Plazas, sidewalks, and parking lots.**			❑ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Not applicable for Preliminary WQMP

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Site Design & Landscape Planning SD-10

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description
Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach
Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications
Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations
Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11

Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.

- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:

  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff

  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect

  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible

  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth

- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Source Control
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutant
- Collect and Convey

Description

Alternative building materials are selected instead of conventional materials for new construction and renovation. These materials reduce potential sources of pollutants in stormwater runoff by eliminating compounds that can leach into runoff, reducing the need for pesticide application, reducing the need for painting and other maintenance, or by reducing the volume of runoff.

Approach

Alternative building materials are available for use as lumber for decking, roofing materials, home siding, and paving for driveways, decks, and sidewalks.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Decking

One of the most common materials for construction of decks and other outdoor construction has traditionally been pressure treated wood, which is now being phased out. The standard treatment is called CCA, for chromated copper arsenate. The key ingredients are arsenic (which kills termites, carpenter ants and other insects), copper (which kills the fungi that cause wood to rot) and chromium (which reacts with the other ingredients to bind them to the wood). The amount of arsenic is far from trivial. A deck just 8 feet x 10 feet contains more than 1 1/3 pounds of this highly potent poison. Replacement materials include a new type of pressure treated wood, plastic and composite lumber.

There are currently over 20 products in the market consisting of plastic or plastic-wood composites. Plastic lumber is made from 100% recycled plastic, # 2 HDPE and polyethylene plastic milk jugs and soap bottles. Plastic-wood composites are a combination of plastic and wood fibers or sawdust. These materials are a long lasting exterior weather, insect, and chemical resistant wood lumber replacement for non structural applications. Use it for decks, docks, raised garden beds and planter boxes, pallets, hand railings, outdoor furniture, animal pens, boat decks, etc.

New pressure treated wood uses a much safer recipe, ACQ, which stands for ammoniacal copper quartenary. It contains no arsenic and no chromium. Yet the American Wood Preservers Association has found it to be just as effective as the standard formula. ACQ is common in Japan and Europe.

Roofing

Several studies have indicated that metal used as roofing material, flashing, or gutters can leach metals into the environment. The leaching occurs because rainfall is slightly acidic and slowly dissolved the exposed metals. Common traditional applications include copper sheathing and galvanized (zinc) gutters.

Coated metal products are available for both roofing and gutter applications. These products eliminate contact of bare metal with rainfall, eliminating one source of metals in runoff. There are also roofing materials made of recycled rubber and plastic that resemble traditional materials.

A less traditional approach is the use of green roofs. These roofs are not just green, they're alive. Planted with grasses and succulents, low- profile green roofs reduce the urban heat island effect, stormwater runoff, and cooling costs, while providing wildlife habitat and a connection to nature for building occupants. These roofs are widely used on industrial facilities in Europe and have been established as experimental installations in several locations in the US, including Portland, Oregon. Their feasibility is questionable in areas of California with prolonged, dry, hot weather.

Paved Areas

Traditionally, concrete is used for construction of patios, sidewalks, and driveways. Although it is non-toxic, these paved areas reduce stormwater infiltration and increase the volume and rate of runoff. This increase in the amount of runoff is the leading cause of stream channel degradation in urban areas.

There are a number of alternative materials that can be used in these applications, including porous concrete and asphalt, modular blocks, and crushed granite. These materials, especially modular paving blocks, are widely available and a well established method to reduce stormwater runoff.

Building Siding

Wood siding is commonly used on the exterior of residential construction. This material weathers fairly rapidly and requires repeated painting to prevent rotting. Alternative "new" products for this application include cement-fiber and vinyl. Cement-fiber siding is a masonry product made from Portland cement, sand, and cellulose and will not burn, cup, swell, or shrink.

Pesticide Reduction

A common use of powerful pesticides is for the control of termites. Chlordane was used for many years for this purpose and is now found in urban streams and lakes nationwide. There are a number of physical barriers that can be installed during construction to help reduce the use of pesticides.

Sand barriers for subterranean termites are a physical deterrent because the termites cannot tunnel through it. Sand barriers can be applied in crawl spaces under pier and beam foundations, under slab foundations, and between the foundation and concrete porches, terraces, patios and steps. Other possible locations include under fence posts, underground electrical cables, water and gas lines, telephone and electrical poles, inside hollow tile cells and against retaining walls.

Metal termite shields are physical barriers to termites which prevent them from building invisible tunnels. In reality, metal shields function as a helpful termite detection device, forcing them to build tunnels on the outside of the shields which are easily seen. Metal termite shields also help prevent dampness from wicking to adjoining wood members which can result in rot, thus making the material more attractive to termites and other pests. Metal flashing and metal plates can also be used as a barrier between piers and beams of structures such as decks, which are particularly vulnerable to termite attack.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

There are no good, independent, comprehensive sources of information on alternative building materials for use in minimizing the impacts of stormwater runoff. Most websites or other references to "green" or "alternative" building materials focus on indoor applications, such as formaldehyde free plywood and low VOC paints, carpets, and pads. Some supplemental information on alternative materials is available from the manufacturers.

Fires are a source of concern in many areas of California. Information on the flammability of alternative decking materials is available from the University of California Forest Product Laboratory (UCFPL) website at: http://www.ucfpl.ucop.edu/WDDeckIntro.htm

Bioretention TC-32

Design Considerations

- Soil for Infiltration
- Tributary Area
- Slope
- Aesthetics
- Environmental Side-effects

Targeted Constituents

☑	Sediment	■
☑	Nutrients	▲
☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

Description

The bioretention best management practice (BMP) functions as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. These facilities normally consist of a grass buffer strip, sand bed, ponding area, organic layer or mulch layer, planting soil, and plants. The runoff's velocity is reduced by passing over or through buffer strip and subsequently distributed evenly along a ponding area. Exfiltration of the stored water in the bioretention area planting soil into the underlying soils occurs over a period of days.

California Experience

None documented. Bioretention has been used as a stormwater BMP since 1992. In addition to Prince George's County, MD and Alexandria, VA, bioretention has been used successfully at urban and suburban areas in Montgomery County, MD; Baltimore County, MD; Chesterfield County, VA; Prince William County, VA; Smith Mountain Lake State Park, VA; and Cary, NC.

Advantages

- Bioretention provides stormwater treatment that enhances the quality of downstream water bodies by temporarily storing runoff in the BMP and releasing it over a period of four days to the receiving water (EPA, 1999).

- The vegetation provides shade and wind breaks, absorbs noise, and improves an area's landscape.

Limitations

- The bioretention BMP is not recommended for areas with slopes greater than 20% or where mature tree removal would be required since clogging may result, particularly if the BMP receives runoff with high sediment loads (EPA, 1999).

- Bioretention is not a suitable BMP at locations where the water table is within 6 feet of the ground surface and where the surrounding soil stratum is unstable.

- By design, bioretention BMPs have the potential to create very attractive habitats for mosquitoes and other vectors because of highly organic, often heavily vegetated areas mixed with shallow water.

- In cold climates the soil may freeze, preventing runoff from infiltrating into the planting soil.

Design and Sizing Guidelines

- The bioretention area should be sized to capture the design storm runoff.

- In areas where the native soil permeability is less than 0.5 in/hr an underdrain should be provided.

- Recommended minimum dimensions are 15 feet by 40 feet, although the preferred width is 25 feet. Excavated depth should be 4 feet.

- Area should drain completely within 72 hours.

- Approximately 1 tree or shrub per 50 ft^2 of bioretention area should be included.

- Cover area with about 3 inches of mulch.

Construction/Inspection Considerations

Bioretention area should not be established until contributing watershed is stabilized.

Performance

Bioretention removes stormwater pollutants through physical and biological processes, including adsorption, filtration, plant uptake, microbial activity, decomposition, sedimentation and volatilization (EPA, 1999). Adsorption is the process whereby particulate pollutants attach to soil (e.g., clay) or vegetation surfaces. Adequate contact time between the surface and pollutant must be provided for in the design of the system for this removal process to occur. Thus, the infiltration rate of the soils must not exceed those specified in the design criteria or pollutant removal may decrease. Pollutants removed by adsorption include metals, phosphorus, and hydrocarbons. Filtration occurs as runoff passes through the bioretention area media, such as the sand bed, ground cover, and planting soil.

Common particulates removed from stormwater include particulate organic matter, phosphorus, and suspended solids. Biological processes that occur in wetlands result in pollutant uptake by plants and microorganisms in the soil. Plant growth is sustained by the uptake of nutrients from the soils, with woody plants locking up these nutrients through the seasons. Microbial activity within the soil also contributes to the removal of nitrogen and organic matter. Nitrogen is removed by nitrifying and denitrifying bacteria, while aerobic bacteria are responsible for the decomposition of the organic matter. Microbial processes require oxygen and can result in depleted oxygen levels if the bioretention area is not adequately aerated. Sedimentation occurs in the swale or ponding area as the velocity slows and solids fall out of suspension.

The removal effectiveness of bioretention has been studied during field and laboratory studies conducted by the University of Maryland (Davis et al, 1998). During these experiments, synthetic stormwater runoff was pumped through several laboratory and field bioretention areas to simulate typical storm events in Prince George's County, MD. Removal rates for heavy metals and nutrients are shown in Table 1.

Table 1 Laboratory and Estimated Bioretention Davis et al. (1998); PGDER (1993)

Pollutant	Removal Rate
Total Phosphorus	70-83%
Metals (Cu, Zn, Pb)	93-98%
TKN	68-80%
Total Suspended Solids	90%
Organics	90%
Bacteria	90%

Results for both the laboratory and field experiments were similar for each of the pollutants analyzed. Doubling or halving the influent pollutant levels had little effect on the effluent pollutants concentrations (Davis et al, 1998).

The microbial activity and plant uptake occurring in the bioretention area will likely result in higher removal rates than those determined for infiltration BMPs.

Siting Criteria

Bioretention BMPs are generally used to treat stormwater from impervious surfaces at commercial, residential, and industrial areas (EPA, 1999). Implementation of bioretention for stormwater management is ideal for median strips, parking lot islands, and swales. Moreover, the runoff in these areas can be designed to either divert directly into the bioretention area or convey into the bioretention area by a curb and gutter collection system.

The best location for bioretention areas is upland from inlets that receive sheet flow from graded areas and at areas that will be excavated (EPA, 1999). In order to maximize treatment effectiveness, the site must be graded in such a way that minimizes erosive conditions as sheet flow is conveyed to the treatment area. Locations where a bioretention area can be readily incorporated into the site plan without further environmental damage are preferred. Furthermore, to effectively minimize sediment loading in the treatment area, bioretention only should be used in stabilized drainage areas.

Additional Design Guidelines

The layout of the bioretention area is determined after site constraints such as location of utilities, underlying soils, existing vegetation, and drainage are considered (EPA, 1999). Sites with loamy sand soils are especially appropriate for bioretention because the excavated soil can be backfilled and used as the planting soil, thus eliminating the cost of importing planting soil.

The use of bioretention may not be feasible given an unstable surrounding soil stratum, soils with clay content greater than 25 percent, a site with slopes greater than 20 percent, and/or a site with mature trees that would be removed during construction of the BMP.

Bioretention can be designed to be off-line or on-line of the existing drainage system (EPA, 1999). The drainage area for a bioretention area should be between 0.1 and 0.4 hectares (0.25 and 1.0 acres). Larger drainage areas may require multiple bioretention areas. Furthermore, the maximum drainage area for a bioretention area is determined by the expected rainfall intensity and runoff rate. Stabilized areas may erode when velocities are greater than 5 feet per second (1.5 meter per second). The designer should determine the potential for erosive conditions at the site.

The size of the bioretention area, which is a function of the drainage area and the runoff generated from the area is sized to capture the water quality volume.

The recommended minimum dimensions of the bioretention area are 15 feet (4.6 meters) wide by 40 feet (12.2 meters) long, where the minimum width allows enough space for a dense, randomly-distributed area of trees and shrubs to become established. Thus replicating a natural forest and creating a microclimate, thereby enabling the bioretention area to tolerate the effects of heat stress, acid rain, runoff pollutants, and insect and disease infestations which landscaped areas in urban settings typically are unable to tolerate. The preferred width is 25 feet (7.6 meters), with a length of twice the width. Essentially, any facilities wider than 20 feet (6.1 meters) should be twice as long as they are wide, which promotes the distribution of flow and decreases the chances of concentrated flow.

In order to provide adequate storage and prevent water from standing for excessive periods of time the ponding depth of the bioretention area should not exceed 6 inches (15 centimeters). Water should not be left to stand for more than 72 hours. A restriction on the type of plants that can be used may be necessary due to some plants' water intolerance. Furthermore, if water is left standing for longer than 72 hours mosquitoes and other insects may start to breed.

The appropriate planting soil should be backfilled into the excavated bioretention area. Planting soils should be sandy loam, loamy sand, or loam texture with a clay content ranging from 10 to 25 percent.

Generally the soil should have infiltration rates greater than 0.5 inches (1.25 centimeters) per hour, which is typical of sandy loams, loamy sands, or loams. The pH of the soil should range between 5.5 and 6.5, where pollutants such as organic nitrogen and phosphorus can be adsorbed by the soil and microbial activity can flourish. Additional requirements for the planting soil include a 1.5 to 3 percent organic content and a maximum 500 ppm concentration of soluble salts.

Soil tests should be performed for every 500 cubic yards (382 cubic meters) of planting soil, with the exception of pH and organic content tests, which are required only once per bioretention area (EPA, 1999). Planting soil should be 4 inches (10.1 centimeters) deeper than the bottom of the largest root ball and 4 feet (1.2 meters) altogether. This depth will provide adequate soil for the plants' root systems to become established, prevent plant damage due to severe wind, and provide adequate moisture capacity. Most sites will require excavation in order to obtain the recommended depth.

Planting soil depths of greater than 4 feet (1.2 meters) may require additional construction practices such as shoring measures (EPA, 1999). Planting soil should be placed in 18 inches or greater lifts and lightly compacted until the desired depth is reached. Since high canopy trees may be destroyed during maintenance the bioretention area should be vegetated to resemble a terrestrial forest community ecosystem that is dominated by understory trees. Three species each of both trees and shrubs are recommended to be planted at a rate of 2500 trees and shrubs per hectare (1000 per acre). For instance, a 15 foot (4.6 meter) by 40 foot (12.2 meter) bioretention area (600 square feet or 55.75 square meters) would require 14 trees and shrubs. The shrub-to-tree ratio should be 2:1 to 3:1.

Trees and shrubs should be planted when conditions are favorable. Vegetation should be watered at the end of each day for fourteen days following its planting. Plant species tolerant of pollutant loads and varying wet and dry conditions should be used in the bioretention area.

The designer should assess aesthetics, site layout, and maintenance requirements when selecting plant species. Adjacent non-native invasive species should be identified and the designer should take measures, such as providing a soil breach to eliminate the threat of these species invading the bioretention area. Regional landscaping manuals should be consulted to ensure that the planting of the bioretention area meets the landscaping requirements established by the local authorities. The designers should evaluate the best placement of vegetation within the bioretention area. Plants should be placed at irregular intervals to replicate a natural forest. Trees should be placed on the perimeter of the area to provide shade and shelter from the wind. Trees and shrubs can be sheltered from damaging flows if they are placed away from the path of the incoming runoff. In cold climates, species that are more tolerant to cold winds, such as evergreens, should be placed in windier areas of the site.

Following placement of the trees and shrubs, the ground cover and/or mulch should be established. Ground cover such as grasses or legumes can be planted at the beginning of the growing season. Mulch should be placed immediately after trees and shrubs are planted. Two to 3 inches (5 to 7.6 cm) of commercially-available fine shredded hardwood mulch or shredded hardwood chips should be applied to the bioretention area to protect from erosion.

Maintenance

The primary maintenance requirement for bioretention areas is that of inspection and repair or replacement of the treatment area's components. Generally, this involves nothing more than the routine periodic maintenance that is required of any landscaped area. Plants that are appropriate for the site, climatic, and watering conditions should be selected for use in the bioretention cell. Appropriately selected plants will aide in reducing fertilizer, pesticide, water, and overall maintenance requirements. Bioretention system components should blend over time through plant and root growth, organic decomposition, and the development of a natural soil horizon. These biologic and physical processes over time will lengthen the facility's life span and reduce the need for extensive maintenance.

Routine maintenance should include a biannual health evaluation of the trees and shrubs and subsequent removal of any dead or diseased vegetation (EPA, 1999). Diseased vegetation should be treated as needed using preventative and low-toxic measures to the extent possible. BMPs have the potential to create very attractive habitats for mosquitoes and other vectors because of highly organic, often heavily vegetated areas mixed with shallow water. Routine inspections for areas of standing water within the BMP and corrective measures to restore proper infiltration rates are necessary to prevent creating mosquito and other vector habitat. In addition, bioretention BMPs are susceptible to invasion by aggressive plant species such as cattails, which increase the chances of water standing and subsequent vector production if not routinely maintained.

In order to maintain the treatment area's appearance it may be necessary to prune and weed. Furthermore, mulch replacement is suggested when erosion is evident or when the site begins to look unattractive. Specifically, the entire area may require mulch replacement every two to three years, although spot mulching may be sufficient when there are random void areas. Mulch replacement should be done prior to the start of the wet season.

New Jersey's Department of Environmental Protection states in their bioretention systems standards that accumulated sediment and debris removal (especially at the inflow point) will normally be the primary maintenance function. Other potential tasks include replacement of dead vegetation, soil pH regulation, erosion repair at inflow points, mulch replenishment, unclogging the underdrain, and repairing overflow structures. There is also the possibility that the cation exchange capacity of the soils in the cell will be significantly reduced over time. Depending on pollutant loads, soils may need to be replaced within 5-10 years of construction (LID, 2000).

Cost

Construction Cost

Construction cost estimates for a bioretention area are slightly greater than those for the required landscaping for a new development (EPA, 1999). A general rule of thumb (Coffman, 1999) is that residential bioretention areas average about $3 to $4 per square foot, depending on soil conditions and the density and types of plants used. Commercial, industrial and institutional site costs can range between $10 to $40 per square foot, based on the need for control structures, curbing, storm drains and underdrains.

Retrofitting a site typically costs more, averaging $6,500 per bioretention area. The higher costs are attributed to the demolition of existing concrete, asphalt, and existing structures and the replacement of fill material with planting soil. The costs of retrofitting a commercial site in Maryland, Kettering Development, with 15 bioretention areas were estimated at $111,600.

In any bioretention area design, the cost of plants varies substantially and can account for a significant portion of the expenditures. While these cost estimates are slightly greater than those of typical landscaping treatment (due to the increased number of plantings, additional soil excavation, backfill material, use of underdrains etc.), those landscaping expenses that would be required regardless of the bioretention installation should be subtracted when determining the net cost.

Perhaps of most importance, however, the cost savings compared to the use of traditional structural stormwater conveyance systems makes bioretention areas quite attractive financially. For example, the use of bioretention can decrease the cost required for constructing stormwater conveyance systems at a site. A medical office building in Maryland was able to reduce the amount of storm drain pipe that was needed from 800 to 230 feet - a cost savings of $24,000 (PGDER, 1993). And a new residential development spent a total of approximately $100,000 using bioretention cells on each lot instead of nearly $400,000 for the traditional stormwater ponds that were originally planned (Rappahanock,). Also, in residential areas, stormwater management controls become a part of each property owner's landscape, reducing the public burden to maintain large centralized facilities.

Maintenance Cost

The operation and maintenance costs for a bioretention facility will be comparable to those of typical landscaping required for a site. Costs beyond the normal landscaping fees will include the cost for testing the soils and may include costs for a sand bed and planting soil.

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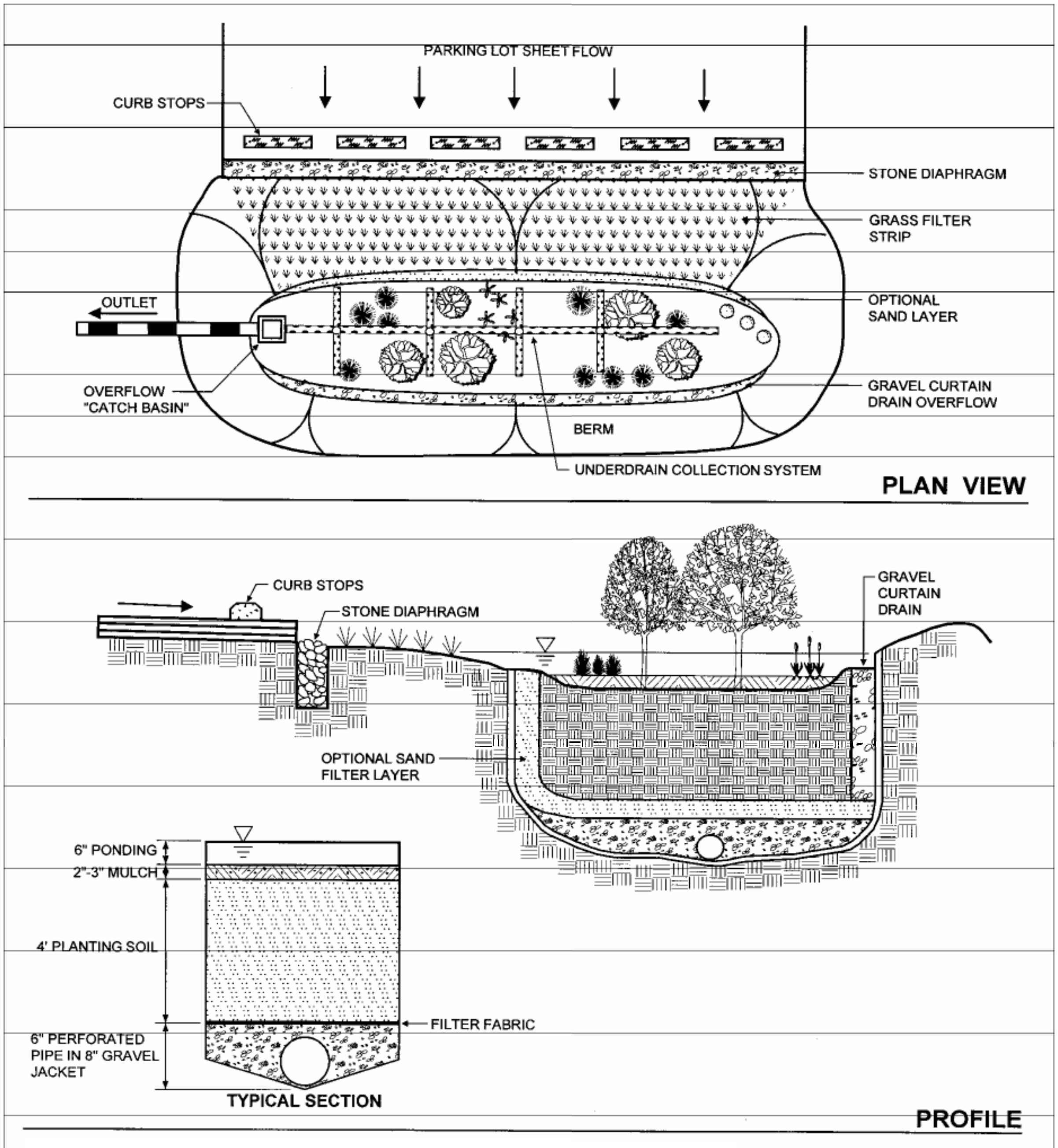

Schematic of a Bioretention Facility (MDE, 2000)

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

CASQA
California Stormwater Quality Association

- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.

- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.

- Keep accurate logs of the number of catch basins cleaned.

- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.

- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.

- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.

- Conduct routine maintenance at each pump station.

- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.

- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:

  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?

- Record locations of apparent illegal discharges/illicit connections?

- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.

- Eliminate the discharge once the origin of flow is established.

■ Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

■ Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

■ Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.

■ Establish a system for tracking incidents. The system should be designed to identify the following:

- Illegal dumping hot spots

- Types and quantities (in some cases) of wastes

- Patterns in time of occurrence (time of day/night, month, or year)

- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)

- Responsible parties

■ Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.

■ Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

■ Train crews in proper maintenance activities, including record keeping and disposal.

■ Allow only properly trained individuals to handle hazardous materials/wastes.

■ Have staff involved in detection and removal of illicit connections trained in the following:

- OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.

- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.

- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.

- Regulations may include adoption of substantial penalties for illegal dumping and disposal.

- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

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