

Appendix A

Emissions Calculations

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

**Delta Dams Rodent Burrowing Remediation Project
Contra Costa County, Annual**

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	79.03	3,442,546.80	0
User Defined Industrial	1.00	User Defined Unit	15.70	683,892.00	0
User Defined Industrial	1.00	User Defined Unit	8.10	352,836.00	0

1.2 Other Project Characteristics

Urbanization	Rural	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	58
Climate Zone	4			Operational Year	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	CH4 Intensity (lb/MWhr)	0.029	N2O Intensity (lb/MWhr)	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Delta Dams Rodent Burrowing Remediation Project. Contra Costa County.

Land Use - Clifton Court Forebay = permanent: 46 acres and temporary: 33.03 acres

Dyer Reservoir = permanent: 8.4 acres and temporary: 7.3 acres

Construction Phase - Work completed at CCF site September 2021 through October 2021 and all sites from May 2022 through October 2022.

Off-road Equipment - Default equipment assumed.

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Off-road Equipment - Default equipment assumed.

Off-road Equipment - Default equipment assumed.

Trips and VMT - Updated trip lengths based on distance to closest material facilities within area. Updated vendor trips to account for water trucks (two water trucks).

Grading - Material import based on project specific information. Distributed total over all phases.

Vehicle Emission Factors -

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Exterior	2239639	1721275
tblAreaCoating	Area_Nonresidential_Interior	6718917	5163825
tblConstructionPhase	NumDays	120.00	15.00
tblConstructionPhase	NumDays	310.00	27.00
tblConstructionPhase	NumDays	120.00	15.00
tblConstructionPhase	NumDays	310.00	30.00
tblConstructionPhase	NumDays	120.00	86.00
tblGrading	AcresOfGrading	17.00	41.23
tblGrading	AcresOfGrading	231.00	37.80
tblGrading	AcresOfGrading	33.00	11.20
tblGrading	AcresOfGrading	327.00	6.00
tblGrading	AcresOfGrading	66.00	0.70
tblGrading	MaterialImported	0.00	15,320.00
tblGrading	MaterialImported	0.00	15,320.00
tblGrading	MaterialImported	0.00	18,182.00
tblGrading	MaterialImported	0.00	18,182.00
tblGrading	MaterialImported	0.00	18,182.00
tblLandUse	LandUseSquareFeet	0.00	3,442,546.80
tblLandUse	LandUseSquareFeet	0.00	683,892.00
tblLandUse	LandUseSquareFeet	0.00	352,836.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

tblLandUse	LotAcreage	0.00	79.03
tblLandUse	LotAcreage	0.00	15.70
tblLandUse	LotAcreage	0.00	8.10
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripNumber	1,915.00	1,867.00
tblTripsAndVMT	HaulingTripNumber	1,904.00	1,867.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	WorkerTripNumber	10.00	30.00
tblTripsAndVMT	WorkerTripNumber	20.00	60.00
tblTripsAndVMT	WorkerTripNumber	10.00	60.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					
2021	0.0975	1.2225	0.6518	2.0900e-003	0.4049	0.0461	0.4510	0.1959	0.0426	0.2385	0.0000	193.6952	193.6952	0.0351	0.0148	198.9684
2022	0.2463	3.0188	1.6956	5.8600e-003	1.0392	0.1128	1.1520	0.5375	0.1040	0.6415	0.0000	545.7968	545.7968	0.0907	0.0437	561.0754
Maximum	0.2463	3.0188	1.6956	5.8600e-003	1.0392	0.1128	1.1520	0.5375	0.1040	0.6415	0.0000	545.7968	545.7968	0.0907	0.0437	561.0754

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					
2021	0.0975	1.2225	0.6518	2.0900e-003	0.4049	0.0461	0.4510	0.1959	0.0426	0.2385	0.0000	193.6951	193.6951	0.0351	0.0148	198.9683
2022	0.2463	3.0188	1.6956	5.8600e-003	1.0392	0.1128	1.1520	0.5375	0.1040	0.6415	0.0000	545.7965	545.7965	0.0907	0.0437	561.0751
Maximum	0.2463	3.0188	1.6956	5.8600e-003	1.0392	0.1128	1.1520	0.5375	0.1040	0.6415	0.0000	545.7965	545.7965	0.0907	0.0437	561.0751

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied**3.0 Construction Detail****Construction Phase**

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Staging/Access 1	Site Preparation	9/1/2021	9/21/2021	5	15	
2	High Priority Repairs	Grading	9/22/2021	10/28/2021	5	27	
3	Staging/Access 2	Site Preparation	5/1/2022	5/20/2022	5	15	
4	Burrow Remediation	Grading	5/21/2022	7/1/2022	5	30	
5	Drainage Channel/Intake Channel/Tree Removal	Site Preparation	7/2/2022	10/31/2022	5	86	

Acres of Grading (Site Preparation Phase): 41.23**Acres of Grading (Grading Phase): 37.8****Acres of Paving: 0****Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)**

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Staging/Access 1	Rubber Tired Dozers	3	8.00	247	0.40
Staging/Access 1	Tractors/Loaders/Backhoes	4	8.00	97	0.37
High Priority Repairs	Excavators	2	8.00	158	0.38
High Priority Repairs	Graders	1	8.00	187	0.41
High Priority Repairs	Rubber Tired Dozers	1	8.00	247	0.40
High Priority Repairs	Scrapers	2	8.00	367	0.48
High Priority Repairs	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Staging/Access 2	Rubber Tired Dozers	3	8.00	247	0.40
Staging/Access 2	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Burrow Remediation	Excavators	2	8.00	158	0.38
Burrow Remediation	Graders	1	8.00	187	0.41
Burrow Remediation	Rubber Tired Dozers	1	8.00	247	0.40
Burrow Remediation	Scrapers	2	8.00	367	0.48
Burrow Remediation	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Drainage Channel/Intake Channel/Tree Removal	Rubber Tired Dozers	3	8.00	247	0.40
Drainage Channel/Intake Channel/Tree Removal	Tractors/Loaders/Backhoes	4	8.00	97	0.37

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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
Staging/Access 1	4	10.00	4.00	1,867.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
High Priority Repairs	8	20.00	4.00	1,867.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Staging/Access 2	4	30.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Burrow Remediation	8	60.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Drainage Channel/Intake Channel/Tree Removal	4	60.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT

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3.1 Mitigation Measures Construction

3.2 Staging/Access 1 - 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					
Fugitive Dust					0.1251	0.0000	0.1251	0.0588	0.0000	0.0588	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0292	0.3037	0.1587	2.9000e-004		0.0153	0.0153		0.0141	0.0141	0.0000	25.0768	25.0768	8.1100e-003	0.0000	25.2796
Total	0.0292	0.3037	0.1587	2.9000e-004	0.1251	0.0153	0.1404	0.0588	0.0141	0.0729	0.0000	25.0768	25.0768	8.1100e-003	0.0000	25.2796

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	5.2100e-003	0.1431	0.0328	4.6000e-004	0.0119	1.9300e-003	0.0138	3.2700e-003	1.8400e-003	5.1100e-003	0.0000	45.5742	45.5742	1.5300e-003	7.2200e-003	47.7643
Vendor	1.0000e-004	1.9000e-003	5.8000e-004	1.0000e-005	1.8000e-004	3.0000e-005	2.1000e-004	5.0000e-005	3.0000e-005	8.0000e-005	0.0000	0.5844	0.5844	1.0000e-005	9.0000e-005	0.6102
Worker	2.3000e-004	1.7000e-004	1.9800e-003	1.0000e-005	5.9000e-004	0.0000	6.0000e-004	1.6000e-004	0.0000	1.6000e-004	0.0000	0.4925	0.4925	2.0000e-005	2.0000e-005	0.4975
Total	5.5400e-003	0.1452	0.0353	4.8000e-004	0.0127	1.9600e-003	0.0146	3.4800e-003	1.8700e-003	5.3500e-003	0.0000	46.6511	46.6511	1.5600e-003	7.3300e-003	48.8721

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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					0.1251	0.0000	0.1251	0.0588	0.0000	0.0588	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0292	0.3037	0.1587	2.9000e-004		0.0153	0.0153		0.0141	0.0141	0.0000	25.0768	25.0768	8.1100e-003	0.0000	25.2795
Total	0.0292	0.3037	0.1587	2.9000e-004	0.1251	0.0153	0.1404	0.0588	0.0141	0.0729	0.0000	25.0768	25.0768	8.1100e-003	0.0000	25.2795

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	5.2100e-003	0.1431	0.0328	4.6000e-004	0.0119	1.9300e-003	0.0138	3.2700e-003	1.8400e-003	5.1100e-003	0.0000	45.5742	45.5742	1.5300e-003	7.2200e-003	47.7643
Vendor	1.0000e-004	1.9000e-003	5.8000e-004	1.0000e-005	1.8000e-004	3.0000e-005	2.1000e-004	5.0000e-005	3.0000e-005	8.0000e-005	0.0000	0.5844	0.5844	1.0000e-005	9.0000e-005	0.6102
Worker	2.3000e-004	1.7000e-004	1.9800e-003	1.0000e-005	5.9000e-004	0.0000	6.0000e-004	1.6000e-004	0.0000	1.6000e-004	0.0000	0.4925	0.4925	2.0000e-005	2.0000e-005	0.4975
Total	5.5400e-003	0.1452	0.0353	4.8000e-004	0.0127	1.9600e-003	0.0146	3.4800e-003	1.8700e-003	5.3500e-003	0.0000	46.6511	46.6511	1.5600e-003	7.3300e-003	48.8721

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3.3 High Priority Repairs - 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					
Fugitive Dust					0.2528	0.0000	0.2528	0.1297	0.0000	0.1297	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0566	0.6264	0.4169	8.4000e-004		0.0268	0.0268		0.0247	0.0247	0.0000	73.5682	73.5682	0.0238	0.0000	74.1631
Total	0.0566	0.6264	0.4169	8.4000e-004	0.2528	0.0268	0.2796	0.1297	0.0247	0.1544	0.0000	73.5682	73.5682	0.0238	0.0000	74.1631

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	5.2100e-003	0.1431	0.0328	4.6000e-004	0.0119	1.9300e-003	0.0138	3.2700e-003	1.8400e-003	5.1100e-003	0.0000	45.5742	45.5742	1.5300e-003	7.2200e-003	47.7643
Vendor	1.8000e-004	3.4200e-003	1.0500e-003	1.0000e-005	3.2000e-004	6.0000e-005	3.8000e-004	9.0000e-005	5.0000e-005	1.5000e-004	0.0000	1.0519	1.0519	3.0000e-005	1.5000e-004	1.0984
Worker	8.2000e-004	6.2000e-004	7.1100e-003	2.0000e-005	2.1400e-003	1.0000e-005	2.1500e-003	5.7000e-004	1.0000e-005	5.8000e-004	0.0000	1.7731	1.7731	6.0000e-005	6.0000e-005	1.7910
Total	6.2100e-003	0.1472	0.0409	4.9000e-004	0.0143	2.0000e-003	0.0163	3.9300e-003	1.9000e-003	5.8400e-003	0.0000	48.3991	48.3991	1.6200e-003	7.4300e-003	50.6537

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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					0.2528	0.0000	0.2528	0.1297	0.0000	0.1297	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0566	0.6264	0.4169	8.4000e-004		0.0268	0.0268		0.0247	0.0247	0.0000	73.5681	73.5681	0.0238	0.0000	74.1630
Total	0.0566	0.6264	0.4169	8.4000e-004	0.2528	0.0268	0.2796	0.1297	0.0247	0.1544	0.0000	73.5681	73.5681	0.0238	0.0000	74.1630

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	5.2100e-003	0.1431	0.0328	4.6000e-004	0.0119	1.9300e-003	0.0138	3.2700e-003	1.8400e-003	5.1100e-003	0.0000	45.5742	45.5742	1.5300e-003	7.2200e-003	47.7643
Vendor	1.8000e-004	3.4200e-003	1.0500e-003	1.0000e-005	3.2000e-004	6.0000e-005	3.8000e-004	9.0000e-005	5.0000e-005	1.5000e-004	0.0000	1.0519	1.0519	3.0000e-005	1.5000e-004	1.0984
Worker	8.2000e-004	6.2000e-004	7.1100e-003	2.0000e-005	2.1400e-003	1.0000e-005	2.1500e-003	5.7000e-004	1.0000e-005	5.8000e-004	0.0000	1.7731	1.7731	6.0000e-005	6.0000e-005	1.7910
Total	6.2100e-003	0.1472	0.0409	4.9000e-004	0.0143	2.0000e-003	0.0163	3.9300e-003	1.9000e-003	5.8400e-003	0.0000	48.3991	48.3991	1.6200e-003	7.4300e-003	50.6537

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3.4 Staging/Access 2 - 2022

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					0.2057	0.0000	0.2057	0.1100	0.0000	0.1100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0238	0.2481	0.1477	2.9000e-004		0.0121	0.0121		0.0111	0.0111	0.0000	25.0795	25.0795	8.1100e-003	0.0000	25.2823
Total	0.0238	0.2481	0.1477	2.9000e-004	0.2057	0.0121	0.2178	0.1100	0.0111	0.1212	0.0000	25.0795	25.0795	8.1100e-003	0.0000	25.2823

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	6.9600e-003	0.2480	0.0570	9.0000e-004	0.0238	2.1700e-003	0.0259	6.5300e-003	2.0800e-003	8.6100e-003	0.0000	88.8479	88.8479	2.9100e-003	0.0141	93.1166
Vendor	7.0000e-005	1.5800e-003	4.9000e-004	1.0000e-005	1.8000e-004	2.0000e-005	2.0000e-004	5.0000e-005	2.0000e-005	7.0000e-005	0.0000	0.5708	0.5708	1.0000e-005	8.0000e-005	0.5959
Worker	6.3000e-004	4.6000e-004	5.4500e-003	2.0000e-005	1.7800e-003	1.0000e-005	1.7900e-003	4.7000e-004	1.0000e-005	4.8000e-004	0.0000	1.4330	1.4330	5.0000e-005	4.0000e-005	1.4468
Total	7.6600e-003	0.2501	0.0630	9.3000e-004	0.0257	2.2000e-003	0.0279	7.0500e-003	2.1100e-003	9.1600e-003	0.0000	90.8517	90.8517	2.9700e-003	0.0142	95.1593

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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					0.2057	0.0000	0.2057	0.1100	0.0000	0.1100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0238	0.2481	0.1477	2.9000e-004		0.0121	0.0121		0.0111	0.0111	0.0000	25.0795	25.0795	8.1100e-003	0.0000	25.2823
Total	0.0238	0.2481	0.1477	2.9000e-004	0.2057	0.0121	0.2178	0.1100	0.0111	0.1212	0.0000	25.0795	25.0795	8.1100e-003	0.0000	25.2823

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	6.9600e-003	0.2480	0.0570	9.0000e-004	0.0238	2.1700e-003	0.0259	6.5300e-003	2.0800e-003	8.6100e-003	0.0000	88.8479	88.8479	2.9100e-003	0.0141	93.1166
Vendor	7.0000e-005	1.5800e-003	4.9000e-004	1.0000e-005	1.8000e-004	2.0000e-005	2.0000e-004	5.0000e-005	2.0000e-005	7.0000e-005	0.0000	0.5708	0.5708	1.0000e-005	8.0000e-005	0.5959
Worker	6.3000e-004	4.6000e-004	5.4500e-003	2.0000e-005	1.7800e-003	1.0000e-005	1.7900e-003	4.7000e-004	1.0000e-005	4.8000e-004	0.0000	1.4330	1.4330	5.0000e-005	4.0000e-005	1.4468
Total	7.6600e-003	0.2501	0.0630	9.3000e-004	0.0257	2.2000e-003	0.0279	7.0500e-003	2.1100e-003	9.1600e-003	0.0000	90.8517	90.8517	2.9700e-003	0.0142	95.1593

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3.5 Burrow Remediation - 2022

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					0.3324	0.0000	0.3324	0.1809	0.0000	0.1809	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0544	0.5827	0.4356	9.3000e-004		0.0245	0.0245		0.0226	0.0226	0.0000	81.8019	81.8019	0.0265	0.0000	82.4633
Total	0.0544	0.5827	0.4356	9.3000e-004	0.3324	0.0245	0.3569	0.1809	0.0226	0.2035	0.0000	81.8019	81.8019	0.0265	0.0000	82.4633

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	6.9600e-003	0.2480	0.0570	9.0000e-004	0.0238	2.1700e-003	0.0259	6.5300e-003	2.0800e-003	8.6100e-003	0.0000	88.8479	88.8479	2.9100e-003	0.0141	93.1166
Vendor	1.3000e-004	3.1600e-003	9.9000e-004	1.0000e-005	3.6000e-004	3.0000e-005	3.9000e-004	1.0000e-004	3.0000e-005	1.4000e-004	0.0000	1.1416	1.1416	3.0000e-005	1.7000e-004	1.1918
Worker	2.5300e-003	1.8200e-003	0.0218	6.0000e-005	7.1400e-003	4.0000e-005	7.1800e-003	1.9000e-003	3.0000e-005	1.9300e-003	0.0000	5.7321	5.7321	1.8000e-004	1.7000e-004	5.7872
Total	9.6200e-003	0.2530	0.0798	9.7000e-004	0.0313	2.2400e-003	0.0335	8.5300e-003	2.1400e-003	0.0107	0.0000	95.7216	95.7216	3.1200e-003	0.0144	100.0956

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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					0.3324	0.0000	0.3324	0.1809	0.0000	0.1809	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0544	0.5827	0.4356	9.3000e-004		0.0245	0.0245		0.0226	0.0226	0.0000	81.8018	81.8018	0.0265	0.0000	82.4632
Total	0.0544	0.5827	0.4356	9.3000e-004	0.3324	0.0245	0.3569	0.1809	0.0226	0.2035	0.0000	81.8018	81.8018	0.0265	0.0000	82.4632

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	6.9600e-003	0.2480	0.0570	9.0000e-004	0.0238	2.1700e-003	0.0259	6.5300e-003	2.0800e-003	8.6100e-003	0.0000	88.8479	88.8479	2.9100e-003	0.0141	93.1166
Vendor	1.3000e-004	3.1600e-003	9.9000e-004	1.0000e-005	3.6000e-004	3.0000e-005	3.9000e-004	1.0000e-004	3.0000e-005	1.4000e-004	0.0000	1.1416	1.1416	3.0000e-005	1.7000e-004	1.1918
Worker	2.5300e-003	1.8200e-003	0.0218	6.0000e-005	7.1400e-003	4.0000e-005	7.1800e-003	1.9000e-003	3.0000e-005	1.9300e-003	0.0000	5.7321	5.7321	1.8000e-004	1.7000e-004	5.7872
Total	9.6200e-003	0.2530	0.0798	9.7000e-004	0.0313	2.2400e-003	0.0335	8.5300e-003	2.1400e-003	0.0107	0.0000	95.7216	95.7216	3.1200e-003	0.0144	100.0956

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3.6 Drainage Channel/Intake Channel/Tree Removal - 2022

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					0.3989	0.0000	0.3989	0.2187	0.0000	0.2187	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1363	1.4226	0.8470	1.6400e-003		0.0693	0.0693		0.0638	0.0638	0.0000	143.7894	143.7894	0.0465	0.0000	144.9520
Total	0.1363	1.4226	0.8470	1.6400e-003	0.3989	0.0693	0.4682	0.2187	0.0638	0.2825	0.0000	143.7894	143.7894	0.0465	0.0000	144.9520

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	6.9600e-003	0.2480	0.0570	9.0000e-004	0.0238	2.1700e-003	0.0259	6.5300e-003	2.0800e-003	8.6100e-003	0.0000	88.8479	88.8479	2.9100e-003	0.0141	93.1166
Vendor	3.7000e-004	9.0500e-003	2.8300e-003	3.0000e-005	1.0200e-003	1.0000e-004	1.1200e-003	3.0000e-004	9.0000e-005	3.9000e-004	0.0000	3.2727	3.2727	7.0000e-005	4.8000e-004	3.4166
Worker	7.2600e-003	5.2200e-003	0.0625	1.8000e-004	0.0205	1.1000e-004	0.0206	5.4400e-003	1.0000e-004	5.5400e-003	0.0000	16.4321	16.4321	5.2000e-004	4.9000e-004	16.5898
Total	0.0146	0.2623	0.1224	1.1100e-003	0.0452	2.3800e-003	0.0476	0.0123	2.2700e-003	0.0145	0.0000	108.5527	108.5527	3.5000e-003	0.0151	113.1230

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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					0.3989	0.0000	0.3989	0.2187	0.0000	0.2187	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.1363	1.4226	0.8470	1.6400e-003		0.0693	0.0693		0.0638	0.0638	0.0000	143.7892	143.7892	0.0465	0.0000	144.9518
Total	0.1363	1.4226	0.8470	1.6400e-003	0.3989	0.0693	0.4682	0.2187	0.0638	0.2825	0.0000	143.7892	143.7892	0.0465	0.0000	144.9518

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	6.9600e-003	0.2480	0.0570	9.0000e-004	0.0238	2.1700e-003	0.0259	6.5300e-003	2.0800e-003	8.6100e-003	0.0000	88.8479	88.8479	2.9100e-003	0.0141	93.1166
Vendor	3.7000e-004	9.0500e-003	2.8300e-003	3.0000e-005	1.0200e-003	1.0000e-004	1.1200e-003	3.0000e-004	9.0000e-005	3.9000e-004	0.0000	3.2727	3.2727	7.0000e-005	4.8000e-004	3.4166
Worker	7.2600e-003	5.2200e-003	0.0625	1.8000e-004	0.0205	1.1000e-004	0.0206	5.4400e-003	1.0000e-004	5.5400e-003	0.0000	16.4321	16.4321	5.2000e-004	4.9000e-004	16.5898
Total	0.0146	0.2623	0.1224	1.1100e-003	0.0452	2.3800e-003	0.0476	0.0123	2.2700e-003	0.0145	0.0000	108.5527	108.5527	3.5000e-003	0.0151	113.1230

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

**Delta Dams Rodent Burrowing Remediation Project
Contra Costa County, Summer**

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	79.03	3,442,546.80	0
User Defined Industrial	1.00	User Defined Unit	15.70	683,892.00	0
User Defined Industrial	1.00	User Defined Unit	8.10	352,836.00	0

1.2 Other Project Characteristics

Urbanization	Rural	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	58
Climate Zone	4			Operational Year	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	CH4 Intensity (lb/MWhr)	0.029	N2O Intensity (lb/MWhr)	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Delta Dams Rodent Burrowing Remediation Project. Contra Costa County.

Land Use - Clifton Court Forebay = permanent: 46 acres and temporary: 33.03 acres

Construction Phase - Work completed at CCF site September 2021 through October 2021 and all sites from May 2022 through October 2022.

Off-road Equipment - Default equipment assumed.

Off-road Equipment - Default equipment assumed.

Off-road Equipment - Default equipment assumed.

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Off-road Equipment - Default equipment assumed.

Off-road Equipment - Default equipment assumed.

Trips and VMT - Updated trip lengths based on distance to closest material facilities within area. Updated vendor trips to account for water trucks (two water trucks).

Grading - Material import based on project specific information. Distributed total over all phases.

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Exterior	2239639	1721275
tblAreaCoating	Area_Nonresidential_Interior	6718917	5163825
tblConstructionPhase	NumDays	120.00	15.00
tblConstructionPhase	NumDays	310.00	27.00
tblConstructionPhase	NumDays	120.00	15.00
tblConstructionPhase	NumDays	310.00	30.00
tblConstructionPhase	NumDays	120.00	86.00
tblGrading	AcresOfGrading	17.00	41.23
tblGrading	AcresOfGrading	231.00	37.80
tblGrading	AcresOfGrading	33.00	11.20
tblGrading	AcresOfGrading	327.00	6.00
tblGrading	AcresOfGrading	66.00	0.70
tblGrading	MaterialImported	0.00	15,320.00
tblGrading	MaterialImported	0.00	15,320.00
tblGrading	MaterialImported	0.00	18,182.00
tblGrading	MaterialImported	0.00	18,182.00
tblGrading	MaterialImported	0.00	18,182.00
tblLandUse	LandUseSquareFeet	0.00	3,442,546.80
tblLandUse	LandUseSquareFeet	0.00	683,892.00
tblLandUse	LandUseSquareFeet	0.00	352,836.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

tblLandUse	LotAcreage	0.00	79.03
tblLandUse	LotAcreage	0.00	15.70
tblLandUse	LotAcreage	0.00	8.10
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripNumber	1,915.00	1,867.00
tblTripsAndVMT	HaulingTripNumber	1,904.00	1,867.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	WorkerTripNumber	10.00	30.00
tblTripsAndVMT	WorkerTripNumber	20.00	60.00
tblTripsAndVMT	WorkerTripNumber	10.00	60.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					
2021	4.6603	59.1922	33.9487	0.1011	19.8189	2.3060	21.9520	9.9096	2.1311	11.8775	0.0000	10,547.4648	10,547.4648	2.0750	1.0758	10,903.6129
2022	4.2885	65.2765	34.4871	0.1609	30.9630	1.9057	32.8687	15.6389	1.7640	17.4029	0.0000	17,053.5919	17,053.5919	2.1732	2.0870	17,716.2380
Maximum	4.6603	65.2765	34.4871	0.1609	30.9630	2.3060	32.8687	15.6389	2.1311	17.4029	0.0000	17,053.5919	17,053.5919	2.1732	2.0870	17,716.2380

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					
2021	4.6603	59.1922	33.9487	0.1011	19.8189	2.3060	21.9520	9.9096	2.1311	11.8775	0.0000	10,547.4648	10,547.4648	2.0750	1.0758	10,903.6129
2022	4.2885	65.2765	34.4871	0.1609	30.9630	1.9057	32.8687	15.6389	1.7640	17.4029	0.0000	17,053.5919	17,053.5919	2.1732	2.0870	17,716.2380
Maximum	4.6603	65.2765	34.4871	0.1609	30.9630	2.3060	32.8687	15.6389	2.1311	17.4029	0.0000	17,053.5919	17,053.5919	2.1732	2.0870	17,716.2380

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	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
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	Staging/Access 1	Site Preparation	9/1/2021	9/21/2021	5	15	
2	High Priority Repairs	Grading	9/22/2021	10/28/2021	5	27	
3	Staging/Access 2	Site Preparation	5/1/2022	5/20/2022	5	15	
4	Burrow Remediation	Grading	5/21/2022	7/1/2022	5	30	
5	Drainage Channel/Intake Channel/Tree Removal	Site Preparation	7/2/2022	10/31/2022	5	86	

Acres of Grading (Site Preparation Phase): 41.23

Acres of Grading (Grading Phase): 37.8

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating –

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied**OffRoad Equipment**

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Staging/Access 1	Rubber Tired Dozers	3	8.00	247	0.40
Staging/Access 1	Tractors/Loaders/Backhoes	4	8.00	97	0.37
High Priority Repairs	Excavators	2	8.00	158	0.38
High Priority Repairs	Graders	1	8.00	187	0.41
High Priority Repairs	Rubber Tired Dozers	1	8.00	247	0.40
High Priority Repairs	Scrapers	2	8.00	367	0.48
High Priority Repairs	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Staging/Access 2	Rubber Tired Dozers	3	8.00	247	0.40
Staging/Access 2	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Burrow Remediation	Excavators	2	8.00	158	0.38
Burrow Remediation	Graders	1	8.00	187	0.41
Burrow Remediation	Rubber Tired Dozers	1	8.00	247	0.40
Burrow Remediation	Scrapers	2	8.00	367	0.48
Burrow Remediation	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Drainage Channel/Intake Channel/Tree Removal	Rubber Tired Dozers	3	8.00	247	0.40
Drainage Channel/Intake Channel/Tree Removal	Tractors/Loaders/Backhoes	4	8.00	97	0.37

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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
Staging/Access 1	4	10.00	4.00	1,867.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
High Priority Repairs	8	20.00	4.00	1,867.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Staging/Access 2	4	30.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Burrow Remediation	8	60.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Drainage Channel/Intake Channel/Tree Removal	4	60.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.1 Mitigation Measures Construction

3.2 Staging/Access 1 - 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					
Fugitive Dust					16.6805	0.0000	16.6805	7.8354	0.0000	7.8354			0.0000			0.0000
Off-Road	3.8882	40.4971	21.1543	0.0380		2.0445	2.0445		1.8809	1.8809		3,685.6569	3,685.6569	1.1920		3,715.4573
Total	3.8882	40.4971	21.1543	0.0380	16.6805	2.0445	18.7250	7.8354	1.8809	9.7163		3,685.6569	3,685.6569	1.1920		3,715.4573

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	0.7000	18.4301	4.3346	0.0615	1.6328	0.2568	1.8897	0.4476	0.2457	0.6933		6,697.6698	6,697.6698	0.2258	1.0612	7,019.5434
Vendor	0.0135	0.2444	0.0765	8.0000e-004	0.0245	4.2500e-003	0.0288	7.0500e-003	4.0700e-003	0.0111		85.8862	85.8862	2.0800e-003	0.0126	89.6811
Worker	0.0334	0.0205	0.2928	7.7000e-004	0.0822	4.4000e-004	0.0826	0.0218	4.1000e-004	0.0222		78.2520	78.2520	2.3300e-003	2.0800e-003	78.9312
Total	0.7468	18.6951	4.7039	0.0631	1.7395	0.2615	2.0010	0.4764	0.2502	0.7266		6,861.8079	6,861.8079	0.2302	1.0758	7,188.1556

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					16.6805	0.0000	16.6805	7.8354	0.0000	7.8354			0.0000			0.0000
Off-Road	3.8882	40.4971	21.1543	0.0380		2.0445	2.0445		1.8809	1.8809	0.0000	3,685.6569	3,685.6569	1.1920		3,715.4573
Total	3.8882	40.4971	21.1543	0.0380	16.6805	2.0445	18.7250	7.8354	1.8809	9.7163	0.0000	3,685.6569	3,685.6569	1.1920		3,715.4573

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	0.7000	18.4301	4.3346	0.0615	1.6328	0.2568	1.8897	0.4476	0.2457	0.6933		6,697.6698	6,697.6698	0.2258	1.0612	7,019.5434
Vendor	0.0135	0.2444	0.0765	8.0000e-004	0.0245	4.2500e-003	0.0288	7.0500e-003	4.0700e-003	0.0111		85.8862	85.8862	2.0800e-003	0.0126	89.6811
Worker	0.0334	0.0205	0.2928	7.7000e-004	0.0822	4.4000e-004	0.0826	0.0218	4.1000e-004	0.0222		78.2520	78.2520	2.3300e-003	2.0800e-003	78.9312
Total	0.7468	18.6951	4.7039	0.0631	1.7395	0.2615	2.0010	0.4764	0.2502	0.7266		6,861.8079	6,861.8079	0.2302	1.0758	7,188.1556

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

CalEEMod Version: CalEEMod.2020.4.0

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.3 High Priority Repairs - 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					
Fugitive Dust					18.7230	0.0000	18.7230	9.6103	0.0000	9.6103			0.0000			0.0000
Off-Road	4.1912	46.3998	30.8785	0.0620		1.9853	1.9853		1.8265	1.8265		6,007.0434	6,007.0434	1.9428		6,055.6134
Total	4.1912	46.3998	30.8785	0.0620	18.7230	1.9853	20.7083	9.6103	1.8265	11.4368		6,007.0434	6,007.0434	1.9428		6,055.6134

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	0.3889	10.2390	2.4081	0.0342	0.9071	0.1427	1.0498	0.2487	0.1365	0.3852		3,720.9277	3,720.9277	0.1254	0.5895	3,899.7463
Vendor	0.0135	0.2444	0.0765	8.0000e-004	0.0245	4.2500e-003	0.0288	7.0500e-003	4.0700e-003	0.0111		85.8862	85.8862	2.0800e-003	0.0126	89.6811
Worker	0.0668	0.0411	0.5857	1.5500e-003	0.1643	8.9000e-004	0.1652	0.0436	8.2000e-004	0.0444		156.5040	156.5040	4.6700e-003	4.1700e-003	157.8624
Total	0.4691	10.5245	3.0703	0.0365	1.0959	0.1478	1.2437	0.2993	0.1414	0.4407		3,963.3178	3,963.3178	0.1322	0.6063	4,147.2898

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

CalEEMod Version: CalEEMod.2020.4.0

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					18.7230	0.0000	18.7230	9.6103	0.0000	9.6103			0.0000			0.0000
Off-Road	4.1912	46.3998	30.8785	0.0620		1.9853	1.9853		1.8265	1.8265	0.0000	6,007.0434	6,007.0434	1.9428		6,055.6134
Total	4.1912	46.3998	30.8785	0.0620	18.7230	1.9853	20.7083	9.6103	1.8265	11.4368	0.0000	6,007.0434	6,007.0434	1.9428		6,055.6134

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	0.3889	10.2390	2.4081	0.0342	0.9071	0.1427	1.0498	0.2487	0.1365	0.3852		3,720.9277	3,720.9277	0.1254	0.5895	3,899.7463
Vendor	0.0135	0.2444	0.0765	8.0000e-004	0.0245	4.2500e-003	0.0288	7.0500e-003	4.0700e-003	0.0111		85.8862	85.8862	2.0800e-003	0.0126	89.6811
Worker	0.0668	0.0411	0.5857	1.5500e-003	0.1643	8.9000e-004	0.1652	0.0436	8.2000e-004	0.0444		156.5040	156.5040	4.6700e-003	4.1700e-003	157.8624
Total	0.4691	10.5245	3.0703	0.0365	1.0959	0.1478	1.2437	0.2993	0.1414	0.4407		3,963.3178	3,963.3178	0.1322	0.6063	4,147.2898

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

CalEEMod Version: CalEEMod.2020.4.0

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.4 Staging/Access 2 - 2022

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					27.4261	0.0000	27.4261	14.6713	0.0000	14.6713			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	3.1701	33.0835	19.6978	0.0380	27.4261	1.6126	29.0387	14.6713	1.4836	16.1548		3,686.0619	3,686.0619	1.1922		3,715.8655

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	0.9388	31.9353	7.5417	0.1198	3.2660	0.2896	3.5556	0.8953	0.2771	1.1723		13,056.0274	13,056.0274	0.4290	2.0690	13,683.3084
Vendor	8.7800e-003	0.2034	0.0647	7.8000e-004	0.0245	2.2800e-003	0.0268	7.0500e-003	2.1900e-003	9.2400e-003		83.8826	83.8826	1.8500e-003	0.0122	87.5677
Worker	0.0928	0.0543	0.8050	2.2500e-003	0.2464	1.2600e-003	0.2477	0.0654	1.1600e-003	0.0665		227.6201	227.6201	6.3000e-003	5.7700e-003	229.4964
Total	1.0403	32.1930	8.4115	0.1228	3.5369	0.2931	3.8301	0.9677	0.2804	1.2481		13,367.5301	13,367.5301	0.4372	2.0870	14,000.3725

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					27.4261	0.0000	27.4261	14.6713	0.0000	14.6713			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	3.1701	33.0835	19.6978	0.0380	27.4261	1.6126	29.0387	14.6713	1.4836	16.1548	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655

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	0.9388	31.9353	7.5417	0.1198	3.2660	0.2896	3.5556	0.8953	0.2771	1.1723		13,056.0274	13,056.0274	0.4290	2.0690	13,683.3084
Vendor	8.7800e-003	0.2034	0.0647	7.8000e-004	0.0245	2.2800e-003	0.0268	7.0500e-003	2.1900e-003	9.2400e-003		83.8826	83.8826	1.8500e-003	0.0122	87.5677
Worker	0.0928	0.0543	0.8050	2.2500e-003	0.2464	1.2600e-003	0.2477	0.0654	1.1600e-003	0.0665		227.6201	227.6201	6.3000e-003	5.7700e-003	229.4964
Total	1.0403	32.1930	8.4115	0.1228	3.5369	0.2931	3.8301	0.9677	0.2804	1.2481		13,367.5301	13,367.5301	0.4372	2.0870	14,000.3725

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied**3.5 Burrow Remediation - 2022****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					22.1609	0.0000	22.1609	12.0604	0.0000	12.0604			0.0000			0.0000
Off-Road	3.6248	38.8435	29.0415	0.0621		1.6349	1.6349		1.5041	1.5041		6,011.4105	6,011.4105	1.9442		6,060.0158
Total	3.6248	38.8435	29.0415	0.0621	22.1609	1.6349	23.7958	12.0604	1.5041	13.5645		6,011.4105	6,011.4105	1.9442		6,060.0158

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	0.4694	15.9676	3.7709	0.0599	1.6330	0.1448	1.7778	0.4476	0.1385	0.5862		6,528.0137	6,528.0137	0.2145	1.0345	6,841.6542
Vendor	8.7800e-003	0.2034	0.0647	7.8000e-004	0.0245	2.2800e-003	0.0268	7.0500e-003	2.1900e-003	9.2400e-003		83.8826	83.8826	1.8500e-003	0.0122	87.5677
Worker	0.1855	0.1085	1.6100	4.5000e-003	0.4929	2.5200e-003	0.4954	0.1307	2.3200e-003	0.1331		455.2402	455.2402	0.0126	0.0115	458.9927
Total	0.6636	16.2796	5.4456	0.0652	2.1504	0.1496	2.3000	0.5854	0.1431	0.7285		7,067.1365	7,067.1365	0.2290	1.0582	7,388.2146

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					22.1609	0.0000	22.1609	12.0604	0.0000	12.0604			0.0000			0.0000
Off-Road	3.6248	38.8435	29.0415	0.0621		1.6349	1.6349		1.5041	1.5041	0.0000	6,011.4105	6,011.4105	1.9442		6,060.0158
Total	3.6248	38.8435	29.0415	0.0621	22.1609	1.6349	23.7958	12.0604	1.5041	13.5645	0.0000	6,011.4105	6,011.4105	1.9442		6,060.0158

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	0.4694	15.9676	3.7709	0.0599	1.6330	0.1448	1.7778	0.4476	0.1385	0.5862		6,528.0137	6,528.0137	0.2145	1.0345	6,841.6542
Vendor	8.7800e-003	0.2034	0.0647	7.8000e-004	0.0245	2.2800e-003	0.0268	7.0500e-003	2.1900e-003	9.2400e-003		83.8826	83.8826	1.8500e-003	0.0122	87.5677
Worker	0.1855	0.1085	1.6100	4.5000e-003	0.4929	2.5200e-003	0.4954	0.1307	2.3200e-003	0.1331		455.2402	455.2402	0.0126	0.0115	458.9927
Total	0.6636	16.2796	5.4456	0.0652	2.1504	0.1496	2.3000	0.5854	0.1431	0.7285		7,067.1365	7,067.1365	0.2290	1.0582	7,388.2146

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.6 Drainage Channel/Intake Channel/Tree Removal - 2022

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					9.2757	0.0000	9.2757	5.0854	0.0000	5.0854			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	3.1701	33.0835	19.6978	0.0380	9.2757	1.6126	10.8883	5.0854	1.4836	6.5689		3,686.0619	3,686.0619	1.1922		3,715.8655

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	0.1637	5.5701	1.3154	0.0209	0.5697	0.0505	0.6202	0.1562	0.0483	0.2045		2,277.2141	2,277.2141	0.0748	0.3609	2,386.6236
Vendor	8.7800e-003	0.2034	0.0647	7.8000e-004	0.0245	2.2800e-003	0.0268	7.0500e-003	2.1900e-003	9.2400e-003		83.8826	83.8826	1.8500e-003	0.0122	87.5677
Worker	0.1855	0.1085	1.6100	4.5000e-003	0.4929	2.5200e-003	0.4954	0.1307	2.3200e-003	0.1331		455.2402	455.2402	0.0126	0.0115	458.9927
Total	0.3580	5.8821	2.9902	0.0262	1.0870	0.0553	1.1424	0.2939	0.0528	0.3468		2,816.3369	2,816.3369	0.0893	0.3846	2,933.1840

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Summer

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					9.2757	0.0000	9.2757	5.0854	0.0000	5.0854			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	3.1701	33.0835	19.6978	0.0380	9.2757	1.6126	10.8883	5.0854	1.4836	6.5689	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655

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	0.1637	5.5701	1.3154	0.0209	0.5697	0.0505	0.6202	0.1562	0.0483	0.2045		2,277.2141	2,277.2141	0.0748	0.3609	2,386.6236
Vendor	8.7800e-003	0.2034	0.0647	7.8000e-004	0.0245	2.2800e-003	0.0268	7.0500e-003	2.1900e-003	9.2400e-003		83.8826	83.8826	1.8500e-003	0.0122	87.5677
Worker	0.1855	0.1085	1.6100	4.5000e-003	0.4929	2.5200e-003	0.4954	0.1307	2.3200e-003	0.1331		455.2402	455.2402	0.0126	0.0115	458.9927
Total	0.3580	5.8821	2.9902	0.0262	1.0870	0.0553	1.1424	0.2939	0.0528	0.3468		2,816.3369	2,816.3369	0.0893	0.3846	2,933.1840

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

**Delta Dams Rodent Burrowing Remediation Project
Contra Costa County, Winter**

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	79.03	3,442,546.80	0
User Defined Industrial	1.00	User Defined Unit	15.70	683,892.00	0
User Defined Industrial	1.00	User Defined Unit	8.10	352,836.00	0

1.2 Other Project Characteristics

Urbanization	Rural	Wind Speed (m/s)	2.2	Precipitation Freq (Days)	58
Climate Zone	4			Operational Year	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	CH4 Intensity (lb/MWhr)	0.029	N2O Intensity (lb/MWhr)	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Delta Dams Rodent Burrowing Remediation Project. Contra Costa County.

Land Use - Clifton Court Forebay = permanent: 46 acres and temporary: 33.03 acres

Construction Phase - Work completed at CCF site September 2021 through October 2021 and all sites from May 2022 through October 2022.

Off-road Equipment - Default equipment assumed.

Off-road Equipment - Default equipment assumed.

Off-road Equipment - Default equipment assumed.

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

Off-road Equipment - Default equipment assumed.

Off-road Equipment - Default equipment assumed.

Trips and VMT - Updated trip lengths based on distance to closest material facilities within area. Updated vendor trips to account for water trucks (two water trucks).

Grading - Material import based on project specific information. Distributed total over all phases.

Table Name	Column Name	Default Value	New Value
tblAreaCoating	Area_Nonresidential_Exterior	2239639	1721275
tblAreaCoating	Area_Nonresidential_Interior	6718917	5163825
tblConstructionPhase	NumDays	120.00	15.00
tblConstructionPhase	NumDays	310.00	27.00
tblConstructionPhase	NumDays	120.00	15.00
tblConstructionPhase	NumDays	310.00	30.00
tblConstructionPhase	NumDays	120.00	86.00
tblGrading	AcresOfGrading	17.00	41.23
tblGrading	AcresOfGrading	231.00	37.80
tblGrading	AcresOfGrading	33.00	11.20
tblGrading	AcresOfGrading	327.00	6.00
tblGrading	AcresOfGrading	66.00	0.70
tblGrading	MaterialImported	0.00	15,320.00
tblGrading	MaterialImported	0.00	15,320.00
tblGrading	MaterialImported	0.00	18,182.00
tblGrading	MaterialImported	0.00	18,182.00
tblGrading	MaterialImported	0.00	18,182.00
tblLandUse	LandUseSquareFeet	0.00	3,442,546.80
tblLandUse	LandUseSquareFeet	0.00	683,892.00
tblLandUse	LandUseSquareFeet	0.00	352,836.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

tblLandUse	LotAcreage	0.00	79.03
tblLandUse	LotAcreage	0.00	15.70
tblLandUse	LotAcreage	0.00	8.10
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripLength	20.00	15.00
tblTripsAndVMT	HaulingTripNumber	1,915.00	1,867.00
tblTripsAndVMT	HaulingTripNumber	1,904.00	1,867.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	HaulingTripNumber	3,809.00	3,734.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	VendorTripNumber	0.00	4.00
tblTripsAndVMT	WorkerTripNumber	10.00	30.00
tblTripsAndVMT	WorkerTripNumber	20.00	60.00
tblTripsAndVMT	WorkerTripNumber	10.00	60.00

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					
2021	4.6519	60.1871	33.9554	0.1011	19.8189	2.3064	21.9523	9.9096	2.1315	11.8777	0.0000	10,542.2173	10,542.2173	2.0752	1.0764	10,898.5340
2022	4.2704	67.0221	34.4557	0.1607	30.9630	1.9063	32.8693	15.6389	1.7645	17.4035	0.0000	17,040.0135	17,040.0135	2.1742	2.0888	17,703.2015
Maximum	4.6519	67.0221	34.4557	0.1607	30.9630	2.3064	32.8693	15.6389	2.1315	17.4035	0.0000	17,040.0135	17,040.0135	2.1742	2.0888	17,703.2015

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					
2021	4.6519	60.1871	33.9554	0.1011	19.8189	2.3064	21.9523	9.9096	2.1315	11.8777	0.0000	10,542.2173	10,542.2173	2.0752	1.0764	10,898.5340
2022	4.2704	67.0221	34.4557	0.1607	30.9630	1.9063	32.8693	15.6389	1.7645	17.4035	0.0000	17,040.0135	17,040.0135	2.1742	2.0888	17,703.2015
Maximum	4.6519	67.0221	34.4557	0.1607	30.9630	2.3064	32.8693	15.6389	2.1315	17.4035	0.0000	17,040.0135	17,040.0135	2.1742	2.0888	17,703.2015

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

	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
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	Staging/Access 1	Site Preparation	9/1/2021	9/21/2021	5	15	
2	High Priority Repairs	Grading	9/22/2021	10/28/2021	5	27	
3	Staging/Access 2	Site Preparation	5/1/2022	5/20/2022	5	15	
4	Burrow Remediation	Grading	5/21/2022	7/1/2022	5	30	
5	Drainage Channel/Intake Channel/Tree Removal	Site Preparation	7/2/2022	10/31/2022	5	86	

Acres of Grading (Site Preparation Phase): 41.23

Acres of Grading (Grading Phase): 37.8

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating –

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied**OffRoad Equipment**

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Staging/Access 1	Rubber Tired Dozers	3	8.00	247	0.40
Staging/Access 1	Tractors/Loaders/Backhoes	4	8.00	97	0.37
High Priority Repairs	Excavators	2	8.00	158	0.38
High Priority Repairs	Graders	1	8.00	187	0.41
High Priority Repairs	Rubber Tired Dozers	1	8.00	247	0.40
High Priority Repairs	Scrapers	2	8.00	367	0.48
High Priority Repairs	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Staging/Access 2	Rubber Tired Dozers	3	8.00	247	0.40
Staging/Access 2	Tractors/Loaders/Backhoes	4	8.00	97	0.37
Burrow Remediation	Excavators	2	8.00	158	0.38
Burrow Remediation	Graders	1	8.00	187	0.41
Burrow Remediation	Rubber Tired Dozers	1	8.00	247	0.40
Burrow Remediation	Scrapers	2	8.00	367	0.48
Burrow Remediation	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Drainage Channel/Intake Channel/Tree Removal	Rubber Tired Dozers	3	8.00	247	0.40
Drainage Channel/Intake Channel/Tree Removal	Tractors/Loaders/Backhoes	4	8.00	97	0.37

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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
Staging/Access 1	4	10.00	4.00	1,867.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
High Priority Repairs	8	20.00	4.00	1,867.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Staging/Access 2	4	30.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Burrow Remediation	8	60.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT
Drainage Channel/Intake Channel/Tree Removal	4	60.00	4.00	3,734.00	10.80	6.60	15.00	LD_Mix	HDT_Mix	HHDT

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.1 Mitigation Measures Construction

3.2 Staging/Access 1 - 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					
Fugitive Dust					16.6805	0.0000	16.6805	7.8354	0.0000	7.8354			0.0000			0.0000
Off-Road	3.8882	40.4971	21.1543	0.0380		2.0445	2.0445		1.8809	1.8809		3,685.6569	3,685.6569	1.1920		3,715.4573
Total	3.8882	40.4971	21.1543	0.0380	16.6805	2.0445	18.7250	7.8354	1.8809	9.7163		3,685.6569	3,685.6569	1.1920		3,715.4573

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	0.6884	19.4073	4.4200	0.0615	1.6328	0.2572	1.8901	0.4476	0.2461	0.6937		6,699.0623	6,699.0623	0.2251	1.0614	7,020.9958
Vendor	0.0134	0.2573	0.0791	8.0000e-004	0.0245	4.2600e-003	0.0288	7.0500e-003	4.0800e-003	0.0111		85.8905	85.8905	2.0700e-003	0.0126	89.6912
Worker	0.0325	0.0254	0.2711	7.1000e-004	0.0822	4.4000e-004	0.0826	0.0218	4.1000e-004	0.0222		71.6075	71.6075	2.6500e-003	2.4000e-003	72.3897
Total	0.7342	19.6900	4.7702	0.0630	1.7395	0.2619	2.0014	0.4764	0.2506	0.7270		6,856.5604	6,856.5604	0.2298	1.0764	7,183.0767

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Winter

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					16.6805	0.0000	16.6805	7.8354	0.0000	7.8354			0.0000			0.0000
Off-Road	3.8882	40.4971	21.1543	0.0380		2.0445	2.0445		1.8809	1.8809	0.0000	3,685.6569	3,685.6569	1.1920		3,715.4573
Total	3.8882	40.4971	21.1543	0.0380	16.6805	2.0445	18.7250	7.8354	1.8809	9.7163	0.0000	3,685.6569	3,685.6569	1.1920		3,715.4573

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	0.6884	19.4073	4.4200	0.0615	1.6328	0.2572	1.8901	0.4476	0.2461	0.6937		6,699.0623	6,699.0623	0.2251	1.0614	7,020.9958
Vendor	0.0134	0.2573	0.0791	8.0000e-004	0.0245	4.2600e-003	0.0288	7.0500e-003	4.0800e-003	0.0111		85.8905	85.8905	2.0700e-003	0.0126	89.6912
Worker	0.0325	0.0254	0.2711	7.1000e-004	0.0822	4.4000e-004	0.0826	0.0218	4.1000e-004	0.0222		71.6075	71.6075	2.6500e-003	2.4000e-003	72.3897
Total	0.7342	19.6900	4.7702	0.0630	1.7395	0.2619	2.0014	0.4764	0.2506	0.7270		6,856.5604	6,856.5604	0.2298	1.0764	7,183.0767

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.3 High Priority Repairs - 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					
Fugitive Dust					18.7230	0.0000	18.7230	9.6103	0.0000	9.6103			0.0000			0.0000
Off-Road	4.1912	46.3998	30.8785	0.0620		1.9853	1.9853		1.8265	1.8265		6,007.0434	6,007.0434	1.9428		6,055.6134
Total	4.1912	46.3998	30.8785	0.0620	18.7230	1.9853	20.7083	9.6103	1.8265	11.4368		6,007.0434	6,007.0434	1.9428		6,055.6134

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	0.3824	10.7819	2.4556	0.0342	0.9071	0.1429	1.0500	0.2487	0.1367	0.3854		3,721.7013	3,721.7013	0.1250	0.5897	3,900.5532
Vendor	0.0134	0.2573	0.0791	8.0000e-004	0.0245	4.2600e-003	0.0288	7.0500e-003	4.0800e-003	0.0111		85.8905	85.8905	2.0700e-003	0.0126	89.6912
Worker	0.0649	0.0507	0.5423	1.4200e-003	0.1643	8.9000e-004	0.1652	0.0436	8.2000e-004	0.0444		143.2151	143.2151	5.3100e-003	4.8000e-003	144.7794
Total	0.4607	11.0899	3.0769	0.0364	1.0959	0.1480	1.2440	0.2993	0.1416	0.4409		3,950.8069	3,950.8069	0.1324	0.6071	4,135.0239

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Winter

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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					18.7230	0.0000	18.7230	9.6103	0.0000	9.6103			0.0000			0.0000
Off-Road	4.1912	46.3998	30.8785	0.0620		1.9853	1.9853		1.8265	1.8265	0.0000	6,007.0434	6,007.0434	1.9428		6,055.6134
Total	4.1912	46.3998	30.8785	0.0620	18.7230	1.9853	20.7083	9.6103	1.8265	11.4368	0.0000	6,007.0434	6,007.0434	1.9428		6,055.6134

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	0.3824	10.7819	2.4556	0.0342	0.9071	0.1429	1.0500	0.2487	0.1367	0.3854		3,721.7013	3,721.7013	0.1250	0.5897	3,900.5532
Vendor	0.0134	0.2573	0.0791	8.0000e-004	0.0245	4.2600e-003	0.0288	7.0500e-003	4.0800e-003	0.0111		85.8905	85.8905	2.0700e-003	0.0126	89.6912
Worker	0.0649	0.0507	0.5423	1.4200e-003	0.1643	8.9000e-004	0.1652	0.0436	8.2000e-004	0.0444		143.2151	143.2151	5.3100e-003	4.8000e-003	144.7794
Total	0.4607	11.0899	3.0769	0.0364	1.0959	0.1480	1.2440	0.2993	0.1416	0.4409		3,950.8069	3,950.8069	0.1324	0.6071	4,135.0239

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.4 Staging/Access 2 - 2022

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					27.4261	0.0000	27.4261	14.6713	0.0000	14.6713			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836		3,686.0619	3,686.0619	1.1922		3,715.8655
Total	3.1701	33.0835	19.6978	0.0380	27.4261	1.6126	29.0387	14.6713	1.4836	16.1548		3,686.0619	3,686.0619	1.1922		3,715.8655

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	0.9124	33.6573	7.6962	0.1199	3.2660	0.2902	3.5561	0.8953	0.2776	1.1729		13,061.6844	13,061.6844	0.4275	2.0700	13,689.2162
Vendor	8.6900e-003	0.2143	0.0672	7.8000e-004	0.0245	2.2900e-003	0.0268	7.0500e-003	2.1900e-003	9.2500e-003		83.9160	83.9160	1.8400e-003	0.0122	87.6077
Worker	0.0904	0.0670	0.7495	2.0600e-003	0.2464	1.2600e-003	0.2477	0.0654	1.1600e-003	0.0665		208.3512	208.3512	7.2000e-003	6.6500e-003	210.5120
Total	1.0114	33.9386	8.5128	0.1227	3.5369	0.2937	3.8306	0.9677	0.2810	1.2486		13,353.9517	13,353.9517	0.4366	2.0888	13,987.3359

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Winter

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					27.4261	0.0000	27.4261	14.6713	0.0000	14.6713			0.0000			0.0000
Off-Road	3.1701	33.0835	19.6978	0.0380		1.6126	1.6126		1.4836	1.4836	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655
Total	3.1701	33.0835	19.6978	0.0380	27.4261	1.6126	29.0387	14.6713	1.4836	16.1548	0.0000	3,686.0619	3,686.0619	1.1922		3,715.8655

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	0.9124	33.6573	7.6962	0.1199	3.2660	0.2902	3.5561	0.8953	0.2776	1.1729		13,061.6844	13,061.6844	0.4275	2.0700	13,689.2162
Vendor	8.6900e-003	0.2143	0.0672	7.8000e-004	0.0245	2.2900e-003	0.0268	7.0500e-003	2.1900e-003	9.2500e-003		83.9160	83.9160	1.8400e-003	0.0122	87.6077
Worker	0.0904	0.0670	0.7495	2.0600e-003	0.2464	1.2600e-003	0.2477	0.0654	1.1600e-003	0.0665		208.3512	208.3512	7.2000e-003	6.6500e-003	210.5120
Total	1.0114	33.9386	8.5128	0.1227	3.5369	0.2937	3.8306	0.9677	0.2810	1.2486		13,353.9517	13,353.9517	0.4366	2.0888	13,987.3359

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Winter

CalEEMod Version: CalEEMod.2020.4.0

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EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

3.5 Burrow Remediation - 2022

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					22.1609	0.0000	22.1609	12.0604	0.0000	12.0604			0.0000			0.0000
Off-Road	3.6248	38.8435	29.0415	0.0621		1.6349	1.6349		1.5041	1.5041		6,011.4105	6,011.4105	1.9442		6,060.0158
Total	3.6248	38.8435	29.0415	0.0621	22.1609	1.6349	23.7958	12.0604	1.5041	13.5645		6,011.4105	6,011.4105	1.9442		6,060.0158

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	0.4562	16.8286	3.8481	0.0599	1.6330	0.1451	1.7781	0.4476	0.1388	0.5864		6,530.8422	6,530.8422	0.2138	1.0350	6,844.6081
Vendor	8.6900e-003	0.2143	0.0672	7.8000e-004	0.0245	2.2900e-003	0.0268	7.0500e-003	2.1900e-003	9.2500e-003		83.9160	83.9160	1.8400e-003	0.0122	87.6077
Worker	0.1807	0.1340	1.4989	4.1200e-003	0.4929	2.5200e-003	0.4954	0.1307	2.3200e-003	0.1331		416.7025	416.7025	0.0144	0.0133	421.0241
Total	0.6456	17.1770	5.4142	0.0648	2.1504	0.1499	2.3003	0.5854	0.1433	0.7287		7,031.4607	7,031.4607	0.2300	1.0605	7,353.2399

Delta Dams Rodent Burrowing Remediation Project - Contra Costa County, Winter

CalEEMod Version: CalEEMod.2020.4.0

Date: 7/30/2021 1:38 PM

EMFAC Off-Model Adjustment Factors for Gasoline Light Duty Vehicle to Account for the SAFE Vehicle Rule Not Applied

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					22.1609	0.0000	22.1609	12.0604	0.0000	12.0604			0.0000			0.0000
Off-Road	3.6248	38.8435	29.0415	0.0621		1.6349	1.6349		1.5041	1.5041	0.0000	6,011.4105	6,011.4105	1.9442		6,060.0158
Total	3.6248	38.8435	29.0415	0.0621	22.1609	1.6349	23.7958	12.0604	1.5041	13.5645	0.0000	6,011.4105	6,011.4105	1.9442		6,060.0158

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	0.4562	16.8286	3.8481	0.0599	1.6330	0.1451	1.7781	0.4476	0.1388	0.5864		6,530.8422	6,530.8422	0.2138	1.0350	6,844.6081
Vendor	8.6900e-003	0.2143	0.0672	7.8000e-004	0.0245	2.2900e-003	0.0268	7.0500e-003	2.1900e-003	9.2500e-003		83.9160	83.9160	1.8400e-003	0.0122	87.6077
Worker	0.1807	0.1340	1.4989	4.1200e-003	0.4929	2.5200e-003	0.4954	0.1307	2.3200e-003	0.1331		416.7025	416.7025	0.0144	0.0133	421.0241
Total	0.6456	17.1770	5.4142	0.0648	2.1504	0.1499	2.3003	0.5854	0.1433	0.7287		7,031.4607	7,031.4607	0.2300	1.0605	7,353.2399

Appendix B

Biological Resources Existing Conditions Report

Biological Resources Existing Conditions Report for the Delta Dams Rodent Burrow Remediation Project Alameda and Contra Costa Counties, California

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SEPTEMBER 2021

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Acronyms and Abbreviations

Acronym	Definition
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta
BCC	Bird of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CEQA Guidelines	State of California CEQA Guidelines
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
DPS	Distinct Population Segment
DWR	California Department of Water Resources
FC	candidate for federal listing as threatened or endangered
FE	Federally listed as endangered
FESA	federal Endangered Species Act
FP	Fully Protected species by California Department of Fish and Wildlife
FT	Federally listed as threatened
GIS	geographic information system
HCP	Habitat Conservation Plan
NMFS	National Marine Fisheries Service
Project	Delta Dams Rodent Burrow Remediation Project
RWQCB	Regional Water Quality Control Board
SE	State listed as endangered
SSC	California Species of Special Concern
ST	State listed as threatened
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WL	Watch List species

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Executive Summary

The California Department of Water Resources (DWR) is proposing the Delta Dams Rodent Burrow Remediation Project (Project) to address dam stability and safety concerns at Clifton Court Forebay Dam in eastern Contra Costa County and Dyer Dam and Patterson Dam in eastern Alameda County. The Project would involve rodent burrow repairs and restoration measures, ongoing monitoring, and permanent measures to prevent future burrowing where warranted. DWR also proposes to implement a Rodent Burrow Maintenance and Monitoring Plan, which describes a program for routine inspections, burrow collapse, excavation, compaction, and backfilling. The purpose of this report is to describe the existing conditions of biological resources within the Project site in terms of vegetation, wildlife, special-status species and their habitat, jurisdictional aquatic resources, and wildlife movement. This report is also intended to provide biological support for analysis of the Project under the California Environmental Quality Act (CEQA) as well as applications to the California Department of Fish and Wildlife (CDFW) for an Incidental Take Permit pursuant to Section 2081 of the California Endangered Species Act and a Lake and Streambed Alteration Agreement pursuant to Section 1602 of the California Fish and Game Code.

Biological resources were identified through an extensive literature review and field surveys of the Project site at each dam. This report describes biological resources identified during surveys conducted from December 2020 to mid-June 2021, as well as special-status plants or animals for which suitable habitat is present and that could be identified before the completion of surveys in August 2021. Focused special-status species surveys and assessments included special-status plant surveys; a multispecies burrow assessment to identify habitat for burrowing owl (*Athene cunicularia*), San Joaquin kit fox (*Vulpes macrotis mutica*) and American badger (*Taxidea taxus*); subsequent protocol-level surveys for burrowing owl and San Joaquin kit fox; and a Swainson's hawk (*Buteo swainsoni*) nesting survey. Eagle surveys and a wildlife game camera study conducted for a future Habitat Conservation Plan (HCP) within DWR's Delta Field Division were conducted concurrently with Project surveys and were also used to inform the report.

In total, 32 vegetation communities or land cover types were mapped within the Project site. Disturbed and developed land cover types comprise most of the overall Project site because of their extent at Clifton Court Forebay Dam, but are slightly less extensive than grassland and associated herbaceous communities at Dyer Dam and Patterson Dam. Approximately 15 acres of riparian communities and 2.4 acres of scrub (coyote brush [*Baccharis pilularis*] scrub) are only present at Clifton Court Forebay Dam. Bog and marsh communities occur at all three dams but comprise a higher percentage of total land cover at Clifton Court Forebay Dam (15%) than at Dyer Dam and Patterson Dam (3.4% at both). In total, 12 sensitive natural communities (CDFW 2020) were mapped, including alkali heath marsh (1.9 acres), America bulrush marsh (1.8 acres), hardstem and California bulrush marshes (0.2 acres), two associations of iodine bush scrub (5.4 acres of *Allenrolfea occidentalis*/*Distichlis spicata* Provisional Association and 7.5 acres of *A. occidentalis* Association), California brome–blue wildrye prairie (2.6 acres), needle grass–melic grass grassland (17.9 acres), arroyo willow thickets (less than 0.05 acres), button willow thickets (1.4 acres), Gooding's willow–red willow riparian woodland and forest (7.6 acres), Hind's walnut and related stands (1.2 acres), and red alder forest (0.3 acres). Most of these communities occur at Clifton Court Forebay. These and other communities are described in Section 4.1, Vegetation Communities and Land Cover Types, and Section 4.5.1, Sensitive Natural Communities.

Jurisdictional aquatic resources include waters of the United States under the U.S. Army Corps of Engineers (USACE) and Regional Water Quality Control Board (RWQCB) jurisdiction and CDFW-jurisdictional waters. Jurisdictional aquatic resources are summarized in Section 4.2.

Dudek detected two special-status plant species during focused surveys of the Project site through April 2021: long-styled sand-spurrey (*Spergularia macrotheca* var. *longistyla*), which has a California Rare Plant Rank (CRPR) of 1B (considered rare throughout their range) and woolly rose-mallow (*Hibiscus lasiocarpus* var. *occidentalis*) (CRPR 1B). Both species were observed in the southern portion of the Clifton Court Forebay Dam biological resources study area. Special-status plant species are described in Section 4.5.2.

Twenty-two (22) special-status wildlife species have been directly observed or are considered to have high potential to occur within or adjacent to the Project site. Vernal pool fairy shrimp (*Branchinecta lynchi*) has been observed in alkali grassland south of Clifton Court Forebay and may still occur there. Six special-status fish species are known to occur in or near Clifton Court Forebay: green sturgeon (*Acipenser medirostris*), Central Valley steelhead (*Oncorhynchus mykiss*), Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon, delta smelt (*Hypomesus transpacificus*), and longfin smelt (*Spirinchus thaleichthys*). California tiger salamander (*Ambystoma californiense*) and California red-legged frog (*Rana draytonii*) have been observed near all three dams and suitable habitat is present. Swainson's hawk (*Buteo swainsoni*) is known to nest in riparian habitat at Clifton Court Forebay but does not occur at Dyer Dam or Patterson Dam. Suitable habitat for burrowing owl (*Athene cunicularia*) occurs at all three dams and the species or its sign was observed during 2021 field surveys. Other special-status bird species for which suitable nesting habitat occurs in or near the Project site include northern harrier (*Circus hudsonius*), white-tailed kite (*Elanus leucurus*), loggerhead shrike (*Lanius ludovicianus*), "Modesto" song sparrow (*Melospiza melodia*) at Clifton Court Forebay, and tricolored blackbird (*Agelaius tricolor*). The Project site is within the northern range of San Joaquin kit fox (*Vulpes macrotis mutica*) but there are few recent occurrences in the vicinity. Suitable habitat for American badger (*Taxidea taxus*) is present at all three dams and sign was observed in the Clifton Court Forebay Dam and Patterson Dam study areas. Additional information on these and other special-status wildlife species is provided in Section 4.5.3.

Wildlife movement through the Project site is constrained by existing water delivery infrastructure (i.e., canals, reservoirs, access roads, facility fencing) so most medium- to large-bodied terrestrial species likely use the multiple overchutes, underchutes, and road crossings to move across or around the reservoirs and aqueducts at the three dams. The Dyer Dam and Patterson Dam Project sites are in the regional "Mt. Diablo-Diablo Range" critical linkage mapped by the Critical Linkages: Bay Area and Beyond project (Penrod et al. 2013) that extends from the southeast flank of Mt. Diablo down to Del Puerto Canyon. Local movement at these sites is less constrained than at Clifton Court Forebay because of large expanses of nearby annual grassland, but wildlife must still cross or move around the South Bay Aqueduct and reservoirs.

1 Introduction

1.1 Purpose of the Report

The California Department of Water Resources (DWR) Delta Dams Rodent Burrow Remediation Project (Project) would involve rodent burrow repairs and restoration measures, ongoing monitoring, and permanent measures to prevent future burrowing where warranted. There are three dams that are part of the overall Project—Clifton Court Forebay Dam, Dyer Dam, and Patterson Dam. For each site, the Project components were buffered by 300 feet to create a biological resources study area (or study area); open reservoir waters, private lands, and sediment or stormwater basins within the 300-foot buffer were considered when assessing species' potential to occur, but were excluded from resource mapping. Because some of the biological resources on each site differ, each site is described separately in this report.

The purpose of this biological resources existing conditions report is to describe the existing conditions of biological resources within the Project site in terms of vegetation, wildlife, special-status species and their habitat, jurisdictional aquatic resources, and wildlife movement. This biological resources existing conditions report will be used in the California Environmental Quality Act (CEQA) document to describe the sensitive biological resources that occur or could potentially occur on the Project site. Additionally, this report is intended to provide biological support for upcoming application to the U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW).

1.2 Project Description

The Project would involve rodent burrow remediation (burrow collapse, excavation, compaction, and backfilling), erosion prevention measures, restoration measures, ongoing monitoring, and permanent measures to prevent future burrowing where warranted. These measures are described in DWR's proposed Rodent Burrow Maintenance and Monitoring Plan. Initial remediation actions would be taken in 2021 and 2022. Ongoing monitoring would continue in future years, and additional remediation and restoration measures may be warranted.

A more detailed description of the Project sites (Clifton Court Forebay Dam, Dyer Dam, and Patterson Dam) is provided in Section 1.3, Site Description and Location. For additional Project description information and figures depicting the Project, see the Initial Study for the Delta Dams Rodent Burrow Remediation Project (DWR 2021).

1.2.1 Clifton Court Forebay Dam

Burrowing activity has been identified at locations in all portions of the approximately 8-mile-long Clifton Court Forebay Dam. The most extensive burrowing—and therefore the most severe damage—occurs mostly along three segments (in the northwest corner, along the central portion of the western side, and along central and eastern portions of the southern side), while less widespread individual burrow holes and burrow clusters occur throughout all reaches of the dam. Burrow remediation activities are expected to affect a total of 37.5 acres of the downstream face of Clifton Court Forebay Dam. Rodent burrow remediation work to restore the dam embankments and complete burrow prevention measures would take place over 1 to 2 years. After construction, any materials not used or reused in the Project would be hauled off site and reused, disposed of in a landfill, or recycled at a recycling facility. Construction would include clearing and grubbing of trees and shrubs, including any stumps. Cleared and grubbed

vegetation would be removed from the site and disposed of at an approved location. Construction would occur continuously during daylight hours between May and October in each year that construction takes place, with no work occurring for 24 hours following a rain event.

Where shallow ruts and near-surface deformations occur, DWR would fill and compact these areas with native soil of similar type to that of the downstream dam embankment slope. This would require use of lightweight and heavy construction equipment such as skid-steer, dozer, backhoe, skip-loader, soil compactor, excavator, and water truck. Fill material would be delivered to the site from a stockpile location using dump trucks or light-duty trucks. No export of soil is anticipated for excavation and recompaction of the dam face, but some limited import may be needed while armoring the dam. Rock, bedding material, mesh, or other suitable materials required for armoring would be imported to the site via the existing or proposed construction access roads and staged in staging areas or access roads.

Clifton Court Forebay Dam has a seepage collection system consisting of perimeter drainage channels and several collection sumps. The drainage channels capture seepage water and convey it into the sumps, which continuously pump water back into the forebay. Sump No. 4 is located at the northwest end of the dam and several large trees within its footprint are proposed to be removed in the fall of 2021 to prevent leaves and limbs from obstructing the intake pump screens.

DWR has identified a high-priority repair area at the Clifton Court Forebay intake channel to restore the slope and install permanent improvement measures to prevent animal burrowing. The repairs include excavation, grouting, backfill, and recompaction; installation of PVC-coated steel wire mesh and bedding material; and placement of armoring rock. This work would occur on the downstream slope (channel side) from the downstream crest (at approximately 16.5 feet above mean sea level) to an elevation of 4 feet, and be performed during low tide conditions to avoid working directly within waters. Clearing and grubbing would occur on the downstream slope to remove debris, vegetation, and existing riprap remains from original construction of the dam. Restoration of the dam intake channel slope would require excavating to a depth of approximately 2 feet. After excavation has exposed subgrade, any holes or cavities that remain would be grouted as needed. Grouting is expected to be performed on a limited basis and as determined by the field engineer. Once grouting is complete, the excavated areas would be backfilled and recompacted in lifts, back to the original design slope. The embankment slope would be backfilled with a combination of impervious native soil, cementitious-soil slurry, or similar embankment material. It is anticipated that any excavation and recompaction of the dam's face would result in minor import or export of materials. Following the recompaction effort, a layer of bedding material (6 inches thick) and wire mesh would be placed over the restored embankment slope. The bedding material and PVC-coated steel wire mesh would be placed on the entire remediation area. An 18-inch-thick layer of large armoring rock would be placed over the bedding material and PVC wire mesh to deter future animal burrowing and prevent erosion within the intake channel slope due to wave action.

1.2.1.1 Project Location, Access, and Staging

Clifton Court Forebay is located in Contra Costa County, California. The primary access to the dam is via Byron Highway to Clifton Court Road, and a secondary access is provided from Byron Highway via the Skinner Fish Facility entrance. The primary access point provides access to the west, north, and east dam segments. Typical access to the south dam segment is also from Clifton Court Road, but this access point is subject to traffic load restrictions because it passes over the intake control structure bridge. Thus, the additional access point through the Skinner Fish Facility entrance would provide access to the southern dam embankment and intake channel

for heavy haul trucks or construction equipment. Clifton Court Forebay Dam is approximately 8 miles long, impounds 28,653 acre-feet, and serves as the intake point and northernmost terminus of the California Aqueduct. The dam embankment has a maximum height of 30 feet and a crest width of 20 feet. The overall crest length of the dam is 36,500 feet (6.9 miles).

DWR has identified 11 staging areas around the perimeter of the dam totaling approximately 10.4 acres. Staging areas would be used to stockpile material needed to implement the burrow remediation, including filling of ruts and deformations. The materials would include rock, bedding material, wire mesh, or other materials required for armoring and/or backfilling the burrow holes.

In addition to the access provided by the dam's paved crest roadway, existing maintenance roads may be used along the dam toe. An additional maximum of 10.6 acres of permanent toe access roads may be necessary for construction and long-term operations and maintenance. It is anticipated that any excavation and recompaction of the dam's face will require import. Rock, bedding material, wire mesh, or other materials required for armoring and/or backfilling the burrow holes, will be imported to the site via the existing crest and maintenance access roads. Placement of materials will be achieved from the dam crest and toe.

1.2.1.2 Construction Equipment

The following construction equipment would be used to implement the proposed dam remediation efforts:

- concrete truck
- skid-steer
- scraper
- grader
- dozer
- backhoe
- mobile grout mixing plant
- concrete pump truck
- skip-loader
- soil compactor
- excavator
- dump truck
- water truck

1.2.2 Dyer Dam

Dyer Dam is a relatively small dam, and rodent burrowing within its downstream embankment is relatively dense. DWR's Division of Safety of Dams classifies Dyer Dam as high hazard, indicating that its failure is likely to result in the loss of at least one human life. These factors make Dyer Dam a candidate for excavation, recompaction, and permanent armoring with wire mesh and rock. Burrowing occurs on all sides of Dyer Dam, with the west side categorized as high priority and the north, east, and south sides categorized as medium priority. This includes significant burrowing that has been observed along the east side of the dam in a slope above the crest roadway. While this area is not within the dam prism, repairs are warranted to remediate burrowing activity that could ultimately result in instability, potential embankment failure, and increased annual maintenance. Remediation is expected to be required on approximately 5.54 acres of the dam.

Where shallow ruts and near-surface deformations occur, these areas would be filled with native soil of similar type to that of the downstream dam embankment slope and this soil would be compacted. Depending on location, size, burrow cluster density, and depths, burrow holes may alternatively be excavated and backfilled. Then native

soil, cementitious-soil slurry, low pressure grout, and/or similar embankment material would be used to backfill holes and would be compacted level with the surrounding ground. For zones where heavy construction equipment cannot be used, burrows may be filled by hand and/or lightweight equipment. Permanent armoring with wire mesh and rock would be placed on the dam embankment to deter future rodent burrowing. Equipment for these activities would include lightweight and heavy equipment such as skid-steer, grader, dozer, backhoe, skip-loader, soil compactor, excavator, and water trucks. Some fill material would be needed to offset shrinkage of the excavated and recompacted material. Imported fill materials would be delivered to the site using dump trucks or light-duty trucks.

Surface runoff is collected by a V-shaped ditch and stormwater control feature that runs parallel to the north access road west of Dyer Reservoir. Segments of the existing V-shaped ditch are unlined, while others are concrete lined. These stormwater control features have been subject to ongoing failure that can be attributed to high drainage velocities focused on the unlined segments of the V-shaped ditch design, poor foundation/embankment material, and rodent burrowing along this reach. Approximately 1,300 linear feet of the existing V-shaped ditch and stormwater control features are proposed for improvements that include regrading and concrete lining to improve drainage and reduce erosion. Remediation of the existing embankment slope includes limited excavation, backfilling and compaction, and concrete lining. Minor imported backfill, grouting, or soil-cement slurry may be used to backfill cavities, cracks, or holes. The embankment slope would be restored where it shows signs of instability and where recent internal erosion occurred during the V-shaped ditch and stormwater control feature failures.

Directly south of these ditch and stormwater control features, ongoing erosion is also occurring along a portion of the south side of Entrance Road, which intersects with the South Bay Aqueduct. At this location, erosion along Entrance Road is evident from deep furrows developing within interspersed areas of riprap. Similar to the original stabilization methods, the bank slope along the southern side of Entrance Road will be stabilized using riprap. Fill and riprap material would be delivered using dump trucks or light-duty trucks staged in staging areas or access roads. A combination of soil fill and riprap will be placed in between the existing riprap at this location to repair and stabilize the eroding slope. Additionally, accumulated sediment downstream of the culvert pipes under the road will be excavated and removed to an upland disposal location.

1.2.2.1 Project Location, Access, and Staging

Dyer Reservoir is located in the Altamont Hills, approximately 7 miles northeast of Livermore in Alameda County. Dyer Dam can be accessed from Dyer Road via the existing entrance road serving the reservoir facility. Access to the entire toe of the dam and the dam facility is provided by an existing gravel road, which provides access to a paved roadway atop the crest of the dam via ramps on the north and south side of the reservoir. Existing gravel access roads and the paved crest road would provide access to the western embankment slope, while the eastern embankment slope would be accessed from the paved crest road and from the upper settling pond maintenance road.

DWR has identified three staging areas for remediation activities at Dyer Reservoir and Dam. The staging areas would be located on both existing improved areas and undisturbed areas and would total approximately 5.11 acres. Staging Area 1 is a rectangular area along the western side of the South Bay Aqueduct; Staging Area 2 is a roughly triangular area south of the southeast corner of the dam; and Staging Area 3 is a roughly triangular area east of the settling pond.

1.2.2.2 Construction Equipment

The following construction equipment would be used to implement the proposed dam remediation efforts:

- skid-steer
- dozer
- backhoe
- grader
- skip-loader
- soil compactor
- excavator
- scraper
- water truck
- dump trucks
- flatbed trucks
- concrete truck
- mobile grout mixing plant
- concrete pump truck

1.2.3 Patterson Dam

Patterson Dam is a relatively small dam with relatively dense rodent burrowing within its downstream embankment. DWR's Division of Safety of Dams classifies Patterson Dam as high hazard, indicating that its failure is likely to result in the loss of at least one human life. These factors make Patterson Dam a candidate for excavation, recompaction, and permanent armoring with wire mesh and rock. All areas of Patterson Dam are subject to high-severity burrow damage. Remediation is expected to be required for the downstream dam face and the ascending slope in the east side of the facility, adjacent to the crest road access ramp. The proposed Project would entail filling shallow ruts and near-surface deformations near the ground surface with native soil of similar type to that of the downstream dam embankment slope and compacting the fill material. Depending on location, size, burrow cluster density, and depths, burrow holes may alternatively be excavated and backfilled. Then native soil, cementitious-soil slurry, low pressure grout, and/or similar embankment material would be used to backfill holes and would be compacted level with the surrounding ground. For zones where heavy construction equipment cannot be used, burrows may be filled by hand and/or lightweight equipment. Permanent armoring with wire mesh and rock would be placed on the dam embankment to deter future rodent burrowing. Due to steep downstream slope (1.5:1 to 2:1), other suitable materials may be employed for permanent armoring. The permanent armoring area may include a buffer area, as well as a cut-off trench wall that uses controlled low-strength material beyond the dam toe. Equipment for this activity would include lightweight and heavy equipment such as skid-steer, dozer, backhoe, skip-loader, soil compactor, and excavator. If needed, fill material would be delivered to the site from a stockpile location using dump trucks and/or concrete trucks.

In order to comply with a DWR Division of Safety of Dams recommendation, the proposed Project also includes improvements to the low-level outlet drainage channel. These improvements consist of vegetation removal, minor regrading of channel invert slope, and placement of permanent vegetation and erosion control. Permanent vegetation control (e.g., rock and geofabric) is proposed for approximately 180 linear feet of the trapezoidal channel downstream of the concrete outfall structure. A one-time vegetation clearing and removal is proposed for approximately 500 linear feet of the downstream drainage channel beyond the permanent drainage channel improvements within DWR's right-of-way. Minor concrete repairs are also proposed for spalled concrete and exposed rebar at the wingwall outfall structure. A permanent maintenance road would be constructed adjacent to the permanently improved drainage channel to provide better access for annual maintenance. The maintenance road would include a vehicle turnaround area and would have a gravel surface.

The proposed Project includes minor modifications and improvements to drainage features in upland areas in the northwest of Patterson Reservoir currently experiencing sheet flow. A damaged 18-inch-diameter corrugated metal pipe culvert crossing near the toe access road and a second 12-inch-diameter corrugated metal pipe culvert crossing near the maintenance building would both be replaced with improved high-density polyethylene culverts. Existing drainage features upstream and downstream of the culverts would be modified to convey water more efficiently to the main western drainage channel. The improvements may include excavating, regrading, and/or lining of the drainage features and culverts.

1.2.3.1 Project Location, Access, and Staging

Patterson Reservoir is located approximately 1 mile east of Livermore. Patterson Dam can be accessed from Patterson Pass Road. Approximately 1 mile to the west, Patterson Pass Road intersects with Greenville Road, which then provides access to Interstate 580. Existing paved and gravel access roads within the Patterson Reservoir facility would provide access to most of the construction areas within this site. A temporary construction access area would be constructed north of the proposed staging area and existing settling pond on the east side of the reservoir, and a second temporary construction access area would be provided through the existing maintenance yard.

DWR has identified four staging areas for remediation activities at Patterson Dam and Reservoir, including an area at the existing maintenance yard south of the reservoir, a staging area on currently undisturbed land surrounding the existing settling pond east of the reservoir, and an area east of the temporary construction access area. These staging areas have a combined acreage of approximately 4.63 acres. Access to the staging areas would be from Patterson Pass Road on the existing paved and gravel access roads and from a new temporary construction access area. The paved toe and crest roads may be used to repair the downstream dam embankment slope; however, the crest road is narrow and would only be accessible to smaller vehicles and equipment. As noted previously, if this limitation of the crest road prevents use of heavy construction equipment in certain areas, burrows may be filled by hand and/or lightweight equipment.

1.2.3.2 Construction Equipment

The following construction equipment would be used to implement the proposed dam remediation efforts:

- skid-steer
- dozer
- backhoe
- grader
- skip-loader
- soil compactor
- excavator
- scraper
- water truck
- dump trucks
- flatbed trucks
- concrete truck
- mobile grout mixing plant
- concrete pump truck

1.3 Site Description and Location

1.3.1 Clifton Court Forebay Dam

The Clifton Court Forebay Dam study area is located 10 miles northwest of the City of Tracy in Contra Costa County. The study area is east of Byron Highway/Byron-Bethany Road (County Route J4), south of the Italian Slough, west of the West Canal, and north of the Delta-Mendota Canal (Figure 1, Project Location). The study area is within the U.S. Geological Survey 7.5-minute Clifton Court Forebay quadrangle map, Sections 13, 24, and 25 of Township 1S, Range 3E; and Sections 07, 08, 17, 18, 19, 20, 30 of Township 1S, Range 4E. The approximate geographic center of the study area is 121° 34'30.123"W, 37° 50'20.362"N.

The study area consists of the area between Clifton Court Forebay and the surrounding waterways, the California Aqueduct, Old River, Italian Slough, and the West Canal. This area includes access roads, DWR facilities, developed and disturbed habitat, and a variety of native and non-native vegetation communities. The Clifton Court Forebay Dam study area is situated within a matrix of agricultural land uses. A small residential development, Kings Island, is located within the Delta island complex located immediately to the north.

Within the Clifton Court Forebay Dam study area, average temperatures range from approximately 50°F to 73°F. The study area receives an average annual rainfall of 12.03 inches per year (WRCC 2021).

Topography

The elevations within the study area at Clifton Court Forebay Dam range from 5 feet below mean sea level to 10 feet above mean sea level.

Soils

The U.S. Department of Agriculture Soil Survey mapped most of the study area as being underlain by the following soil types (also known as soil map units): fluvaquents, Merritt loam, Ryde silt loam, Sacramento clay, Solano Loma, and water (USDA 2021) (Table 1; Figure 2A, Soils-Clifton Court Forebay Dam).

Table 1. Soils within the Clifton Court Forebay Dam Study Area

Soil Code	Soil Name	Acreage
Fc	Fluvaquents	183.3
FcF	Fluvaquents, 0% to 2% slopes, frequently flooded	0.3
Md	Merritt loam	0.3
Rh	Ryde silt loam	48.2
Sa	Sacramento clay	5.2
Sb	Sacramento clay, alkali	24.5
Sh	Solano loam	12.7
Sk	Solano loam, strongly alkali	22.3
W	Water	62.4
Total		359.3

Sources: USDA 2021.

Note: Totals may not sum due to rounding.

Hydrology

The Clifton Court Forebay Dam study area is located within the Clifton Court Forebay subwatershed (Hydrologic Unit Code 12 180400030605), which drains 15,707 acres of the Old River Watershed (Hydrologic Unit Code 10 1804000306) (Figure 3, Hydrologic Setting).

1.3.2 Dyer Dam

The Dyer Dam study area is located northeast of Livermore in Alameda County. The study area for Dyer Dam is located east of Dyer Road, north of Altamont Pass Road. (Figure 1). The Dyer Dam study area is within the U.S. Geological Survey 7.5-minute Byron Hot Springs quadrangle, Section 17 of Township 2 South, and Range 3 East; the approximate center of the study area is longitude 121°40'24.55"W and latitude 37°45'27.09"N (37.757525; -121.673486).

The Dyer Dam study area includes the areas surrounding Dyer Reservoir and the South Bay Aqueduct, including access roads, DWR facilities, disturbed habitat, and a variety of native and non-native vegetation communities. The Altamont Landfill is east of the study area, there are some rural residences west of the study area, and the remaining areas are farmland.

Within the Dyer Dam study area, average temperatures range from approximately 50°F to 73°F. The study area receives an average annual rainfall of 12.03 inches per year (WRCC 2021).

Topography

The elevations within the Dyer Dam study area range from approximately 700 to 860 feet above mean sea level.

Soils

The U.S. Department of Agriculture Soil Survey mapped most of the site as being underlain by the following soil types (also known as soil map units): Altamont clay, Cotati fine sandy loam, and Pescadero clay (USDA 2021) (Table 2; Figure 2B, Soils–Dyer Dam).

Table 2. Soils within the Dyer Dam Study Area

Soil Code	Soil Name	Acreage
Aac	Altamont clay, 3% to 15% slopes	20.1
Aad	Altamont clay, 15% to 30% slopes	9.7
AmE2	Altamont clay, moderately deep, 30% to 45% slopes, eroded	0.6
CoC2	Cotati fine sandy loam, eroded	14.6
Pd	Pescadero clay	13.6
Total		58.7

Sources: USDA 2021.

Note: Totals may not sum due to rounding.

Hydrology

The Dyer Dam study area is located within the Arroyo Las Positas Watershed Hydrologic Unit. Dyer Dam is located within the Upper Arroyo Las Positas subwatershed (180500040203) (Figure 3).

1.3.3 Patterson Dam

The Patterson Dam study area is located just east of Livermore in Alameda County. The study area for Patterson Dam is located on Patterson Pass Road, east of Greenville Road. (Figure 1). The Patterson Dam study area is within the U.S. Geological Survey 7.5-minute Altamont quadrangle, Section 6 of Township 3 South, and Range 3 East; the approximate center of the study area is longitude 121° 40'49.90"W and latitude 37° 41'51.60"N (37.697667; -121.680528).

The Patterson Dam study area includes the areas surrounding Patterson Reservoir and the South Bay Aqueduct, including access roads, DWR facilities, disturbed habitat, and a variety of native and non-native vegetation communities. The study area is immediately surrounded by farmland and rural residences. The limits of Livermore are approximately 1 mile to the west of the study area.

Within the Patterson Dam study area, average temperatures range from approximately 50°F to 73°F. The study area receives an average annual rainfall of 12.03 inches per year (WRCC 2021).

Topography

The elevations on the Patterson Dam study area range from approximately 645 to 700 feet above mean sea level.

Soils

The U.S. Department of Agriculture Soil Survey mapped most of the site as being underlain by the following soil types (also known as soil map units): Linne clay loam, Rincon clay loam, and San Ysidro loam (USDA 2021) (Table 3; Figure 2C, Soils–Patterson Dam).

Table 3. Soils within the Patterson Dam Study Area

Soil Code	Soil Name	Hydric Rating	Acreage
LaE2	Linne clay loam, 30% to 45% slopes	Partially hydric	12.6
RdB	Rincon clay loam, 3% to 7% slopes	Not hydric	13.8
Sy	San Ysidro loam	Partially hydric	8.6
Total			35.0

Sources: USDA 2021.

Note: Totals may not sum due to rounding.

Hydrology

The Patterson Dam study area is located within the Arroyo Seco subwatershed (180500040203) (Figure 3).

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2 Applicable Statutes and Regulations

DWR will process all required permits and adhere to all relevant regulatory requirements as required for the Project. Impacts to listed species, including take of individuals, will be covered through standard state and federal incidental take permit processes as applicable.

2.1 Federal

2.1.1 Federal Endangered Species Act

The federal Endangered Species Act (FESA) of 1973 (16 USC 1531 et seq.), as amended, is administered by the U.S. Fish and Wildlife Service (USFWS), National Oceanic and Atmospheric Administration, and National Marine Fisheries Service (NMFS). This legislation is intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend, and provide programs for the conservation of those species, thus preventing extinction of plants and wildlife. As part of this regulatory act, the FESA provides for designation of Critical Habitat, defined in the FESA, Section 3(5)(A), as specific areas within the geographical range occupied by a species where physical or biological features “essential to the conservation of the species” are found and that “may require special management considerations or protection.” Critical Habitat may also include areas outside the current geographical area occupied by the species that are nonetheless “essential for the conservation of the species.” Under provisions of Section 9(a)(1)(B) of the FESA, it is unlawful to “take” any listed species. “Take” is defined in Section 3(19) of the FESA as, harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing, or collecting, or attempting to engage in any such conduct.

Section 7(a)(2) of the FESA directs federal agencies to consult with USFWS for any actions they authorize, fund, or carry out that may jeopardize the continued existence of any listed species or result in the destruction or adverse modification of federally designated Critical Habitat. Consultation begins when the federal agency submits a written request for initiation to USFWS or NMFS, along with the agency’s Biological Assessment of its proposed action (if necessary), and USFWS or NMFS accepts that sufficient information has been provided to initiate consultation. If USFWS or NMFS concludes that the action is not likely to adversely affect a listed species, the action may be conducted without further review under the FESA. Otherwise, USFWS or NMFS must prepare a written Biological Opinion describing how the agency’s action will affect the listed species and its Critical Habitat.

2.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act prohibits the take of any migratory bird or any part, nest, or eggs of any such bird. Under the Migratory Bird Treaty Act, “take” is defined as pursuing, hunting, shooting, capturing, collecting, or killing, or attempting to do so (16 USC 703 et seq.). In December 2017, Department of the Interior Principal Deputy Solicitor Jorjani issued a memorandum (M-37050) that interprets the Migratory Bird Treaty Act’s “take” prohibition to apply only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs; unintentional or accidental take is not prohibited (M-37050). However, in August 2020, a federal court upheld the long-standing interpretation of the Migratory Bird Treaty Act, such that it covers intentional and unintentional take. Additionally, Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires that any project with federal involvement address impacts of federal actions on migratory birds with the purpose of promoting conservation of migratory bird populations (66 FR 3853–3856). Executive Order 13186 requires federal agencies to work with USFWS to develop a memorandum of understanding. USFWS reviews actions that might affect migratory bird species.

2.1.3 Clean Water Act

Pursuant to Section 404 of the Clean Water Act, the USACE regulates the discharge of dredged and/or fill material into “waters of the United States.” The term “wetlands” (a subset of waters) is defined as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (33 CFR 328.3[b]). In the absence of wetlands, the limits of USACE jurisdiction in non-tidal waters, such as intermittent streams, extend to the “ordinary high water mark” (33 CFR 328.3[e]).

2.1.4 Bald and Golden Eagle Protection Act

Bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) are federally protected under the Bald and Golden Eagle Protection Act (BGEPA), which was passed in 1940 to protect bald eagles and amended in 1962 to include golden eagles (16 USC 668 et seq.). This act prohibits the take, possession, sale, purchase, barter, offer to sell or purchase, export or import, or transport of bald eagles and golden eagles or their parts, eggs, or nests without a permit issued by USFWS. The definition of “take” includes to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb. The definition of “disturb” has been further clarified by regulation as follows: “Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle; (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior” (50 CFR 22.3).

The BGEPA prohibits any form of possession or taking of both eagle species, and the statute imposes criminal and civil sanctions, as well as an enhanced penalty provision for subsequent offenses. Further, the BGEPA provides for the forfeiture of anything used to acquire eagles in violation of the statute. The statute exempts from its prohibitions on possession the use of eagles or eagle parts for exhibition, scientific, or Native American religious uses.

In November 2009, USFWS published the Final Eagle Permit Rule (74 FR 46836–46879) providing a mechanism to permit and allow for incidental (i.e., nonpurposeful) take of bald and golden eagles pursuant to the BGEPA (16 USC 668 et seq.). The previous year, 2008, USFWS adopted Title 50, Part 22.11(a) of the Code of Federal Regulations, which provides that a permit authorizing take under the FESA, Section 10, applies with equal force to take of golden eagles authorized under the BGEPA. These regulations were followed by issuance of guidance documents for inventory and monitoring protocols and for avian protection plans. In January 2011, USFWS released its Draft Eagle Conservation Plan Guidance aimed at clarifying expectations for acquiring take permits by wind power projects, consistent with the 2009 rule (USFWS 2011).

On December 16, 2016, USFWS adopted additional regulations regarding incidental take of golden eagles and their nests (81 FR 91494 et seq.). Most of the new regulations address “programmatic eagle nonpurposeful take permits” such as those typically requested by members of the alternative energy industry, including wind farms. For example, the new regulations extend the duration of such permits from 5 to 30 years. In addition, the new regulations modify the definition of the BGEPA “preservation standard” to mean “consistent with the goals of maintaining stable or increasing breeding populations in all eagle management units and the persistence of local populations throughout the service range of each species” (81 FR 91496–91497). This process has also resulted in standardizing mitigation options for permitted take.

2.2 State

2.2.1 California Endangered Species Act

CDFW administers the California Endangered Species Act (CESA) (California Fish and Game Code, Section 2050 et seq.), which prohibits the “take” of plant and animal species designated by the Fish and Game Commission as endangered, candidate, or threatened in the State of California. Under the CESA, Section 86, take is defined as “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.” The CESA addresses the take of threatened, endangered, or candidate species by stating the following (California Fish and Game Code, Sections 2080–2085):

No person shall import into this state, export out of this state, or take, possess, purchase, or sell within this state, any species, or any part or product thereof, that the Commission determines to be an endangered species or a threatened species, or attempt any of those acts, except as otherwise provided in this chapter, the Native Plant Protection Act (California Fish and Game Code, Sections 1900–1913), or the California Desert Native Plants Act (Food and Agricultural Code, Section 80001).

Sections 2081(b) and (c) of the California Fish and Game Code authorize take of endangered, threatened, or candidate species if take is incidental to otherwise lawful activity and if specific criteria are met. In certain circumstances, Section 2080.1 of the CESA allows CDFW to adopt a federal incidental take statement or a 10(a) permit as its own, based on its findings that the federal permit adequately protects the species and is consistent with state law. A Section 2081(b) permit may not authorize the take of “Fully Protected” species, “specially protected mammal” species, and “specified birds” (California Fish and Game Code, Sections 3505, 3511, 4700, 4800, 5050, 5515, and 5517). If a project is planned in an area where a Fully Protected species, specially protected mammal, or a specified bird occurs, an applicant must design the project to avoid take.

2.2.2 California Fish and Game Code

2.2.2.1 Lake and Streambed Alteration Program

Under California Fish and Game Code, Section 1602, CDFW has authority to regulate work that will substantially divert or obstruct the natural flow of or substantially change or use any material from the bed, channel, or bank of any river, stream, or lake. CDFW also has authority to regulate work that will deposit or dispose of debris, water, or other material where it may pass into any river, stream, or lake. CDFW’s regulation of work in these resources takes the form of a requirement for a Lake and Streambed Alteration Agreement and is applicable to any person, state, or local governmental agency or public utility (California Fish and Game Code, Section 1601). CDFW jurisdiction includes ephemeral, intermittent, and perennial watercourses (including dry washes) and lakes characterized by the presence of (1) defined bed and banks and (2) existing fish or wildlife resources. In practice, CDFW-jurisdictional limits extend to the top of the stream or lake bank or to the outer edge of riparian vegetation, if present. In some cases, CDFW jurisdiction may extend to the edge of the 100-year floodplain. Because riparian habitats do not always support wetland hydrology or hydric soils, wetland boundaries, as defined by Clean Water Act, Section 404, sometimes include only portions of the riparian habitat adjacent to a river, stream, or lake. Therefore, jurisdictional boundaries under Section 1602 may encompass a greater area than those regulated under Clean Water Act, Section 404.

2.2.2.2 Fully Protected Species and Resident and Migratory Birds

Sections 3511, 4700, 5050, and 5515 of the California Fish and Game Code designate certain birds, mammals, reptiles and amphibians, and fish as Fully Protected species. Fully Protected species may not be taken or possessed without a permit from the Fish and Game Commission. CDFW may not authorize the take of such species except (1) for necessary scientific research, (2) for the protection of livestock, (3) when the species is a covered species under an approved natural community conservation plan, or (4) as legislatively authorized by the passing of a State Assembly Bill.

In addition, the California Fish and Game Code prohibits the needless destruction of nests or eggs of native bird species (California Fish and Game Code, Section 3503), and it states that no birds in the orders of Falconiformes or Strigiformes (birds of prey) can be taken, possessed, or destroyed (California Fish and Game Code, Section 3503.5).

For the purposes of these state regulations, CDFW currently considers an active nest as one that is under construction or in use and includes existing nests that are being modified. For example, if a hawk is adding to or maintaining an existing stick nest in a tree, then it would be considered to be active and covered under these California Fish and Game Code Sections.

2.2.2.3 California Native Plant Protection Act

The Native Plant Protection Act of 1977 (California Fish and Game Code, Sections 1900–1913) directed CDFW to carry out the legislature’s intent to “preserve, protect and enhance rare and endangered plants in this State.” The Native Plant Protection Act gave the Fish and Game Commission the power to designate native plants as “endangered” or “rare,” and prohibited take, with some exceptions, of endangered and rare plants. When the CESA was amended in 1984, it expanded on the original Native Plant Protection Act, enhanced legal protection for plants, and created the categories of “threatened” and “endangered” species to parallel the FESA. The 1984 amendments to the CESA also made the exceptions to the take prohibition set forth in Section 1913 of the Native Plant Protection Act applicable to plant species listed as threatened or endangered under the CESA. The CESA categorized all rare animals as threatened species under the CESA, but did not do so for rare plants, which resulted in three listing categories for plants in California: rare, threatened, and endangered. The Native Plant Protection Act remains part of the California Fish and Game Code, and mitigation measures for impacts to rare plants are specified in a formal agreement between CDFW and project proponents.

2.2.3 Porter–Cologne Water Quality Control Act

The intent of the Porter–Cologne Water Quality Control Act is to protect water quality and the beneficial uses of water, and it applies to both surface water and groundwater. Under this law, the State Water Resources Control Board develops statewide water quality plans, and the Regional Water Quality Control Boards (RWQCBs) develop basin plans that identify beneficial uses, water quality objectives, and implementation plans. The RWQCBs have the primary responsibility to implement the provisions of both statewide and basin plans. All waters of the state are regulated under the Porter–Cologne Water Quality Control Act, including isolated waters that are no longer regulated by USACE. Recent changes in state procedures require increased analysis and mitigation. Developments with impact to jurisdictional waters of the state must demonstrate compliance with the goals of the act by developing stormwater pollution prevention plans, standard urban stormwater mitigation plans, and other measures to obtain a Clean Water Act, Section 401 certification and/or Waste Discharge Requirement.

2.2.4 California Environmental Quality Act

CEQA requires identification of a project’s potentially significant impacts on biological resources and feasible mitigation measures and alternatives that could avoid or reduce significant impacts. The State of California CEQA Guidelines (CEQA Guidelines), Section 15380(b)(1), defines endangered animals or plants as species or subspecies whose “survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors” (14 CCR 15000 et seq.). A rare animal or plant is defined in Section 15380(b)(2) as a species that, although not presently threatened with extinction, exists “in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or ... [t]he species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered ‘threatened’ as that term is used in the federal Endangered Species Act.” Additionally, an animal or plant may be presumed to be endangered, rare, or threatened if it meets the criteria for listing, as defined further in CEQA Guidelines, Section 15380(c). CEQA also requires identification of a project’s potentially significant impacts on riparian habitats (e.g., wetlands, bays, estuaries, and marshes) and other sensitive natural communities, including habitats occupied by endangered, rare, and threatened species.

2.3 Regional

2.3.1 East Alameda County Conservation Strategy

The East Alameda County Conservation Strategy (Conservation Strategy) (ICF 2010) is a voluntary conservation plan that was collaboratively developed by local and regulatory agencies between 2007 and 2009; the final draft was completed in December 2010. The Conservation Strategy is not a formal Habitat Conservation Plan (HCP) in that it does not require local agencies to conserve species and habitat prior to approving projects that impact listed species and/or their habitat, nor does it have a corresponding programmatic incidental take permit from USFWS. Instead, it is intended to streamline state and local permitting by providing guidance on avoidance, minimization, and mitigation for project-level impacts on selected focal special-status species and sensitive habitats. Projects and activities intended to benefit from the Conservation Strategy include urban and suburban growth and a variety of road, water, and other needed infrastructure construction and maintenance activities. Because the Conservation Strategy does not have corresponding permits, individual projects may need to implement different or more avoidance, minimization, and mitigation measures than what is outlined therein. To avoid this from happening, the USFWS and CDFW participated in the development of the Conservation Strategy with the intent that it would become the blueprint for all mitigation and conservation in the region. Both agencies still refer to the Conservation Strategy when reviewing project-level impacts on focal species and their habitat. The following local agencies also participated in Conservation Strategy development:

- Alameda County Congestion Management Agency
- Alameda County Resource Conservation District
- Alameda County Waste Management Authority
- City of Dublin
- City of Livermore
- City of Pleasanton
- County of Alameda
- East Bay Regional Park District
- Natural Resources Conservation Service
- San Francisco Bay Regional Water Quality Control Board
- Zone 7 Water Agency

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3 Survey Methods

Data regarding biological resources present on the Project site were obtained through a review of pertinent literature, field surveys, and mapping. Each method is described in detail in this section.

3.1 Literature Review

Special-status biological resources present or potentially present within the Project site were identified through an extensive literature search using the following sources: the USFWS Information for Planning and Consultation online tool (USFWS 2020a), the CDFW California Natural Diversity Database (CNDDDB) (CDFW 2021a, 2021b, 2021c), and the California Native Plant Society (CNPS) Online Inventory of Rare and Endangered Vascular Plants (CNPS 2021a). The Soil Survey Geographic Database for California (USDA 2021) was also reviewed to identify potentially occurring special-status plants based upon known soil associations. Native plant community classifications used in this report follow a Manual of California Vegetation Online (CNPS 2021b) and California Natural Community List (CDFW 2020).

To identify “established native resident or migratory wildlife movement corridors” that could be impacted by the Project (i.e., criterion (d) of the biological resources checklist in Appendix G to the CEQA Guidelines), Dudek biologists reviewed the Critical Linkages: Bay Area and Beyond report (Penrod et al. 2013).

3.2 Field Surveys

Based on preliminary scoping conducted in October 2020, Dudek initiated biological field surveys of the Project site in December 2020. Surveys were conducted on foot and in accordance with focused survey guidelines or protocols where applicable. Survey dates, personnel, and weather conditions for each site are included in Tables 4, 5, and 6.

Table 4. Schedule of Surveys Conducted by Dudek, Clifton Court Forebay Dam

Date	Hours	Personnel	Conditions
<i>Aquatic Resources Delineation/Vegetation Mapping</i>			
12/16/2020	7:16 a.m. to 4:46 p.m.	AG, CA	40°F–55°F; 70% cc; 0 mph wind
12/17/2020	7:00 a.m. to 1:37 p.m.	AG, CA	50°F–57°F; 40%–50% cc; 0–3 mph wind
1/4/2021	10:30 a.m. to 4:30 p.m.	AG, AS	63°F–NR; 5–15 mph wind
1/5/2021	7:37 a.m. to 5:37 p.m.	AG	38°F–48°F; 30%–50% cc; 5–15 mph wind
1/6/2021	7:38 a.m. to 1:49 p.m.	AG	34°F–38°F; 70%–100% cc; 0–10 mph wind
<i>Rare Plants</i>			
4/14/2021	7:15 a.m. to 4:00 p.m.	JH	52°F–72°F; 0–10% cc; 2–4 mph wind
4/15/2021	7:49 a.m. to 4:00 p.m.	JH	55°F–75°F; 0% cc; 2 mph wind
4/20/2021	7:58 a.m. to 4:39 p.m.	JH	49°F–64°F; NR; NR
7/14/2021	7:49 a.m. to 3:58 p.m.	AG, CAA	63°F–89°F; 0% cc; 5 mph wind
7/15/2021	7:53 a.m. to 4:34 p.m.	AG, CAA	64°F–89°F; 0% cc; 4 mph wind
7/20/2021	7:56 a.m. to 12:34 p.m.	AG, CAA	68–79°F; 0% cc; 5–16 mph wind
<i>General Wildlife Habitat Assessment</i>			
1/11/2021	12:55 p.m. to 3:00 p.m.	BO, MR	63°F–68°F; 0% cc; 5–10 mph wind

Table 4. Schedule of Surveys Conducted by Dudek, Clifton Court Forebay Dam

Date	Hours	Personnel	Conditions
Burrow Assessment/Burrowing Owl/San Joaquin Kit Fox			
2/24/2021	10:23 a.m. to 5:00 p.m.	AS, PK, TY	51°F–61°F; 0% cc; 5–21 mph wind
4/21/2021	6:00 a.m. to 10:00 a.m.	TY	44°F–62°F; 0% cc; 5 mph wind
4/21/2021	5:30 p.m. to 8:30 p.m.	TY	76°F–59°F; 0% cc; 15–20 mph wind
6/8/2021	5:45 a.m. to 10:30 a.m.	TY	52°F–55°F; 0% cc; 20–30 mph wind
6/8/2021	5:30 p.m. to 8:15 p.m.	TY	70°F–68°F; 0% cc; 20 mph wind
7/14/2021	7:45 a.m. to 12:06 p.m.	MR	67°F–81°F; 0% cc; 2–5 mph wind
Swainson's Hawk Nesting			
3/22/2021	4:08 p.m. to 7:30 p.m.	MR, TY	58°F–66°F; 10%–20% cc; 7–15 mph wind
4/14/2021	7:15 a.m. to 12:15 p.m.; 4:30 p.m. to 8:28 p.m.	TY	43°F–72°F; 0%–10% cc; 0–5 mph wind; 74°F–54°F; 10%–20% cc; 0–15 mph
6/23/2021	6:45 a.m. to 12:00 p.m.	TY	61°F–82°F; 0% cc; 15 mph wind

Notes: cc = cloud cover; NR = not recorded.

Personnel: AG = Anna Godinho; AS = Allie Sennett; BO = Brock Ortega; CA = Callie Amoaku; CAA = Charles Adams; JH = Jeanette Halderman; MR = Matt Ricketts; PK = Paul Keating; TY = Tyler Young.

Table 5. Schedule of Surveys Conducted by Dudek, Dyer Dam

Date	Hours	Personnel	Conditions
Aquatic Resources Delineation/Vegetation Mapping			
12/15/2020	7:08 a.m. to 4:30 p.m.	AG, CA	35°F–55°F; 10–40% cc; 0 mph wind
Rare Plants			
3/5/2021	8:09 a.m. to 4:00 p.m.	CAA, KD	43°F–65°F; 0% cc; 0–3 mph wind
05/11/2021	7:14 a.m.–4:05 p.m.	TB	67–87°F; 0% cc; 0–5 mph wind
7/21/2021	7:30 a.m. to 10:30 a.m.	AG, LB	63°F–75°F; 0% cc; 5–10 mph wind
General Wildlife Habitat Assessment			
1/11/2021	11:00 a.m. to 12:20 p.m.	BO, MR	55°F–60°F; 0% cc; 3–5 mph wind
Burrow Assessment/Burrowing Owl/San Joaquin Kit Fox			
2/23/2021	6:00 a.m. to 8:26 a.m.	AS, PK, TY	75°F–71°F; 0% cc; 5–10 mph wind
4/22/2021	6:00 a.m. to 8:15 a.m.	TY	42°F–50°F; 0% cc; 5–10 mph wind
6/9/2021	9:00 a.m. to 11:00 a.m.	TY	57°F–60°F; 5% cc; 10–15 mph wind
7/15/2021	7:53 p.m. to 8:45 p.m.	MR	60°F–68°F; 0% cc; 10–23 mph wind
Swainson's Hawk Nesting			
3/22/2021	7:45 a.m. to 9:50 a.m.	MR, TY	43°F–46°F; 0% cc; 5–12 mph wind
4/13/2021	8:35 a.m. to 12:00 p.m.	TY	56°F–71°F; 0% cc; 12–18 mph wind

Note: cc = cloud cover.

Personnel: AG = Anna Godinho; AS = Allie Sennett; BO = Brock Ortega; CA = Callie Amoaku; CAA = Charles Adams; KD = Kathleen Dayton; LB = Laura Burris; MR = Matt Ricketts; PK = Paul Keating; Tanya Baxter = TB; TY = Tyler Young.

Table 6. Schedule of Surveys Conducted by Dudek, Patterson Dam

Date	Hours	Personnel	Conditions
<i>Aquatic Resources Delineation/Vegetation Mapping</i>			
12/14/2020	10:41 a.m. to 5:00 p.m.	CA	59°F–62°F; 0%–10% cc; 0–1 mph wind
<i>Rare Plants</i>			
3/16/2021	8:52 a.m. to 12:19 p.m.	KD, PH	39°F–54°F; 0% cc; 0–4 mph wind
05/11/2021	3:20 p.m.–3:50 p.m.	MF, ML	
7/20/2021	12:33 p.m. to 2:40 p.m.	AG, LB	78°F–84°F; 0% cc; 5–10 mph wind
<i>General Wildlife Habitat Assessment</i>			
1/11/2021	9:00 a.m. to 10:35 a.m.	BO, MR	48°F–55°F; 0% cc; 3–5 mph wind
<i>Burrow Assessment/Burrowing Owl/San Joaquin Kit Fox</i>			
2/23/2021	3:26 p.m. to 5:23 p.m.	AS, PK, TY	75°F–71°F; 0% cc; 5–10 mph wind
4/22/2021	8:30 a.m. to 11:30 a.m.	TY	53°F–64°F; 0% cc; 2 mph wind
6/9/2021	5:45 a.m. to 8:00 a.m.	TY	48°F–54°F; 5% cc; 10–15 mph wind
7/15/2021	6:35 p.m. to 7:33 p.m.	MR	70°F–73°F; 0% cc; 3–8 mph wind
<i>Swainson’s Hawk Nesting</i>			
3/22/2021	7:45 a.m. to 9:50 a.m.	MR, TY	43°F–46°F; 0% cc; 5–12 mph wind
4/13/2021	4:40 p.m. to 8:15 p.m.	TY	71°F–54°F; 0% cc; 15–20 mph wind

Note: cc = cloud cover.

Personnel: AG = Anna Godinho; AS = Allie Sennett; BO = Brock Ortega; CA = Callie Amoaku; KD = Kathleen Dayton; LB = Laura Burris; MF = Mackenzie Forgey; ML = Michele Laskowski; MR = Matt Ricketts; PH = Patrick Hendrix; PK = Paul Keating; TY = Tyler Young.

3.2.1 Resource Mapping

Vegetation community classifications in this report follow the California Natural Community List (CDFW 2020) and were identified using descriptions from the Manual of California Vegetation Online (CNPS 2021b). Communities were mapped to the alliance level except where mapping to the association level was necessary to determine sensitivity. Specifically, where there was potential for the site to support a sensitive association listed in CDFW (2020) within an alliance otherwise not sensitive, it was mapped to the association level. An alliance and/or association is considered sensitive if indicated with a state rarity rank of S1–S3 or indicated as sensitive without a rarity ranking in the California Natural Community List (CDFW 2020). Alliances were mapped based on constituent species and membership rules as defined in the Manual of California Vegetation Online (CNPS 2021b). Non-natural land covers and unvegetated communities that do not follow CDFW (2020) were identified as disturbed habitat, general agriculture, open water, and urban/developed.

3.2.2 Flora

All plant species encountered during the field surveys were identified and recorded. Latin and common names for plant species with a California Rare Plant Rank (CRPR) (formerly CNPS List) follow the CNPS Online Inventory of Rare and Endangered Plants of California (CNPS 2020). For plant species without a CRPR, Latin names follow the Jepson Interchange List of Currently Accepted Names of Native and Naturalized Plants of California (Jepson Flora Project 2020), and common names follow the U.S. Department of Agriculture Natural Resources Conservation Service Plants Database (USDA 2020). The list of plant species observed on site is presented in Appendix A, Plant Species Observed within the Project Site.

3.2.3 Fauna

Wildlife species detected during field surveys by sight, calls, tracks, scat, or other sign were recorded. Binoculars (8- to 10-times magnification) were used to identify observed wildlife. A list of wildlife species observed or detected on site is presented in Appendix B, Wildlife Species Observed within the Project Site.

Latin and common names of animals follow Crother (2017) for reptiles and amphibians and the American Ornithological Society (AOS 2020) for birds. Mammal names primarily follow Wilson and Reeder (2005), but some species names reflect recent changes in taxonomy.

3.2.4 Aquatic Resources Delineation

From December 2020 to January 2021, Dudek biologists conducted an aquatic resources delineation of waters of the United States/state on the Project site. Tables 4, 5, and 6 show the specific dates and times Dudek biologists conducted the aquatic resources delineation on each site. The methods for delineating USACE, CDFW, and RWQCB jurisdictional waters of the United States /state are summarized below.

USACE Jurisdictional Methods

The USACE wetlands delineation was performed in accordance with the 1987 U.S. Army Corps of Engineers Wetlands Delineation Manual (USACE 1987), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (USACE 2008a), and A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States: A Delineation Manual (USACE 2008b).

CDFW Jurisdiction Methods

The delineation defined areas under the jurisdiction of the CDFW pursuant to Sections 1600–1603 of the California Fish and Game Code. A predominance of hydrophytic vegetation, where associated with a stream channel, was used to determine CDFW-regulated riparian areas. Streambeds under the jurisdiction of CDFW were delineated using the Cowardin method of waters classification, which defines waters boundaries by a single parameter (i.e., hydric soils, hydrophytic vegetation, or hydrology).

RWQCB Jurisdiction Methods

Non-wetland waters subject to RWQCB jurisdiction were delineated to the extent of the top of bank, mapped as the physical break in slope between the channel and surrounding upland. Wetland waters subject to RWQCB jurisdiction were mapped based on methods described in the 1987 Corps of Engineers Wetlands Delineation Manual (USACE 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (USACE 2008a). In 2019, the State Water Resources Control Board issued the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (SWRCB 2019). These procedures define wetlands that encompass “the full range of wetland types commonly recognized in California, including some features not protected under federal law, and reflects current scientific understanding of the formation and functioning of wetlands.” The State Water Resources Control Board defines wetlands as: “An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area’s vegetation is dominated by hydrophytes or the area lacks vegetation.”

Site-specific aquatic resources delineation reports were prepared for Clifton Court Forebay Dam and Dyer and Patterson Dams and submitted to the USACE, CDFW, and RWQCB for verification.

3.2.5 Special-Status Plant Surveys

Dudek conducted focused surveys for special-status plant species in March, April, May, and July 2021, at the appropriate phenological stage (blooming and fruiting) to detect and identify target species (Appendix C, Special-Status Plant Species' Potential to Occur within the Project Site).

Survey dates, personnel, and weather conditions for each site are included in Tables 4, 5, and 6. Field survey methods and mapping of rare plants generally conformed to CNPS Botanical Survey Guidelines (CNPS 2001), Protocols for Surveying and Evaluating Impacts to Special Status Native Populations and Natural Communities (CDFW 2018), and General Rare Plant Survey Guidelines (Cypher 2002). The assessment consisted of one survey pass that provided 100% coverage of the Project site.

Dudek biologists conducted pedestrian surveys, which consisted of walking straight-line transects with spacing of approximately 66 feet (20 meters) throughout all habitats within each biological resources study area (Figure 4A, Biological Study Area–Clifton Court Forebay Dam; Figure 4B, Biological Study Area–Dyer Dam; and Figure 4C, Biological Study Area–Patterson Dam). The species locations were mapped using Esri ArcGIS Collector as point records or polygons. The number of individuals within a polygon were estimated and the number of individuals associated with each point were directly counted. The special-status plant observations were then digitized into the geodatabase by a Dudek geographic information system (GIS) technician using ArcGIS software.

Prior to conducting each survey pass, representative populations of target species (i.e., reference sites) were visited to confirm survey timing. Reference sites for special-status plant species were identified through an analysis of past records documented in the CNDDB (CDFW 2021a), the Calflora online database (Calflora 2021), and the California Consortium of Herbaria online database (CCH 2021). Reference site visits were conducted by Dudek botanist Laura Burris on March 3 and 5, and July 9, 2021; Dudek biologists Laura Burris and Paul Keating on July 12, 2021; and DWR botanist Jane Van Susteren on February 17, 2021.

Some target species reference populations could not be located due to lack of access or because the recorded occurrences within the Project region were historic and no longer extant. Observation and herbarium records were reviewed for these species to determine appropriate bloom time (CDFW 2021a; Calflora 2021; CCH 2021).

3.2.6 Special-Status Wildlife Surveys

Dudek conducted focused surveys for burrowing owl (*Athene cunicularia*) and nesting Swainson's hawks (*Buteo swainsoni*) and initiated camera surveys for San Joaquin kit fox from February to July 2021. In addition, special-status wildlife observed while conducting other surveys, including observations of nests or other evidence of breeding, were recorded in Esri ArcGIS Collector; the resulting information is incorporated into this report. Methodology for the three types of focused special-status wildlife surveys is described below.

3.2.6.1 Burrow Assessment, Burrowing Owl Surveys, and San Joaquin Kit Fox Surveys

Dudek conducted a multispecies burrow assessment in areas of potentially suitable habitat (e.g., grasslands, disturbed lands, roadside areas, ditches, and other open habitats where suitable burrow resources exist and are relatively flat or have low slopes) on the Project site on February 23 and 24, 2021. Survey dates, personnel, and weather conditions are included in Tables 4, 5, and 6. The assessment consisted of the biologists walking straight-line transects with a maximum spacing of approximately 66 feet (20 meters) and recording the location of all suitable burrows (e.g., those at least 4 inches [11 centimeters] in diameter or greater, and greater than 150 centimeters in depth) and/or burrow surrogates (e.g., rock cavities, pipes, culverts, debris piles) using Esri ArcGIS Collector. All burrows were investigated for sign of burrowing owl occupancy, including regurgitated castings (pellets) of prey remains, scat (whitewash), and feathers. The locations of any observed burrowing owls were also recorded. Burrows were also investigated for sign of kit fox and American badger occupancy, including prey remains, scat, tracks, and claw/scratch marks. Surveys were conducted under good weather conditions that would permit clear detection of individuals should they occur on site. Other information, such as areas of California ground squirrel (*Spermophilus beecheyi*) activity, and the presence of coyotes (*Canis latrans*) or other canids—red fox (*Vulpes vulpes*) and grey fox (*Urocyon cinereoargenteus*)—were also documented. The burrow assessment also coincided with the first of multiple required visits for protocol-level burrowing owl surveys (CDFG 2012) and early evaluation habitat assessment for San Joaquin kit fox (USFWS 1999), discussed below.

Dudek conducted a protocol-level burrowing owl breeding season survey in accordance with Appendices C and D of CDFW's Staff Report on Burrowing Owl Mitigation (CDFG 2012). The first survey visit coincided with the multispecies burrow assessment described above. Subsequent visits focused on revisiting areas where burrowing owls or their sign were previously observed to determine breeding status and areas with high burrow density to look for newly-arrived owls. Survey details are provided in Tables 4, 5, and 6.

The February 2021 burrow assessment also served as the “one set of walking transects” to evaluate San Joaquin kit fox habitat suitability on the Project site in accordance with the early evaluation requirements in the San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999). Observations during the burrow assessment, as well as a parallel burrow assessment and wildlife game camera study for the Delta Field Division HCP (see Section 3.2.7, Wildlife Surveys for Delta Field Division Habitat Conservation Plan), indicated that subsequent spotlighting surveys were unnecessary and that the deployment of camera stations at select locations identified as suitable for kit fox movement would be sufficient to detect any kit foxes using the area. Methods for determining the number and location of camera stations were developed in coordination with USFWS and CDFW.

3.2.6.2 Swainson's Hawk Nesting Survey

From March to July 2021, Dudek conducted Swainson's hawk nesting surveys in accordance with Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley (SHTAC 2000). The survey focused on inspecting individual trees and groves of trees in the study area for evidence of Swainson's hawk nesting and also documented evidence of nesting great-horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), and other competitor species. Nesting habitat outside but within 0.5 miles of the study area was also surveyed with spotting scopes in accordance with the Swainson's Hawk Technical Advisory Committee (2000) survey guidelines. Where possible, trees were examined from multiple angles for extended periods. Some areas within the 0.5-mile survey buffer, where biologists did not have access to private roads and the Project is not proposing any activities, received relatively limited coverage. Survey dates, personnel, and weather conditions are provided in Tables 4, 5, and 6.

3.2.7 Wildlife Surveys for Delta Field Division Habitat Conservation Plan

In February 2021, Dudek also began field surveys to inform a future HCP for operations and maintenance of the California State Water Project and associated facilities within DWR's Delta Field Division. The HCP study area encompasses the entire DWR right-of-way and therefore contains the Project study area. Although the HCP wildlife surveys are being conducted separately from the Project-specific surveys described above, they cover the same areas and provide complementary information. All the above-listed surveys (burrow assessment, burrowing owl, San Joaquin kit fox, Swainson's hawk) were also conducted within the HCP study area in 2021. Specific additional HCP survey efforts used to inform Section 4 of this report are briefly described below.

3.2.7.1 Eagle Surveys

Dudek is conducting annual ground-based surveys of the HCP study area to determine to what degree the right-of-way is being used by golden eagles and/or bald eagles, including whether the right-of-way or its immediate vicinity supports active eagle nests or is being used by eagles as part of an active nest territory. Three survey rounds were completed during the 2021 nesting season, the first during the week of March 22 through 26 by Dudek biologists Keith Babcock and Michelle Leis, the second by Keith Babcock the week of April 26 through 30, and the third by Keith Babcock and Michelle Leis the week of May 24 through 28.

3.2.7.2 Wildlife Game Camera Study

Dudek initiated a wildlife game camera study of the larger HCP study area in March 2021; a fall component of the study is anticipated to commence in September 2021. Approximately 188 potential wildlife crossings within the HCP study area are being assessed as a part of a larger game camera study (crossings provided by DWR in February 2021). Potential wildlife crossings include culverts, overchutes, siphons, bridges, and roads. Crossings determined to be unsuitable for wildlife use, such as collapsed culverts and broken overchutes, use were not assessed. Of the total camera stations established, 14 were located among 7 potential crossings within or near the Project study area: 3 crossings at Dyer Dam, and 4 crossings at Patterson Dam.

A minimum of two to four camera stations were set at each potential wildlife crossing location with one on each side of the potential wildlife crossing determined by the biologist as most suitable for capturing wildlife use through the Project study area. Additional camera stations were placed in the vicinity of the Project study area (beyond the 300-foot buffer) to capture wildlife movements at a landscape scale (refer to Section 4.5.4). Preferred camera sets either had a good direct view into the structure entrance, or view of surrounding areas that led to the structure and to guide wildlife to the structure. One type of wildlife camera was used: Browning Spec Op game cameras. Each camera was supplied with a 16 to 32-gigabyte memory SD card and high-performance AA batteries. Digital cameras were set to fire immediately upon triggering and three shots were fired per trigger event. The trigger delay was set at 0 to 1 second. Camera aperture settings were set in the mid-range for better image sharpness and to capture the widest range of the site conditions. Cameras were unbaited and no scent lure was applied. Station set-up varied based on the type of crossing assessed, as well as the surrounding conditions. One method included driving a "T" post into the ground so that the attached camera would be at the appropriate height, roughly level with the crossing. As a result, some poles were slightly tilted. Cameras were generally placed approximately 2 to 3 feet off the ground. Another method included attaching the camera to an adjacent fence or railing with zip-ties, which afforded more flexibility in angling the cameras and minimizing movement. Cable locks or chains were also used at each camera station for security as many stations were established in areas that replaced when they could be traversed by the public. Forty cameras were placed

per session and generally covered 20 locations. Cameras were left in place for between 9 to 11 days before being moved to the next set of locations. Batteries were replaced when they reached 0.33 capacity which generally meant that they lasted for 3 to 4 rounds.

Once the cameras were collected, the SD cards were downloaded to the Dudek server and then uploaded to the University of California, Davis Road Ecology Group's Wildlife Observer Net, which is an automated artificial intelligence photo analyzer that categorizes photos as either including animals or not, and also attempts to count the number of animals. Once Wildlife Observer Net separated photos into two categories, those that contained wildlife and those that did not, a Dudek biologist reviewed the "animal" photos to identify the species. In addition, an experienced biologist performed random spot-checks of the photos not deemed to include animal photos, reviewed the species identifications, and difficult photos.

3.3 Survey Limitations

3.3.1 Flora

Direct observations of special-status plants were recorded during vegetation mapping, aquatic resources delineations, rare plant surveys, and habitat assessments. Focused surveys for special-status plants were conducted in the spring and summer of 2021. Fluctuations in annual plant populations and rates of germination are associated with variations in rainfall and other climatic conditions. Therefore, in addition to focused surveys, an emphasis was placed on conducting habitat assessments for special-status plant species (Appendix D, Special-Status Wildlife Species' Potential to Occur within the Project Site). In addition, reference checks were conducted for occurrences of rare plants within the Project vicinity to determine appropriate survey timing.

3.3.2 Fauna

Limitations of the field surveys include a diurnal bias for most species and the absence of focused trapping for mammals and reptiles, because trapping is generally only performed for select listed species. Additionally, due to seasonal restrictions, vernal pool branchiopod (e.g., vernal pool fairy shrimp) surveys were not possible within possible aquatic habitat features in the southern portion of the Clifton Court Forebay Dam study area. Surveys were conducted mostly during the daytime to maximize potential for the detection of plants and most animals. Birds represent the largest component of the vertebrate fauna, and because they are active in the daytime, diurnal surveys maximize the number of observations of this portion of the fauna. Daytime surveys may result in fewer observations of animals that are more active at night, such as mammals. However, the San Joaquin kit fox and wildlife movement camera studies were able to capture some nighttime activity. In addition, many species of reptiles and amphibians are nocturnal and/or secretive in their habits and are difficult to observe using standard meandering transects. Despite these limitations, the survey work conducted within the Project study area was extensive and provides an adequate overall assessment of faunal resources for purposes of evaluating potential Project impacts. To account for survey limitations, special-status wildlife species having the potential occur, based on pertinent distribution, habitat preference literature, and recorded off-site observations, are included in the analysis.

4 Environmental Setting (Existing Conditions)

4.1 Vegetation Communities and Land Cover Types

The acreages of the mapped vegetation associations and/or alliances and other land covers within the Project site are presented in Table 7, including those that are considered sensitive biological resources by CDFW under CEQA per the California Natural Community List (CDFW 2020); sensitive natural communities are included in Table 7 in bold text. The term semi-natural stands is used to distinguish between natural vegetation communities and vegetation types dominated by non-native plant species (Sawyer et al. 2009). The alliances and other land covers are grouped in Table 7 by the generalized habitat. The locations of the vegetation community alliances and land covers within the Project site are shown on Figure 5A, Vegetation Communities–Clifton Court Forebay Dam, Figure 5B, Vegetation Communities–Dyer Dam, and Figure 5C, Vegetation Communities–Patterson Dam, and are described by generalized habitat type in Sections 4.1.1 through 4.1.6.

Table 7. Vegetation Communities within the Project Site

Bog and Marsh	Alkali heath marsh	<i>Frankenia salina</i> Association	1.9	—	—	1.9
	American bulrush marsh	<i>Schoenoplectus americanus</i> Association	1.8	—	—	1.8
	Baltic and Mexican rush marshes	<i>Juncus arcticus</i> var. <i>balticus</i> –(var. <i>mexicanus</i>) Association	0.3	—	—	0.3
	Cattail marshes	<i>Typha (latifolia, angustifolia)</i> Association	—	0.6	0.7	1.3
	Common and giant reed marshes	<i>Arundo donax</i> Semi-natural Association	0.9	—	—	0.9
	Hardstem and California bulrush marshes	<i>Schoenoplectus acutus</i> Association	0.2	—	0.0 ^a	0.2
	Iodine bush scrub	<i>Allenrolfea occidentalis</i> / <i>Distichlis spicata</i> Provisional Association	5.4	—	—	5.4
		<i>Allenrolfea occidentalis</i> Association	7.5	—	—	7.5
	Perennial pepper weed patches	<i>Lepidium latifolium</i> Semi-natural Association	21.5	—	—	21.5
	Quailbush scrub	<i>Atriplex lentiformis</i> Association	7.3	0.1	—	7.4
	Salt grass flats	<i>Distichlis spicata</i> Association	0.6	1.3	0.5	2.3
	Smartweed–cocklebur patches	<i>Polygonum (amphibium, lapathifolium)</i> Association	7.1	—	—	7.1
<i>Bog and Marsh Subtotal</i>			54.5	2.0	1.2	57.7
Disturbed and Developed	N/A	Disturbed Habitat	13.9	3.9	0.4	18.2
	N/A	General Agriculture	0.0 ^a	—	—	0.0 ^a
	N/A	Open water	60.6	—	0.0 ^a	60.7
	N/A	Urban/Developed	109.6	21.5	15.4	146.4
<i>Disturbed and Developed Total</i>			184.2	25.3	15.8	225.3
Dune	Ice plant mats	<i>Carpobrotus (edulis)</i> Semi-natural Association	1.9	—	—	1.9
	<i>Dune Subtotal</i>			1.9	—	—
Grass and Herb Dominated	California brome–blue wildrye prairie	<i>Elymus glaucus</i> Association	2.6	—	—	2.6
	Needle grass–Melic grass grassland	Needle grass–Melic grass grassland (<i>Nassella</i> spp.– <i>Melica</i> spp.) Alliance	—	17.2	0.7	17.9

Table 7. Vegetation Communities within the Project Site

	Perennial rye grass fields	<i>Lolium perenne</i> – <i>Hordeum marinum</i> – <i>Ranunculus californicus</i> Semi-natural Association	22.3	1.1	–	23.4
	Poison hemlock or fennel patches	<i>Conium maculatum</i> Semi-natural Association	12.7	–	–	12.7
	Upland mustards or star-thistle fields	<i>Brassica nigra</i> Semi-natural Association	18.4	3.6	5.8	27.9
		<i>Carduus pycnocephalus</i> – <i>Silybum marianum</i> Provisional Semi-natural Association	–	2.5		2.5
		<i>Raphanus sativus</i> Semi-natural Association	–	–	2.3	2.3
	Wild oats and annual brome grasslands	Wild oats and annual brome grasslands (<i>Avena</i> spp.– <i>Bromus</i> spp.) Semi-natural Alliance	45.6	6.9	9.2	61.7
	<i>Grass and Herb Dominated Total</i>		101.6	31.3	18.0	150.9
Riparian	Arroyo willow thickets	<i>Salix lasiolepis</i> Association	–	0.0 ^a	–	0.0 ^a
	Button willow thickets	<i>Cephalanthus occidentalis</i> Association	1.4	–	–	1.4
	Goodding’s willow–red willow riparian woodland and forest	<i>Salix gooddingii</i> Association	7.6	–	–	7.6
	Himalayan blackberry–rattlebox–edible fig riparian scrub	<i>Rubus armeniacus</i> Semi-natural Association	4.1	–	–	4.1
	Hinds’s walnut and related stands	<i>Juglans hindsii</i> Semi-natural Association	1.2	–	–	1.2
	Red alder forest	<i>Alnus rubra</i>/<i>Salix lasiolepis</i>/<i>Rubus</i> spp. Association	0.3	–	–	0.3
	<i>Riparian Subtotal</i>		14.6	0.0		14.7
Scrub	Coyote brush scrub	<i>Baccharis pilularis</i> /Annual grass–herb Association	2.4	–	–	2.4
	<i>Scrub Subtotal</i>		2.4	–	–	2.4
	Grand Total		359.3	58.7	35.0	452.9

Notes: An alliance and/or association is considered **sensitive** (bolded above) if indicated with a state rarity rank of S1–S3 or indicated as sensitive without a rarity ranking in the California Natural Community List (CDFW 2020).

^a 0.0 are values that are less than 0.05 acres.

4.1.1 Bog and Marsh

4.1.1.1 Alkali Heath Marsh Alliance (52.500.00)

Within the alkali heath marsh alliance, alkali heath (*Frankenia salina*) is greater than 30% cover in the herbaceous layer, sometimes co-dominant with saltgrass (*Distichlis spicata*) or other herbs and subshrubs (CNPS 2021b). Cover is open to continuous and less than 60 centimeters in height. This association occurs within coastal salt marshes, brackish marshes, alkali meadows, and alkali playas. Within the Project site there is one association in the alkali heath marsh alliance, as described below.

***Frankenia salina* Association (52.500.02)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs in a small portion of the seasonally inundated lowland between Clifton Court Forebay and the West Canal, in a matrix of facultative and facultative wetland species. Within the study area, alkali heath constitutes approximate 60% relative cover and Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*) constitutes approximately 40% relative cover.

Frankenia salina association comprises 1.9 acres of the Clifton Court Forebay Dam biological resources study area. This association is considered sensitive (CDFW 2020).

4.1.1.2 American Bulrush Marsh Alliance (52.111.00)

Within the American bulrush marsh alliance, American bulrush (*Schoenoplectus americanus*) is greater than 50% relative cover in the herbaceous layer with hardstem bulrush (*S. acutus*), California bulrush (*S. californicus*), common threesquare (*S. pungens*), or cattail (*Typha* spp.) (CNPS 2021b). Emergent trees and shrubs such as willow (*Salix* spp.) may be present at low cover. Cover is intermittent to continuous and less than 4 meters in height. This alliance generally occurs along streams, around ponds and lakes, and in sloughs, swamps, fresh and brackish marshes, and roadside ditches. Soils have a high organic content and are poorly aerated. Within the Project site there is one association in the American bulrush alliance, as described below.

***Schoenoplectus americanus* Association (52.111.04)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs in semi-permanently flooded or seasonally inundated features such as ditches and freshwater emergent wetlands. Within the study area, American bulrush constitutes between 70% and 75% relative cover with cattails ranging from 15% to 25%; one stand of this vegetation community contains perennial pepper weed (*Lepidium latifolium*).

Schoenoplectus americanus association comprises 1.8 acres of the Clifton Court Forebay Dam biological resources study area. This association is considered sensitive (CDFW 2020).

4.1.1.3 Baltic and Mexican Rush Marshes Alliance (45.562.00)

Within the Baltic and Mexican rush marshes alliance, Baltic rush (*Juncus balticus*) or Mexican rush (*J. mexicanus*) is dominant or co-dominant (CNPS 2021b). This alliance generally occurs within wet and mesic meadows, along stream banks, rivers, lakes, ponds, fens, and sloughs, and within freshwater, brackish, and alkaline marshes. Soils are poorly drained, often with a thick organic layer. Within the Project site there is one association in the Baltic and Mexican rush alliance, as described below.

***Juncus arcticus* var. *balticus*–(var. *mexicanus*) Association (45.562.08)**

Within the Clifton Court Forebay Dam biological resources study area, this alliance occurs in an isolated freshwater emergent wetland located south of Clifton Court Forebay. Within the study area, Baltic rush relative cover was approximately 75% with ripgut brome (*Bromus diandrus*) at 10% cover with alkali heath at 5% cover.

Juncus arcticus var. *balticus*–(var. *mexicanus*) association comprises 0.3 acres of the Clifton Court Forebay Dam biological resources study area. This association is not considered sensitive (CDFW 2020).

4.1.1.4 Cattail Marshes Alliance (52.050.00)

Within the cattail marsh alliance, narrowleaf cattail (*Typha angustifolia*) and/or broadleaf cattail (*T. latifolia*) is greater than 50% relative cover in the herbaceous layer (CNPS 2021b) with nutsedges (*Cyperus* spp.), salt grass, barnyardgrass (*Echinochloa crus-galli*), pale spike rush (*Eleocharis macrostachya*), rushes (*Juncus* spp.), annual rabbitsfoot grass (*Polypogon monspeliensis*), knotweed (*Persicaria* spp.), or bulrush (*Schoenoplectus* spp.), among others. Emergent trees and shrubs may be present at low cover, including willows. Cover is intermittent to continuous and less than 1.5 meters in height. Soils may be clayey or silty. Within the Project site there is one association in the cattail marshes alliance, as described below.

***Typha* (*latifolia*, *angustifolia*) Association (52.050.04)**

Within the Dyer Dam biological resources study area, this association occurs in semi-permanently flooded freshwater or brackish marshes. Within the Patterson Dam biological resources study area, this association occurs within the semi-permanently flooded main drainage. Within the Dyer Dam biological resources study area, this association occurs within a relocated drainage channel running north to south through the eastern portion of the study area. Within these study areas, the *Typha* (*latifolia*, *angustifolia*) association is dominated narrowleaf cattail ranging between 70% and 90% relative cover. Other species present include tall flatsedge (*Cyperus eragrostis*) and fringed willowherb (*Epilobium ciliatum*).

Typha (*latifolia*, *angustifolia*) association comprises 0.6 acres of the Dyer Dam biological resources study area and 0.7 acres of the Patterson Dam biological resources study area. This association is not considered sensitive (CDFW 2020).

4.1.1.5 Common and Giant Reed Marshes Alliance (42.081.00)

Within the common and giant reed marsh alliance, common reed (*Phragmites australis*) or giant reed (*Arundo donax*) are dominant in the herbaceous layer. This alliance occurs in riparian areas, along low-gradient streams and ditches, and within semi-permanently flooded and slightly brackish marshes and impoundments (CNPS 2021b). Within the Project site there is one association in the common and giant reed marshes alliance, as described below.

***Arundo donax* Semi-Natural Association (42.080.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs intermittently along the riprap embankments of Old River, the West Canal, and Italian Slough, and in sporadic stands within the southern portion of the study area. The approximate relative cover for giant reed in the study area is 80%.

Arundo donax semi-natural association comprises 0.9 acres of Clifton Court Forebay Dam biological resources study area. This association is not considered sensitive (CDFW 2020).

4.1.1.6 Hardstem and California Bulrush Marshes Alliance (52.128.00)

Within the hardstem bulrush and California bulrush alliance, hardstem bulrush (*Schoenoplectus acutus*) and/or California bulrush (*Schoenoplectus californicus*) are dominant or co-dominant in the herbaceous layer (CNPS 2021b). Cover is intermittent to continuous, and less than 4 meters in height. This alliance occurs in brackish to freshwater marshes, along stream shores, bars and channels of river mouth estuaries, around ponds and lakes, in sloughs, swamps, and roadside ditches. Soils have a high organic content and are poorly aerated. Within the Project site there is one association in the hardstem and California bulrush marshes alliance, as described below.

***Schoenoplectus acutus* Association (52.122.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs within semi-permanently flooded or seasonally inundated features such as ditches and freshwater emergent wetlands. Within the Patterson Dam biological study area, this association occurs within the semi-permanently flooded main drainages on site. Within these study areas, this community contains 80% relative cover of hardstem bulrush and 20% relative cover of poison hemlock (*Conium maculatum*).

Schoenoplectus acutus association comprises 0.2 acres of the Clifton Court Forebay Dam biological resources study area and less than 0.05 acres of the Patterson Dam biological resources study area. This association is considered sensitive (CDFW 2020).

4.1.1.7 Iodine Bush Scrub Alliance (36.120.00)

Within the iodine bush scrub alliance, iodine bush (*Allenrolfea occidentalis*) is greater than 2% absolute cover in the shrub canopy, and no other shrub species is present at greater or equal cover (CNPS 2021b). Shrub canopy is open to continuous, less than 2 meters in height, and includes shrubby seepweed (*Suaeda nigra*). Herbaceous layer is variable and consists of saltgrass and alkali seaheath. This association occurs within dry lakebed margins, hummocks, playas perches above current drainages, and seeps. Within the Project site there are two associations in the iodine bush scrub alliance, as described below.

***Allenrolfea occidentalis*/*Distichlis spicata* Provisional Association (36.120.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs within an alkaline flat in the southern portion of the study area. Within the study area, this provisional association contains approximately 30% iodine bush and 20% Mediterranean barley; other associated species include common tarweed (*Centromadia pungens* ssp. *pungens*), quailbush (*Atriplex lentiformis*), and bush seepweed.

Allenrolfea occidentalis/*Distichlis spicata* provisional association comprises 5.4 acres of the Clifton Court Forebay Dam biological resources study area. This association is considered sensitive (CDFW 2020).

***Allenrolfea occidentalis* Association (36.120.04)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs within a non-jurisdictional drainage and alkaline flat in the southern portion of the study area. The study area also includes a portion of a larger stand of this association to the west.

Allenrolfea occidentalis association comprises 7.5 acres of the Clifton Court Forebay Dam biological resources study area. This association is considered sensitive (CDFW 2020).

4.1.1.8 Perennial Pepper Weed Patches Alliance (52.205.00)

Within the perennial pepper weed patches alliance, perennial pepperweed (*Lepidium latifolium*) is present at greater than 30% absolute cover in the herbaceous layer with other non-natives present at greater than 90% cover (CNPS 2021b). Cover is open to continuous and less than 2 meters in height. This alliance generally occurs in intermittently and seasonally flooded fresh and saltwater marshes and riparian corridors. Within the Project site there is one association in the perennial pepper weed patches alliance, as described below.

***Lepidium latifolium* Semi-Natural Association (52.205.02)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs throughout seasonally inundated lowlands of the study area. Within this study area, the *Lepidium latifolium* semi-natural association contains 50% to 90% perennial pepperweed.

Lepidium latifolium semi-natural association comprises 21.5 acres of the Clifton Court Forebay Dam biological resources study area. This association is not considered sensitive (CDFW 2020).

4.1.1.9 Quailbush Scrub Alliance (36.370.00)

Within the quailbush scrub alliance, quailbush or Torrey's saltbush (*Atriplex torreyi*) is dominant in the shrub canopy (CNPS 2021b). Shrub cover is open to intermittent and less than 5 meters in height; herbaceous layer is variable. This alliance occurs on gentle to steep southeast and southwest-facing slopes. Soils are clays. Within the Project site there is one association in the quailbush scrub alliance, as described below.

***Atriplex lentiformis* Association (36.370.01)**

This association occurs within semi-permanently flooded or seasonally inundated features including non-jurisdictional ditches and swales within the southern portion the Clifton Court Forebay Dam biological resources study area. It occurs within the northwest portion of the Dyer Dam biological resources study area, west of the South Bay Aqueduct. Within the study areas, the *Atriplex lentiformis* association occurs co-dominantly with iodine bush; the distribution of relative cover is approximately 40% relative cover of quailbush and 30% relative cover of iodine bush. Other associated species include salt grass and soft brome.

Atriplex lentiformis association comprises 7.3 acres of the Clifton Court Forebay Dam biological resources study area and 0.1 acres of the Dyer Dam biological resources study area. This association is not considered sensitive.

4.1.1.10 Salt Grass Flats Alliance

Within the salt grass flats alliance, salt grass, spiny rush (*Juncus acutus*), and/or Cooper's rush (*Juncus cooperi*) are dominant or codominant in the herbaceous layer (CNPS 2021b). Cover is open to continuous and less than 1.5 meters in height. This alliance occurs in coastal salt marshes, inland habitats such as playas, swales, and terraces along washes that may be intermittently flooded. Soils are often deep, alkaline or saline, and poorly drained. When the soil is dry, the surface usually has salt accumulations. Within the Project site there is one association in the salt grass flats alliance, as described below.

***Distichlis spicata* Association (41.200.13)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs within semi-permanently flooded or seasonally inundated features including a non-jurisdictional ditch and swale within the southern portion of the study area. Within the Dyer Dam biological resources study area, this association occurs within seasonally inundated features in the western portion of the study area. Within the Patterson Dam biological resources study area, this association occurs adjacent to the semi-permanently flooded drainage to the west of Patterson Reservoir. Within these study areas salt grass varies between 50% relative cover and 75% relative cover.

Distichlis spicata association comprises 0.6 acres of the Clifton Court Forebay Dam biological resources study area, 1.3 acres of the Dyer Dam biological resources study area, and 0.5 acres of the Patterson Dam biological resources study area. This association is not considered sensitive (CDFW 2020).

4.1.1.11 Smartweed–Cocklebur Patches Alliance (42.207.00)

Within the smartweed-cocklebur patches alliance, smartweed (*Persicaria lapathifolia*, formerly *Polygonum lapathifolium*) and/or cocklebur (*Xanthium strumarium*), or other knotweed species (*Persicaria* spp.) are dominant or co-dominant in the herbaceous layer (CNPS 2021b). Cover is open to continuous and less than 1.5 meters in height. This alliance occurs within marshes, regularly disturbed vernal wet pools, fields, and stream terraces. Within the Project site there is one association in the smartweed–cocklebur patches alliance, as described below.

***Polygonum (amphibium, lapathifolium)* Association (42.207.02)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs within a seasonally inundated lowland between the West Canal and Clifton Court Forebay within a matrix of facultative and facultative wetland species. Within the study area, the *Polygonum (amphibium, lapathifolium)* association contains approximately 30% relative cover of longroot smartweed (*Persicaria amphibia*), 30% relative cover of cocklebur (*Xanthium strumarium*), 30% relative cover of fat hen (*Atriplex prostrata*), and 10% relative cover of common sunflower (*Helianthus annuus*).

Polygonum (amphibium, lapathifolium) association comprises 7.1 acres of the Clifton Court Forebay Dam biological resources study area. This association is not considered sensitive.

4.1.2 Disturbed and Developed

4.1.2.1 Disturbed Habitat

Disturbed habitat within the Clifton Court Forebay Dam biological resources study area is composed of unpaved access roads associated with Clifton Court Forebay operations and maintenance. While unpaved, these areas were heavily compacted and mostly barren of vegetation. Where present, vegetation consisted of ruderal or disturbance-tolerant non-native grasses and forbs.

Disturbed habitat within the Dyer Dam biological resources study area is composed of unpaved access roads, earthen stormwater control features (e.g., drainage ditches), erosion control (e.g., riprap), and one gravel-lined staging area in the northwest. These areas are highly disturbed due to ongoing maintenance and support sparse ruderal or disturbance-tolerant non-native grasses and forbs.

Disturbed habitat within the Patterson Dam biological resources study area is limited to a landscaped hedge of oleander (*Nerium oleander*) along a staging area to the south of Patterson Reservoir.

Disturbed habitat comprises 13.9 acres of the Clifton Court Forebay Dam biological resources study area, 3.9 acres of the Dyer Dam biological resources study area, and 0.4 acres of the Patterson Dam biological resources study area. Disturbed habitat is not considered sensitive.

4.1.2.2 General Agriculture

The Clifton Court Forebay Dam biological resources study area is adjoined to the south by agricultural fields and associated unpaved access roads and irrigation channels. These lands contained both active and fallow row crops at the time of the field surveys.

General agriculture comprises less than 0.05 acres of Clifton Court Forebay Dam biological resources study area. General agriculture is considered sensitive is not considered sensitive.

4.1.2.3 Open Water

Within the Clifton Court Forebay Dam biological resources study area, open water consists of portions of the relatively permanent waterways surrounding Clifton Court Forebay, including Old River to the north, Italian Slough to the west, and the West Canal to the east. In addition, inundated areas of an unnamed drainage canal to the south and the engineered ditch/sump complex that circumnavigates Clifton Court Forebay contains open water. The water level within these areas likely fluctuates seasonally based on rainfall and California State Water Project operations. Open water within the Patterson Dam biological resources study area is limited to an earthen drainage channel to the east of Patterson Reservoir.

Within the Clifton Court Forebay Dam biological resources study area, open water comprises 60.6 acres of the study area. There is less 0.05 acres of open water in the Patterson Dam biological resources study area.

4.1.2.4 Urban/Developed

Most land cover within the Clifton Court Forebay Dam biological resources study area is composed of urban and developed lands (e.g., paved levee road, gravel embankments) and artificial structures associated with Clifton Court Forebay infrastructure. Urban/developed areas within the Clifton Court Forebay Dam biological resources study area also includes operations and maintenance areas including staging, parking, and laydown areas. Much of this area is devoid of vegetation due to composition of the substrate (e.g., asphalt) and maintenance activities (e.g., mowing).

Most land cover within the Dyer Dam biological resources study area is composed of urban and developed lands (e.g., access roads and staging areas) and artificial structures associated with Dyer Dam infrastructure. Developed areas also include concrete-lined stormwater control features (e.g., V-ditches). These areas are mostly devoid of vegetation due to the compaction and impermeable substrate.

Most land cover within the Patterson Dam biological resources study area is composed of urban and developed lands (e.g., access roads and staging areas) and artificial structures associated with Patterson Dam infrastructure. Developed areas also include stormwater control features (e.g., V-ditches). These areas are highly disturbed due to ongoing maintenance and support sparse ruderal or disturbance-tolerant non-native grasses and forbs.

Urban/developed lands comprise 109.6 acres of the Clifton Court Forebay Dam biological resources study area, 21.5 acres of the Dyer Dam biological resources study area, and 15.4 acres of the Patterson Dam biological resources study area. Urban/developed lands are not considered sensitive.

4.1.3 Dune

4.1.3.1 Ice Plant Mats Alliance (21.200.00)

Within the ice plant mats alliance, hottentot fig (*Carpobrotus edulis*) or other ice plant taxa are strongly dominant (greater than 80% relative cover) (CNPS 2021b). The cover is intermittent to continuous and less than 50 centimeters in height. This association generally occurs within bluffs, disturbed land, and sand dunes of immediate coastline. Within the Project site there is one association in the ice plants mats alliance, as described below.

***Carpobrotus (edulis)* Semi-Natural Association (21.200.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs within one dense, roadside patch between Old River and Clifton Court Forebay. Within the study area, the *Carpobrotus (edulis)* semi-natural association contains 90% relative cover of hottentot fig.

Carpobrotus (edulis) semi-natural association comprises 1.9 acres of within the Clifton Court Forebay Dam biological resources study area. This association is not considered sensitive.

4.1.4 Grass and Herb Dominated

4.1.4.1 California Brome–Blue Wildrye Prairie Alliance (41.131.00)

Within the California brome–blue wildrye alliance, California brome, seaside brome (*Bromus sitchensis* var. *maritimus*), blue wildrye, and/or western bracken fern (*Pteridium aquilinum*) are dominant or co-dominant in the herbaceous layer. Cover is open to continuous and less than 1 meter in height. This alliance occurs within basins, terraces, dry floodplains, steep mesic slopes, and forest openings. Within the Project site there is one association in the California brome–blue wildrye prairie alliance, as described below.

***Elymus glaucus* Association (41.640.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs within seasonally inundated lowlands between Clifton Court Forebay and the West Canal, and between Clifton Court Forebay and Old River in a matrix of facultative and facultative wetland species. Within the study area, this association contains approximately 80% relative cover of blue wildrye.

Elymus glaucus association comprises 2.6 acres of the Clifton Court Forebay Dam biological resources study area. This association is considered sensitive (CDFW 2020).

4.1.4.2 Needle Grass–Melic Grass Grassland Alliance (41.151.00)

Purple needle grass (*Stipa pulchra*, formerly *Nassella pulchra*) is greater than 5% absolute cover in the herbaceous layer with other perennial grasses and herbs including wavyleaf soap plant (*Chlorogalum pomeridianum*), bluedicks (*Dipterostemon capitatus*), and California poppy (*Eschscholzia californica*), among others (CNPS 2021b). Cover in this alliance is open to continuous and less than 1 meter in height. This alliance generally occurs in all topographic locations. Soils may be deep with high clay content, loamy, sandy, or silty derived from mudstone, sandstone, or serpentine substrates. Within the Dyer Dam biological resources study area, this alliance occurs co-dominantly with grazed annual grassland in the north and east. This alliance occurs co-dominantly with annual grassland in the north and east of the Patterson Dam biological resources study area.

Within the Dyer Dam biological resources study area, a majority of the vegetated portion of the study area (17.2 acres) is composed of needle grass–melic grass grassland (*Nassella* spp.–*Melica* spp.) alliance. The needle grass–Melic grass grassland alliance comprises 0.7 acres of the Patterson Dam biological resources study area. This alliance is considered sensitive (CDFW 2020).

4.1.4.3 Perennial Rye Grass Fields Alliance (41.321.00)

Within the perennial rye grass field alliance, perennial rye grass (*Festuca perennis*, formerly *Lolium perenne*) is dominant or co-dominant with other non-natives in the herbaceous layer (CNPS 2021b). This association occurs in lowlands with periodic flooding, disked fields, and uplands. Within the Project site there is one association in the perennial rye grass fields alliance, as described below.

***Lolium perenne*–*Hordeum marinum*–*Ranunculus californicus* Semi-Natural Association (41.321.05)**

Within the Clifton Court Forebay Dam biological resources study area, perennial rye grass occurred co-dominantly with mouse barley (*Hordeum marinum*), another facultative grass, throughout uplands and seasonally inundated depressions. Within the Dyer Dam biological resources study area, perennial rye grass occurred co-dominantly with mouse barley within the wide drainage in the southern portion of the study area.

Lolium perenne–*Hordeum marinum*–*Ranunculus californicus* semi-natural association comprises 22.3 acres of the Clifton Court Forebay Dam biological resources study area and 1.1 acres of the Dyer Dam biological resources study area. This association is not considered sensitive.

4.1.4.4 Poison Hemlock or Fennel Patches Alliance (45.556.00)

Within the poison hemlock or fennel patches alliance, poison hemlock (*Conium maculatum*), fennel (*Foeniculum vulgare*), or another non-native invasive plant of the Apiaceae family is dominant or co-dominant with other non-native plants in the herbaceous layer (CNPS 2021b). Cover is open to continuous and less than 2 meters in height. This association occurs within all topography, including wetlands. Within the Project site there is one association in the poison hemlock or fennel patches alliance, which is described below.

***Conium maculatum* Semi-Natural Association (45.556.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs within seasonally inundated lowlands of the study area. Within this association, poison hemlock ranges from 70% to 75% relative cover.

Conium maculatum semi-natural association comprises 12.7 acres of the Clifton Court Forebay Dam biological resources study area. This association is not considered sensitive.

4.1.4.5 Upland Mustards or Star-Thistle Fields Alliance (42.013.00)

Black mustard (*Brassica nigra*), field mustard (*Brassica rapa*), Italian plumeless thistle (*Carduus pycnocephalus*), Maltese star-thistle (*Centaurea melitensis*), yellow star-thistle (*Centaurea solstitialis*), cardoon (*Cynara cardunculus*), Geraldton carnation weed (*Euphorbia terracina*), shortpod mustard (*Hirschfeldia incana*), Dyer's woad (*Isatis tinctoria*), cultivated radish (*Raphanus sativus*), or similar ruderal forbs are dominant in the herbaceous layer of this alliance (CNPS 2021b). Cover is open to continuous and less than 2 meters in height. Within the Project site there are three semi-natural associations in the upland mustards or star-thistle field alliance, as described below.

***Brassica nigra* Semi-Natural Association (42.011.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs in uplands adjacent to annual grassland, urban/developed, and disturbed areas. Within the Dyer Dam biological resources study area, this association occurs within the upland slopes on either side of the wide drainage in the southern portion of the study area. Within the Patterson Dam study area, this association occurs on the south-facing slope of the South Bay Aqueduct embankment, and within and adjacent to the main drainages on the study area.

Brassica nigra semi-natural association comprises 18.4 acres of the Clifton Court Forebay Dam biological resources study area, 3.6 acres of the Dyer Dam biological resources study area, and 5.8 acres of the Patterson Dam biological resources study area. This association is not considered sensitive.

***Carduus pycnocephalus*–*Silybum marianum* Provisional Semi-Natural Association (42.013.01)**

With the Dyer Dam biological resources study area, this association occurs within the upland slopes on either side of the wide drainage in the southern portion of the study area.

Carduus pycnocephalus–*Silybum marianum* provisional semi-natural association comprises 2.5 acres of the Dyer Dam biological resources study area. This association is not considered sensitive.

***Raphanus sativus* Semi-Natural Association (42.011.04)**

Within the Patterson Dam biological resources study area, this association occurs northwest of the reservoir and southwest of the South Bay Aqueduct.

Raphanus sativus semi-natural association comprises 2.3 acres of the Patterson Dam biological resources study area. This association is not considered sensitive.

4.1.4.6 Wild Oats and Annual Brome Grasslands Alliance (42.027.00)

Wild oat (*Avena* spp.), brome (*Bromus* spp.), and medusahead (*Elymus caput-medusae*) (“annual grasses”) are dominant or co-dominant (greater than 50% relative cover) in the herbaceous layer of this alliance (CNPS 2021b). A variety of forb species also occur within this alliance, including burclover (*Medicago polymorpha*), dove weed (*Croton setiger*), Russian thistle (*Salsola tragus*), and many others. Wild oats and annual brome grasslands occur in all topographic settings in foothills, waste places, rangelands, and openings in woodlands. Large amounts of standing dead plant material can be found during summer in years of abundant rainfall and light to moderate grazing pressure. Although annual grassland habitats consist largely of non-native annuals, these effectively prevent the reestablishment of native perennials over large areas and are considered climax communities (Kie 1988). This association occurred within highly disturbed uplands of the Clifton Court Forebay Dam biological resources study area. Within the Dyer Dam biological resources study area this association occurs within grazed pastureland in the western and northern portion of the study area. Finally, within the Patterson Dam biological study area, this association occurred within highly disturbed uplands of the northern and eastern portions of the study area.

The wild oats and annual brome grasslands comprises 45.6 acres of the Clifton Court Forebay Dam biological resources study area, 6.9 acres of the Dyer Dam biological resources study area, and 9.2 acres of the Patterson Dam biological resources study area. This association is not considered sensitive.

4.1.5 Riparian

4.1.5.1 Arroyo Willow Thickets Alliance (61.201.00)

Within the arroyo willow thickets alliance, arroyo willow (*Salix lasiolepis*) is dominant or co-dominant in the tall shrub or low tree canopy (CNPS 2021b). Canopy is open to continuous and less than 10 meters in height; herbaceous layer is variable. This alliance occurs on stream banks and benches, slope seeps, and stringers along drainages.

Within the Project site there is one association in the arroyo willow thickets alliance, as described below.

***Salix lasiolepis* Association (61.201.01)**

Within the Dyer Dam biological resources study area, one fragmented stand of this association occurs within an eroded side channel of the relocated drainage channel in the eastern portion of the study area. This stand consisted of several arroyo willow saplings up to 7 feet in height, covered approximately 40% of the area, with a sparse understory of ruderal grasses and forbs.

Salix lasiolepis association comprises less than 0.05 acres of the Dyer Dam biological resources study area. This association is considered sensitive (CDFW 2020).

4.1.5.2 Button Willow Thickets Alliance (63.300.00)

Within the button willow thickets alliance, button willow (*Cephalanthus occidentalis*) is dominant in the shrub or small tree canopy with willows and red osier (*Cornus sericea*) (CNPS 2021b). Canopy is continuous, intermittent, or open, and less than 6 meters in height; herbaceous later is sparse or grassy. This alliance occurs within seasonally flooded basins, sloughs, and oxbow basins on floodplains with subsurface water at the end of the growing season. Soils are poorly aerated and finely textured. Within the Project site there is one association in the button willow thickets alliance, as described below.

***Cephalanthus occidentalis* Association (63.300.01)**

Within the Clifton Court Forebay Dam biological resources study area, intermittent thickets occur along and adjacent to the riprap embankments of Italian Slough. Within this study area, buttonwillow comprises 40% to 50% of the relative cover of the *Cephalanthus occidentalis* association.

Cephalanthus occidentalis association comprises 1.4 acres of the study area. This association is considered sensitive (CDFW 2020).

4.1.5.3 Goodding's Willow–Red Willow Riparian Woodland and Forest Alliance (61.216.00)

Within the Goodding's willow–red willow riparian woodland and forest alliance, Goodding's willow (*Salix gooddingii*) and/or red willow (*S. laevigata*) are dominant or co-dominant in the tree or shrub canopy (CNPS 2021b). Tree canopy is open to continuous and less than 30 meters in height; shrub layer is sparse to continuous; herbaceous layer is variable. This association generally occurs on terraces along large rivers, canyons, along floodplains of streams, seeps, springs ditches, floodplains, lake edges, or low-gradient depositions. Within the Project site there is one association in the Goodding's willow–red willow riparian woodland and forest alliance, as described below.

***Salix gooddingii* Association (61.211.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs in a dense stand between the West Canal and Clifton Court Forebay in the northeastern corner of the study area, adjacent to two non-jurisdictional drainages. The relative percent cover of Goodding's black willow ranges from 10% to 80%.

Salix gooddingii association comprises 7.6 acres of the Clifton Court Forebay Dam biological resources study area. This association is considered sensitive (CDFW 2020).

4.1.5.4 Himalayan Blackberry–Rattlebox–Edible Fig Riparian Scrub Alliance (63.906.00)

Within the Himalayan blackberry–rattlebox–edible fig riparian scrub alliance, Himalayan blackberry (*Rubus ursinus*), rattlebox (*Sesbania punicea*), or edible fig (*Ficus carica*) is dominant or co-dominant (CNPS 2021b). Shrub canopy is intermittent to continuous, and herbaceous layer is open to intermittent. Shrubs and small trees are less than 10 meters in height. This alliance occurs in pastures, forest plantations, roadsides, streamsides, river flats, floodplains, fence lines, mesic disturbed areas, and right-of-way corridors. Within the Project site there is one association in the Himalayan blackberry–rattlebox–edible fig riparian scrub alliance, as described below.

***Rubus armeniacus* Semi-Natural Association (63.906.01)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs throughout the riprap embankments of Old River, the West Canal, and Italian Slough, and in several thickets within the northern and eastern portions of the study area.

Rubus armeniacus semi-natural association comprises 4.1 acres of the Clifton Court Forebay Dam biological resources study area. This association is not considered sensitive.

4.1.5.5 Hinds’s Walnut and Related Stands Alliance (61.810.00)

Within the Hinds’s walnut and related stands alliance, Hind’s walnut (*Juglans hindsii*) or hybrids are dominant in the tree canopy (CNPS 2021b). Tree canopy is intermittent to continuous and less than 25 meters in height; shrub layer is open to intermittent; and herbaceous layer is sparse. This association occurs within intermittently flooded or saturated riparian corridors, floodplains, stream banks, and terraces. Soils are alluvial. Within the Project site there is one association in the Hinds’s walnut and related stands alliance, as described below.

***Juglans hindsii* Semi-Natural Association (61.810.02)**

Within the Clifton Court Forebay Dam biological resources study area, this association made up one remnant stand between the West Canal and Clifton Court Forebay, within a matrix of facultative and facultative wetland species. This stand contains 25% relative cover of Northern California walnut, 50% relative cover of Himalayan blackberry, and 25% tree tobacco (*Nicotiana glauca*).

Juglans hindsii semi-natural association comprises 1.2 acres of the Clifton Court Forebay Dam biological resources study area. This association is considered sensitive (CDFW 2020).

4.1.5.6 Red Alder Forest Alliance (61.410.00)

Within the red alder forest alliance, red alder (*Alnus rubra*) is dominant or co-dominant in the tree canopy (CNPS 2021b). Tree canopy is continuous and less than 40 meters in height; shrub layer is sparse to intermittent; herbaceous layer is open to continuous, especially with ferns and forbs. This alliance occurs in stream and river backwaters, banks, bottoms, flood plains, mouths, terraces, and slopes of all aspects. Within the Project site there is one association in the red alder alliance, as described below.

***Alnus rubra/Salix lasiolepis/Rubus* spp. Association (61.410.05)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs in a few, fragmented stands along the riprap embankment of the West Canal at the check dam into Clifton Court Forebay in the southeast corner of the study area. These stands contain approximately 20% relative cover of red alder, 10% cover of arroyo willow, 20% relative cover of hardstem bulrush, and 20% prostrate knotweed (*Polygonum aviculare*). Other associated species include Himalayan blackberry and poison hemlock.

Alnus rubra/Salix lasiolepis/Rubus spp. association comprises 0.3 acres of the Clifton Court Forebay Dam biological resources study. This association is considered sensitive (CDFW 2021).

4.1.6 Scrub

4.1.6.1 Coyote Brush Scrub Alliance (32.060.00)

Within the coyote brush scrub alliance, coyote brush (*Baccharis pilularis*) is dominant to co-dominant (CNPS 2021b). Shrub canopy is variable and less than 3 meters in height; herbaceous layer is variable. This alliance occurs within river mouths, stream sides, terraces, stabilized dunes of coastal bars, spits along the coastline, coastal bluffs, open slopes, and ridges. Soils are variable, sandy to relatively heavy clay. Disturbances such as road cuts or landslides create opportunities for light, wind-dispersed seed and xeric condition-tolerant scrub species to establish (de Becker 1988). Within the Project site there is one association in the coyote brush scrub alliance, as described below.

***Baccharis pilularis*/Annual Grass–Herb Association (32.060.20)**

Within the Clifton Court Forebay Dam biological resources study area, this association occurs in an upland area within the northwestern corner of the study area. The relative percent cover of coyote brush ranges from 50% to 70%.

Baccharis pilularis/annual grass–herb association comprises 2.4 acres of the Clifton Court Forebay Dam biological resources study area. This association is not considered sensitive.

4.2 Jurisdictional Aquatic Resources

Jurisdictional aquatic resources include waters (i.e., wetlands and non-wetland waters) of the United States under the jurisdiction of USACE, waters of the state under the jurisdiction of the RWQCB, and streams and lakes under the jurisdiction of CDFW. The agencies tend to have overlapping jurisdiction over many resources; however, waters of the state extend beyond USACE waters of the United States and CDFW regulates riparian vegetation beyond the limits of waters of the United States/state.

Aquatic resources delineation reports were prepared for the Project site, including the biological resources study areas for Clifton Court Forebay Dam, Dyer Dam, and Patterson Dam and submitted to the USACE, CDFW, and RWQCB for verification.

Sections 4.2.1 through 4.2.3 below summarize the jurisdictional areas by resources agency.

4.2.1 USACE Potential Waters of the United States

Potential waters of the United States within the Project site total 85 acres and are composed of 20.4 acres of wetlands and 64.6 acres of non-wetlands. Table 8 summarizes the potential USACE waters of the United States by each biological resources study area (Figure 6A, USACE - Delineated Aquatic Resources–Clifton Court Forebay Dam; Figure 6B, USACE-Jurisdictional Areas–Dyer Dam; Figure 6C, USACE-Jurisdictional Areas–Patterson Dam).

Table 8. Acres of USACE Potential Waters of the United States by Biological Resources Study Area

Feature Type	Clifton Court Forebay Dam	Dyer Dam	Patterson Dam	Total
Wetland	18.2	1.2	1.0	20.4
Non-wetland waters	64.1	0.5	0.0 ^a	64.6
Total^b	82.4	1.6	1.0	85.0

Notes: USACE = U.S. Army Corps of Engineers.

^a 0.0 are values that are less than 0.05 acres.

^b Totals may not sum due to rounding.

Clifton Court Forebay Dam

Within the Clifton Court Forebay Dam biological resources study area, there are 82.4 acres of potential waters of the United States under the jurisdiction of the USACE, including 18.2 acres of wetlands and 64.1 acres of non-wetland waters.

Dyer Dam

Within the Dyer Dam biological resources study area, there are 1.6 acres of waters of the United States under the jurisdiction of the USACE, including 1.2 acres of wetlands and 0.5 acres of non-wetland waters.

Patterson Dam

Within the Patterson Dam biological resources study area, there are 1.0 acres of waters of the United States under the jurisdiction of the USACE, including 1.0 acres of wetlands and less than 0.05 acres of non-wetland waters.

4.2.2 RWQCB Potential Waters of the State

Potential waters of the state within the Project site total 87.6 acres and are composed of 20.4 acres of wetlands and 67.2 acres of non-wetlands. Table 9 summarizes the potential RWQCB waters of the state by each biological resources study area (Figure 7A, RWQCB–Delineated Aquatic Resources–Clifton Court Forebay Dam; Figure 7B, RWQCB-Jurisdictional Areas–Dyer Dam; Figure 7C, RWQCB-Jurisdictional Areas–Patterson Dam).

Table 9. Acres of RWQCB Potential Waters of the State by Biological Resources Study Area

Feature Type	Clifton Court Forebay Dam	Dyer Dam	Patterson Dam	Total
Wetland	18.2	1.2	1.0	20.4
Non-wetland waters	64.6	2.4	0.2	67.2
Total^a	82.8	3.6	1.2	87.6

Note: RWQCB = regional water quality control board.

^a Totals may not sum due to rounding.

Clifton Court Forebay Dam

Within the Clifton Court Forebay Dam biological resources study area, there are 82.8 acres of potential waters of the state under the jurisdiction of the RWQCB, including 18.2 acres of wetlands and 64.6 acres of non-wetland waters.

Dyer Dam

Within the Dyer Dam biological resources study area, there are 3.6 acres of waters of the state under the jurisdiction of the RWQCB, including 1.2 acres of wetlands and 2.4 acres of non-wetland waters.

Patterson Dam

Within the Patterson Dam biological resources study area, there are 1.2 acres of waters of the state under the jurisdiction of the RWQCB, including 1.0 acres of wetlands and 0.2 acres of non-wetland waters.

4.2.3 CDFW-Jurisdictional Waters

CDFW-jurisdictional waters within the Project site total 65.7 acres and are composed of 4.1 acres of riparian habitat and 61.6 acres of streambed. Table 10 summarizes the CDFW waters of the state by each biological resources study area (Figure 8A, CDFW-Jurisdictional Areas–Clifton Court Forebay Dam; Figure 8B, CDFW-Jurisdictional Areas–Dyer Dam; Figure 8C, CDFW-Jurisdictional Areas–Patterson Dam).

Table 10. Acres of CDFW-Jurisdictional Waters by Biological Resources Study Area

Feature Type	Clifton Court Forebay Dam	Dyer Dam	Patterson Dam	Total
Riparian	1.9	1.2	1.0	4.1
Streambed	58.9	2.5	0.2	61.6
Total	60.8	3.7	1.2	65.7

Note: CDFW = California Department of Fish and Wildlife.

Clifton Court Forebay Dam

Within the Clifton Court Forebay Dam biological resources study area, there are 60.8 acres of CDFW-jurisdictional waters, including 1.9 acres of riparian habitat and 58.9 acres of streambed.

Dyer Dam

Within the Dyer Dam biological resources study area, there are 3.7 acres of CDFW-jurisdictional waters, including 1.2 acres of riparian habitat and 2.5 acres of streambed.

Patterson Dam

Within the Patterson Dam biological resources study area, there are 1.2 acres of CDFW jurisdictional waters, including 1.0 acres of riparian habitat and 0.2 acres of streambed.

4.3 Botany – Plant Diversity

A total of 220 species of plants were observed within the Project site during the 2021 surveys (Appendix A). Species composition includes 115 (52%) native species and 107 (48%) non-native species occurring on site.

Within the Project site, six special-status plant species were observed—long-styled sand-spurrey (*Spergularia macrotheca* var. *longistyla*; CRPR 1B.2), woolly rose-mallow (*Hibiscus lasiocarpus* var. *occidentalis*; CRPR 1B.2), brittlescale (*Atriplex depressa*; CRPR 1B.2), heartscale (*Atriplex cordulata* var. *cordulata*; CRPR 1B.2); Mason's lilaeopsis (*Lilaeopsis masonii*; CRPR 1B.1), and Suisun Marsh aster (*Symphotrichum lentum*; CRPR 1B.2). These species are discussed in Section 4.5.2, Special-Status Plant Species.

4.4 Zoology – Wildlife Diversity

The Project site supports habitat for common upland and some wetland wildlife species. Vegetation communities in the study areas at Dyer and Patterson Dams are primarily grass- and herb-dominated and therefore provide habitat for grassland wildlife species, while the study area at Clifton Court Forebay Dam has a wider variety of vegetation communities, including riparian scrub and woodland, scrub, and marsh, in addition to grassland and other herbaceous communities.

A total of 54 species were observed within the Project site during the 2020 and 2021 surveys. Of the total species observed, 53 (98%) of these are native wildlife species. Species observed within the Project site were recorded during focused surveys, habitat assessments, vegetation mapping, aquatic resources delineation, and sensitive plant surveys. A cumulative list of wildlife species observed during these surveys is provided in Appendix B. Special-status wildlife species that may occur but were not observed are discussed under Section 4.5.3, Special-Status Wildlife Species. Latin and common names of animals follow Crother (2017) for reptiles and amphibians, American Ornithological Society (AOS 2020) for birds, Wilson and Reeder (2005) for mammals, North American Butterfly Association (NABA 2016) for butterflies, and Moyle (2002) for fish.

4.4.1 Invertebrates

No invertebrates were identified within the Project study areas by direct observation; however, a wide variety of ants, bees, moths, butterflies, beetles, spiders, and other invertebrates undoubtedly occur within the study areas.

4.4.2 Fishes

Clifton Court Forebay is operated as a regulating reservoir within the tidally influenced region of the Delta to improve operations of the California State Water Project Harvey O. Banks Pumping Plant and water diversions to the California Aqueduct. Clifton Court Forebay is generally characterized by relatively shallow and uniform aquatic habitat with limited structural diversity.

4.4.3 Reptiles and Amphibians

Three reptile and one amphibian species were observed within the Project site—western pond turtle (*Actinemys marmorata*), western fence lizard (*Sceloporus occidentalis*), California kingsnake (*Lampropeltis californiae*), and

California red-legged frog (*Rana draytonii*). Western pond turtle and California red-legged frog are special-status species and are discussed in Section 4.5.3. Other common reptile or amphibian species that likely occur within the study areas include side-blotched lizard (*Uta stansburiana*), western skink (*Plestiodon skiltonianus*), western yellow-billed racer (*Coluber constrictor mormon*), gophersnake (*Pituophis catenifer*), western rattlesnake (*Crotalus oreganus*), western toad (*Anaxyrus boreas halophilus*), and Sierran treefrog (*Pseudacris sierra*).

4.4.4 Birds

A total of 46 species of birds were observed within the Project site or immediately off site during the surveys conducted in 2020 and 2021 (Appendix B). Common species observed include red-tailed hawk, turkey vulture (*Cathartes aura*), red-winged blackbird (*Agelaius phoeniceus*), common raven (*Corvus corax*), American crow (*Corvus brachyrhynchos*), house finch (*Haemorhous mexicanus*), northern mockingbird (*Mimus polyglottos*), mourning dove (*Zenaida macroura*), mallard (*Anas platyrhynchos*), and western kingbird (*Tyrannus verticalis*). A total of 9 special-status bird species were observed, including golden eagle, Swainson's hawk, northern harrier (*Circus hudsonius*), bald eagle, burrowing owl, white-tailed kite (*Elanus leucurus*), loggerhead shrike (*Lanius ludovicianus*), song sparrow ("Modesto population") (*Melospiza melodia*), and American white pelican (*Pelecanus erythrorhynchos*). Other non-special-status species of local interest (i.e., not rare or declining, but with local distribution and/or associated with a specific habitat type) include western meadowlark (*Sturnella neglecta*) and savannah sparrow (*Passerculus sandwichensis*).

4.4.5 Mammals

Four mammals were detected within the Project site—California ground squirrel, coyote, North American river otter (*Lontra canadensis*), and American badger (sign). Common species within the Project site include black-tailed jackrabbit (*Lepus californicus*), Botta's pocket gopher (*Thomomys bottae*), California vole (*Microtus californicus*), and mule deer (*Odocoileus hemionus*). Common bat species that may occur include big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), Californian myotis (*Myotis californicus*), canyon bat (*Parastrellus hesperus*), hoary bat (*Lasiurus cinereus*), and Yuma myotis (*Myotis yumanensis*).

4.5 Sensitive Biological Resources

The following resources are discussed in this section: habitat areas that are unique, are of relatively limited distribution, or are of particular value to wildlife; plant and animal species present in the Project vicinity that are given special recognition by federal, state, or local conservation agencies and organizations owing to declining, limited, or threatened populations; and wildlife corridors and habitat linkages. Sources used for determination of sensitive biological resources were included in Section 3.1, Literature Review.

4.5.1 Sensitive Natural Communities

As previously discussed, sensitive vegetation alliances and associations are indicated in the California Natural Communities List (CDFW 2020). These vegetation communities are considered sensitive natural communities for CEQA purposes. Sensitive vegetation communities found on the Project site are presented in Table 11, organized by biological resources study area. Figures 5A, 5B, and 5C show the sensitive natural communities present on the Project site.

Table 11. Sensitive Natural Communities by Biological Resources Study Area

General Category	Alliance Name	Vegetation Community	Clifton Court Forebay Dam	Dyer Dam	Patterson Dam	Total
Bog and Marsh	Alkali heath marsh	<i>Frankenia salina</i> Association	1.9	—	—	1.9
	American bulrush marsh	<i>Schoenoplectus americanus</i> Association	1.8	—	—	1.8
	Hardstem and California bulrush marshes	<i>Schoenoplectus acutus</i> Association	0.2	—	0.0 ^a	0.2
	Iodine bush scrub	<i>Allenrolfea occidentalis</i> / <i>Distichlis spicata</i> Provisional Association	5.4	—	—	5.4
		<i>Allenrolfea occidentalis</i> Association	7.5	—	—	7.5
<i>Bog and Marsh Subtotal</i>			16.9		0.0 ^a	16.9
Grass and Herb Dominated	California brome–blue wildrye prairie	<i>Elymus glaucus</i> Association	2.6	—	—	2.6
	Needle grass–Melic grass grassland	Needle grass–Melic grass grassland (<i>Nassella</i> spp.– <i>Melica</i> spp.) Alliance	—	17.2	0.7	17.9
<i>Grass and Herb Dominated Total</i>			2.6	17.2	0.7	20.5
Riparian	Arroyo willow thickets	<i>Salix lasiolepis</i> Association	—	0.0 ^a	—	0.0
	Button willow thickets	<i>Cephalanthus occidentalis</i> Association	1.4	—	—	1.4
	Gooding’s willow–red willow riparian woodland and forest	<i>Salix gooddingii</i> Association	7.6	—	—	7.6
	Hinds’s walnut and related stands	<i>Juglans hindsii</i> Semi-natural Association	1.2	—	—	1.2
	Red alder forest	<i>Alnus rubra</i> / <i>Salix lasiolepis</i> / <i>Rubus</i> spp. Association	0.3	—	—	0.3
<i>Riparian Subtotal</i>			10.6	0.0 ^a	—	10.5
Grand Total			30.0	17.2	0.7	47.9

Note:

^a 0.0 are values that are less than 0.05 acres.

Clifton Court Forebay Dam

Within the Clifton Court Forebay Dam biological resources study area, there are 30.0 acres of sensitive natural communities on site.

Dyer Dam

Within the Dyer Dam biological resources study area, there are 17.2 acres of sensitive natural communities on site.

Patterson Dam

Within the Patterson Dam biological resources study area, there are 0.7 acres of sensitive natural communities on site.

4.5.2 Special-Status Plant Species

Special-status plant surveys were conducted to determine the presence or absence of plant species considered endangered, rare, or threatened under CEQA Guidelines, Section 15380 (14 CCR 15000 et seq.). Endangered, rare, or threatened plant species, as defined in CEQA Guidelines, Section 15380(b) (14 CCR 15000 et seq.), are referred to as “special-status plant species” in this report and include endangered or threatened plant species recognized in the context of the CESA and the FESA and plant species with a CRPR of 1 or 2 (CDFW 2021c; CNPS 2020, 2021a). Special-status plant species directly observed during focused surveys or known to occur in the surrounding region are described in Appendix C. Appendix C includes descriptions of special-status plants’ known occurrences or potential to occur within each study area based on their general biology (e.g., primary habitat associations, life form, blooming period, and known elevation range). Focused surveys within the Project site were conducted in 2021 according to the methods presented in Section 3.2.5, Special-Status Plant Surveys.

4.5.2.1 Clifton Court Forebay Dam

Within the Clifton Court Forebay Dam biological resources study area, six special-status plant species were observed—long-styled sand-spurrey (CRPR 1B.2), woolly rose-mallow (CRPR 1B.2), brittlescale (CRPR 1B.2), heartscale (CRPR 1B.2); Mason’s lilaopsis (CRPR 1B.1), and Suisun Marsh aster (CRPR 1B.2). These species are discussed below. Crownscale (*Atriplex coronata* var. *coronata*) was observed within the Clifton Court Forebay Dam biological resources study area, but this species has a CRPR of 4.2, which is not considered special-status because this occurrence is not significant locally¹ and impacts to this occurrence would not be considered significant.

Special-status plant species that are not expected to occur or have a low potential to occur due to lack of suitable habitat or because the site is outside of the known elevation range of the species are listed in Appendix C. These species are not discussed further because no significant direct, indirect, or cumulative impacts are expected to result from the proposed Project. Due, in part, to the extensive surveys conducted on site, there are no special-status plants with a moderate or high potential to occur in the Clifton Court Forebay Dam biological resources study area.

Long-Styled Sand-Spurrey (CRPR 1B.2)

Long-styled sand-spurrey has a CRPR 1B.2. Long-styled sand-spurrey is a perennial herb found in meadows, seeps, marshes, and swamps on alkaline soils. This species’ blooming period is between February and May. Long-styled sand-spurrey celery occurs between 0 feet and 835 feet in elevation (CNPS 2020).

A total of approximately 30,263 long-styled sand-spurrey plants were observed within the southern portion of the Clifton Court Forebay Dam biological resources study area by Dudek in 2021. Figure 9, Special-Status Plants–Clifton Court Forebay Dam, shows the location of the long-styled sand-spurrey within the study area.

¹ Plants with a CRPR of 4 that may be considered significant locally are: (1) the type locality; (2) populations at the periphery of a species’ range; (3) areas where the taxon is especially uncommon; (4) areas where the taxon has sustained heavy losses; and (5) populations exhibiting unusual morphology or occurring on unusual substrates.

Woolly Rose-Mallow (CRPR 1B.2)

Woolly rose-mallow has a CRPR 1B.2. Woolly rose-mallow is a perennial, rhizomatous herb and is found in marshes and seeps and often in riprap on the side of levees. This species' blooming period is between June and September. Woolly rose-mallow occurs between 0 feet and 395 feet in elevation (CNPS 2020).

A total of 11 individuals of woolly rose mallow were observed in the northern and southeastern portion of the Clifton Court Forebay Dam biological resources study area. Figure 9 shows the location of the woolly rose-mallow within the study area.

Brittlescale (CRPR 1B.2)

Brittlescale has a CRPR 1B.2. Brittlescale is an annual herb and is found in chenopod scrub, meadows and seeps, plays, valley and foothill grasslands, and vernal pools on alkaline or clay soils. This species' blooming period is between April and October. Brittlescale occurs between 5 and 1,050 feet in elevation (CNPS 2021a).

A total of 10 individuals of brittlescale were observed on the south side of the Clifton Court Forebay biological resources study area. Figure 9 shows the location of the brittlescale within the study area.

Heartscale (CRPR 1B.2)

Heart scale has a CRPR 1B.2. Heartscale is an annual herb and is found in chenopod scrub, meadows and seeps, and valley and foothill grasslands with sandy soils. This species' blooming period is between April and October. Heartscale occurs between 0 and 1,835 feet in elevation (CNPS 2021)

A total of 14 individuals were observed on the north and west side of the Clifton Court Forebay biological resources study area. Figure 9 shows the location of the heartscale within the study area.

Mason's lilaepsis (CRPR 1B.1)

Mason's lilaepsis has a CRPR 1B.2. Mason's lilaepsis is a perennial, rhizomatous herb and is found in marshes in brackish and freshwater and riparian scrub. This species' blooming period is between April and November. Mason's lilaepsis occurs between 0 and 35 feet in elevation (CNPS 2021).

A total of 512 individuals were observed on the west side of the Clifton Court Forebay biological resources study. Figure 9 shows the location of the Mason's lilaepsis within the study area.

Suisun Marsh Aster (CRPR 1B.2)

Suisun Marsh aster has a CRPR 1B.2. Suisun Marsh aster is a perennial, rhizomatous herb and is found in marshes and swamps in freshwater or brackish water. This species' blooming period is between April and May. Suisun Marsh aster occurs between 0 and 10 feet in elevation (CNPS 2021).

One individual was observed within the southeast portion of the Clifton Court Forebay biological resources study. Figure 9 shows the location of the Suisun Marsh Aster within the study area.

4.5.2.2 Dyer Dam

No special-status plants were observed in the Dyer Dam biological resources study area. Special-status plant species that are not expected to occur or have a low potential to occur due to lack of suitable habitat or because the site is outside of the known elevation range of the species are listed in Appendix C. These species are not discussed further because no significant direct, indirect, or cumulative impacts are expected to result from the proposed Project. Due, in part, to the extensive surveys conducted on site, there are no special-status plants with a moderate or high potential to occur in the Dyer Dam biological resources study area

4.5.2.3 Patterson Dam

No special-status plants were observed in the Patterson Dam biological resources study area. Special-status plant species that are not expected to occur or have a low potential to occur due to lack of suitable habitat or because the site is outside of the known elevation range of the species are listed in Appendix C. These species are not discussed further because no significant direct, indirect, or cumulative impacts are expected to result from the proposed Project. Due, in part, to the extensive surveys conducted on site, there are no special-status plants with a moderate or high potential to occur in the Patterson Dam biological resources study area

4.5.3 Special-Status Wildlife Species

Special-status wildlife species include species that meet any of the following criteria (some species may meet several criteria):

- Listed, proposed for listing, or candidates (FC) for listing as threatened (FT) or endangered (FE) under the FESA
- Listed or candidates for listing as threatened (ST) or endangered (SE) under the CESA
- Designated as a Species of Special Concern (SSC) or a Watch List species (WL) by CDFW
- Designated a Bird of Conservation Concern (BCC) by USFWS
- Designated as a Fully Protected (FP) species by the California Fish and Game Code
- Meet the definition of rare, threatened, or endangered as described in the CEQA Guidelines, Section 15380

Appendix D describes the special-status wildlife species that have been observed; have low, moderate, or high potential to occur; or are not expected to occur. The potential to occur is based on documented occurrences in the region, life history and general habitat requirements, and overall suitability of the habitat within the Project area to support such species.

Focused surveys for various wildlife species were conducted according to the methods presented in Section 3.2, Field Surveys. A total of five special-status species were observed during surveys conducted by Dudek in 2020 and 2021. Special-status wildlife species observed or detected during surveys or with high potential to occur are discussed in this section. Species with low or moderate potential to occur, but for which focused assessments were conducted by Dudek in 2021 are also discussed below. The remaining species with low or moderate potential to occur are listed in Appendix D.

4.5.3.1 Invertebrates

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*), FT/None

Vernal pool fairy shrimp (*Branchinecta lynchi*) was federally listed as threatened on September 19, 1994 (59 FR 48136–48153) and is endemic to California and the Agate Desert of southern Oregon. It only occurs in vernal pools or vernal pool-like habitats such as alkali pools, ephemeral drainages, stock ponds, roadside ditches, vernal swales, and rock outcrop pools (Helm 1998); it has never been found in riverine, marine, or other permanent bodies of water. Suitable pool types range from small, clear sandstone depressions to large, turbid, alkaline valley floor pools. Although they have been collected from large pools, vernal pool fairy shrimp typically occur in smaller pools less than 0.05 acres in size (Helm 1998; USFWS 2005). Vernal pool fairy shrimp have been observed in pools from early December to early May (Eriksen and Belk 1999). To withstand the harsh environmental conditions after pools dry up, vernal pool fairy shrimp eggs, or cysts, develop hard shells and remain dormant in the soil during the dry season.

Occurrence within Study Area

Clifton Court Forebay Dam

The CNDDDB contains nine vernal pool fairy shrimp occurrences within 5 miles of the Clifton Court Forebay Dam study area, two of which fall within or are near the study area. Occurrence number 631 is associated with a vernal alkali plain with occasional shallow depressions at the southern end of the study area, approximately 0.3 miles north-northeast of the Byron Highway/Herdlyn Road junction. Hundreds of adult vernal pool fairy shrimp were observed in two pools at this location on February 24, 2009. This area is outside the Project site but a proposed temporary toe access road runs along the northern edge of a 5.36-acre wetland with occasional shallow depressions that may support the species. Occurrence number 630 is associated with a pool complex north of the Skinner Fish Facility. Thousands of adult vernal pool fairy shrimp were observed in multiple pools in this area on February 23, 2009.

Vernal pool fairy shrimp have high potential to occur in the southwestern portion of the study area. Wetlands and earthen ditches within grassland and scrub (e.g., iodine bush scrub) communities with hydrologic connectivity to known CNDDDB occurrences are assumed suitable for this species.

Dyer Dam

This species does not have potential to occur within the Dyer Dam study area.

Patterson Dam

This species does not have potential to occur within the Patterson Dam study area.

4.5.3.2 Fish

North American Green Sturgeon, Southern DPS (*Acipenser medirostris*), FT/SSC

On April 7, 2006, NMFS listed the Southern Distinct Population Segment (DPS) of the North American green sturgeon as threatened under the FESA. The Southern DPS includes individual reproductive populations south of the Eel River. Green sturgeon are found in the lower reaches of large rivers, including the Sacramento–San Joaquin

River basin, and in the Eel, Mad, Klamath, and Smith Rivers. Green sturgeon adults and juveniles are found throughout the upper Sacramento River; they spawn predominantly in the upper Sacramento River and are found primarily in the mainstem Sacramento River.

The green sturgeon is a primitive, bottom-dwelling fish found from Ensenada, Mexico, to the Bering Sea and Japan. It is characterized by its large size (up to 7 feet long and 350 pounds), a long, round body, and “scutes,” or plates along dorsal and lateral sides. It is known to migrate up to 600 miles between freshwater and saltwater environments and is commercially caught in the Columbia River and coastal Washington. Very little is known about the life history of the green sturgeon relative to other fish species. It is an anadromous fish that spends most of its life in salt water and returns to spawn in freshwater. It is slow growing and late maturing and may spawn as little as every 4 to 11 years. Individuals congregate in the bays of these systems in summer, while some may travel upstream to spawn in spring and summer.

Juvenile green sturgeon, between 6 months and 2 years of age, may rear in the Delta. Green sturgeon use these areas to forage and rear until they reach osmoregulatory capacity to tolerate higher salinity concentrations.

Occurrence within Study Area

Clifton Court Forebay Dam

Green sturgeon may be present and entrained into Clifton Court Forebay during any month of the year. Adult and juvenile green sturgeon are not likely to use shallow habitats near the embankment repair areas because they prefer to occupy deep, low-light habitats. This species does not spawn in the Delta.

Dyer Dam

This species does not have potential to occur within the Dyer Dam study area.

Patterson Dam

This species does not have potential to occur within the Patterson Dam study area.

Critical Habitat

While the Project site is not within designated critical habitat for the Southern DPS of the North American green sturgeon, critical habitat has been designated in Old River adjacent to Clifton Court Forebay. The critical habitat designation includes the stream channel to the lateral extent of the ordinary high-water line (50 CFR 226.219).

Steelhead, Central Valley DPS (*Oncorhynchus mykiss irideus* pop. 11), FT

Historically, steelhead spawned and reared in most of the accessible upstream reaches of Central Valley rivers, including the Sacramento and American Rivers and many of their tributaries. Compared with Chinook salmon, steelhead generally migrated farther into tributaries and headwater streams where cool, well-oxygenated water is available year-round. In the Central Valley, steelhead are now restricted to the upper Sacramento River downstream of Keswick Reservoir; the lower reaches of large tributaries downstream of impassable dams; small, perennial tributaries of the Sacramento River mainstem; and the San Francisco Bay/Sacramento–San Joaquin Delta (Bay–Delta) system.

Occurrence within Study Area

Clifton Court Forebay Dam

Migrating Central Valley steelhead DPS can occur within Clifton Court Forebay and adjacent waters, primarily between December and May.

Central Valley steelhead DPS do not spawn in the Delta.

Dyer Dam

This species does not have potential to occur within the Dyer Dam study area.

Patterson Dam

This species does not have potential to occur within the Patterson Dam study area.

Critical Habitat

Critical habitat for the Central Valley steelhead DPS was designated on August 12, 2005; a final designation was published on September 2, 2005, with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include select waters in the Sacramento and San Joaquin River basins. While the Project site is not within designated critical habitat for the Central Valley steelhead DPS, critical habitat has been designated in Old River adjacent to Clifton Court Forebay.

Sacramento Winter-Run Chinook Salmon (*Oncorhynchus tshawytscha*), FE/SE

Adult Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*) leave the ocean and migrate through the Delta into the Sacramento River system from November through July. Salmon migrate upstream past Red Bluff Diversion Dam on the Sacramento River from mid-December through July, and most of the spawning population has passed Red Bluff Diversion Dam by late June. Winter-run Chinook salmon spawn from mid-April through August, and incubation continues through October. The primary spawning grounds in the Sacramento River are above Red Bluff Diversion Dam. Adult winter-run Chinook salmon generally do not enter the American River.

Occurrence within Study Area

Clifton Court Forebay Dam

Migrating winter-run Chinook salmon could occur within Clifton Court Forebay and adjacent waters, primarily between December and May.

Winter-run Chinook salmon do not spawn in the Delta.

Dyer Dam

This species does not have potential to occur within the Dyer Dam study area.

Patterson Dam

This species does not have potential to occur within the Patterson Dam study area.

Critical Habitat

Essential Fish Habitat identified for Sacramento River winter-run Chinook salmon evolutionarily significant unit includes migration, holding, and rearing habitat for the Sacramento River. Critical habitat for the winter-run Chinook salmon evolutionarily significant unit was designated on June 16, 1993 by NMFS (58 FR 33212) with an effective date of July 16, 1993. Critical habitat is designated to include the Sacramento River from Keswick Dam (River Mile 302) to Chipps Island (River Mile 0) and all waters westward including the San Francisco Bay north of the Bay Bridge to the Golden Gate Bridge. The Project site is not within or in the vicinity of designated winter-run Chinook salmon evolutionarily significant unit critical habitat.

Central Valley Spring-Run Chinook Salmon (*Oncorhynchus tshawytscha*), FT/ST

Central Valley spring-run Chinook salmon were historically the second most abundant run of Central Valley Chinook salmon. They occupied the headwaters of all major river systems in the Central Valley where there were no natural barriers. Adults returning to spawn ascended the tributaries to the upper Sacramento River, including the Pit, McCloud, and Little Sacramento Rivers. They also occupied Cottonwood, Battle, Antelope, Mill, Deer, Stony, Big Chico, and Butte Creeks and the Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, Merced, San Joaquin, and Kings Rivers. Spring-run Chinook salmon migrated farther into headwater streams where cool, well-oxygenated water is available year-round. Historical records indicate that adult spring-run Chinook salmon enter the mainstem Sacramento River in February and March and continue to their spawning streams, where they then hold in deep, cold pools until they spawn. Spring-run Chinook salmon are sexually immature during their spawning migration (Cramer and Demko 1997). Some adult spring-run Chinook salmon start arriving in the Feather River below Fish Barrier Dam in June. They remain there until the fish ladder is opened in early September.

Occurrence within Study Area

Clifton Court Forebay Dam

Migrating spring-run Chinook salmon could occur within Clifton Court Forebay and adjacent waters, primarily between December and May.

Spring-run Chinook salmon do not spawn in the Delta.

Dyer Dam

This species does not have potential to occur within the Dyer Dam study area.

Patterson Dam

This species does not have potential to occur within the Patterson Dam study area.

Critical Habitat

Essential Fish Habitat identified for Central Valley spring-run Chinook salmon evolutionarily significant unit includes migration, holding, and rearing habitat for the Sacramento River. Critical habitat for the Central Valley spring-run Chinook salmon was designated on August 12, 2005; a final designation was published on September 2, 2005, with an effective date of January 2, 2006 (70 FR 52487). Critical habitat is designated to include selected waters in the Sacramento River basin from approximately Redding (River Mile 302) to approximately Chipps Island (River Mile 0) at the westward margin of the Delta and includes the Sacramento River. The Project site is not within or in the vicinity of designated Central Valley spring-run Chinook salmon critical habitat.

Delta Smelt (*Hypomesus transpacificus*), FT/SE

The delta smelt is endemic to the Bay-Delta in California and is restricted to the area from San Pablo Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo Counties (Moyle 2002). Their range extends from San Pablo Bay upstream to Verona on the Sacramento River and Mossdale on the San Joaquin River. The delta smelt has a fairly simple life history as a large majority of individuals live only 1 year (Bennett 2005; Moyle et al. 2016), and because it is an endemic species (Moyle 2002), comprising only one genetic population (Fisch et al. 2011) that completes its full life cycle in the northern reaches of the Bay-Delta (Merz et al. 2011).

The distribution of sub-adult delta smelt in fall (September to November) and adult delta smelt in winter (January to May) does not extend as far south as Clifton Court Forebay; however, the distribution of delta smelt sub-juveniles in spring (April to June) and juveniles in summer (July) may occasionally extend as far south as Clifton Court Forebay. Additionally, the distribution of delta smelt adults in spring (March to April) may also extend as far south as Clifton Court Forebay in some years. Data from the Summer Townet Survey shows that nearly 90% of the delta smelt sampled in the summer are found in Suisun Bay, Suisun Marsh (Montezuma Slough), the Sacramento and San Joaquin Rivers confluence, and in the lower Sacramento River. Delta smelt are essentially absent from the east and south Delta during this period (CDFW 2021d). By summer (June and July), juveniles appear to have retreated to and are concentrated in areas where they will remain for the following 6 months. These areas include north and south Suisun Bay, the Sacramento and San Joaquin Rivers confluence, and the lower Sacramento River, particularly around Decker Island, and notably, in the Cache Slough complex of channels. The average distribution of delta smelt observed in Interagency Ecological Program monitoring surveys by location indicates that delta smelt are generally absent from the south Delta (where Clifton Court Forebay is located) from June through November/December (CDFW 2021e).

Delta smelt are a pelagic species, inhabiting open waters away from the bottom and shore associated structural features. Captive delta smelt have been shown to avoid in-water structure like submerged aquatic vegetation (Ferrari et al. 2014). The proliferation of submerged aquatic vegetation in areas that might otherwise be attractive to delta smelt represents a significant habitat degradation, not only because it creates structure in the water column, but also because it is associated with higher water transparency (Hestir et al. 2016), and a fish fauna with which the delta smelt does not seem able to coexist (Nobriga et al. 2005; Conrad et al. 2016). Characterization of delta smelt as an open-water fish appears to be accurate and does not imply occupation of a particular water column depth (USFWS 2019).

Occurrence within Study Area

Clifton Court Forebay Dam

The presence of delta smelt within Clifton Court Forebay varies each year. The annual distribution of delta smelt seasonally expands as adults disperse in response to winter flow increases that also coincide with seasonal increases in turbidity and decreasing water temperature (Sommer et al. 2011). Every year some delta smelt seasonally and transiently occupy Old and Middle Rivers in the south Delta, although there is a high risk of entrainment when they do (Kimmerer 2008; Grimaldo et al. 2009). This species does not spawn in the south Delta.

Dyer Dam

This species does not have potential to occur within the Dyer Dam study area.

Patterson Dam

This species does not have potential to occur within the Patterson Dam study area.

Critical Habitat

On December 19, 1994, USFWS designated critical habitat for delta smelt in the following geographic areas (59 FR 65256): areas of all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), Montezuma Sloughs, and Clifton Court Forebay; and the existing contiguous waters contained within the Delta, as defined in Section 12220 of the California Water Code.

Longfin smelt (*Spirinchus thaleichthys*), FC/ST

Longfin smelt are found in open water channels and bays ranging from freshwater to seawater (Moyle 2002). The longfin smelt occurring in the Bay-Delta is considered a DPS based on its separation from other populations of longfin smelt (CDFG 2009). They are pelagic and facultative anadromous species, spawning in fresh water and migrating to the ocean, usually as juveniles. Because they are facultatively anadromous, they can choose to migrate to the ocean or not depending on the environmental conditions. Longfin smelt live for 2 years on average. The spawning period in the Bay-Delta being as early as November and go until as late as June (CDFG 2009; Moyle 2002). Based on their preference for sandy substrates in tributaries to Lake Washington, they likely prefer similar substrates in the Bay-Delta to spawn (USFWS 2017a).

Occurrence within Study Area

Clifton Court Forebay Dam

The presence of longfin smelt within Clifton Court Forebay varies each year. Longfin smelt seasonally and transiently occupy Old and Middle Rivers in the south Delta, although there is a high risk of entrainment when they do. This species does not spawn in the south Delta.

Dyer Dam

This species does not have potential to occur within the Dyer Dam study area.

Patterson Dam

This species does not have potential to occur within the Patterson Dam study area.

4.5.3.3 Amphibians and Reptiles

California Tiger Salamander (*Ambystoma californiense*), Central California DPS, FT/ST

All California tiger salamanders are federally listed; however, they are listed as three unique DPS: the Sonoma County DPS and Santa Barbara County DPS are listed as endangered, and the Central DPS, including those in the Project vicinity, are listed as threatened. All populations are listed as threatened under the CESA. California tiger salamander occurs within low-elevation grassland and oak woodland communities of the Central Valley, coastal valleys, and bordering foothills from at least Colusa County south to Santa Barbara and Tulare Counties (Shaffer et al. 1993). They require areas that support fossorial rodents, whose burrows provide underground retreats during the dry nonbreeding season, and with ponds, vernal pools, and intermittent streams that hold water during the winter and spring to provide aquatic breeding habitat (Shaffer et al. 1993). Although breeding by tiger salamanders has been documented in permanent ponds, if there are predatory fish or bullfrogs in the pond, breeding will most likely be unsuccessful. Various trapping studies in Monterey and Solano Counties have shown that most nonbreeding California tiger salamanders reside more than 100 yards, but within 0.6 and 1.2 miles, of breeding ponds (Ford et al. 2013).

Occurrence within Study Area

Clifton Court Forebay Dam

The CNDDDB contains 29 California tiger salamander occurrences within 5 miles of the Clifton Court Forebay Dam study area, nearly all from the Diablo Range and foothills to the northwest, west, and southwest. Only two of these occurrences are within the 1.3-mile maximum known dispersal distance of the species (Orloff 2011), and only one of these is east of the Byron Highway, which presents a major barrier to terrestrial wildlife movement. The lone occurrence east of the highway is an observation of an “unknown number of larvae and juveniles” in a “farm pond surrounded by grassland” on July 4, 1982 (Occ. No. 169) (CDFW 2021a). All the remaining CNDDDB occurrences are west of the Byron Highway.

California tiger salamander is highly unlikely to occur within the Clifton Court Forebay Dam study area. Open water within the drainages between the dam embankments and adjacent Delta levees in the northern part of the study area resemble suitable aquatic breeding habitat, but are highly disturbed, of artificial origin, and isolated from known or potential breeding sites (i.e., stock ponds) in the Diablo Range foothills west and southwest of the Byron Highway. These areas, as well as remaining dam embankments in the study area, are also isolated from the undeveloped lands surrounding the 1982 CNDDDB occurrence by Italian Slough and the California Aqueduct. Both canals would be considered permanent barriers to California tiger salamander movement (USFWS 2017b) because of their width, depth, and non-native aquatic predator assemblage. Any tiger salamanders still occupying the area between the Byron Highway and Clifton Court Forebay would not be able to traverse these features to access the

poor-quality habitat in the northern part of the study area, and it is highly unlikely they would attempt to do so. Google Earth aerial imagery from March 2017 shows a seasonal pool surrounded by open grassland between the California Aqueduct and Bruns Road, approximately 0.9 miles southwest of a proposed staging area east of the Skinner Fish Facility. If this feature were occupied by tiger salamanders, there is some potential that individuals could cross Byron Highway and venture into the southern staging areas during rain events. However, the feature does not show on subsequent rainy season imagery (April 2018 and April 2019) and its habitat value therefore appears limited. In summary, there is low potential for California tiger salamanders to occasionally venture into or near the southern portion of the study area (including proposed staging areas) during the rainy season, but the species is presumed absent from the remainder of Clifton Court Forebay Dam study area.

Dyer Dam

The CNDDDB contains 15 California tiger salamander occurrences within 2 miles of Dyer Dam. Five of these occurrences are within the 1.3-mile maximum known dispersal distance of the species (Orloff 2011). The remaining occurrences fall within the grasslands and rolling hills to the north and west of the site, with a few occurrences within the Altamont Landfill to the east. One CNDDDB occurrence overlaps with the Dyer Dam study area boundary (Occ. No. 1196) in which several individuals were discovered within the DWR construction site in 2010 and 2011 and relocated (CDFW 2021a). Other occurrences within the 1.3-mile radius of the dam are from between 1989 and 1992, except for Occ. No. 199, approximately 0.9 miles north of Dyer Dam, in which larvae and adults were collected and/or observed between 1980 and 2007. All occurrences to the west of the site are separated from the study area by the South Bay Aqueduct and Dyer Road.

California tiger salamander is likely to occur at Dyer Dam. Suitable upland (dispersal and refuge) habitat is present, particularly in the grassy slopes north and east of the site where California ground squirrel burrows are abundant. Potential upland habitat is also present in vegetated portions of the Dyer Dam study area (e.g., slope east of reservoir between the reservoir crest road and the settling pond to the east), although these areas do not contain as many burrows and are more disturbed than surrounding grassland. There is low potential for California tiger salamanders to breed in seasonal wetlands or drainages supporting aquatic vegetation, although the species rarely breeds in drainages with dense vegetation (Ford et al. 2013). In summary, California tiger salamander is assumed present within the Dyer Dam study area because of its previous occurrence there during reservoir construction and suitable dispersal and refuge habitat.

Patterson Dam

The CNDDDB contains 10 California tiger salamander occurrences within 2 miles of Patterson Dam. Only 3 of these occurrences are within the 1.3-mile maximum known dispersal distance of the species (Orloff 2011). The remaining occurrences are generally located within the grasslands and rolling hills to the south and east of Patterson Dam, with several occurrences on the eastern side of the South Bay Aqueduct, a barrier to salamander movement. The three occurrences within 1.3 miles are from 1989 (Occ. No. 105), 1994 (Occ. No. 552), and 1998 (Occ. Num. 899). The closest is approximately 0.1 miles to the south, where four salamanders were observed along Patterson Pass and South Flynn Roads between 8:00 p.m. and 11:00 p.m. on November 25, 1989 (the specific locations are not provided in the CNDDDB). The most recent occurrence in the vicinity is from April 2020, where a dead adult was found on Flynn Road N, approximately 2 miles northeast of the dam (Occ. No. 543).

California tiger salamander is likely to occur within the Patterson Dam study area. Suitable upland habitat is present within the Patterson Dam study area, particularly in the pasture west of DWR's property and the grassy slopes northeast of the South Bay Aqueduct where California ground squirrel burrows are abundant. Potential upland habitat is also present in the downstream dam face, upper slope east of the dam, and staging areas east of the dam, although these areas do not contain as many burrows and are more disturbed than surrounding pasture or grassland. There is low potential for California tiger salamanders to breed in the low-outlet drainage channel in the western portion of the Patterson Dam study area, but the dense vegetation likely precludes breeding and work in the channel would be conducted during the nonbreeding season when individuals would not be present in aquatic habitat. There is also a pond partially filled with emergent wetland vegetation approximately 350 feet west of the low-outlet drainage channel that may be suitable for tiger salamander breeding. In summary, California tiger salamander is assumed present within the Patterson Dam study area because of suitable dispersal and refuge habitat, potential aquatic breeding habitat within known dispersal distance, and previous occurrences in the vicinity.

Critical Habitat

USFWS designated 382,666 acres of critical habitat for the Central DPS of California tiger salamander on August 10, 2004 (69 FR 48570); this designation was revised to 199,109 acres in 19 California counties on August 23, 2005 (70 FR 49380). The critical habitat designation included a description of primary constituent elements of California tiger salamander, which are "physical and biological features...that are essential to the conservation of the species, and that may require special management and protection." These include such features as space for individual and population growth, nutritional and physical requirements (food, water, air, light, minerals), cover or shelter, breeding sites, and habitats representative of those where the species historically occurred. The primary constituent elements of critical habitat for the central population of California tiger salamander include the following:

- **Aquatic Breeding Habitat:** Standing bodies of freshwater ponds, vernal pools, and other ephemeral or permanent waterbodies that typically support inundation during winter rains and hold water for a minimum of 12 weeks in a year of average rainfall.
- **Upland Habitat:** Upland habitats adjacent and accessible to and from breeding ponds that contain small mammal burrows or other underground habitat for California tiger salamanders.
- **Dispersal Habitat:** Accessible upland dispersal habitat between occupied locations that allow for movement between such sites.

The Project site does not overlap with any designated critical habitat units for California tiger salamander. Unit 18 in the Central Valley Region is located approximately 6 miles west of the Project site.

California Red-legged Frog (*Rana draytonii*), FT, SSC

California red-legged frog occurs from sea level to elevations near 5,000 feet. It has been extirpated from 70% of its former range and now is found primarily in coastal drainages of Central California, from Marin County south to northern Baja California, and in isolated drainages in the Sierra Nevada, northern Coast, and northern Transverse Ranges. Breeding habitat includes freshwater pools and backwaters within streams and creeks, ponds, marshes, springs, and lagoons. They also frequently breed in artificial impoundments such as stock ponds (USFWS 2002). During the nonbreeding season, California red-legged frogs need moist areas in which to take refuge from the heat and predators, such as intermittent or ephemeral streams with dense riparian vegetation, overhanging banks, and rootwads; springs or spring boxes; rodent burrows; and damp leaf litter in riparian woodlands (Ford et al. 2013). USFWS (2002, 2019) considers freshwater habitat and associated upland habitat within 1 mile as red-legged frog breeding, foraging, and dispersal habitat.

Occurrence within Study Area

Clifton Court Forebay Dam

The CNDDDB contains 40 California red-legged frog occurrences within 5 miles of Clifton Court Forebay Dam, nearly all from the Diablo Range and foothills to the northwest, west, and southwest. The only occurrence within 1 mile consists of three locations to the southwest: two in the southern reaches of Italian Slough and one northwest of the intersection of North Bruns Way and the Byron Highway. In Italian Slough, one juvenile was observed in a ditch approximately 2,100 feet west of the proposed staging areas west of the California Aqueduct and two adults were “observed in a canal” approximately 2,100 feet southwest of the proposed staging areas on February 24, 2009. At the third location northwest of the intersection of North Bruns Way and the Byron Highway, two frogs were observed on January 16, 2003 (Occ. No. 862) (CDFW 2021a). All the remaining CNDDDB occurrences are west of the Byron Highway.

California red-legged frog is highly unlikely to occur in the Clifton Court Forebay Dam study area. Freshwater pond and wetland habitat occurs between the dam embankments and Italian Slough to the west/northwest and Old River to the northeast, but surveys of these areas (including a protocol-level survey in 2013(DWR, unpubl. data) have not found any red-legged frogs. These areas, as well as remaining dam embankments in the Project site, are also isolated from occupied habitat to the southwest (i.e., CNDDDB Occ. No. 862) by Italian Slough north of Clifton Court Road and the California Aqueduct. Both canals are approximately 250 to 300 feet wide, over 10 feet deep, and likely to support non-native aquatic predators. Any red-legged frogs occurring in the southern reaches of Italian Slough northwest of the Skinner Fish Facility would not be expected to swim across such features to access marginal aquatic habitat over 2.3 miles away. In summary, California red-legged frog is presumed absent from the Project site due to the poor quality of available aquatic habitat and lack of habitat connectivity to potentially occupied habitat north of the Skinner Fish Facility.

Dyer Dam

The CNDDDB contains 15 California red-legged frog occurrences within 2 miles of Dyer Dam. However, many of these occurrences are sensitive records in which locational information is suppressed by the CNDDDB. The remaining occurrences are located to the east of Dyer Dam outside of the 1-mile dispersal radius for California red-legged frog and separated from Dyer Dam by the South Bay Aqueduct. California red-legged frog are also known to occur within the Altamont Landfill, located approximately 1 mile east of the dam.

California red-legged frog is likely to occur within the Dyer Dam study area. Suitable nonbreeding aquatic habitat is present in the northern portion of the relocated drainage channel that supports riparian and freshwater emergent vegetation and the seasonal wetlands and swales in the western portion of Dyer Dam. These areas are within 1 mile and are hydrologically connected to the known occurrence along Dyer Road. Grasslands to the north, east, and south of Dyer Dam and vegetated areas within the site (e.g., western dam face, slope between reservoir and reservoir crest road) also provide upland and dispersal habitat, but such areas are more likely to be used during the rainy season when frogs move from aquatic nonbreeding sites to breeding sites (e.g., ponds). Therefore, the likelihood of California red-legged frogs occurring in upland areas during Project construction is low. In summary, California red-legged frog is assumed present within the Dyer Dam study area because of suitable aquatic, upland, and dispersal habitat within 1 mile of a known occurrence, but they are more likely to occur in riparian and wetland vegetation instead of uplands at the time of Project construction.

Patterson Dam

The CNDDDB contains nine California red-legged frog occurrences within 2 miles of Patterson Dam. Of these occurrences, three are located within the 1-mile dispersal radius for this species. All three occurrences were documented prior to 2004. Occ. No. 95 is the closest documented occurrence to Patterson Dam, located immediately southwest of the reservoir facility in an artificial drainage channel (CDFW 2021a). Numerous California red-legged frog breeding observations (eggs, larvae, adults) were made at this location between 1991 and 2000. Occ. No. 603 is located approximately 0.3 miles northwest of Patterson Dam, in which adults were observed within an artificial pond from 2002 to 2004 (CDFW 2021a). Occ. No. 387 was approximately 0.14 miles northeast of Patterson Dam in which one juvenile was observed in an artificial pond in 2000, however this location is separated from the site by the South Bay Aqueduct. The remaining observations are located west of the Patterson Dam study area, west of Greenville Road.

California red-legged frog is known to occur in the low-outlet drainage within the Patterson Dam study area and may also occur in other areas. The downstream dam face, upper slope east of the dam, and staging areas east of the dam are suitable upland and dispersal habitat, but frogs are unlikely to occur in these areas outside the rainy season when Project construction is proposed. In summary, California red-legged frog is assumed present within the Patterson Dam study area because of its known occurrence and suitable aquatic habitat in the drainage to the west, and suitable upland and dispersal habitat within dispersal distance of aquatic habitat. It is more likely to occur in wetland vegetation instead of uplands at the time of Project construction, however.

Critical Habitat

USFWS designated 4,140,440 acres of critical habitat for California red-legged frog in 28 California counties on March 13, 2001 (66 FR 14625–14758). Critical habitat for this species has been revised several times since 2006, with the most recent revision (and the one currently in effect) dated March 17, 2010, and comprising approximately 1,636,609 acres in 27 counties (75 FR 12816–12959). The primary constituent elements of critical habitat for California red-legged frog, described in the 2010 designation, are summarized as follows:

- **Aquatic Breeding Habitat:** Standing bodies of fresh water (with salinities less than 4.5 ppt), including natural and constructed (e.g., stock) ponds, slow-moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains and hold water for a minimum of 20 weeks in all but the driest of years
- **Aquatic Nonbreeding Habitat:** Freshwater pond and stream habitats that may not hold water long enough for the species to complete its aquatic life cycle but which provide for shelter, foraging, predator avoidance, and aquatic dispersal of juvenile and adult California red-legged frogs. Other wetland habitats considered to meet these criteria include, but are not limited to plunge pools within intermittent creeks, seeps, quiet backwaters within streams during high water flows, and springs of sufficient flow to provide mesic surface conditions during dry periods
- **Upland Habitat:** upland areas adjacent to or surrounding breeding and nonbreeding aquatic and riparian habitat up to a distance of 1.6 kilometers (1 mile) in most cases (i.e., depending on surrounding landscape and dispersal barriers) including various vegetation types such as grassland, woodland, forest, wetland, or riparian areas that provide shelter, forage, and predator avoidance for the California red-legged frog
- **Dispersal Habitat:** Accessible upland or riparian habitat within and between occupied or previously occupied sites that are located within 1 mile of each other, and that support movement between such sites

The Clifton Court Forebay Dam study area is located outside of critical habitat for California red-legged frog. Dyer Dam is entirely located within the Mount Diablo critical habitat unit (CCS-2B). The northeastern/eastern edge of Patterson Dam is located within the Arroyo Valle critical habitat unit (ALA-2). The Dyer and Patterson Dam study areas do not support aquatic breeding habitat but do have nonbreeding aquatic habitat and upland and dispersal habitat.

Western Pond Turtle (*Actinemys marmorata*), SSC

The western pond turtle is uncommon to common in suitable aquatic habitat throughout California, west of the Sierra-Cascade crest and absent from desert regions, except in the Mojave Desert along the Mojave River and its tributaries. Western pond turtles typically forage on land and in quiet pools of water and, as omnivores with a broad feeding niche, they eat almost anything they can capture (Bury 1986). While moving between pools within the stream system, average distances were 354 meters (1,161 feet) for males, 169 meters (554 feet) for females, and 142 meters (466 feet) for juveniles. Holland (1994) reported that western pond turtles have been found up to one kilometer (3,280 feet) from watercourses and can move up to five kilometers (3.1 miles) between drainages. Although western pond turtles can move long distances, they are generally characterized as sedentary animals.

Occurrence within Study Area

Clifton Court Forebay Dam

Western pond turtle is known to occur in the Clifton Court Forebay Dam study area. There are multiple occurrences in the southern portion of the study area, including February and March 2021 observations by Dudek biologists on dam embankments and an April observation at Sump No. 4 in the northwest portion of the study area. DWR biologists have also observed pond turtles in the drainages in the western, northwestern, and northeastern portions of the study area and have documented nesting near the northeastern dam embankment (DWR, unpubl. data). Grasslands adjacent to aquatic habitat features also provide suitable upland nesting habitat.

Dyer Dam

Western pond turtle has moderate potential to occur within the Dyer Dam study area. The only nearby occurrence is a March 11, 1982, CNDDDB occurrence approximately 530 feet southwest of Dyer Dam, although the exact location and number of turtles observed is not reported (Occ. No. 120) (CDFW 2021a). DWR biologists have not observed pond turtles during preconstruction surveys for similar maintenance projects in the last 5 years (DWR, unpubl. data). Marginally suitable aquatic habitat is present in drainages within the study area and the nearby reservoir is also suitable for this species. If these aquatic habitat features are used by pond turtles, surrounding uplands could be used for nesting.

Patterson Dam

Western pond turtle has high potential to occur within the Patterson Dam study area. There is suitable habitat present on site and there are CNDDDB occurrences less than 2 miles southwest of the site (CDFW 2021a). Marginally suitable aquatic habitat is present in drainages within the study area and the nearby reservoir is also suitable for this species. If these aquatic habitat features are used by pond turtles, surrounding uplands could be used for nesting.

San Joaquin Coachwhip (*Masticophis flagellum ruddocki*), SSC

San Joaquin coachwhips occur in arid environments with open, sparsely vegetated land with little to no tree cover; vegetation communities include grassland and saltbush scrub (Jennings and Hayes 1994). It can occur in a variety of land types, including sandy or rocky, and flat or sloping topography (Stebbins 2003). It has been observed climbing bushes such as saltbushes (*Atriplex* spp.) to survey its surrounding and look for prey, such as nesting birds, and predators (Jennings and Hayes 1994). Coachwhips often burrow in rodent burrows for refuge and possibly for oviposition (Stebbins 2003; Jennings and Hayes 1994). Within the Plan Area, this species is recorded with herbaceous communities in topography with low relief. It occurs in elevation ranges from 65 to 2,950 feet above mean sea level (Nafis 2021).

Occurrence within Study Area

Clifton Court Forebay Dam

San Joaquin coachwhip has high potential to occur within the Clifton Court Forebay Dam study area. There is suitable habitat present in grassland and saltbush scrub in southern portion of study area.

Dyer Dam

This species has low potential to occur within the Dyer Dam study area. Suitable grassland habitat is present but the study area is on the periphery of known range of species (CDFW 2021f) and there are no occurrences in the vicinity of Dyer Dam.

Patterson Dam

This species has moderate potential to occur within the Patterson Dam study area. Suitable grassland habitat is present and a CNDDDB occurrence located 1.8 miles south-southwest of the site (CDFW 2021a).

4.5.3.4 Birds

Golden Eagle (*Aquila chrysaetos*), BCC/FP, WL

The golden eagle is a year-round, diurnally active species that is a permanent resident and migrant throughout California. Golden eagles are more common in northeast California and the Coast Ranges than in Southern California and the deserts. Foraging habitat for this species includes open habitats with scrub, grasslands, desert communities, and agricultural areas.

Golden eagles breed from January through August, with peak breeding activity occurring from February through July. Nest building can occur almost any time during the year. This species nests on cliffs, rock outcrops, large trees, and artificial structures such as electrical transmission towers, generally near open habitats used for foraging (Johnsgard 1990; Katzner et al. 2020; Scott 1985). Golden eagles commonly build, maintain, and variably use multiple alternative nest sites in their breeding territories, routinely refurbishing and reusing individual nests over many years. Generally, the nests are large platforms composed of sticks, twigs, and greenery that are often 10 feet across and 3 feet high (Zeiner et al. 1990a). Pairs may build more than one nest and attend to them prior to laying eggs (Katzner et al. 2020). Each pair can have up to 10 nests, but only 2 to 3 are generally used in rotation from one year to the next. Some pairs use the same nest each year, and others use alternate nests year after year, and still others apparently nest only every other year. Succeeding generations of eagles may even use the same nest (Terres 1980).

Occurrence within Study Area

Clifton Court Forebay Dam

There is no suitable nesting habitat for golden eagle within the Clifton Court Forebay Dam study area. There is moderate potential for this species to forage on site in the winter. One golden eagle was observed soaring just north of the study area in April 2021.

Dyer Dam

There is no suitable nesting habitat for golden eagle within the Dyer Dam study area. There is high potential for this species to forage on site in the winter. One individual was observed flying over the valley north of the reservoir during the January 2021 wildlife habitat assessment and biologists conducting wildlife surveys for the Delta Field Division HCP observed eagles soaring in the study area vicinity (approximately 0.5 miles north and 0.6 miles south) in March and April.

Patterson Dam

There is no suitable nesting habitat for golden eagle within the Patterson Dam study area but DWR biologists observed a pair nesting in a blue gum stand approximately 0.5 mile north of the study area from 2015 to 2019 (DWR, unpubl. data) and Dudek observed the nest is still active in 2021. Although not directly observed during 2021 field surveys, there is high potential for this pair to forage over the study area throughout the year.

Swainson's Hawk (*Buteo swainsoni*), ST

Swainson's hawk nests in California in the Central Valley, Klamath Basin, Northeastern Plateau, Lassen County, and the Mojave Desert. This species breeds in riparian areas, stands of trees, and isolated trees in agricultural environments, oak savannah, and juniper-sage flats. In the San Joaquin Valley, it typically nests in riparian areas and in isolated tree clusters, often near rural residences or other areas with some human disturbance. Alfalfa fields are the favored foraging areas of Swainson's hawk in the Central Valley, but the species also forages in other low-density row crops, undisturbed grasslands, rangelands, and fallow agricultural fields.

Occurrence within Study Area

Clifton Court Forebay Dam

One Swainson's hawk nest was observed within the Clifton Court Forebay Dam study area in 2021. On April 21, Dudek observed an adult flush from a nest in a willow (*Salix* sp.) adjacent to the West Canal approximately 0.6 miles north of the intake channel. The nest was abandoned on the subsequent June 23 visit, however. There is suitable nesting habitat present in study area and vicinity and additional nests were observed outside of the study area but within the Swainson's hawk survey boundary. There are many nearby occurrences along Delta waterways (e.g., Widdows Island, Coney Island) (CDFW 2021a; DWR, unpubl. data); one occurrence overlaps with the study area and is a documented nest site (CDFW 2021a).

Dyer Dam

Swainson's hawk is not expected to nest within the Dyer Dam study area due to lack of nesting habitat. Although suitable nesting habitat is present within 0.5 miles of the study area, Dudek biologists did not observe any Swainson's hawks within 0.5 miles during 2021 field surveys. The closest CNDDDB locations are around the Clifton Court Forebay Dam study area.

Patterson Dam

Swainson's hawk is not expected to nest within the Patterson Dam study area due to lack of nesting habitat. Although suitable nesting habitat is present within 0.5 miles of the study area, Dudek biologists did not observe any Swainson's hawks within 0.5 miles during 2021 field surveys. The majority of the CNDDDB occurrences are within the Clifton Court Forebay Dam study area, but there is one record from 2017 approximately 2.5 miles southwest of Patterson Dam documenting a nesting pair (CDFW 2021a).

Northern Harrier (*Circus hudsonius*), SCC

The northern harrier breeds throughout most of Canada and Alaska; south through the northern and central Great Basin, Rocky Mountains, and Great Plains; in the northeastern United States; and in scattered locales from central, coastal, and southwestern California south to Baja California, Mexico (Smith et al. 2020). Northern harriers winter across most of the coterminous United States south through Mexico, Central America, the Bahamas, and Cuba. In California, northern harriers breed in the Central Valley, Great Basin, most of the Coast Ranges, and in some coastal areas from San Luis Obispo County southward (Davis and Niemela 2008). Northern harrier inhabits annual grassland, lodgepole pine, and pine meadow habitats in the Central Valley, the Sierra Nevada, and northeastern California (Zeiner et al. 1990a). This species is less common in the Central Valley, and permanently resides on the northeastern plateau and coastal areas. Northern harrier breeds from sea level to 5,700 feet and nests on the ground in shrubby vegetation, within tall grasses and forbs in wetland (Brown and Amadon 1968). Extensive grazing general precludes nesting by northern harriers, which typically require relatively large tracts of undisturbed habitat (Smith et al. 2020).

Occurrence within Study Area

Clifton Court Forebay Dam

One northern harrier was observed foraging near the northeast portion of the Clifton Court Forebay Dam study area in December 2020 and in February 2021 a pair was observed in the same area displaying courtship. Another foraging individual was observed in the western portion of the study area in December 2020. Northern harrier has high potential to nest in portions of the Clifton Court Forebay Dam study area with dense ground cover. There is one CNDDDB record from 1989 within 5 miles of Clifton Court Forebay Dam (CDFW 2021a).

Dyer Dam

Northern harrier has high potential to nest within the Dyer Dam study area where there is dense groundcover. There are no CNDDDB occurrences within 5 miles of Dyer Dam (CDFW 2021a).

Patterson Dam

Northern harrier has high potential to nest within the Patterson Dam study area where the dense mustard west of the reservoir provides high-quality-habitat. Dudek biologists observed a pair in this area during 2021 field surveys. There are no CNDDDB occurrences within 5 miles of Patterson Dam (CDFW 2021a).

White-Tailed Kite (*Elanus leucurus*), FP

White-tailed kite inhabits herbaceous and open cismontane habitats (Zeiner et al. 1990a). It is commonly associated with certain types of agricultural areas (Grinnell and Miller 1944). This species is a year-round resident in coastal and valley lowlands, and forages in open grasslands, meadows, farmlands, and emergent wetlands. It will also use marginal habitats such as freeway edges and medians when foraging for voles and mice. Nests are constructed in a variety of trees, with coast live oak perhaps the most common, and placed high in the crown on thin branches (Peeters and Peeters 2005). Riparian areas adjacent to open space areas are also typically used for nesting, and kites prefer dense, broad-leafed deciduous trees for nesting and night roosting (Brown and Amadon 1968). They also nest in young redwoods (*Sequoia sempervirens*) and mid-sized Douglas firs (*Pseudotsuga menziesii*) in Northern California.

Occurrence within Study Area

Clifton Court Forebay Dam

White-tailed kite has high potential to nest and forage on site. There are suitable nesting trees in and around the Clifton Court Forebay Dam study area. One CNDDDB record within 5 miles from 1993 documented a nesting pair of kites (CDFW 2021a).

Dyer Dam

White-tailed kite is not expected to nest within the Dyer Dam study area due to lack of nesting habitat. There is one CNDDDB record within 5 miles from 1996 documenting a nesting pair of kites (CDFW 2021a).

Patterson Dam

White-tailed kite is not expected to nest within the Patterson Dam study area due to lack of nesting habitat. One white-tailed kite was observed perched in a tree at the northeastern edge of the study area during the 2021 field surveys. There is one CNDDDB record within 5 miles from 1996 documenting a nesting pair of kites (CDFW 2021a).

Bald Eagle (*Haliaeetus leucocephalus*), SE, FP

In California, most nesting bald eagles are found in the northern part of the state, but pairs nest locally south through the Sierra Nevada, coastal counties in Central and Southern California, and on the Channel Islands. Bald eagles typically nest in large conifers or on rock outcrops near aquatic features, but also occasionally in large hardwoods, such as sycamores and oaks (Anthony et al. 1982). They usually nest in one of the largest trees available near water and generally situated with a prominent overview of the surrounding area (Buehler 2020). Bald eagles prefer to forage on fish and waterfowl, but their diet varies regionally and seasonally in response to locally available resources, and often includes a variety of mammals as well as carrion, especially in winter (Todd et al. 1982; Stalmaster 1987; Ewins and Andress 1995; Buehler 2020).

Occurrence within Study Area

Clifton Court Forebay Dam

A pair of nesting bald eagles was observed at the northern edge of the Clifton Court Forebay Dam study area (Widdows Island) in a eucalyptus tree during the March 2021 field surveys. An adult was in the nest incubating eggs.

Dyer Dam

Bald eagle is not expected to occur within the Dyer Dam study area. Suitable open-water foraging habitat with nearby large trees for nesting is absent from the study area and vicinity.

Patterson Dam

Bald eagle is not expected to occur within the Patterson Dam study area. Suitable nesting habitat is absent from the study area and vicinity. A bald eagle was observed flying just west of the study area by Dudek biologists during 2021 field surveys.

Burrowing Owl (*Athene cunicularia*), BCC/SSC

Burrowing owl occurs throughout North and Central America west of the eastern edge of the Great Plains south to Panama. In California, it is a year-round resident of lowlands throughout much of the state; these resident populations may be augmented by migrants from other parts of western North America in the winter (Gervais et al. 2008). Burrowing owl has disappeared as a breeding species from many portions of its former statewide range, especially along the central and southern coasts (Gervais et al. 2008; Wilkerson and Siegel 2010).

Burrowing owls require habitat with three basic attributes: open, well-drained terrain; short, sparse vegetation; and underground burrows or burrow surrogates such as culverts, concrete debris piles, or riprap (Klute et al. 2003). They occupy grasslands, deserts, sagebrush scrub, agricultural areas (including pastures and untilled margins of cropland), earthen levees and berms, coastal uplands, and urban vacant lots, as well as the margins of airports, golf courses, and roads. This species also prefers sandy soils with higher bulk density and less silt, clay, and gravel (Lenihan 2007).

Occurrence within Study Area

Clifton Court Forebay Dam

Dudek observed two burrowing owls in the southern portion of the Clifton Court Forebay Dam study area during the 2021 field surveys. Numerous suitable burrowing owl burrows were mapped during the 2021 burrow surveys. In addition, DWR biologists have observed multiple burrowing owls in the study area since 2009, with most observations in the grassland north of the Skinner Fish Facility (DWR, unpubl. data).

Dyer Dam

Burrowing owl has high potential to occur within the Dyer Dam study area. There is a CNDDDB occurrence (Occ. No. 670) that overlaps the study area and indicates the former presence of a sizeable population (up to 19 pairs and over 50 juveniles in 2006) in the mid-2000s. Dudek biologists observed burrowing owl sign (i.e., feathers and pellets) in the proposed staging area northeast of the reservoir during 2021 field surveys and high-quality habitat is present in the grasslands within the study area.

Patterson Dam

Burrowing owl has high potential to occur within the Patterson Dam study area. Burrowing owl sign (pellet and/or feathers) was observed at two locations along the northern/northeastern portions of the study area during the February 2021 burrow surveys.

Loggerhead Shrike (*Lanius ludovicianus*), BCC/SSC

Loggerhead shrike ranges throughout California in the lowlands and foothills. The largest breeding populations are in portions of the Central Valley, the Coast Ranges, and the southeastern deserts (Humble 2008). The loggerhead shrike is a resident in much of California, and migratory in the north. Winter visitors augment resident populations. Preferred habitats for loggerhead shrikes are open areas that include scattered shrubs, trees, posts, fences, utility lines, or other structures that provide hunting perches with views of open ground, as well as nearby spiny vegetation or built structures (such as the top of chain-link fences or barbed wire) that provide a location to impale prey items for storage or manipulation (Humble 2008). Loggerhead shrikes occur most frequently in riparian areas along the woodland edge, grasslands with available perch and butcher sites, scrublands, and open canopied woodlands; they can also occur in agricultural areas and rangelands, as well as developed areas such as mowed roadsides, cemeteries, and golf courses. They rarely occur in heavily urbanized areas. For nesting, the height of shrubs and presence of canopy cover are most important (Yosef 2020). Loggerhead shrikes nest in trees and shrubs, especially thorny or spiny ones. In some cases, tumbleweeds and brush or debris (e.g., discarded rolls of barbed wire) piles may be used for nesting (Ricketts, pers. obs. 2013).

Occurrence within Study Area

Clifton Court Forebay Dam

Loggerhead shrike was observed in the Clifton Court Forebay Dam study area during Dudek's 2021 field surveys. Shrikes were observed perching in the northern and western portions of the study area in 2020 and 2021.

The study area provides high-quality nesting and foraging habitat for this species. Nesting habitat occurs in scattered trees and shrubs (e.g., willow stands) and grassland and open areas provide foraging habitat.

Dyer Dam

One loggerhead shrike was observed perched on a fence during the 2021 field surveys within the Dyer Dam study area. The Dyer Dam study area has limited shrubs and trees to provide nesting habitat; therefore, this species has moderate potential to nest on site.

Patterson Dam

The Patterson Dam study area has limited shrubs and trees to provide nesting habitat; therefore, this species has moderate potential to nest on site. This species likely forages on site.

Song Sparrow, Modesto population (*Melospiza melodia*), SSC

Song sparrows range from Mexico and Baja California through the United States and into southern Alaska. The "Modesto population" is endemic to California in the north-central portion of the Central Valley with the highest

densities occurring in the Butte Sink area of the Sacramento Valley (Gardali 2008). Song sparrows occur in a wide variety of marsh, forest, shrub, and riparian habitats. Nests are established in substrate with secure support provided by the ground or vegetation that are concealed from predators.

Occurrence within Study Area

Clifton Court Forebay Dam

Song sparrows assumed to belong to the Modesto population were observed during 2021 field surveys and have potential to occur throughout the Clifton Court Forebay Dam study area. There are CNDDDB records in study area and vicinity (CDFW 2021a).

Dyer Dam

The Dyer Dam study area is outside of the known range of this subspecies.

Patterson Dam

The Patterson Dam study area is outside of the known range of this subspecies.

Tricolored Blackbird (*Agelaius tricolor*), ST, SSC

Tricolored blackbirds are largely endemic to California, with more than 99% of the global population occurring in the state. Breeding tricolored blackbirds occur in four general areas of the state: the Central Valley, the central coast, the Sierra Nevada foothills, and Southern California. Madera, Merced, and Stanislaus Counties have the greatest numbers of consistently breeding birds (Meese 2014).

Tricolored blackbirds nest in colonies, primarily in freshwater marshes dominated by dense stands of emergent vegetation such as cattails and bulrushes, but they also nest in willows, blackberries, thistles, and nettles (*Urtica* spp.). They are known to forage up to 5.6 miles from active breeding colonies (UC Davis 2020).

Occurrence within Study Area

Clifton Court Forebay Dam

This species has high potential to occur within the Project site. The Clifton Court Forebay Dam study area supports nesting and foraging habitat for tricolored blackbird. There are small, scattered patches of marsh or blackberry around Clifton Court Forebay Dam. There are CNDDDB occurrences of tricolored blackbird documented within the surrounding area (CDFW 2021a).

Dyer Dam

This species has high potential to occur within the Dyer Dam study area. Dyer Dam supports nesting and foraging habitat for tricolored blackbird. There is a narrow channel dominated by cattails in the northeastern portion of Dyer Dam. There are CNDDDB occurrences of tricolored blackbird documented within the surrounding area (CDFW 2021a).

Patterson Dam

This species has high potential to occur within the Patterson Dam study area. Patterson Dam supports nesting and foraging habitat for tricolored blackbird. There is narrow channel dominated by cattails along the western portion of Patterson Dam. There are CNDDDB occurrences of tricolored blackbird documented within the surrounding area (CDFW 2021a).

4.5.3.5 Mammals

San Joaquin Kit Fox (*Vulpes macrotis mutica*), FT/SE

San Joaquin kit fox is endemic to California, occurring only on the San Joaquin Valley floor, surrounding foothills and ranges, and smaller, adjacent valleys, from northern Ventura and Santa Barbara Counties north to Contra Costa and San Joaquin counties. The three core subpopulations for the kit fox are in the Ciervo–Panoche region (western Fresno and Merced counties and eastern San Benito County), western Kern County, and the Carrizo Plain (USFWS 2010).

San Joaquin kit fox occurs in arid lands with scattered shrubby vegetation underlain by loose-textured, sandy soils suitable for burrowing and supporting primary prey (e.g., kangaroo rats [*Dipodomys* sp.]). Occupied communities and land covers include valley sink scrub, valley saltbush scrub, upper Sonoran subshrub scrub, annual grassland, grazed grasslands, petroleum fields, and urban areas in the southern portion of their range; valley sink scrub, interior coast range saltbush scrub, upper Sonoran subshrub scrub, annual grassland, and the remaining native grasslands in the central portion of their range; and annual grassland and valley oak woodland in the northern part of their range (USFWS 1998). The Project site is in the northern portion of the range.

Occurrence within Study Area

Clifton Court Forebay Dam

The Clifton Court Forebay Dam study area is in the S1 (Alameda, Contra Costa, and San Joaquin Counties) San Joaquin kit fox satellite population recovery area (USFWS 2010), where there have been no confirmed observations since 2002 (USFWS 2020b). Extensive surveys using scent dogs between 2001 and 2003 did not detect any kit foxes in surveyed portions of Alameda and Contra Costa Counties, including DWR (California Aqueduct) and private (Bruns, Kelso/Bruns) parcels southwest of the study area (Smith et al. 2006).

The CNDDDB contains 15 San Joaquin kit fox occurrences within 5 miles of the study area, all from the Diablo Range and foothills to the northwest, west, and southwest. The most recent occurrence is approximately 1.5 miles south of Clifton Court Forebay Dam and 0.45 miles northwest of the Kelso Road/Mountain House Road intersection, where several dens were observed adjacent to the Delta–Mendota Canal on May 24, 2000 (Occ. No. 34) (CDFW 2021a). The closest occurrence is a “sighting sometime from 1972 through July 1975” approximately 0.5 miles west of the northwest Clifton Court Forebay Dam embankment (Occ. No. 1033) (CDFW 2021a).

At the time of writing, Dudek is conducting a wildlife game camera study that is also intended to evaluate kit fox use of the study area. Although several burrows of suitable dimensions for use by San Joaquin kit fox were found during the initial February habitat assessment, no kit foxes or their sign have been detected during camera surveys or other wildlife surveys (e.g., burrowing owl and Swainson’s hawk surveys) and subsequent surveys are unlikely to detect any kit foxes due to the rarity of the species in this part of its range.

Dyer Dam

The Dyer Dam study area is in the S1 (Alameda, Contra Costa, and San Joaquin Counties) San Joaquin kit fox satellite population recovery area (USFWS 2010), where there have been no confirmed observations since 2002 (USFWS 2020b). Extensive surveys using scent dogs conducted between 2001 and 2003 did not detect any kit foxes in surveyed portions of Alameda and Contra Costa Counties, including DWR parcels (California Aqueduct, Bethany Reservoir) northeast of Dyer Dam, Brush Creek Regional Preserve (approximately 1 mile west of Dyer Dam), and the Lawrence Livermore National Laboratory Site 300 (approximately 7 miles east of Patterson Dam) (Smith et al. 2006).

The CNDDDB contains 14 San Joaquin kit fox occurrences within 5 miles of Dyer Dam, all from the Diablo Range and foothills. The most recent and closest occurrence to Dyer Dam, from August 20, 2002, was an observation of one adult in the Brushy Creek Regional Preserve, approximately 1 mile to the northwest (Occ. No. 58).

At the time of writing, Dudek is conducting a wildlife game camera study that is also intended to evaluate kit fox use of the study area. Although several burrows of suitable dimensions for use by San Joaquin kit fox were found during the initial February habitat assessment, no kit foxes or their sign have been detected during camera surveys or other wildlife surveys (e.g., burrowing owl and Swainson's hawk surveys) and subsequent surveys are unlikely to detect any kit foxes due to the rarity of the species in this part of its range.

Patterson Dam

The Patterson Dam study area is in the S1 (Alameda, Contra Costa, and San Joaquin Counties) San Joaquin kit fox satellite population recovery area (USFWS 2010), where there have been no confirmed observations since 2002 (USFWS 2020b). Extensive surveys using scent dogs conducted between 2001 and 2003 did not detect any kit foxes in surveyed portions of Alameda and Contra Costa Counties, including DWR parcels (California Aqueduct, Bethany Reservoir) northeast of Dyer Dam, Brush Creek Regional Preserve (approximately 1 mile west of Dyer Dam), and the Lawrence Livermore National Laboratory Site 300 (approximately 7 miles east of Patterson Dam) (Smith et al. 2006).

The CNDDDB contains three occurrences within 5 miles of Patterson Dam study area, all from the Diablo Range and foothills. The most recent and closest occurrence to Patterson Dam is a June 1989 observation of a den with four individuals approximately 100 feet from South Flynn Road, approximately 0.9 miles to the northeast (Occ. No. 43).

At the time of writing, Dudek is conducting a wildlife game camera study that is also intended to evaluate kit fox use of the study area. Although several burrows of suitable dimensions for use by San Joaquin kit fox were found during the initial February habitat assessment, no kit foxes or their sign have been detected during camera surveys or other wildlife surveys (e.g., burrowing owl and Swainson's hawk surveys) and subsequent surveys are unlikely to detect any kit foxes due to the rarity of the species in this part of its range.

American Badger (*Taxidea taxus*), SSC

American badger occurs throughout California except for the extreme northwestern coastal area (Zeiner et al. 1990b) and higher elevations of the Sierra Nevada. This species prefers dry, open, treeless areas, grasslands, coastal scrub, agriculture, and pastures, especially with friable soils (Zeiner et al. 1990b). This species is considered somewhat tolerant of human activities (Zeiner et al. 1990b).

Occurrence within Study Area

Clifton Court Forebay Dam

There is suitable habitat within the Clifton Court Forebay Dam study area and there are known occurrences from the vicinity. American badger sign was observed in various locations within the study area (e.g., potential burrows and burrows with bones) by Dudek biologists during the 2021 field surveys.

Dyer Dam

There is suitable habitat within the Dyer Dam study area and game cameras detected an individual badger near the South Bay Aqueduct overchute in the southern portion of the study area in April 2021 as well as crossings to the south (see Section 4.5.4.4, Game Camera Results).

Patterson Dam

There is suitable habitat within the Patterson Dam study area and several burrows of appropriate dimensions for badger were observed by Dudek biologists during 2021 field surveys. An American badger skull and carcass were found along the northern portion of the study area by Dudek biologists during the 2021 field surveys.

4.5.4 Wildlife Movement

Wildlife movement includes local and regional travels by species intended to satisfy one or more of their needs. Wildlife corridors and habitat linkages help mitigate some of the impacts of habitat fragmentation by facilitating wildlife movement and improving habitat connectivity.

Wildlife corridors are areas that connect suitable wildlife habitat in a region otherwise fragmented by rugged terrain, changes in vegetation, or human disturbance. Natural features—such as canyon drainages, ridgelines, or areas with vegetation cover—provide corridors for wildlife travel. Wildlife corridors are important because they provide access to mates, food, and water; allow the dispersal of wildlife from high-density areas; and facilitate the exchange of genetic traits between populations (Beier and Loe 1992).

Habitat linkages are patches of native habitat that function to join two larger patches of habitat. They serve as connections between habitat patches and help reduce the adverse effects of habitat fragmentation. The linkage represents a potential route for gene flow and long-term dispersal. Habitat linkages may serve as both habitat and avenues of gene flow for small animals such as passerine birds, small mammals, reptiles, and amphibians. Habitat linkages may be represented by continuous patches of habitat or by nearby habitat “islands” that function as “stepping stones” for dispersal.

The study area may function as a portion of the home ranges (e.g., foraging for food or water, defending territories, searching for mates, breeding areas, or cover) for large-ranging species. For example, mule deer ranges are approximately 121 to 2,812 acres (49 to 1,138 hectares) (Kie et al. 2002), depending on the habitats available. Smaller species, such as butterflies, amphibians, reptiles, birds, and small mammals, have smaller home ranges; therefore, individuals of these species present in the study area may spend most of their lives within the study area. The dispersal of these smaller species occurs over multiple generations (Penrod et al. 2006).

4.5.4.1 Wildlife Movement and the Project Site

Clifton Court Forebay Dam

The Clifton Court Forebay Dam study area is located at the western edge of the San Joaquin Valley near its transition to the rolling foothills of the Diablo Range west of the Byron Highway. Clifton Court Forebay and the surrounding waterways—the California Aqueduct, the Old River, Italian Slough, and the West Canal—effectively block most wildlife movement potential in the vicinity of the study area. Some movement potential exists within the study area between Clifton Court Forebay and Bethany Reservoir to the southwest, but it is constrained by DWR support facilities and roads, leaving canal termini, overchutes (e.g., bridges, siphons), and underchutes (e.g., culverts), available for wildlife to use. Land is available to the north, but is generally fragmented by multiple canals and other wide waterways.

Wildlife corridors are considered sensitive by resource and conservation agencies. The study area is not readily identifiable as a corridor or linkage, because wildlife is not anticipated to normally move through the area due to existing human-made features (e.g., water bodies, roads, facilities, and canals). The forebay and canal system likely serve as barriers to wildlife movement from the surrounding ranchlands and Diablo foothills to the west for small, ground-based wildlife including California tiger salamander. The forebay, canals, and other anthropogenic features likely hinder San Joaquin kit fox movement as well. The Project site is not likely to be part of a regional corridor or linkage for large mammals due to the physical constraints to movement. While Byron Highway, and other roads represent a significant barrier to larger mammal (e.g., coyote, bobcat [*Lynx rufus*], mule deer) movement, it is possible that occasional crossings may occur as multiple overchutes, underchutes, and road crossings are present along the California Aqueduct within the study area. The reservoir and canals themselves prevent nearly all movement across them for larger wildlife and smaller wildlife, such as San Joaquin kit foxes, raccoons, and rabbits; this wildlife likely finds few areas like concrete bridges, culverts, and overchutes where they can cross. It should be noted that the canals have allowed some atypical species (e.g., sea lion, American beaver, river otter) to move in and out of the study area, but are not considered key movement species related to this Project.

Dyer Dam

The Dyer Dam study area is in the Altamont Hills of the Diablo Range in eastern Alameda County, approximately 7 miles northeast of Livermore and 2.3 miles north of Interstate 580. It is located in a large expanse of annual grassland with various land uses such as wind energy facilities, private ranchland, waste management (i.e., Altamont Landfill approximately 0.5 miles to the east) through which most wildlife can move freely, although local movements are constrained by the fence around the reservoir, the South Bay Aqueduct, and fencing associated with other human land uses. Some movement potential exists within the study area at canal terminuses, overchutes, and underchutes, available for wildlife to use to navigate over and around the South Bay Aqueduct.

The Dyer Dam study area is in the “Mt. Diablo-Diablo Range” critical linkage mapped by the Critical Linkages: Bay Area and Beyond project (Penrod et al. 2013). It is one of 14 landscape-level habitat linkages identified by Critical Linkages that, together with the Bay Area Open Space Council’s Conservation Lands Network, provide a comprehensive plan for the preservation and maintenance of wildlife habitat connectivity throughout the nine-county Bay Area. The preliminary mapping of this linkage was based on the estimated needs of mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), California quail (*Callipepla californica*), and American badger, but it is also intended to serve several other species, such as San Joaquin kit fox, northern harrier, white-tailed kite, loggerhead shrike, San Joaquin whipsnake, coast horned lizard, California red-legged frog, and western spadefoot.

Patterson Dam

The Patterson Dam study area is located on the eastern edge of the Livermore Valley approximately 1 mile east of Livermore. Local wildlife movement is constrained by the South Bay Aqueduct. Additionally, movement in the vicinity of Patterson Dam is constrained by development to the west, Patterson Pass Road to the south, and Interstate 580 to the north. These combined barriers can be a substantial barrier to California tiger salamander, large mammals, and smaller wildlife, though some movement is possible across the South Bay Aqueduct overchutes in the vicinity. The Patterson Dam study area is also in the “Mt. Diablo-Diablo Range” critical linkage mapped by the Critical Linkages: Bay Area and Beyond project (Penrod et al. 2013) as described above for Dyer Dam.

4.5.4.2 Mountain Lions

Mountain lions are unlikely to occur in the Project site due to generally unsuitable habitat. More suitable mountain lion habitat exists to the northeast in more mountainous and isolated habitat. Suitable prey species occur throughout the region in the form of mule deer, rabbits, and other species. Because of the existing constraints to movement, mountain lions are not expected to be affected by the Project.

4.5.4.3 Migrating Birds

The study area is located within the Pacific Flyway, which is a major north-south migration route for birds that travel between North and South America. This is a broad-front route that covers much landscape. In Central California, birds typically use the coast and Central Valley with east/west sub routes in the San Francisco Bay area (Kay 2015). The Pacific Coast route is used by gulls, ducks, and other water birds. The longest and most important route of the Pacific Flyway is that originating in northeastern Alaska. This route, which includes most waterfowl and shorebirds, passes through the interior of Alaska and then branches such that large flights continue southeast into the Central and Mississippi Flyways, or they turn in a southwesterly direction and pass through the interior valleys of California, ending or passing through the Salton Sea. The southward route of long-distance migratory land birds of the Pacific Flyway that typically overwinter south of the United States extends through the interior of California to the mouth of the Colorado River, and on to winter quarters that may be located in western Mexico (USGS 2013). The Project sites are located on the western edge of the Central Valley routes and the presence of the reservoirs and river-like aqueduct attract migrating waterbirds. Evidence of this is provided by the large rafts of migrating waterfowl within the reservoirs and aqueducts observed during field work.

Migration timing varies from species to species, and for some, there is little documentation of the timing. In general, bird migration occurs March through April, and August through November. Small bird (passerine) migration occurs mostly at night. Small birds avoid areas that are more turbulent over mountains; therefore, they mostly follow the coast or inland areas to reach their wintering grounds farther south (e.g., Mexico to South America). Smaller birds that do migrate through the mountains will generally seek out forested areas that provide cover during daylight hours. Conversely, migrating raptors and other soaring birds tend to follow mountain ridges and use updrafts created by the topography. Most raptorial species (other than turkey vultures and Swainson’s hawks migrating to and from Mexico) migrate across a broad and diffuse front and are not known to concentrate movements anywhere.

4.5.4.4 Game Camera Results

Twelve mammal species or species groups have been recorded by the wildlife game cameras within the Project study area to date, including striped skunk (*Mephitis mephitis*), Virginia opossum (*Didelphis virginiana*), bobcat, California ground squirrel, coyote, American badger, gray fox (*Urocyon cinereoargenteus*), rabbits, and rodents (Table 12). It should be noted that there is no way to determine how many unique individuals were photographed, but an attempt was made to not double count individuals when photos were taken chronologically close to one another. The observations summarized in Table 12 should be compared to discern relative use of an area by a particular species. Refer to Figures 10A-B, 11A-B, and 12A-B for the location, direction and viewscape, and wildlife recorded at each camera station.

A single American badger was detected at SBA-OC-001 within the Dyer Dam study area on April 9, 2021 (Table 12). Individual badgers were also detected at a culvert and overchute approximately 390 feet (Camera ID SBA-UC-002) and 0.2 miles (Camera ID SBA-OC-002) south of the Dyer Dam study area between April 10 and 18, 2021.

Table 12. Wildlife Game Camera Study Preliminary Results

Camera ID ^a	Location/ Surrounding Vegetation	Wildlife Species Observed and Total Number of Records	
		Species	Total Number of Records
Dyer Dam			
SBA-OC-001-E	Large open channel overchute over South Bay Aqueduct, 0.4 miles south of Dyer Reservoir. Surrounding vegetation primarily consists of open grassland.	American Badger	1
		Coyote	5
SBA-OC-001-W	Large open channel overchute over South Bay Aqueduct, 0.4 miles south of Dyer Reservoir. Surrounding vegetation primarily consists of open grassland.	American Badger	1
		Coyote	3
		Rabbit sp.	1
		Raccoon	1
SBA-OC-002-E	Overchute pipe over South Bay Aqueduct, south of Dyer Reservoir. Surrounding vegetation primarily consists of open grassland.	Bobcat	2
		California Ground Squirrel	139
		Coyote	1
		Rabbit sp.	19
		Raccoon	5
		Rodent sp.	1
SBA-OC-002-W	Overchute pipe over South Bay Aqueduct, south of Dyer Reservoir. Surrounding vegetation primarily consists of California annual grassland.	American Badger	1
		California Ground Squirrel	49
		Rabbit sp.	3
		Raccoon	1
		Rodent sp.	4

Table 12. Wildlife Game Camera Study Preliminary Results

Camera ID ^a	Location/ Surrounding Vegetation	Wildlife Species Observed and Total Number of Records	
		Species	Total Number of Records
SBA-UC-002-E	Culvert under South Bay Aqueduct, south of Dyer Reservoir. Camera facing east. Surrounding vegetation primarily consists of California annual grassland.	Bobcat California Ground Squirrel Rabbit sp. Raccoon Rodent sp.	1 4 69 2 11
SBA-UC-002W	Culvert under South Bay Aqueduct, south of Dyer Reservoir. Camera facing west. Surrounding vegetation primarily consists of California annual grassland.	American Badger California Ground Squirrel Rabbit sp. Raccoon Rodent sp.	2 51 155 1 14
Patterson Dam			
SBA-UC-009-E	Culvert under South Bay Aqueduct, north of Patterson Reservoir. Surrounding vegetation primarily consists of California annual grassland.	California Ground Squirrel Coyote	1 1
SBA-UC-009-W	Culvert under South Bay Aqueduct, north of Patterson Reservoir. Surrounding vegetation primarily consists of California annual grassland.	Coyote Rabbit Sp.	4 37
SBA-OC-011-E	Overchute pipe over South Bay Aqueduct, approx. 500 feet north-northwest of Patterson Reservoir. Surrounding vegetation primarily consists of California annual grassland.	Coyote	1
SBA-OC-011-W	Overchute pipe over South Bay Aqueduct, approx. 500 feet north-northwest of Patterson Reservoir. Surrounding vegetation primarily consists of California annual grassland.	Bobcat California Ground Squirrel Coyote Rabbit sp. Striped skunk Virginia opossum	9 9 1 3 1 1
SBA-BR-005-NE	Patterson Pass Road bridge over the South Bay Aqueduct, south of Patterson Reservoir. Surrounding vegetation primarily consists of California annual grassland.	Domestic cat	1

Table 12. Wildlife Game Camera Study Preliminary Results

Camera ID ^a	Location/ Surrounding Vegetation	Wildlife Species Observed and Total Number of Records	
		Species	Total Number of Records
SBA-BR-005-NW	Patterson Pass Road bridge over the South Bay Aqueduct, south of Patterson Reservoir. Surrounding vegetation primarily consists of California annual grassland.	Coyote Raccoon	6 2
SBA-BR-005-SE	Patterson Pass Road bridge over the South Bay Aqueduct, south of Patterson Reservoir. Surrounding vegetation primarily consists of California annual grassland.	Rabbit sp. Grey fox. Striped skunk	5 4 1
SBA-BR-005-SW	Patterson Pass Road bridge over the South Bay Aqueduct, south of Patterson Reservoir. Surrounding vegetation primarily consists of California annual grassland.	Domestic cow	4

Notes: SBA = South Bay Aqueduct; OC = overcrossing; BR = bridge; UC = underchute.
Camera ID codes: [DWR facility]-[crossing type]-[location ID]-[camera orientation].

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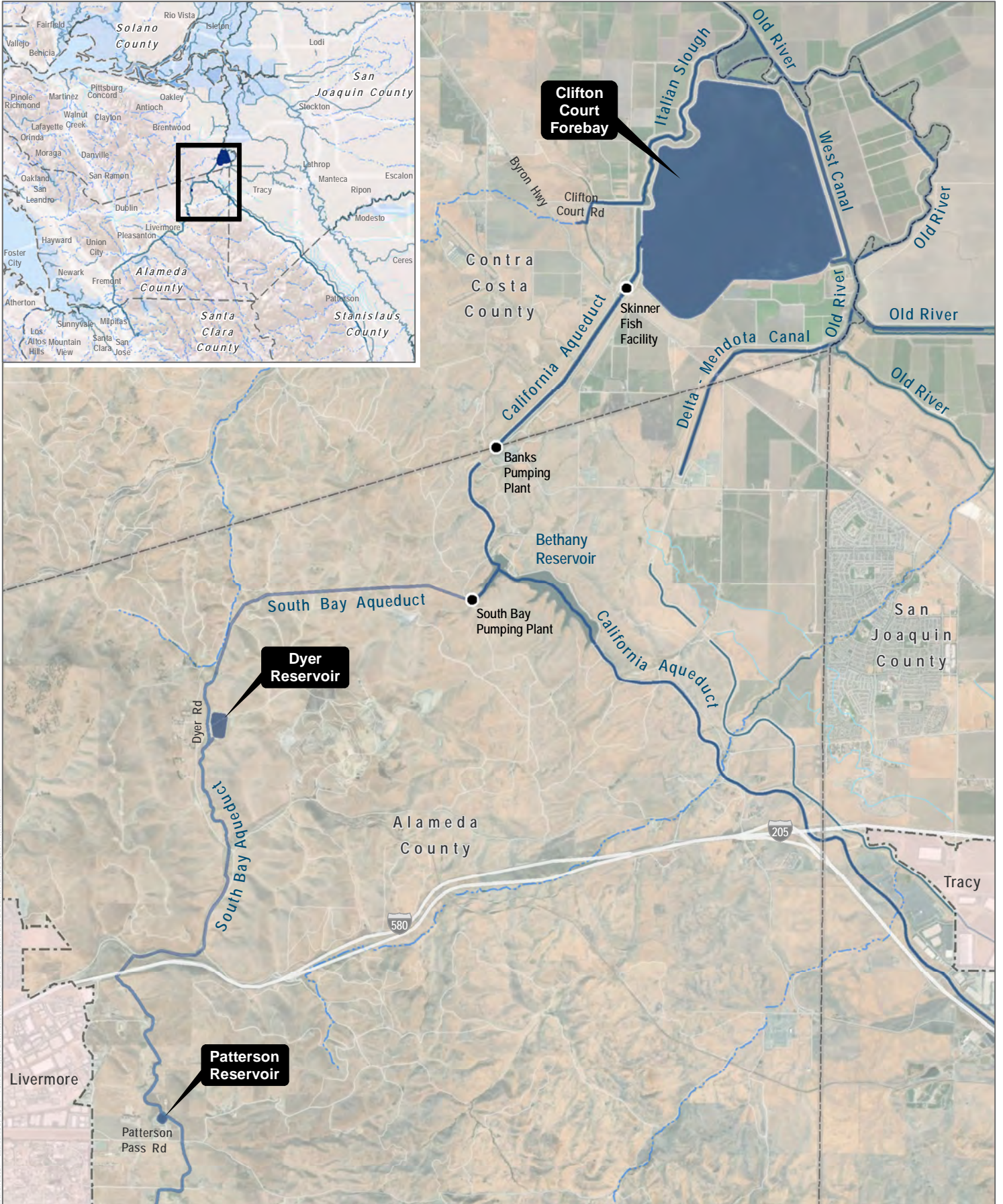
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BASEMAP SOURCE: DWR 2020; USGS 2020; ESRI World Imagery

FIGURE 1
Project Location
Delta Dams Rodent Burrow Remediation Project

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SOURCE: USDA NRCS Soils; ESRI World Imagery

FIGURE 2A
Soils - Clifton Court Forebay Dam
Delta Dams Rodent Burrow Remediation Project





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SOURCE: USDA NRCS Soils; ESRI Imagery

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 Study Area
Soils
 LaE2 - Linne clay loam, 30-45 percent slopes, eroded
 RdB - Rincon clay loam, 3-7 percent slopes
 Sa - San Ysidro loam

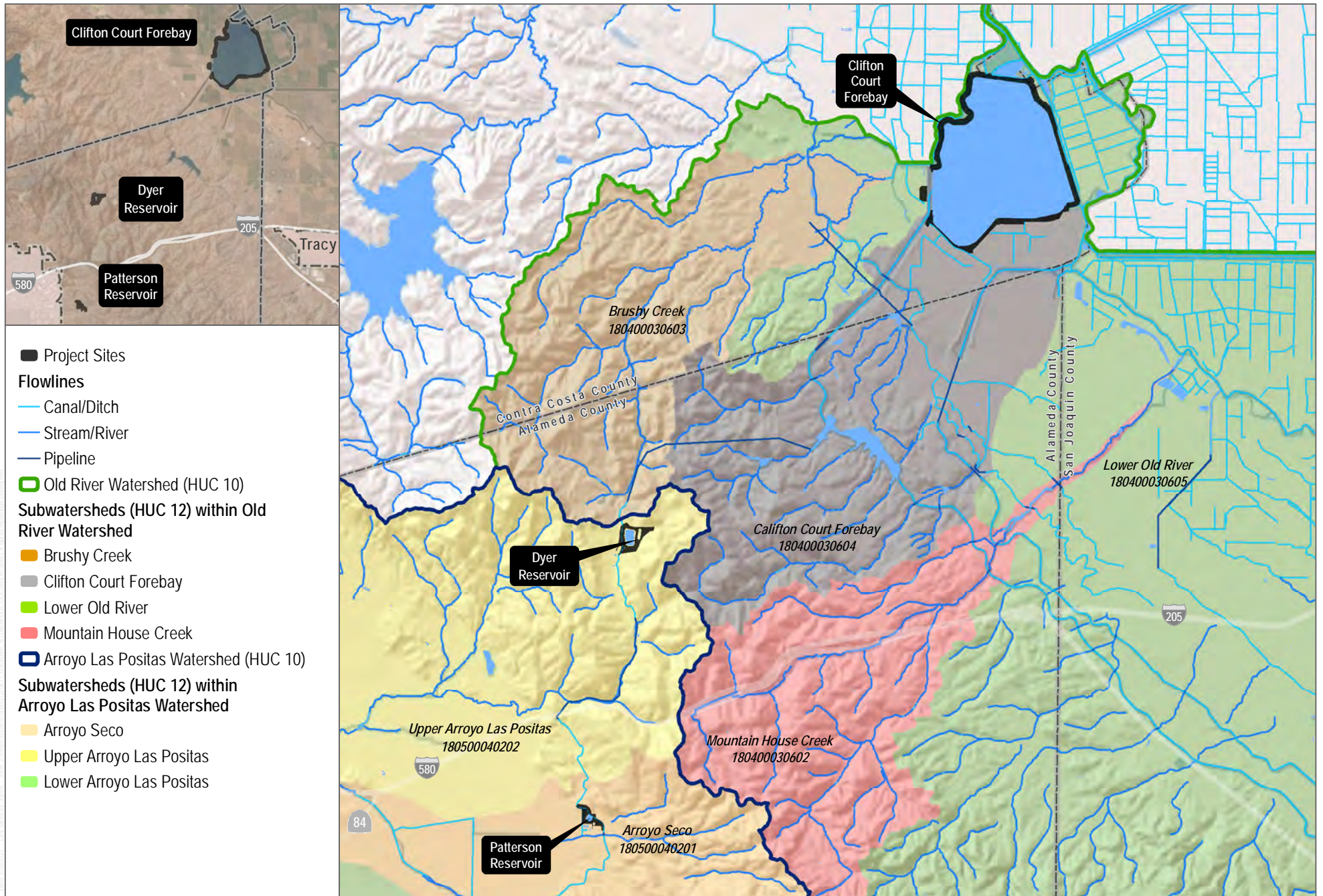
SOURCE: USDA NRCS Soils; ESRI Imagery



FIGURE 2C

Soils - Patterson Dam

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SOURCE: USGS 2020; ESRI Shaded Relief

FIGURE 3

Hydrologic Setting

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SOURCE: ESRI World Imagery



FIGURE 4A
Biological Study Area - Clifton Court Forebay Dam
Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery

DUDEK



0 200 400 Feet

FIGURE 4B

Biological Study Area - Dyer Dam

Delta Dams Rodent Burrow Remediation Project

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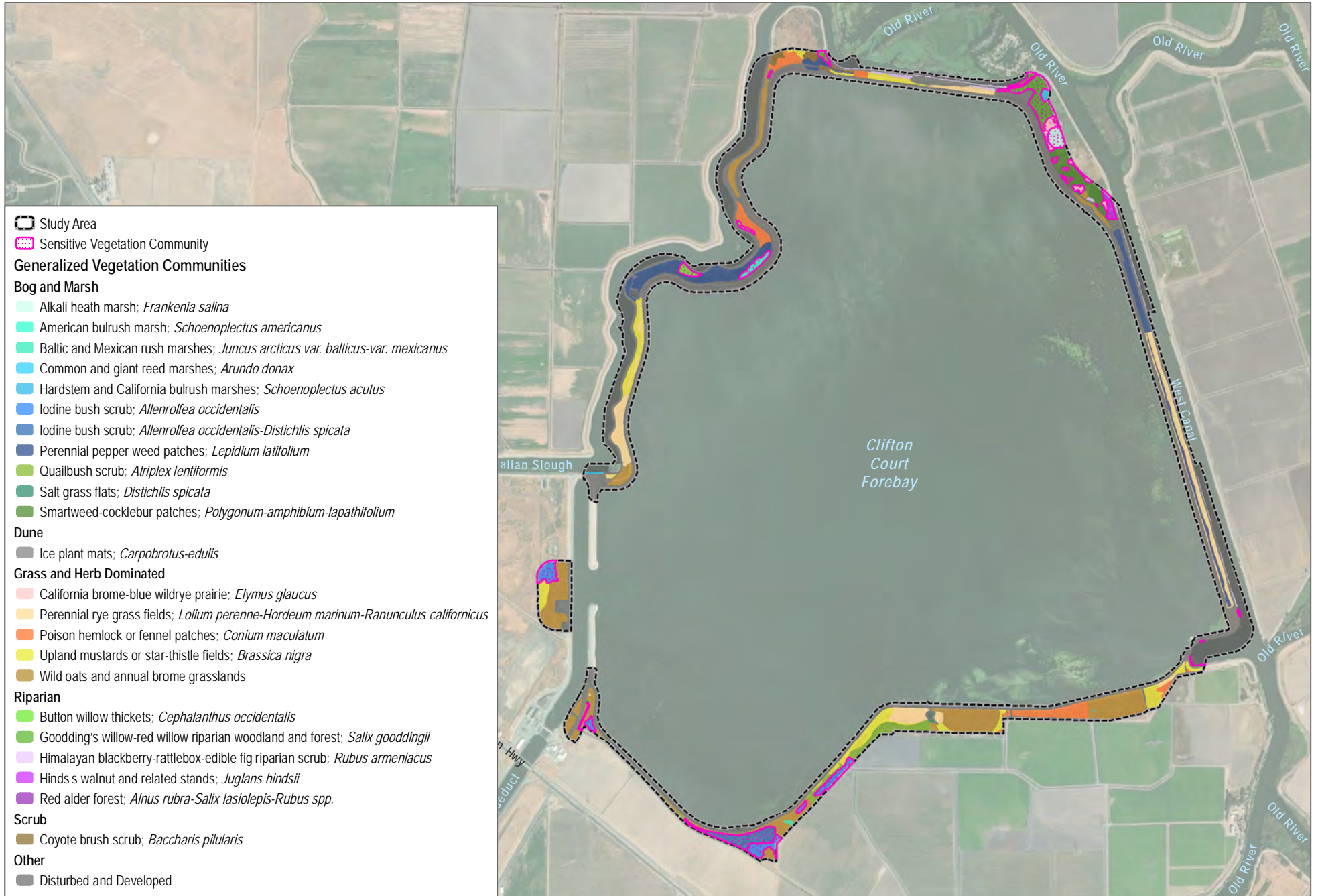


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FIGURE 4C
Biological Study Area - Patterson Dam
Delta Dams Rodent Burrow Remediation Project

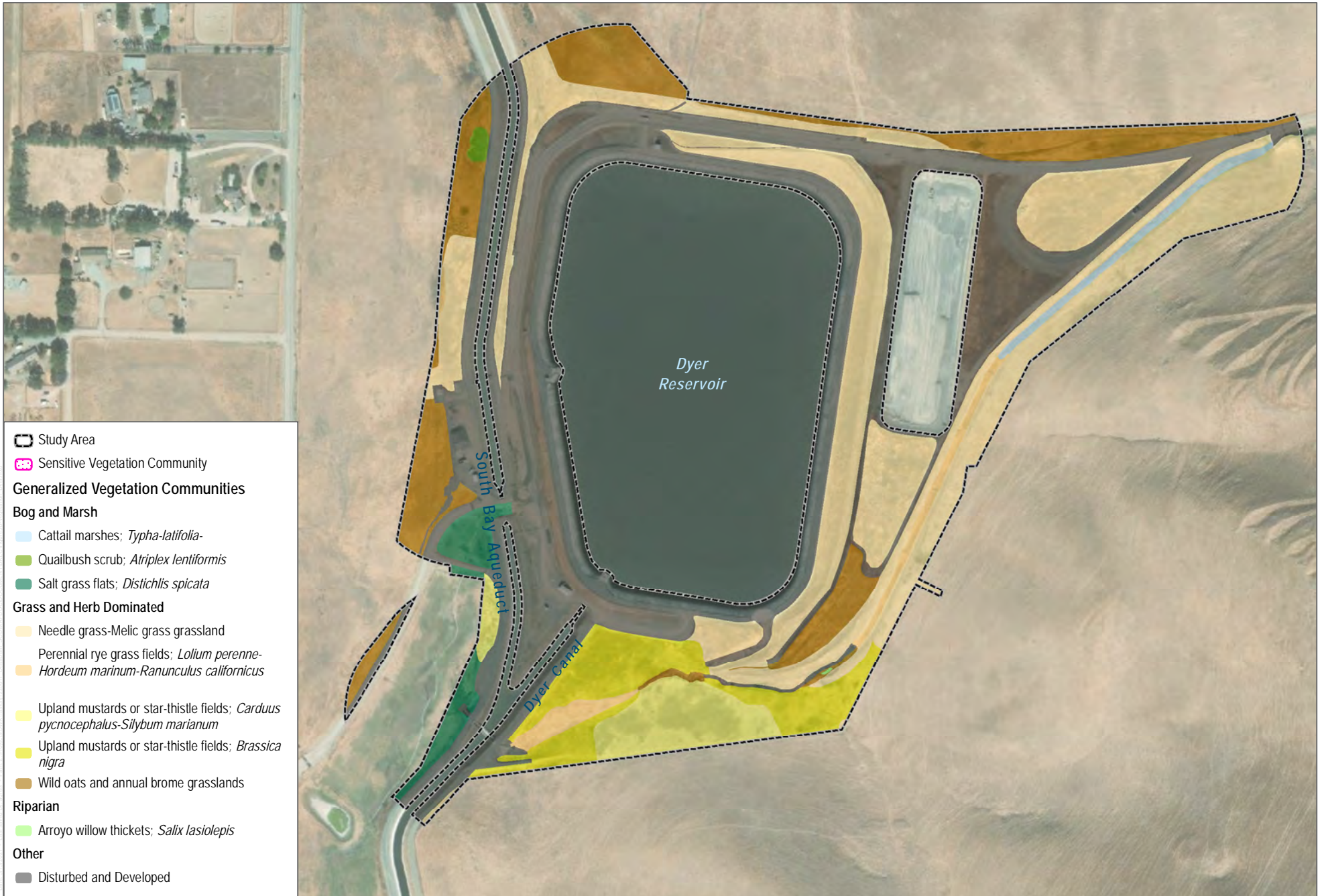
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SOURCE: ESRI World Imagery

FIGURE 5A
Vegetation Communities - Clifton Court Forebay Dam
Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery



FIGURE 5B
 Vegetation Communities - Dyer Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery



FIGURE 5C
Vegetation Communities - Patterson Dam
 Delta Dams Rodent Burrow Remediation Project

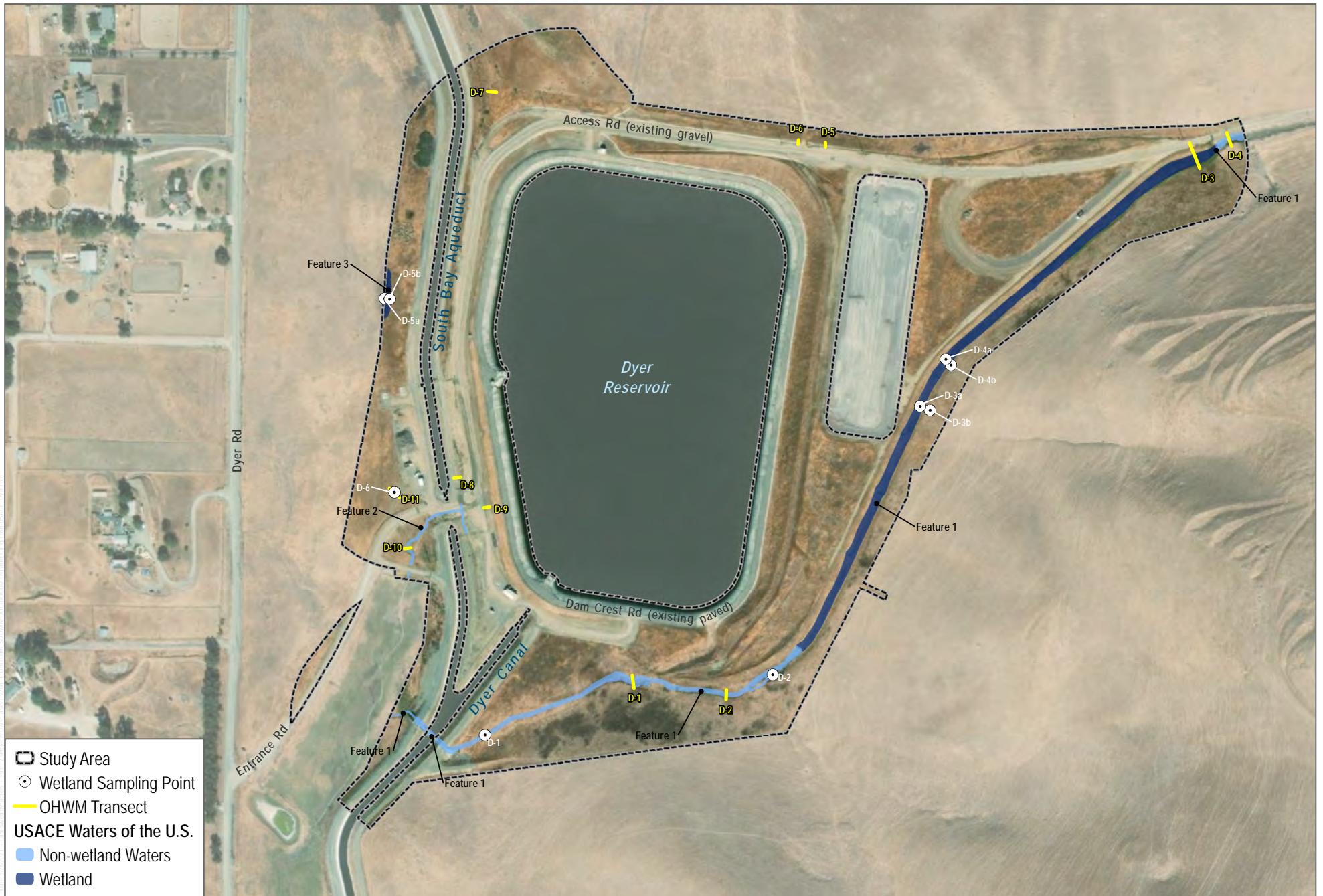
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SOURCE: ESRI World Imagery

FIGURE 6A
 USACE - Delineated Aquatic Resources - Clifton Court Forebay Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery

DUDEK



0 200 400 Feet

FIGURE 6B
USACE-Jurisdictional Areas - Dyer Dam

Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery

FIGURE 6C
 USACE-Jurisdictional Areas - Patterson Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI World Imagery

FIGURE 7A
 RWQCB - Delineated Aquatic Resources - Clifton Court Forebay Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery



FIGURE 7B
 RWQCB-Jurisdictional Areas - Dyer Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery

FIGURE 7C
 RWQCB-Jurisdictional Areas - Patterson Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI World Imagery



FIGURE 8A
CDFW-Jurisdictional Areas - Clifton Court Forebay Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery



FIGURE 8B
CDFW-Jurisdictional Areas - Dyer Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: ESRI Imagery

FIGURE 8C
CDFW-Jurisdictional Areas - Patterson Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: DWR 2020; ESRI World Imagery



FIGURE 9
 Special-Status Plants - Clifton Court Forebay Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: DWR; ESRI World Imagery



FIGURE 10A
 Wildlife Camera Stations - Dyer Reservoir
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: DWR; ESRI World Imagery



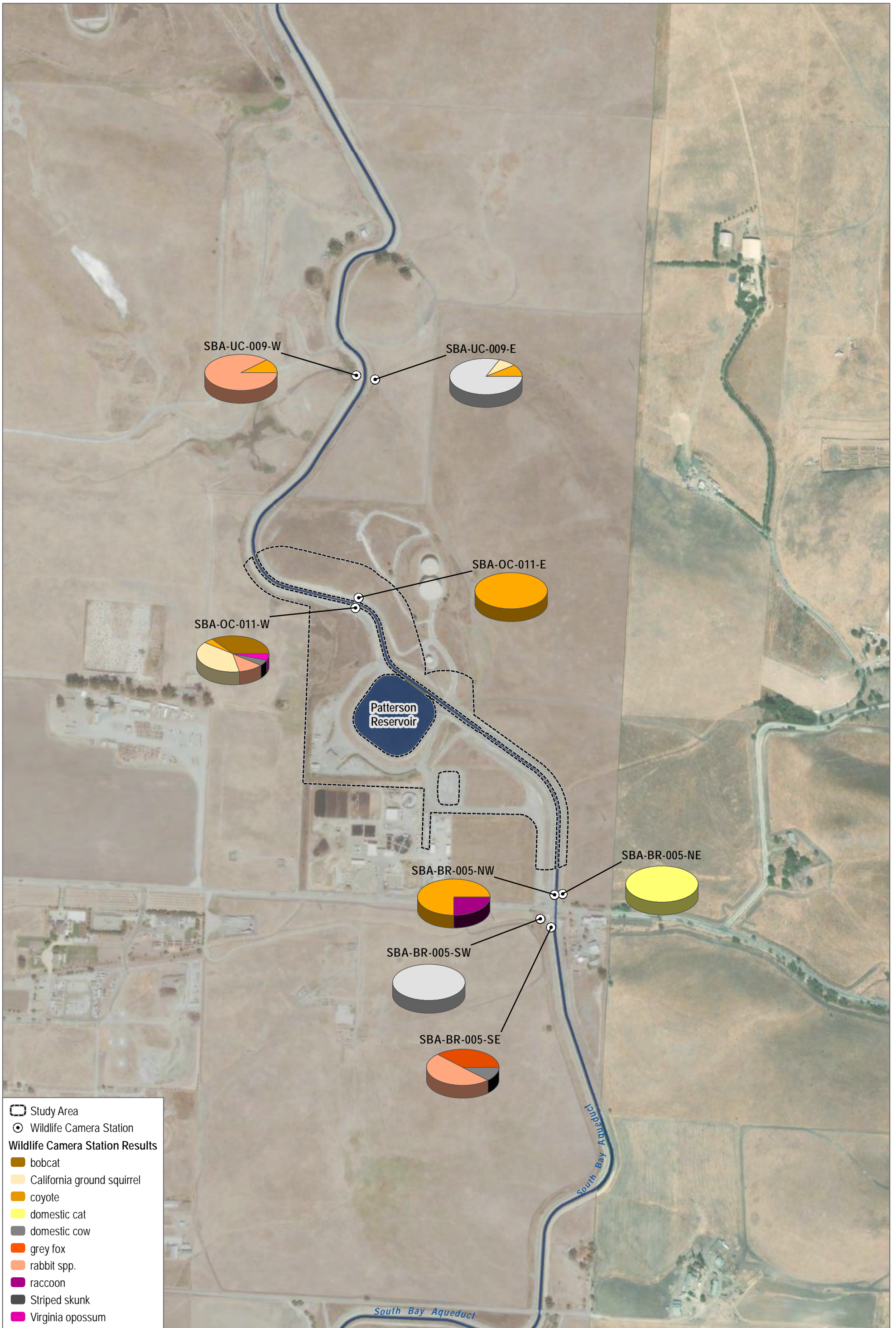
FIGURE 10B
 Wildlife Camera Stations - Patterson Reservoir
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: DWR; ESRI World Imagery

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SOURCE: DWR; ESRI World Imagery

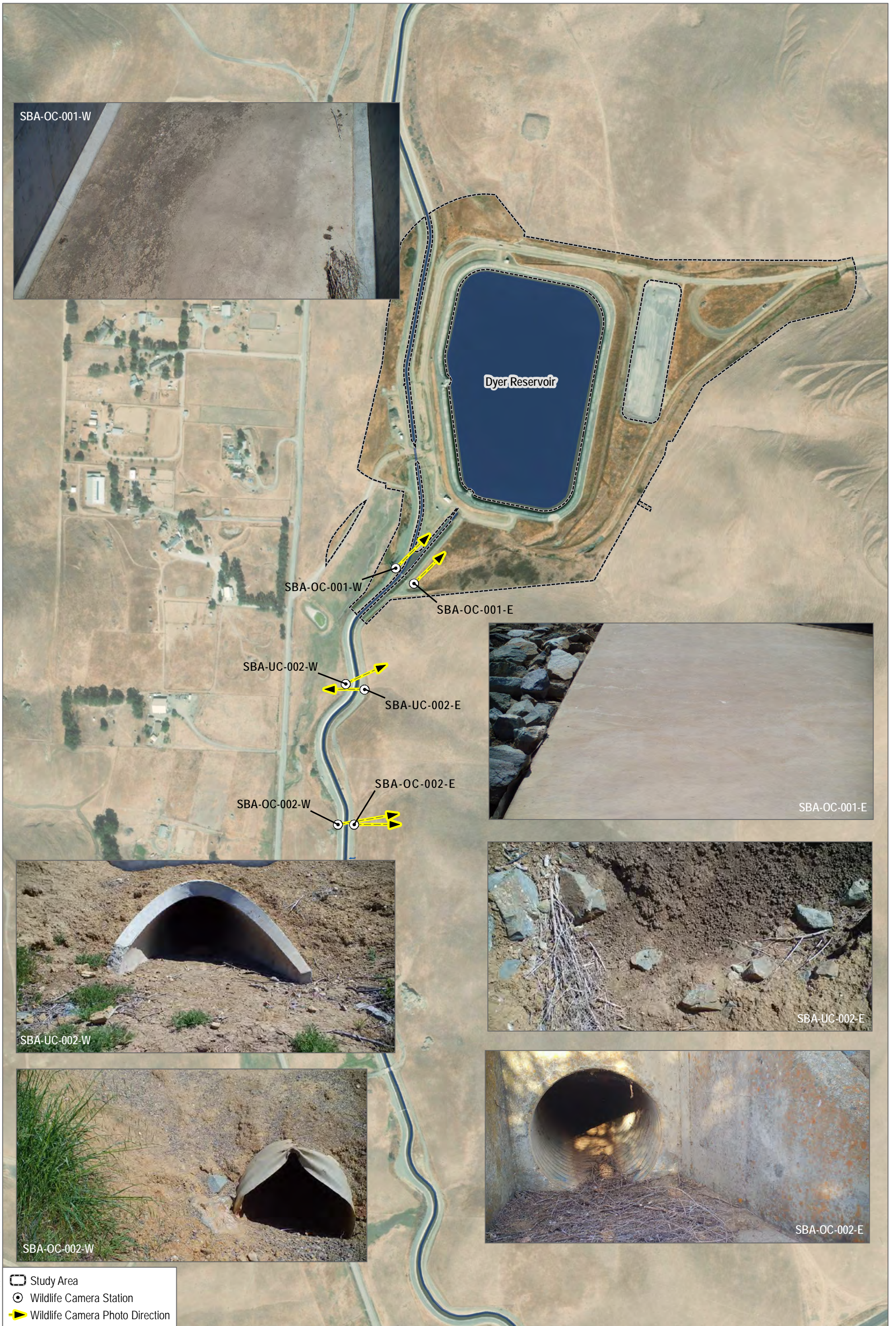


FIGURE 11B

Wildlife Camera Stations Results - Patterson Reservoir

Delta Dams Rodent Burrow Remediation Project

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SOURCE: DWR; ESRI World Imagery

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SOURCE: DWR; ESRI World Imagery



FIGURE 12B
 Wildlife Camera Stations Direction and Viewscape - Dyer Reservoir
 Delta Dams Rodent Burrow Remediation Project

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Appendix A

Plant Species Observed within the Project Site

Vascular Species

Eudicots

ADOXACEAE—MUSKROOT FAMILY

Sambucus nigra ssp. *caerulea*—blue elderberry

AIZOACEAE—FIG-MARIGOLD FAMILY

- * *Carpobrotus edulis*—hottentot fig
- Sesuvium verrucosum*—western sea-purslane

AMARANTHACEAE—AMARANTH FAMILY

- * *Amaranthus albus*—prostrate pigweed

ANACARDIACEAE—SUMAC OR CASHEW FAMILY

- * *Schinus molle*—Peruvian peppertree

APIACEAE—CARROT FAMILY

- * *Anthriscus caucalis*—bur chervil
- * *Conium maculatum*—poison hemlock
- * *Foeniculum vulgare*—fennel
- Lilaeopsis masonii*—Mason's lilaeopsis
- * *Torilis arvensis*—spreading hedgeparsley

APOCYNACEAE—DOGBANE FAMILY

- Apocynum cannabinum*—Indianhemp
- Asclepias fascicularis*—Mexican whorled milkweed
- * *Nerium oleander*—oleander

ARALIACEAE—GINSENG FAMILY

Hydrocotyle ranunculoides—floating marshpennywort
Hydrocotyle verticillata—whorled marshpennywort

ASTERACEAE—SUNFLOWER FAMILY

- Achillea millefolium*—common yarrow
- Artemisia douglasiana*—Douglas' sagewort
- Baccharis pilularis* ssp. *consanguinea*—coyotebrush
- Baccharis salicifolia*—mulefat
- * *Carduus pycnocephalus* ssp. *pycnocephalus*—Italian plumeless thistle
- * *Centaurea solstitialis*—yellow star-thistle
- * *Centaurea sulphurea*—sulphur knapweed

APPENDIX A
PLANT SPECIES OBSERVED WITHIN THE PROJECT SITE

- Centromadia fitchii*—Fitch’s tarweed
Centromadia pungens ssp. *pungens*—common tarweed
- * *Cirsium vulgare*—bull thistle
 - * *Cynara cardunculus*—cardo
 - Deinandra lobbiai*—threeray tarweed
 - * *Dittrichia graveolens*—stinkwort
 - Encelia californica*—California brittle bush
 - Encelia farinosa*—brittle bush
 - * *Erigeron bonariensis*—asthmaweed
 - Erigeron canadensis*—Canadian horseweed
 - Euthamia occidentalis*—western goldentop
 - Gnaphalium palustre*—western marsh cudweed
 - Grindelia camporum*—Great Valley gumweed
 - Helenium puberulum*—rosilla
 - Helianthus annuus*—common sunflower
 - * *Helminthotheca echioides*—bristly oxtongue
 - Heterotheca grandiflora*—telegraphweed
 - * *Hypochaeris glabra*—smooth cat’s ear
 - * *Lactuca serriola*—prickly lettuce
 - Lagophylla ramosissima*—branched lagophylla
 - Lasthenia fremontii*—Fremont’s goldfields
 - Pluchea odorata*—sweetscent
 - * *Pseudognaphalium luteoalbum*—Jersey cudweed
 - Psilocarphus brevissimus*—short woollyheads
 - * *Senecio vulgaris*—old-man-in-the-Spring
 - * *Silybum marianum*—blessed milkthistle
 - * *Sonchus asper*—spiny sowthistle
 - Symphyotrichum lentum*—Suisun Marsh aster
 - Symphyotrichum subulatum*—eastern annual saltmarsh aster
 - * *Tragopogon dubius*—yellow salsify
 - Xanthium strumarium*—cocklebur

BETULACEAE—BIRCH FAMILY

Alnus rhombifolia—white alder

BORAGINACEAE—BORAGE FAMILY

Amsinckia intermedia—common fiddleneck
Amsinckia lycopsoides—tarweed fiddleneck
Amsinckia menziesii—Menzies’ fiddleneck
Heliotropium curassavicum—salt heliotrope

BRASSICACEAE—MUSTARD FAMILY

- * *Brassica nigra*—black mustard
- * *Hirschfeldia incana*—shortpod mustard
- * *Lepidium chalepense*—lenspod whitetop
- * *Lepidium latifolium*—perennial pepper weed
- Lepidium nitidum*—shining pepperweed
- * *Raphanus sativus*—cultivated radish
- Rorippa palustris* ssp. *palustris*—hispid yellowcress

CARYOPHYLLACEAE—PINK FAMILY

- Spergularia macrotheca* var. *longistyla*—long-styled sand-spurrey
- Spergularia marina*—saltmarsh sand-spurrey

CHENOPODIACEAE—GOOSEFOOT FAMILY

- Allenrolfea occidentalis*—iodine bush
- Atriplex argentea* var. *expansa*—silverscale saltbush
- Atriplex argentea*—silverscale saltbush
- Atriplex cordulata* var. *cordulata*—heartscale
- Atriplex coronata* var. *coronata*—crownscale
- Atriplex depressa*—brittlescale
- Atriplex lentiformis*—quailbush
- * *Atriplex prostrata*—fat hen
- * *Atriplex semibaccata*—Australian saltbush
- * *Bassia hyssopifolia*—fivehorn smotherweed
- * *Chenopodium album*—lambsquarters
- Chenopodium californicum*—California goosefoot
- * *Chenopodium murale*—nettleleaf goosefoot
- * *Dysphania ambrosioides*—Mexican tea
- Salicornia pacifica*—Pacific swampfire
- * *Salsola tragus*—prickly Russian thistle
- Suaeda nigra*—bush seepweed

CONVOLVULACEAE—MORNING-GLORY FAMILY

- * *Convolvulus arvensis*—field bindweed
- Cressa truxillensis*—alkali weed

CUCURBITACEAE—GOURD FAMILY

- Marah fabacea*—California man-root

EUPHORBIACEAE—SPURGE FAMILY

- Croton setiger*—dove weed

APPENDIX A
PLANT SPECIES OBSERVED WITHIN THE PROJECT SITE

Euphorbia albomarginata—whitemargin sandmat

- * *Ricinus communis*—castorbean
- * *Triadica sebifera*—Chinese tallow

FABACEAE—LEGUME FAMILY

Astragalus gambelianus—Gambel's dwarf milkvetch

- * *Caesalpinia gilliesii*—bird-of-paradise shrub
- * *Lotus corniculatus*—bird's-foot trefoil
- Lupinus microcarpus*—valley lupine
- Lupinus succulentus*—hollowleaf annual lupine
- * *Medicago polymorpha*—burclover
- * *Melilotus albus*—yellow sweetclover
- * *Melilotus indicus*—annual yellow sweetclover
- * *Trifolium hirtum*—rose clover
- * *Vicia benghalensis*—purple vetch
- * *Vicia villosa*—winter vetch

FAGACEAE—OAK FAMILY

Quercus sp.—oak

FRANKENIACEAE—FRANKENIA FAMILY

Frankenia salina—alkali heath

GENTIANACEAE—GENTIAN FAMILY

Zeltnera muehlenbergii—Muhlenberg's centaury

GERANIACEAE—GERANIUM FAMILY

- * *Erodium botrys*—longbeak stork's bill
- * *Erodium cicutarium*—redstem stork's bill
- * *Erodium moschatum*—musky stork's bill
- * *Geranium dissectum*—cutleaf geranium
- * *Geranium* sp.—geranium

HALORAGACEAE—WATER-MILFOIL FAMILY

Myriophyllum sp.—watermilfoil

JUGLANDACEAE—WALNUT FAMILY

Juglans hindsii—Northern California black walnut

LAMIACEAE—MINT FAMILY

- * *Lamium amplexicaule*—henbit deadnettle
- Lycopus americanus*—American water horehound

APPENDIX A
PLANT SPECIES OBSERVED WITHIN THE PROJECT SITE

- * *Marrubium vulgare*—horehound
- * *Mentha arvensis*—wild mint
- Pogogyne zizyphoroides*—Sacramento mesamint

LYTHRACEAE—LOOSESTRIFE FAMILY

- * *Lythrum hyssopifolia*—hyssop loosestrife

MALVACEAE—MALLOW FAMILY

- Hibiscus lasiocarpus* var. *occidentalis*—woolly rose-mallow
- * *Malva arborea*—tree mallow
- * *Malva parviflora*—cheeseweed mallow
- Malvella leprosa*—alkali mallow

MORACEAE—MULBERRY FAMILY

- * *Ficus carica*—edible fig
- * *Morus alba*—white mulberry

MYRSINACEAE—MYRSINE FAMILY

- * *Lysimachia arvensis*—scarlet pimpernel

MYRTACEAE—MYRTLE FAMILY

- * *Eucalyptus* sp.—eucalyptus

OLEACEAE—OLIVE FAMILY

- Fraxinus dipetala*—California ash
- * *Ligustrum lucidum*—glossy privet
- * *Olea europaea*—olive

ONAGRACEAE—EVENING PRIMROSE FAMILY

- Epilobium brachycarpum*—tall annual willowherb
- Epilobium ciliatum*—fringed willowherb
- * *Ludwigia peploides* ssp. *peploides*—floating primrose-willow
- * *Ludwigia peploides*—floating primrose-willow
- Oenothera elata*—Hooker’s evening primrose
- Oenothera* sp.—evening-primrose

OROBANCHACEAE—BROOM-RAPE FAMILY

- * *Bellardia trixago*—Mediterranean lineseed
- Castilleja exserta* ssp. *exserta*—exserted Indian paintbrush

PAPAVERACEAE—POPPY FAMILY

- Eschscholzia californica*—California poppy

PLANTAGINACEAE—PLANTAIN FAMILY

- * *Plantago lanceolata*—narrowleaf plantain

PLATANACEAE—PLANE TREE, SYCAMORE FAMILY

Platanus racemosa—California sycamore

POLYGONACEAE—BUCKWHEAT FAMILY

Persicaria amphibia—longroot smartweed

- * *Persicaria hydropiper*—marshpepper knotweed
- * *Polygonum aviculare*—prostrate knotweed
- Rumex californicus*—toothed willow dock
- * *Rumex crispus*—curly dock
- Rumex salicifolius*—willow dock

ROSACEAE—ROSE FAMILY

- * *Prunus dulcis*—sweet almond
- Rosa californica*—California rose
- * *Rosa multiflora*—multiflora rose
- * *Rubus armeniacus*—Himalayan blackberry
- Rubus ursinus*—California blackberry

RUBIACEAE—MADDER FAMILY

Cephalanthus occidentalis—button willow

SALICACEAE—WILLOW FAMILY

Populus fremontii—Fremont cottonwood
Salix exigua—sandbar willow
Salix gooddingii—Goodding’s willow
Salix laevigata—red willow
Salix lasiolepis—arroyo willow

SAPINDACEAE—SOAPBERRY FAMILY

Acer negundo—box-elder

SOLANACEAE—NIGHTSHADE FAMILY

- * *Nicotiana glauca*—tree tobacco
- Nicotiana quadrivalvis*—Indian tobacco
- Solanum americanum*—American black nightshade
- * *Solanum carolinense*—Carolina horsenettle

TAMARICACEAE—TAMARISK FAMILY

- * *Tamarix ramosissima*—tamarisk

URTICACEAE—NETTLE FAMILY

- Urtica dioica* ssp. *gracilis*—California nettle
- Urtica dioica*—stinging nettle

VERBENACEAE—VERVAIN FAMILY

- Phyla nodiflora*—turkey tangle fogfruit
- * *Verbena bonariensis*—purpletop vervain
- Verbena lasiostachys*—western vervain

Ferns and Fern Allies

AZOLLACEAE—MOSQUITO FERN FAMILY

- Azolla filiculoides*—Pacific mosquitofern

Gymnosperms and Gnetophytes

PINACEAE—PINE FAMILY

- * *Pinus* sp.—pine

Monocots

AGAVACEAE—AGAVE FAMILY

- Chlorogalum pomeridianum*—wavyleaf soap plant

ARACEAE—ARUM FAMILY

- Lemna minuta*—least duckweed

ARECACEAE—PALM FAMILY

- * *Chamaerops humilis*—Mediterranean fan palm
- * *Phoenix dactylifera*—date palm
- * *Washingtonia robusta*—Washington fan palm

ASPARAGACEAE—ASPARAGUS FAMILY

- * *Asparagus officinalis*—garden asparagus

CYPERACEAE—SEDGE FAMILY

- Bolboschoenus maritimus* ssp. *paludosus*—cosmopolitan bulrush
- Carex nebrascensis*—Nebraska sedge
- Carex obnupta*—slough sedge
- Cyperus eragrostis*—tall flatsedge
- Eleocharis* sp.—beautiful spikerush
- Schoenoplectus acutus*—hardstem bulrush
- Schoenoplectus americanus*—American bulrush
- * *Schoenoplectus triqueter*—three-sided bulrush

HYDROCHARITACEAE—WATERWEED FAMILY

- * *Egeria densa*—Brazilian waterweed
- Elodea canadensis*—Canadian waterweed

IRIDACEAE—IRIS FAMILY

- * *Iris pseudacorus*—pale yellow iris

JUNCACEAE—RUSH FAMILY

- Juncus balticus*—no common name
- * *Juncus effusus* ssp. *effusus*—lamp rush
- Juncus occidentalis*—western rush
- Juncus xiphioides*—irisleaf rush

POACEAE—GRASS FAMILY

- * *Arundo donax*—giant reed
- * *Avena barbata*—slender oat
- * *Avena fatua*—wild oat
- * *Bromus diandrus*—ripgut brome
- * *Bromus hordeaceus*—soft brome
- * *Bromus madritensis*—compact brome
- * *Bromus rubens*—red brome
- * *Cortaderia jubata*—purple pampas grass
- * *Cortaderia selloana*—Uruguayan pampas grass
- * *Cynodon dactylon*—Bermudagrass
- Distichlis spicata*—salt grass
- Elymus glaucus* ssp. *glaucus*—blue wildrye
- Elymus triticoides*—creeping ryegrass
- * *Festuca arundinacea*—tall fescue
- * *Festuca myuros*—rat-tail fescue
- * *Festuca perennis*—perennial rye grass
- Hordeum brachyantherum*—meadow barley
- * *Hordeum marinum* ssp. *gussoneanum*—Mediterranean barley
- * *Hordeum murinum*—mouse barley
- * *Paspalum dilatatum*—dallisgrass
- * *Phalaris aquatica*—Harding grass
- * *Polypogon monspeliensis*—annual rabbitsfoot grass
- Setaria parviflora*—marsh bristlegrass
- * *Setaria* sp.—bristlegrass
- * *Sorghum halepense*—Johnsongrass
- Stipa pulchra*—purple needlegrass

APPENDIX A
PLANT SPECIES OBSERVED WITHIN THE PROJECT SITE

PONTEDERIACEAE—PICKEREL-WEED FAMILY

- * *Eichhornia crassipes*—common water hyacinth

THEMIDACEAE—BRODIAEA FAMILY

Triteleia laxa—Ithuriel's spear

TYPHACEAE—CATTAIL FAMILY

Typha angustifolia—narrowleaf cattail

Typha latifolia—broadleaf cattail

Typha sp.—cattail

- * Signifies introduced (non-native) species

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Appendix B

Wildlife Species Observed within the Project Site

Amphibians

Frogs

RANIDAE—TRUE FROGS

Rana draytonii—California red-legged frog

Birds

Blackbirds, Orioles and Allies

ICTERIDAE—BLACKBIRDS

Agelaius phoeniceus—red-winged blackbird

Euphagus cyanocephalus—Brewer's blackbird

Sturnella neglecta—western meadowlark

Cormorants

PHALACROCORACIDAE—CORMORANTS

Phalacrocorax auritus—double-crested cormorant

Falcons

FALCONIDAE—CARACARAS AND FALCONS

Falco sparverius—American kestrel

Finches

FRINGILLIDAE—FRINGILLINE AND CARDUELINE FINCHES AND ALLIES

Haemorhous mexicanus—house finch

Flycatchers

TYRANNIDAE—TYRANT FLYCATCHERS

Sayornis nigricans—black phoebe

Grebes

PODICIPEDIDAE—GREBES

Aechmophorus clarkii—Clark's grebe

Hawks

ACCIPITRIDAE—HAWKS, KITES, EAGLES, AND ALLIES

Aquila chrysaetos—golden eagle
Buteo jamaicensis—red-tailed hawk
Buteo swainsoni—Swainson’s hawk
Elanus leucurus—white-tailed kite
Haliaeetus leucocephalus—bald eagle
Circus hudsonius—northern harrier

Hérons and Bitterns

ARDEIDAE—HERONS, BITTERNs, AND ALLIES

Ardea alba—great egret
Ardea herodias—great blue heron

Jays, Magpies and Crows

CORVIDAE—CROWS AND JAYS

Corvus brachyrhynchos—American crow
Corvus corax—common raven

Kingfishers

ALCEDINIDAE—KINGFISHERS

Megaceryle alcyon—belted kingfisher

Kinglets

REGULIDAE—KINGLETS

Regulus calendula—ruby-crowned kinglet

Mockingbirds and Thrashers

MIMIDAE—MOCKINGBIRDS AND THRASHERS

Mimus polyglottos—northern mockingbird

New World Quail

ODONTOPHORIDAE—NEW WORLD QUAIL

Callipepla californica—California quail

New World Vultures

CATHARTIDAE—NEW WORLD VULTURES

Cathartes aura—turkey vulture

Owls

STRIGIDAE—TYPICAL OWLS

Athene cunicularia—burrowing owl

Bubo virginianus—great horned owl

Pelicans

PELECANIDAE—PELICANS

Pelecanus erythrorhynchos—American white pelican

Pigeons and Doves

COLUMBIDAE—PIGEONS AND DOVES

Zenaida macroura—mourning dove

Rails, Gallinules and Coots

RALLIDAE—RAILS, GALLINULES, AND COOTS

Fulica americana—American coot

Shorebirds

CHARADRIIDAE—LAPWINGS AND PLOVERS

Charadrius vociferus—killdeer

Shrikes

LANIIDAE—SHRIKES

Lanius ludovicianus—loggerhead shrike

Starlings and Allies

STURNIDAE—STARLINGS

* *Sturnus vulgaris*—European starling

Swallows

HIRUNDINIDAE—SWALLOWS

Petrochelidon pyrrhonota—cliff swallow

Wagtails and Pipits

MOTACILLIDAE—WAGTAILS AND PIPITS

Anthus rubescens—American pipit

Waterfowl

ANATIDAE—DUCKS, GEESE, AND SWANS

Anas platyrhynchos—mallard

Branta canadensis—Canada goose

Bucephala albeola—bufflehead

Mergus serrator—red-breasted merganser

Wood Warblers and Allies

PARULIDAE—WOOD-WARBLERS

Geothlypis trichas—common yellowthroat

Setophaga coronata—yellow-rumped warbler

Wrens

TROGLODYTIDAE—WRENS

Thryomanes bewickii—Bewick's wren

New World Sparrows

PASSERELLIDAE—NEW WORLD SPARROWS

Melospiza lincolnii—Lincoln's sparrow

Melospiza melodia—song sparrow

Passerculus sandwichensis—savannah sparrow

Passerella iliaca—fox sparrow

Pipilo maculatus—spotted towhee

Zonotrichia leucophrys—white-crowned sparrow

Mammals

Canids

CANIDAE—WOLVES AND FOXES

Canis latrans—coyote

Mustelids

MUSTELIDAE—WEASELS, SKUNKS, AND OTTERS

Lontra canadensis—North American river otter

Taxidea taxus—American badger

Squirrels

SCIURIDAE—SQUIRRELS

Spermophilus (Otospermophilus) beecheyi—California ground squirrel

Reptiles

Lizards

PHRYNOSOMATIDAE—IGUANID LIZARDS

Sceloporus occidentalis—western fence lizard

Snakes

COLUBRIDAE—COLUBRID SNAKES

Lampropeltis californiae—California kingsnake

Turtles

EMYDIDAE—BOX AND WATER TURTLES

Actinemys marmorata—northwestern pond turtle

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Appendix C

Special-Status Plant Species' Potential to Occur within the Project Site

APPENDIX C
SPECIAL-STATUS PLANT SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
Sharsmith's onion	<i>Allium sharsmithiae</i>	None/None/1B.3	Chaparral, Cismontane woodland; serpentinite, rocky/perennial bulbiferous herb/Mar-May/1,310-3,935	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. There are no serpentinite soils mapped on site (Calflora 2021). This species was not observed during April 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. There are no serpentinite soils mapped on site (Calflora 2021). This species was not observed during March 2021 or May rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present. This species was not observed during March or May 2021 rare plant surveys. There are no serpentinite soils mapped on site (Calflora 2021).
large-flowered fiddleneck	<i>Amsinckia grandiflora</i>	FE/SE/1B.1	Cismontane woodland, Valley and foothill grassland/annual herb/(Mar)Apr-May/886-1,800	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during April 2021 rare plant surveys.	Not expected to occur. This species was not observed during March or May 2021 rare plant surveys and the site is outside of the known elevation range of the species.	Not expected to occur. This species was not observed during March or May 2021 rare plant surveys and the site is outside of the known elevation range of the species.
bent-flowered fiddleneck	<i>Amsinckia lunaris</i>	None/None/1B.2	Coastal bluff scrub, Cismontane woodland, Valley and foothill grassland/annual herb/Mar-June/10-1,640	Not expected to occur. The closest known occurrence of this species is 25 miles northwest (CDFW 2021). Additionally, this species was not observed during April 2021 rare plant surveys.	Not expected to occur. The closest known occurrence of this species is over 20 miles northwest (CDFW 2021). Additionally, this species was not observed during March or May 2021 rare plant surveys.	Not expected to occur. The closest known occurrence of this species is over 20 miles northwest (CDFW 2021). Additionally, this species was not observed during March or May 2021 rare plant surveys.
Mt. Diablo manzanita	<i>Arctostaphylos auriculata</i>	None/None/1B.3	Chaparral (sandstone), Cismontane woodland/perennial evergreen shrub/Jan-Mar/443-2,130	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. Additionally, it is a large perennial shrub that would have been observed if present; no <i>Arctostaphylos</i> (manzanita) species were observed during April 2021 rare plant surveys.	Not expected to occur. No suitable vegetation present. Additionally, it is a large perennial shrub that would have been observed if present; no <i>Arctostaphylos</i> (manzanita) species were observed during March 2021 rare plant surveys.	Not expected to occur. No suitable vegetation present. Additionally, it is a large perennial shrub that would have been observed if present; no <i>Arctostaphylos</i> (manzanita) species were observed during March 2021 rare plant surveys.
Contra Costa manzanita	<i>Arctostaphylos manzanita</i> ssp. <i>laevigata</i>	None/None/1B.2	Chaparral (rocky)/perennial evergreen shrub/Jan-Mar(Apr)/1,410-3,605	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present. This perennial evergreen species was not observed during April 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present. This species was not observed during March 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present. This species was not observed during March 2021 rare plant surveys.
alkali milk-vetch	<i>Astragalus tener</i> var. <i>tener</i>	None/None/1B.2	Playas, Valley and foothill grassland (adobe clay), Vernal pools; alkaline/annual herb/Mar-June/3-195	Not expected to occur. There are no playas, vernal pools, or grasslands with adobe clay on site. Additionally, this species was not observed during April 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during March or May 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during March or May 2021 rare plant surveys.
heartscale	<i>Atriplex cordulata</i> var. <i>cordulata</i>	None/None/1B.2	Chenopod scrub, Meadows and seeps, Valley and foothill grassland (sandy); saline or alkaline/annual herb/Apr-Oct/0-1,835	Observed. 14 individuals were observed on the north and west side of the Clifton Court Forebay biological resources study area by Dudek in 2021.	Low potential to occur. Suitable habitat present and species known to occur in the vicinity. However, this species was not observed during the July 2021 surveys.	Not expected to occur. Suitable habitat present and species known to occur over 2 miles away from the survey area. Additionally, this species was not observed during the July 2021 surveys.
Lost Hills crownscale	<i>Atriplex coronata</i> var. <i>vallicola</i>	None/None/1B.2	Chenopod scrub, Valley and foothill grassland, Vernal pools; alkaline/annual herb/Apr-Sep/164-2,080	Not expected to occur. The site is outside of the species' known elevation range.	Not expected to occur. This closest known occurrence is over 65 miles south of the site (CDFW 2021) and there are no alkaline soils on site. Additionally, this species was not observed during the May or July 2021 surveys.	Not expected to occur. This closest known occurrence is over 65 miles south of the site (CDFW 2021) and there are no alkaline soils on site. Additionally, this species was not observed during May or July 2021 rare plant surveys.
brittlescale	<i>Atriplex depressa</i>	None/None/1B.2	Chenopod scrub, Meadows and seeps, Playas, Valley and foothill grassland, Vernal pools; alkaline, clay/annual herb/Apr-Oct/3-1,045	Observed. 10 individuals were observed on the south side of the Clifton Court Forebay biological resources study area by Dudek in 2021.	Low potential to occur. Suitable grasslands present and species known to occur in the vicinity. However, this species as not observed during the May or July 2021 surveys.	Low potential to occur. Suitable grasslands present and species known to occur in the vicinity. However, this species as not observed during the May or July 2021 surveys.

APPENDIX C
SPECIAL-STATUS PLANT SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
lesser saltscale	<i>Atriplex minuscula</i>	None/None/1B.1	Chenopod scrub, Playas, Valley and foothill grassland; alkaline, sandy/ annual herb/May–Oct/49–655	Low potential to occur. Suitable grasslands present and species known to occur less than 2 miles from the site (CDFW 2021). However, this species was not observed during July 2021 rare plant surveys.	Low potential to occur. Suitable grasslands present and species known to occur in the vicinity. However, this species was not observed during the May or July 2021 surveys.	Low potential to occur. Suitable grasslands present and species known to occur in the vicinity. However, this species was not observed during the May or July 2021 surveys.
big-scale balsamroot	<i>Balsamorhiza macrolepis</i>	None/None/1B.2	Chaparral, Cismontane woodland, Valley and foothill grassland; sometimes serpentinite/perennial herb/ Mar–June/148–5,100	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during April 2021 rare plant surveys.	Not expected to occur. Although there is suitable grassland on site, the closest known location is over 7 miles from the site (CDFW 2021). Additionally, this species was not observed during March or May 2021 rare plant surveys.	Low potential to occur. There is suitable grasslands on site and the species is known to occur in the vicinity. However, this species was not observed during March or May 2021 rare plant surveys.
big tarplant	<i>Blepharizonia plumosa</i>	None/None/1B.1	Valley and foothill grassland; Usually clay/annual herb/July–Oct/98–1,655	Not expected to occur. Suitable grassland present and species known to occur in the region of the site; however, the site is outside of the species' known elevation range. Additionally, this species was not observed during July 2021 rare plant surveys.	Low to potential too occur. Suitable grasslands present and species known to occur in the vicinity. However, this species was not observed during July 2021 rare plant surveys	Low potential to occur. Suitable grasslands present and species known to occur in the vicinity. However, this species was not observed during July 2021 rare plant surveys
Mt. Diablo fairy-lantern	<i>Calochortus pulchellus</i>	None/None/1B.2	Chaparral, Cismontane woodland, Riparian woodland, Valley and foothill grassland/perennial bulbiferous herb/ Apr–June/98–2,755	Not expected to occur. There is suitable riparian habitat and grasslands on site and the species is known to occur less than 8 miles from the site (CDFW 2021). However, this species was not observed during April 2021 rare plant surveys.	Not expected to occur. Suitable riparian habitat and grasslands on site. Species known to occur approximately 4 miles away (CDFW 2021). However, this species was not observed during they May 2021 surveys.	Low potential to occur. There is suitable grasslands on site and the species is known to occur approximately 7 miles from the site (CDFW 2021). However, this species was not observed during the May 2021 surveys.
chaparral harebell	<i>Campanula exigua</i>	None/None/1B.2	Chaparral (rocky, usually serpentinite)/ annual herb/May–June/902–4,100	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present.	Not expected to occur. No suitable vegetation present.	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present.
bristly sedge	<i>Carex comosa</i>	None/None/2B.1	Coastal prairie, Marshes and swamps (lake margins), Valley and foothill grassland/perennial rhizomatous herb/ May–Sep/0–2,050	Not expected to occur. There is suitable habitat on site and the species is known to occur within the region of the site. However, this species was not observed during July 2021 rare plant surveys.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site.
Lemmon's jewelflower	<i>Caulanthus lemmonii</i>	None/None/1B.2	Pinyon and juniper woodland, Valley and foothill grassland/annual herb/ Feb–May/262–5,180	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during April 2021 rare plant surveys.	Not expected to occur. While there is suitable grassland on site, the species is not known to occur in the vicinity. Additionally, this species was not observed during March or May 2021 rare plant surveys.	Not expected to occur. While there is suitable grassland on site, the species is not known to occur in the vicinity. Additionally, this species was not observed during March or May 2021 rare plant surveys.
Hoover's cryptantha	<i>Cryptantha hooveri</i>	None/None/1A	Inland dunes, Valley and foothill grassland (sandy)/annual herb/ Apr–May/30–490	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site.	Not expected to occur. The site is outside of the species' known elevation range.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site.
Congdon's tarplant	<i>Centromadia parryi</i> ssp. <i>congdonii</i>	None/None/1B.1	Valley and foothill grassland (alkaline)/ annual herb/May–Oct (Nov)/0–755	Not expected to occur. There are suitable grasslands present and alkaline soils present and species is known to occur in the region of the site. However, this species was not observed during July 2021 rare plant surveys.	Low potential to occur. There are suitable grasslands present and alkaline soils present and species is known to occur in the vicinity of the site. However, this species was not observed during the May or July 2021 rare plant surveys.	Low potential to occur. There are suitable grasslands present and alkaline soils present and species is known to occur in the vicinity of the site. However, this species was not observed during the May or July 2021 rare plant surveys.
dwarf soaproot	<i>Chlorogalum pomeridianum</i> var. <i>minus</i>	None/None/1B.2	Chaparral (serpentinite)/perennial bulbiferous herb/May–Aug/ 1,000–3,280	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. The site lacks serpentine soils. Additionally, this	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. The site lacks serpentine	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present. The site lacks serpentine soils. Additionally, this species was

APPENDIX C
SPECIAL-STATUS PLANT SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
				species was not observed during July 2021 rare plant surveys	soils. Additionally, this species was not observed during the May or July 2021 rare plant surveys.	not observed during the May or July 2021 rare plant surveys.
hispid bird's-beak	<i>Chloropyron molle</i> ssp. <i>hispidum</i>	None/None/1B.1	Meadows and seeps, Playas, Valley and foothill grassland; alkaline/annual herb (hemiparasitic)/June-Sep/3-510	Not expected to occur. Suitable grasslands and alkaline soils present on site. Species known to occur in the region. However, this species was not observed during July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during the July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during the July 2021 rare plant surveys.
palmate-bracted bird's-beak	<i>Chloropyron palmatum</i>	FE/SE/1B.1	Chenopod scrub, Valley and foothill grassland; alkaline/annual herb (hemiparasitic)/May-Oct/16-510	Not expected to occur. Suitable grasslands and alkaline soils present on site. Species known to occur in the region. Site elevation slightly below known elevation of species, but within 10 feet above mean sea level. However, this species was not observed during July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during the May or July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during the May or July 2021 rare plant surveys.
Bolander's water-hemlock	<i>Cicuta maculata</i> var. <i>bolanderi</i>	None/None/2B.1	Marshes and swamps; Coastal, fresh or brackish water/perennial herb/July-Sep/0-655	Low potential to occur. Suitable marsh habitat present and species known to occur in the region. However, this species was not observed during July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during the July 2021 rare plant surveys.	Not expected to occur. This species is not known to occur within the region. Additionally, this species was not observed during the July 2021 rare plant surveys.
Mt. Hamilton thistle	<i>Cirsium fontinale</i> var. <i>campylon</i>	None/None/1B.2	Chaparral, Cismontane woodland, Valley and foothill grassland; serpentinite seeps/perennial herb/(Feb)Apr-Oct/328-2,915	Not expected to occur. The site is outside of the species' known elevation range and this species is not known to occur within the region of the site. This species was not observed during April 2021 rare plant surveys.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site. Additionally, this species was not observed during March, May, or July 2021 rare plant surveys.	Not expected to occur. While there is suitable grasslands present, the site lacks serpentinite soils. Additionally, this species was not observed during March, May, or July 2021 rare plant surveys.
Livermore tarplant	<i>Deinandra bacigalupii</i>	None/SE/1B.1	Meadows and seeps (alkaline)/annual herb/June-Oct/492-605	Not expected to occur. The site is outside of the species' known elevation range.	Not expected to occur. While there is mesic habitat on site, the site is outside of the known elevation ranges of the species. Additionally, this species was not observed during July 2021 rare plant surveys.	Not expected to occur. While there is mesic habitat on site, the site is outside of the known elevation ranges of the species. Additionally, this species was not observed during July 2021 rare plant surveys.
Hospital Canyon larkspur	<i>Delphinium californicum</i> ssp. <i>interius</i>	None/None/1B.2	Chaparral (openings), Cismontane woodland (mesic), Coastal scrub/perennial herb/Apr-June/640-3,590	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present.	Not expected to occur. No suitable vegetation present.	Not expected to occur. No suitable vegetation present.
recurved larkspur	<i>Delphinium recurvatum</i>	None/None/1B.2	Chenopod scrub, Cismontane woodland, Valley and foothill grassland; alkaline/perennial herb/Mar-June/10-2,590	Low potential to occur. There is suitable grasslands and alkaline soils present. However, this species was not observed during April 2021 rare plant surveys.	Low potential to occur. There are suitable grasslands present, but this species was not observed during March 2021 rare plant surveys.	Low potential to occur. There are suitable grasslands present, but this species was not observed during March 2021 rare plant surveys.
Mt. Diablo buckwheat	<i>Eriogonum truncatum</i>	None/None/1B.1	Chaparral, Coastal scrub, Valley and foothill grassland; sandy/annual herb/Apr-Sep(Nov-Dec)/10-1,145	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site. Additionally, this species was not observed during April and July 2021 rare plant surveys.	Not expected to occur. There is suitable grasslands on site but the species primarily occurs further west. Additionally, this species was not observed during May or July 2021 rare plant surveys.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site. Additionally, this species was not observed during May or July 2021 rare plant surveys.
Jepson's coyote thistle	<i>Eryngium jepsonii</i>	None/None/1B.2	Valley and foothill grassland, Vernal pools; clay/perennial herb/Apr-Aug/10-985	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site. Additionally, this species was not observed during April and July 2021 rare plant surveys.	Not expected to occur. While there are suitable grasslands and clay soils on site, there are no vernal pools present. Additionally, this species was not observed during May or July 2021 rare plant surveys.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site. Additionally, this species was not observed during May or July 2021 rare plant surveys.
Delta button-celery	<i>Eryngium racemosum</i>	None/SE/1B.1	Riparian scrub (vernally mesic clay depressions)/annual / perennial herb/(May) June-Oct/10-100	Not expected to occur. No vernal mesic clay depressions present. Additionally, this species was not observed during July 2021 rare plant surveys.	Not expected to occur. No suitable riparian scrub or vernal mesic clay depressions present. Additionally, this species was not	Not expected to occur. This species is not known to occur within the region of the site, and the site is outside of the species' known elevation range. There are no vernal mesic

APPENDIX C
SPECIAL-STATUS PLANT SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
					observed during May or July 2021 rare plant surveys.	clay depressions present. Additionally, this species was not observed during May or July 2021 rare plant surveys.
spiny-sepaled button-celery	<i>Eryngium spinosepalum</i>	None/None/1B.2	Valley and foothill grassland, Vernal pools/ annual / perennial herb/Apr-June/ 262-3,195	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during April 2021 rare plant surveys.	Low potential to occur. The site has suitable grassland habitat; however, this species was not observed during March or May 2021 rare plant surveys	Low potential to occur. The site has suitable grassland habitat; however, this species was not observed during March or May 2021 rare plant surveys
diamond-petaled California poppy	<i>Eschscholzia rhombipetala</i>	None/None/1B.1	Valley and foothill grassland (alkaline, clay)/annual herb/Mar-Apr/0-3,195	Low potential to occur. While there is suitable grasslands and soils present, this species was not observed during April 2021 rare plant surveys.	Low potential to occur. While there is suitable grassland present, this species was not observed during March 2021 rare plant surveys.	Low potential to occur. While there is suitable grassland present, this species was not observed during March 2021 rare plant surveys.
San Joaquin spearscale	<i>Extriplex joaquinana</i>	None/None/1B.2	Chenopod scrub, Meadows and seeps, Playas, Valley and foothill grassland; alkaline/annual herb/Apr-Oct/3-2,735	Low potential to occur. Suitable vegetation communities and alkaline soils present. However, this species was not observed during April and July 2021 rare plant surveys.	Low potential to occur. Suitable vegetation communities and alkaline soils present. However, this species was not observed during May or July 2021 rare plant survey.	Low potential to occur. Suitable vegetation communities and alkaline soils present. However, this species was not observed during May or July 2021 rare plant survey.
talus fritillary	<i>Fritillaria falcata</i>	None/None/1B.2	Chaparral, Cismontane woodland, Lower montane coniferous forest; serpentinite, often talus/perennial bulbiferous herb/ Mar-May/984-5,000	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. The site lacks serpentinite soils (Caflora 2021). This species was not observed during April 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. The site lacks serpentinite soils (Caflora 2021). This species was not observed during March or May 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present. The site lacks serpentinite soils (Caflora 2021). This species was not observed during March or May 2021 rare plant surveys.
Diablo helianthella	<i>Helianthella castanea</i>	None/None/1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland, Valley and foothill grassland; Usually rocky, azonal soils. Often in partial shade/perennial herb/ Mar-June/197-4,265	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during April 2021 rare plant surveys.	Low potential to occur. While the site contains suitable grassland habitat, this species was not observed during March or May 2021 rare plant surveys	Low potential to occur. While the site contains suitable grassland habitat, this species was not observed during March or May 2021 rare plant surveys
Brewer's western flax	<i>Hesperolinon breweri</i>	None/None/1B.2	Chaparral, Cismontane woodland, Valley and foothill grassland; usually serpentinite/ annual herb/May-July/98-3,100	Not expected to occur. The site is outside of the species' known elevation range and no serpentinite soils are present on site.	Low potential to occur. The site contains suitable grasslands, but lacks serpentinite soils. Because this species is not restricted to serpentinite soils, there is a still a low potential for it to occur on site. However, this species was not observed during the May or July 2021 rare plant survey.	Low potential to occur. The site contains suitable grasslands, but lacks serpentinite soils. The species is known to occur in the vicinity. Because this species is not restricted to serpentinite soils, there is a still a low potential for it to occur on site. However, this species was not observed during the May or July 2021 surveys.
woolly rose-mallow	<i>Hibiscus lasiocarpus</i> var. <i>occidentalis</i>	None/None/1B.2	Marshes and swamps (freshwater); Often in riprap on sides of levees/ perennial rhizomatous herb (emergent)/ June-Sep/0-395	Observed. Eleven individuals were observed in the Clifton Court Forebay biological resources study area by Dudek in 2021; one individual on the north side of the study area and nine individuals on the southeast side of the study area.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during July 2021 rare plant survey.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during July 2021 rare plant survey.
Loma Prieta hoita	<i>Hoita strobilina</i>	None/None/1B.1	Chaparral, Cismontane woodland, Riparian woodland; usually serpentinite, mesic/ perennial herb/May-July (Aug-Oct)/ 98-2,820	Not expected to occur. The site is outside of the species' known elevation range and this species is not known to occur within the region of the site.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site. Additionally, this species was not observed during May or July 2021 rare plant survey.	Not expected to occur. No suitable vegetation present. Additionally, this species was not observed during May or July 2021 rare plant survey.
Contra Costa goldfields	<i>Lasthenia conjugens</i>	FE/None/1B.1	Cismontane woodland, Playas (alkaline), Valley and foothill grassland, Vernal	Not expected to occur. While there are suitable grasslands and alkaline soils present, there are no	Not expected to occur. While there are suitable grasslands, there are no vernal pools	Not expected to occur. While there are suitable grasslands, there are no vernal pools present.

APPENDIX C
SPECIAL-STATUS PLANT SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
			pools; mesic/annual herb/Mar-June/0-1,540	vernal pools present. The species is not known to occur in the vicinity and was not observed during April 2021 rare plant surveys.	present. The species is not known to occur in the vicinity and was not observed during March 2021 rare plant surveys.	The species is not known to occur in the vicinity and was not observed during March 2021 rare plant surveys.
Delta tule pea	<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	None/None/1B.2	Marshes and swamps (freshwater and brackish)/perennial herb/May-July (Aug-Sep)/0-15	Not expected to occur. There is suitable marsh habitat present on site. However, this species was not observed during July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during May or July 2021 rare plant surveys.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site, and the site is outside of the species' known elevation. Additionally, this species was not observed during May or July 2021 rare plant surveys.
legenere	<i>Legenere limosa</i>	None/None/1B.1	Vernal pools/annual herb/Apr-June/3-2,885	Not expected to occur. There are no vernal pools present and this species is not known to occur within the region. Additionally, this species was not observed during April 2021 rare plant surveys.	Not expected to occur. There are no vernal pools present and this species is not known to occur within the region. This species was not observed during May 2021 rare plant surveys.	Not expected to occur. There are no vernal pools present.
Mt. Hamilton coreopsis	<i>Leptosyne hamiltonii</i>	None/None/1B.2	Cismontane woodland (rocky)/annual herb/Mar-May/1,800-4,265	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. This species was not observed during April 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. Additionally, this species was not observed during March or May 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present. This species was not observed during March or May 2021 rare plant surveys.
Mason's lilaopsis	<i>Lilaeopsis masonii</i>	None/SR/1B.1	Marshes and swamps (brackish or freshwater), Riparian scrub/perennial rhizomatous herb/Apr-Nov/0-35	Observed. A total of 512 individuals were observed on the west side of the Clifton Court Forebay biological resources study area were observed by Dudek in 2021.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during May or July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during May or July 2021 rare plant surveys.
Delta mudwort	<i>Limosella australis</i>	None/None/2B.1	Marshes and swamps (freshwater or brackish), Riparian scrub; Usually mud banks/perennial stoloniferous herb/May-Aug/0-10	Low potential to occur. There is suitable marsh habitat present and the species is known to occur in the vicinity. However, this species was not observed during July 2021 rare plant surveys	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during May or July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species was not observed during May or July 2021 rare plant surveys.
showy golden madia	<i>Madia radiata</i>	None/None/1B.1	Cismontane woodland, Valley and foothill grassland/annual herb/Mar-May/82-3,985	Not expected to occur. The site is outside of the species' known elevation range and this species was not observed during April 2021 rare plant surveys.	Not expected to occur. While there is suitable grassland present, the closest known location is over 11 miles away (CDFW 2021). Additionally, this species was not observed during March or May 2021 rare plant surveys.	Not expected to occur. While there is suitable grassland present, the closest known location is over 11 miles away (CDFW 2021). Additionally, this species was not observed during March or May 2021 rare plant surveys.
Hall's bush-mallow	<i>Malacothamnus hallii</i>	None/None/1B.2	Chaparral, Coastal scrub/perennial evergreen shrub/(Apr)May-Sep(Oct)/33-2,490	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. Additionally, this species was not observed during April 2021 or July 2021 rare plant surveys.	Not expected to occur. There is no suitable vegetation present and this species is not known to occur within the region of the site. Additionally, this species was not observed during May or July 2021 rare plant surveys.	Not expected to occur. No suitable vegetation present. Additionally, this species was not observed during May or July 2021 rare plant surveys.
shining navarretia	<i>Navarretia nigelliformis</i> ssp. <i>radians</i>	None/None/1B.2	Cismontane woodland, Valley and foothill grassland, Vernal pools; Sometimes clay/annual herb/(Mar) Apr-July/213-3,280	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during April or July 2021 rare plant surveys.	Not expected to occur. While there is suitable grassland on site, there are no vernal pools. Additionally, this species was not observed during March, May, or July 2021 rare plant surveys.	Not expected to occur. While there is suitable grasslands on site, there are no vernal pools. Additionally, this species was not observed during March, May, or July 2021 rare plant surveys.
prostrate vernal pool navarretia	<i>Navarretia prostrata</i>	None/None/1B.2	Coastal scrub, Meadows and seeps, Valley and foothill grassland (alkaline), Vernal pools; mesic/annual herb/Apr-July/10-3,965	Not expected to occur. This species is not known to occur within the region of the site and there are no suitable vernal pools on site. Additionally, this	Not expected to occur. There are no suitable vernal pools on site but there is suitable alkaline grasslands on site. However, this	Not expected to occur. There are no suitable vernal pools on site but there is suitable alkaline grasslands on site. However, this species was

APPENDIX C
SPECIAL-STATUS PLANT SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
				species was not observed during April or July 2021 rare plant surveys.	species was not observed during May or July 2021 rare plant surveys.	not observed during May or July 2021 rare plant surveys.
Antioch Dunes evening-primrose	<i>Oenothera deltoides</i> ssp. <i>howellii</i>	FE/SE/1B.1	Inland dunes/perennial herb/Mar-Sep/0-100	Not expected to occur. No suitable vegetation present. This species was not observed during April 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range and there is no suitable vegetation present. Additionally, this species was not observed during March, May, or July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site. Additionally, this species was not observed during the March, May, or July 2021 rare plant surveys.
hairless popcornflower	<i>Plagiobothrys glaber</i>	None/None/1A	Meadows and seeps (alkaline), Marshes and swamps (coastal salt)/annual herb/Mar-May/49-590	Low potential to occur. While there are alkaline soils on site and mesic habitat, this species was not observed during April 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during March or May 2021 rare plant surveys	Not expected to occur. The site is outside of the species' known elevation range. This species was not observed during March or May 2021 rare plant surveys
California alkali grass	<i>Puccinellia simplex</i>	None/None/1B.2	Chenopod scrub, Meadows and seeps, Valley and foothill grassland, Vernal pools; Alkaline, vernal mesic; sinks, flats, and lake margins/annual herb/Mar-May/7-3,050	Low potential to occur. While there is suitable vegetation communities and soils on site, this species was not observed during April 2021 rare plant surveys.	Low potential to occur. While there is suitable habitat present, this species was not observed during March or May 2021 rare plant surveys	Low potential to occur. While there is suitable habitat present, this species was not observed during March or May 2021 rare plant surveys
marsh skullcap	<i>Scutellaria galericulata</i>	None/None/2B.2	Lower montane coniferous forest, Meadows and seeps (mesic), Marshes and swamps/perennial rhizomatous herb/June-Sep/0-6,885	Not expected to occur. This species occurs on wet sites, meadows, streambanks, conifer forest (Jepson Flora Project 2021) and all records of this species are east of the site. Suitable habitat is marginal. Additionally, this species was not observed during July 2021 rare plant surveys.	Not expected to occur. This species occurs on wet sites, meadows, streambanks, conifer forest (Jepson Flora Project 2021) and all records of this species are east of the site. Suitable habitat is marginal. Additionally, this species was not observed during the July 2021 survey.	Low potential to occur. This species occurs on wet sites, meadows, streambanks, conifer forest (Jepson Flora Project 2021) and all records of this species are east of the site. Suitable habitat is marginal. Additionally, this species was not observed during the July 2021 survey.
chaparral ragwort	<i>Senecio aphanactis</i>	None/None/2B.2	Chaparral, Cismontane woodland, Coastal scrub; sometimes alkaline/annual herb/Jan-Apr(May)/49-2,620	Not expected to occur. No suitable vegetation present and the site is outside of the species' known elevation. Additionally, this species was not observed during April 2021 rare plant surveys	Not expected to occur. No suitable vegetation present. Additionally, this species was not observed during the March or May 2021 survey.	Not expected to occur. No suitable vegetation present. This species was not observed during March or May 2021 rare plant surveys.
long-styled sand-spurrey	<i>Spergularia macrotheca</i> var. <i>longistyla</i>	None/None/1B.2	Meadows and seeps, Marshes and swamps; alkaline/perennial herb/Feb-May/0-835	Observed. A total of approximately 30,236 long-styled sand-spurrey individuals were observed within the southern portion of the Clifton Court Forebay biological resources study area by Dudek in 2021.	Low potential to occur. There is suitable habitat and soils present and the species is known to occur within 2 miles of the Dyer Dam study area. However, this species was not observed during March or May 2021 surveys.	Low potential to occur. There is suitable habitat and soils present and the species is known to occur within 2 miles of the Patterson Dam study area. However, this species was not observed during March or May 2021 surveys.
most beautiful jewelflower	<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	None/None/1B.2	Chaparral, Cismontane woodland, Valley and foothill grassland; serpentinite/annual herb/(Mar)Apr-Sep (Oct)/312-3,280	Not expected to occur. The site is outside of the species' known elevation range and this species is not known to occur within the region of the site. The site lacks serpentinite soils (Calflora 2021). This species was not observed during April or July 2021 rare plant surveys.	Not expected to occur. The site is outside of the species' known range and this species was not observed during March or May 2021 rare plant surveys. The site lacks serpentinite soils (Calflora 2021).	Not expected to occur. While there are suitable grasslands site, the site lacks serpentinite soils (Calflora 2021). Additionally, this species was not observed during March or May 2021 rare plant surveys.
Suisun Marsh aster	<i>Symphotrichum lentum</i>	None/None/1B.2	Marshes and swamps (brackish and freshwater)/perennial rhizomatous herb/(Apr)May-Nov/0-10	Observed. One individual was observed within the southeast portion of the Clifton Court Forebay biological resources study area by Dudek in 2021.	Not expected to occur. The site is outside of the species' known elevation range. Additionally, this species would have been observed during May or July 2021 surveys.	Not expected to occur. Although suitable habitat is present on site, this species is not known to occur within the region of the site, and the site is outside of the species' known elevation. Additionally, this species would have been observed during May or July 2021 surveys.

APPENDIX C
SPECIAL-STATUS PLANT SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
saline clover	<i>Trifolium hydrophilum</i>	None/None/1B.2	Marshes and swamps, Valley and foothill grassland (mesic, alkaline), Vernal pools/ annual herb/Apr–June/0–985	Low potential to occur. There are suitable marshes and grasslands on site and alkaline soils but the site lacks vernal pools. This species was not observed during April 2021 rare plant surveys.	Not expected to occur. This species is not known to occur within the region of the site.	Low potential to occur. There are suitable marshes and grasslands on site and alkaline soils but the site lacks vernal pools. This species was not observed during March or May 2021 rare plant surveys.
caper-fruited tropidocarpum	<i>Tropidocarpum capparideum</i>	None/None/1B.1	Valley and foothill grassland (alkaline hills)/annual herb/Mar–Apr/3–1,490	Not expected to occur. There are no alkaline hills on site and this species was not observed during April 2021 rare plant surveys.	Not expected to occur. There are no alkaline hills on site and this species was not observed during March 2021 rare plant surveys.	Not expected to occur. There are no alkaline hills on site and this species was not observed during March 2021 rare plant surveys.
oval-leaved viburnum	<i>Viburnum ellipticum</i>	None/None/2B.3	Chaparral, Cismontane woodland, Lower montane coniferous forest/perennial deciduous shrub/May–June/705–4,590	Not expected to occur. The site is outside of the species' known elevation range, there is no suitable vegetation present, and this species is not known to occur within the region of the site.	Not expected to occur. No suitable vegetation present.	Not expected to occur. There is no suitable vegetation present and this species is not known to occur within the region of the site.

Notes: DWR = California Department of Water Resources; USGS = U.S. Geological Survey.

The Clifton Court Forebay Dam study area is located 10 miles northwest of the City of Tracy in Contra Costa County, and includes the area between Clifton Court Forebay and the surrounding waterways, California Aqueduct, Old River, Italian Slough, and West Canal. This area includes access roads, DWR facilities, developed and disturbed habitat, and a variety of native and non-native vegetation communities.

The Dyer Dam study area is located just east of the City of Livermore in Alameda County, and includes the areas surrounding Dyer Reservoir and the South Bay Aqueduct, including access roads, DWR facilities, disturbed habitat, and a variety of native and non-native vegetation communities.

The Patterson Dam study area is located just east of the City of Livermore in Alameda County, and includes the areas surrounding the Patterson Reservoir and South Bay Aqueduct, including access roads, DWR facilities, disturbed habitat, and a variety of native and non-native vegetation communities.

Region is defined as the USGS 7.5-minute in which the specified dam site is located, and the eight surrounding USGS 7.5-minute quadrangles.

Vicinity is defined as the USGS 7.5-minute in which the specified dam site is located.

Status Legend

Federal

FC: Candidate for federal listing as threatened or endangered

FE: Federally listed as endangered

FT: Federally listed as threatened

State

SCE: Candidate for state listing as endangered

SE: State listed as endangered

ST: State listed as threatened

SR: State listed as rare

CRPR: California Rare Plant Rank

1A: Plants presumed extirpated in California and either rare or extinct elsewhere

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

2A: Plants presumed extirpated in California, but common elsewhere

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

3: Plants about which more information is needed – A Review List

4: Plants of Limited Distribution – A Watch List

Threat Rank

0.1 – Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)

0.2 – Moderately threatened in California (20%–80% occurrences threatened/moderate degree and immediacy of threat)

0.3 – Not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

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Appendix D

Special-Status Wildlife Species' Potential to Occur within the Project Site

APPENDIX D
SPECIAL-STATUS WILDLIFE SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State)	Habitat	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
Invertebrates						
Crotch bumble bee	<i>Bombus crotchii</i>	None/PSE	Open grassland and scrub communities supporting suitable nesting resources within primarily rodent burrows, crevices, and less commonly holes in trees. Less important are floral resources as they rely on many different genera and fly miles to nectar resources. Important nectar resources vary as plants come into and out of bloom. Known to occur from Oregon border to Mexico border generally east of the eastern deserts and highest elevation areas.	Low potential to occur. Key concentrations are from southern Central Valley area. Closest known locations are from early to mid-1900s.	Low potential to occur. Key concentrations are from southern Central Valley area. Closest known locations are from early to mid-1900s.	Low potential to occur. Key concentrations are from southern Central Valley area. Closest known locations are from early to mid-1900s.
western bumble bee	<i>Bombus occidentalis</i>	None/PSE	Open grassland and scrub communities supporting suitable nesting resources within primarily rodent burrows, crevices, and less commonly holes in trees. Less important are floral resources as they rely on many different genera and fly miles to nectar resources. Important nectar resources vary as plants come into and out of bloom. Known to occur throughout the west, but primarily along the Sierra Nevada's and general San Francisco metropolitan area and north coast area.	Low potential to occur. No recent detections, with proximate ones from the mid-1900s.	Low potential to occur. No recent detections, with proximate ones from the mid-1900s.	Low potential to occur. No recent detections, with proximate ones from the mid-1900s.
Conservancy fairy shrimp	<i>Branchinecta conservatio</i>	FE/None	Larger, more turbid vernal pools, playa pools	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. The study area does not contain suitable habitat. Outside the known range of the species.
longhorn fairy shrimp	<i>Branchinecta longiantenna</i>	FE/None	Sandstone outcrop pools, alkaline grassland vernal pools, and pools within alkali sink and alkali scrub communities	Low potential to occur. Suitable habitat present in alkali flats with shallow depressions in southern portion of study area, but the species is extremely rare and has not been observed in the study area vicinity.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
vernal pool fairy shrimp	<i>Branchinecta lynchi</i>	FT/None	Vernal pools, seasonally ponded areas within vernal swales, and ephemeral freshwater habitats	High potential to occur. CNDDB Occurrence No. 631 overlaps the southern portion of the study area where shallow depressions within alkali flat occur and are assumed to support the species.	Moderate potential to occur in study area but not project site. Known to be present nearby.	Not expected to occur. The study area does not contain suitable habitat.
San Bruno elfin butterfly	<i>Callophrys mossii bayensis</i>	FE/None	Coastal chaparral, on steep north-facing slopes, and in fog-belt of the mountains near San Francisco Bay	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. The study area is outside the known range of the species.
valley elderberry longhorn beetle	<i>Desmocerus californicus dimorphus</i>	FT/None	Occurs only in the Central Valley of California, in association with blue elderberry (<i>Sambucus nigra</i> ssp. <i>caerulea</i>)	Not expected to occur. No suitable vegetation present.	Not expected to occur. No suitable vegetation present.	Not expected to occur. No suitable vegetation present.
Bay checkerspot butterfly	<i>Euphydryas editha bayensis</i>	FT/None	Serpentine grassland in Santa Clara and San Mateo Counties. Primary host plant is native plantain (<i>Plantago erecta</i>) with two secondary host plants: purple owl's-clover (<i>Castilleja densiflora</i>) and exserted paintbrush (<i>Castilleja exserta</i>).	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. The study area is outside the known range of the species.

APPENDIX D
SPECIAL-STATUS WILDLIFE SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State)	Habitat	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
vernal pool tadpole shrimp	<i>Lepidurus packardii</i>	FE/None	Ephemeral freshwater habitats including alkaline pools, clay flats, vernal lakes, vernal pools, and vernal swales.	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. No suitable habitat present. The study area is outside the known range of the species.	Not expected to occur. No suitable habitat present. Outside the known range of the species.
Fishes						
green sturgeon (southern DPS)	<i>Acipenser medirostris</i>	FT/SSC	Spawns in deep pools in large, turbulent, freshwater rivers; adults live in oceanic waters, bays, and estuaries	Moderate potential to occur. Migrating individuals could occur in the Old River, West Canal and Intake Channel in late winter and early spring but unlikely to use shallow waters near the embankments. This species does not spawn in the Delta.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
steelhead - Central Valley DPS	<i>Oncorhynchus mykiss irideus</i> pop. 11	FT/None	Spawning in tributaries to the Sacramento River below Keswick Dam. Spawning occurs from December-April in upper watershed streams with cool, well-oxygenated water. Juveniles likely utilize the edges of rivers and sloughs for foraging and rearing as they emigrate, during late winter and early spring (March through June).	Moderate potential to occur. Migrating individuals could occur in the Old River, West Canal and Intake Channel in late winter and early spring but unlikely to use shallow waters near the embankments.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
steelhead - Central California coast DPS	<i>Oncorhynchus mykiss irideus</i> pop. 8	FT/None	Coastal basins from Redwood Creek south to the Gualala River, inclusive; does not include summer-run steelhead	Not expected to occur. The study area is outside the known range of this DPS.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
Chinook salmon [Sacramento winter-run ESU]	<i>Oncorhynchus tshawytscha</i>	FE/SE	Within the Delta, winter-run adults begin to move through the system in early winter (November–December). Juveniles likely utilize the edges of rivers and sloughs for foraging and rearing as they emigrate, during winter and early spring. Spawning occurs primarily from mid-April to mid-August, with peak activity occurring in May and June in the Sacramento River reach between Keswick Dam and the Red Bluff Diversion Dam.	Moderate potential to occur. Migrating individuals could occur in the Old River, West Canal and Intake Channel in late winter and early spring but unlikely to use shallow waters near the embankments.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
Chinook salmon [Central Valley River spring-run ESU]	<i>Oncorhynchus tshawytscha</i>	FT/ST	Remnant, non-sustaining runs in Cottonwood, Battle, Antelope, and Big Chico creeks; sizable, consistent runs of naturally produced fish are found only in Mill and Deer creeks (tributaries to the Sacramento River). The Feather River Fish Hatchery sustains the spring-run population on the Feather River. Juveniles likely utilize the edges of rivers and sloughs for foraging and rearing as they emigrate, during late fall and winter.	Moderate potential to occur. Migrating individuals could occur in the Old River, West Canal and Intake Channel in late winter and early spring but unlikely to use shallow waters near the embankments.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
delta smelt	<i>Hypomesus transpacificus</i>	FT/SE	Sacramento–San Joaquin Delta; seasonally in Suisun Bay, Carquinez Strait, and San Pablo Bay	Moderate potential to occur. Every year some delta smelt seasonally and transiently occupy the Old River in the south Delta. Delta smelt sub-juveniles, juveniles, and adults may also extend as far south as Clifton Court Forebay in some years during different parts of the year. Migrating individuals could occur in the Old	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.

APPENDIX D
SPECIAL-STATUS WILDLIFE SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State)	Habitat	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
				River, West Canal and Intake Channel from December to June but unlikely to use shallow waters near the embankments. This species does not spawn in the south Delta.		
longfin smelt	<i>Spirinchus thaleichthys</i>	FC/ST	San Francisco Estuary and Sacramento/San Joaquin Delta, Humboldt Bay, and estuaries of Eel River and Klamath River. Spawns from November to May (peaking from February to April) in estuarine waters and lower portions of freshwater streams.	Moderate potential to occur. Longfin smelt seasonally and transiently occupy the Old River in the south Delta. Migrating individuals could occur in the Old River, West Canal and Intake Channel from November to May but unlikely to use shallow waters near the embankments. This species does not spawn in the south Delta.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
eulachon	<i>Thaleichthys pacificus</i>	FT/None	Found in Klamath River, Mad River, and Redwood Creek and in small numbers in Smith River and Humboldt Bay tributaries	Low potential to occur. One collected at Skinner Fish Facility on April 27, 1984 (CDFW 2021a) but no recent occurrences in the region. The study area is outside the species' primary distribution from Alaska to northern California.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
Amphibians						
California tiger salamander	<i>Ambystoma californiense</i>	FT/ST, WL	Annual grassland, valley-foothill hardwood, and valley-foothill riparian habitats; vernal pools, other ephemeral pools, and (uncommonly) along stream courses and constructed pools if predatory fishes are absent	Moderate potential to occur. One 1982 CNDDDB occurrence 0.3 miles west of site (CDFW 2021a) isolated from dam embankments where most work would occur but contiguous with potential upland habitat in four southwestern staging areas.	High potential to occur. CNDDDB occurrences within the study area (CDFW 2021a) and suitable habitat present.	High potential to occur. CNDDDB occurrence directly south of study area (CDFW 2021a) and suitable habitat present.
foothill yellow-legged frog	<i>Rana boylei</i>	None/SSC, SE	Rocky streams and rivers with open banks in forest, chaparral, and woodland	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
California red-legged frog	<i>Rana draytonii</i>	FT/SSC	Lowland streams, wetlands, riparian woodlands, livestock ponds; dense, shrubby or emergent vegetation associated with deep, still or slow-moving water; uses adjacent uplands	Moderate potential to occur. Observed in 2009 approximately 2,100 feet southwest of study area (CDFW 2021a), but this area is isolated from the dam embankments where most work would occur. Individuals may occasionally venture into or near westernmost staging area during rain events, but work would occur outside the rainy season. Protocol-level surveys of the drainages and wetlands between the dam and adjacent Sacramento-San Joaquin River Delta levees in the northern portion of the study area in 2013 did not detect any red-legged frogs (DWR, unpubl. data). The study area is located outside designated critical habitat for this species.	High potential to occur. Suitable habitat present and species known to occur in the study area vicinity.	Observed. Detected in the drainage overlapping the western portion of the study area during protocol-level surveys in 2001, 2006, and 2007 (DWR, unpubl. data). Dudek biologists also observed an adult red-legged frog in this area (approximately 130 feet north of low-outlet drainage channel) on January 13, 2021.

APPENDIX D
SPECIAL-STATUS WILDLIFE SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State)	Habitat	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
western spadefoot	<i>Spea hammondi</i>	None/SSC	Primarily grassland and vernal pools, but also in ephemeral wetlands that persist at least 3 weeks in chaparral, coastal scrub, valley-foothill woodlands, pastures, and other agriculture	Moderate potential to occur. Potential seasonal wetland habitat present and the study area is within the known range of the species (CDFW 2021b).	Moderate potential to occur. No vernal pools present, but potential seasonal wetland habitat present and the study area is within the known range of the species (CDFW 2021b).	Moderate potential to occur. No vernal pools present, but potential seasonal wetland habitat present and two CNDDDB occurrences within 2 miles to the southwest (CDFW 2021a)
Reptiles						
western pond turtle	<i>Actinemys marmorata</i>	None/SSC	Slow-moving permanent or intermittent streams, ponds, small lakes, and reservoirs with emergent basking sites; adjacent uplands used for nesting and during winter	Observed. Regularly detected in drainages and basking on dam embankments by DWR biologists (DWR, unpubl. data) and observed by Dudek biologists during 2021 field surveys. Nesting has been documented near the northeastern dam embankment (DWR, unpubl. data) and grasslands in and near the study area also suitable for nesting.	Moderate potential to occur. Suitable habitat present but no recent occurrences in vicinity and not found during August 2020 preconstruction survey for sediment basin maintenance project (DWR 2020; DWR, unpubl. data).	High potential to occur. Suitable habitat present and CNDDDB occurrence less than 2 miles southwest of the site.
northern California legless lizard	<i>Anniella pulchra</i>	None/SSC	Coastal dunes, stabilized dunes, beaches, dry washes, valley-foothill, chaparral, and scrubs; pine, oak, and riparian woodlands; associated with sparse vegetation and sandy or loose, loamy soils	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
California glossy snake	<i>Arizona elegans occidentalis</i>	None/SSC	Grasslands, fields, coastal sage scrub, and chaparral. Prefers open sandy areas with scattered brush. Also found in rocky areas.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
San Joaquin coachwhip	<i>Masticophis flagellum ruddocki</i>	None/SSC	Open, dry, treeless areas including grassland and saltbush scrub	High potential to occur. Suitable habitat present in grassland and saltbush scrub in southern portion of study area.	Low potential to occur. Suitable grassland habitat present but study area on periphery of the known range of the species (CDFW 2021b) and there are no occurrences in the vicinity.	Moderate potential to occur. Suitable grassland habitat present and CNDDDB occurrence located 1.8 miles south-southwest of the site (CDFW 2021a).
Alameda whipsnake	<i>Masticophis lateralis euryxanthus</i>	FT/ST	Open areas in chaparral and scrub habitat; also adjacent grassland, oak savanna, and woodland	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
Blainville's horned lizard	<i>Phrynosoma blainvillii</i>	None/SSC	Open areas of sandy soil in valleys, foothills, and semi-arid mountains including coastal scrub, chaparral, valley-foothill hardwood, conifer, riparian, pine-cypress, juniper, and annual grassland habitats	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
giant gartersnake	<i>Thamnophis gigas</i>	FT/ST	Freshwater marsh habitat and low-gradient streams; also uses canals and irrigation ditches	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.	Not expected to occur. The study area does not contain suitable habitat.
Birds						
golden eagle (nesting and wintering)	<i>Aquila chrysaetos</i>	BCC/FP	Nests and winters in hilly, open/semi-open areas, including shrublands, grasslands, pastures, riparian areas, mountainous canyon land, open desert rimrock terrain; nests in large trees and on cliffs in open areas and forages in open habitats	Not expected to occur (nesting). The study area does not contain suitable nesting habitat. Moderate potential to occur (wintering). Suitable foraging habitat present. Observed flying over study area during 2021 field surveys.	Not expected to occur (nesting). The study area does not contain suitable nesting habitat. High potential to occur (wintering). Suitable foraging habitat present. Observed flying over study area during 2021 field surveys.	Not expected to occur (nesting). The study area does not contain suitable nesting habitat. High potential to occur (wintering). Suitable foraging habitat present.

APPENDIX D
SPECIAL-STATUS WILDLIFE SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State)	Habitat	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
Swainson's hawk (nesting)	<i>Buteo swainsoni</i>	None/ST	Nests in open woodland and savanna, riparian, and in isolated large trees; forages in nearby grasslands and agricultural areas such as wheat and alfalfa fields and pasture	Observed. Observed nesting in eastern portion of study area (outside proposed work area) and study area vicinity by Dudek during 2021 field surveys. Many nearby occurrences along Delta waterways (e.g., Widdows Island, Coney Island) (CDFW 2021a; DWR, unpubl. data).	Not expected to occur. The study area does not contain suitable nesting habitat.	Not expected to occur. The study area does not contain suitable nesting habitat.
northern harrier (nesting)	<i>Circus hudsonius</i>	None/SSC	Nests in open wetlands (marshy meadows, wet lightly-grazed pastures, old fields, freshwater and brackish marshes); also in drier habitats (grassland and grain fields); forages in grassland, scrubs, rangelands, emergent wetlands, and other open habitats	High potential to occur. Pairs observed in suitable nesting habitat by Dudek biologists during 2021 field surveys. Nesting habitat present in portions of the study area with dense ground cover.	High potential to occur. Suitable nesting habitat present in portions of the study area with dense ground cover.	High potential to occur. Pair observed in suitable nesting habitat in western portion of study area by Dudek biologists during 2021 field surveys. Dense ground cover in proposed staging areas in eastern portion of study area also suitable for nesting.
white-tailed kite (nesting)	<i>Elanus leucurus</i>	None/FP	Nests in woodland, riparian, and individual trees near open lands; forages opportunistically in grassland, meadows, scrubs, agriculture, emergent wetland, savanna, and disturbed lands	High potential to occur. Suitable nesting habitat present in study area and vicinity.	Not expected to occur. The study area does not contain suitable nesting habitat. May occasionally forage over the study area.	Not expected to occur. The study area does not contain suitable nesting habitat. May occasionally forage over the study area. This species was observed within the study area by Dudek biologists during 2021 field surveys.
bald eagle (nesting and wintering)	<i>Haliaeetus leucocephalus</i>	FDL, BCC/FP, SE	Nests in forested areas adjacent to large bodies of water, including seacoasts, rivers, swamps, large lakes; winters near large bodies of water in lowlands and mountains	Observed. Observed nesting at northern edge of study area (Widdows Island) during 2021 field surveys.	Not expected to occur. The study area does not contain suitable nesting or wintering habitat.	Not expected to occur. The study area does not contain suitable nesting or wintering habitat. Observed flying just west of the study area by Dudek biologists during 2021 field surveys.
American peregrine falcon (nesting)	<i>Falco peregrinus anatum</i>	FDL, BCC/FP, SDL	Nests on cliffs, buildings, and bridges; forages in wetlands, riparian, meadows, croplands, especially where waterfowl are present	Not expected to occur. The study area does not contain suitable nesting habitat.	Not expected to occur. The study area does not contain suitable nesting habitat.	Not expected to occur. The study area does not contain suitable nesting habitat.
California black rail	<i>Laterallus jamaicensis coturniculus</i>	BCC/FP, ST	Tidal marshes, shallow freshwater margins, wet meadows, and flooded grassy vegetation; suitable habitats are often supplied by canal leakage in Sierra Nevada foothill populations	Low potential to occur. The study area contains a small amount of potentially suitable habitat (Tsao et al. 2015) but it is at the southern periphery of the species' range in the Delta and there are no nearby occurrences.	Not expected to occur. The study area does not contain suitable habitat and is outside of the species' known geographic range.	Not expected to occur. The study area does not contain suitable habitat and is outside of the species' known geographic range.
short-eared owl (nesting)	<i>Asio flammeus</i>	None/SSC	Grassland, prairies, dunes, meadows, irrigated lands, and saline and freshwater emergent wetlands	Low potential to occur. The study area contains suitable nesting habitat but existing disturbance likely precludes nesting.	Low potential to occur. The study area contains suitable nesting habitat but there are no known occurrences in the vicinity and this species is rare in the Bay Area.	Low potential to occur. The study area contains suitable nesting habitat but there are no known occurrences in the vicinity and this species is rare in the Bay Area.
burrowing owl (burrow sites and some wintering sites)	<i>Athene cunicularia</i>	None/SSC	Nests and forages in grassland, open scrub, and agriculture, particularly with ground squirrel burrows	Observed. Multiple breeding season and wintering occurrences in study area (DWR, unpubl. data). Also observed in southern portion of study area by Dudek during 2021 field surveys.	High. CNDDDB occurrence (no. 670) overlaps study area; sign (feathers and pellets) observed by Dudek during 2021 field surveys.	High potential to occur. Suitable burrows present. Sign (feathers; pellet) observed by Dudek during 2021 field surveys.

APPENDIX D
SPECIAL-STATUS WILDLIFE SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State)	Habitat	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
least Bell's vireo (nesting)	<i>Vireo bellii pusillus</i>	FE/SE	Nests and forages in low, dense riparian thickets along water or along dry parts of intermittent streams; forages in riparian and adjacent shrubland late in nesting season	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. The study area is outside the known range of the species.	Not expected to occur. The study area is outside the known range of the species.
loggerhead shrike (nesting)	<i>Lanius ludovicianus</i>	BCC/SSC	Nests and forages in open habitats with scattered shrubs, trees, or other perches.	High potential to occur. The study area contains suitable nesting habitat. Individuals observed by Dudek biologists during 2021 field surveys.	Moderate potential to occur. The study area contains suitable but limited nesting habitat. Individuals observed by Dudek biologists during 2021 field surveys.	Moderate potential to occur. The study area contains suitable but limited nesting habitat.
grasshopper sparrow (nesting)	<i>Ammodramus savannarum</i>	None/SSC	Nests and forages in moderately open grassland with tall forbs or scattered shrubs used for perches.	Not expected to occur. The study area does not contain suitable nesting habitat.	Low potential to occur. The study area contains low-quality nesting habitat.	Low potential to occur. The study area contains low-quality nesting habitat.
song sparrow ("Modesto" population)	<i>Melospiza melodia</i> ("Modesto" population)	None/SSC	Nests and forages in emergent freshwater marsh, riparian forest, vegetated irrigation canals and levees, and newly planted valley oak (<i>Quercus lobata</i>) restoration sites	Observed. Observed during 2021 field surveys; multiple occurrences in study area and vicinity (CDFW 2021a).	Not expected to occur. The study area is outside of the known range of this subspecies	Not expected to occur. The study area is outside of the known range of this subspecies
tricolored blackbird (nesting colony)	<i>Agelaius tricolor</i>	None/SSC, ST	Nests near freshwater, emergent wetland with cattails or tules, but also in Himalayan blackberry; forages in grasslands, woodland, and agriculture	High potential to occur. Suitable nesting habitat present in study area.	High potential to occur. Suitable nesting habitat present in study area.	High potential to occur. Observed in study area vicinity during 2021 field surveys. Suitable nesting habitat present in study area.
saltmarsh common yellowthroat (nesting)	<i>Geothlypis trichas sinuosa</i>	BCC/SSC	Nests and forages in emergent wetlands including woody swamp, brackish marsh, and freshwater marsh	Not expected to occur. The study area is outside the known range of this subspecies.	Not expected to occur. The study area is outside the known range of this subspecies.	Not expected to occur. The study area is outside the known range of this subspecies.
Mammals						
pallid bat	<i>Antrozous pallidus</i>	None/SSC	Grasslands, shrublands, woodlands, forests; most common in open, dry habitats with rocky outcrops, mines, or caves for roosting, but also occasionally roosts in built structures and hollow trees. Social and known to cluster in groups of up to 100's.	High potential to occur (foraging). The study area provides suitable foraging habitat. Low potential to occur (day roosting). The study area does not contain suitable roosting habitat (i.e., mines, rock crevices, or caves). Additionally, this species infrequently day roosts in structures.	High potential to occur (foraging). The study area provides suitable foraging habitat. Low potential to occur (day roosting). The study area does not contain suitable roosting habitat (i.e., mines, rock crevices, or caves). Additionally, this species infrequently day roosts in structures.	High potential to occur (foraging). The study area provides suitable foraging habitat. Low potential to occur (day roosting). The study area does not contain suitable roosting habitat (i.e., mines, rock crevices, or caves). Additionally, this species infrequently day roosts in structures.
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	None/SSC	Mesic habitats characterized by coniferous and deciduous forests and riparian habitat, but also xeric areas; roosts in limestone caves and lava tubes, and occasionally built structures, and tunnels. Since they are extremely sensitive to disturbance, actively used structures are not expected to provide good roosting habitat. While they may roost in the 1,000's they are not typically a clustering species.	Moderate potential to occur (foraging). The study area provides suitable foraging habitat. Low potential to occur (day roosting). The study area does not contain normal roosting habitat and all structures are frequently used so they would likely be unsuitable for roosting purposes.	Moderate potential to occur (foraging). The study area provides suitable foraging habitat. Low potential to occur (day roosting). The study area does not contain normal roosting habitat and all structures are frequently used so they would likely be unsuitable for roosting purposes.	Moderate potential to occur (foraging). The study area provides suitable foraging habitat. Low potential to occur (day roosting). The study area does not contain normal roosting habitat and all structures are frequently used so they would likely be unsuitable for roosting purposes.
western mastiff bat	<i>Eumops perotis californicus</i>	None/SSC	Chaparral, coastal and desert scrub, coniferous and deciduous forest and woodland; roosts in crevices in rocky canyons and cliffs where the canyon or cliff is vertical or nearly vertical, trees, and tunnel.	Not expected to occur. The study area is outside the known range of the species and suitable habitat is not present.	Not expected to occur. The study area is outside the known range of the species and suitable habitat is not present.	Not expected to occur. The study area is outside the known range of the species and suitable habitat is not present.

APPENDIX D
SPECIAL-STATUS WILDLIFE SPECIES' POTENTIAL TO OCCUR WITHIN THE PROJECT SITE

Common Name	Scientific Name	Status (Federal/State)	Habitat	Potential to Occur: Clifton Court Forebay Dam	Potential to Occur: Dyer Dam	Potential to Occur: Patterson Dam
western red bat	<i>Lasiurus blossevillii</i>	None/SSC	Forest, woodland, riparian, mesquite bosque, and orchards, including fig, apricot, peach, pear, almond, walnut, and orange; roosts in tree canopy. A solitary rooster.	Moderate potential to occur. The study area contains suitable but limited tree foliage roosting habitat.	Not expected to occur. The study area does not contain suitable roosting habitat.	Not expected to occur. The study area does not contain suitable roosting habitat.
San Francisco dusky-footed woodrat	<i>Neotoma fuscipes annectens</i>	None/SSC	Forest habitats with a moderate canopy and moderate to dense understory	Not expected to occur. The study area is outside of the known range of this subspecies.	Not expected to occur. The study area is outside the known range of this subspecies.	Not expected to occur. The study area is outside the known range of this subspecies.
riparian brush rabbit	<i>Sylvilagus bachmani riparius</i>	FE/SE	Dense thickets of wild rose, willows, and blackberries growing along the banks of San Joaquin and Stanislaus Rivers	Not expected to occur. The study area is outside the known range of this species. Closest CNDDDB occurrence is more than 8 miles to the east.	Not expected to occur. The study area is outside the known range of this species. Closest CNDDDB is more than 10 miles to the east.	Not expected to occur. The study area is outside the known range of this species. Closest CNDDDB is more than 10 miles to the east.
American badger	<i>Taxidea taxus</i>	None/SSC	Dry, open, treeless areas; grasslands, coastal scrub, agriculture, and pastures, especially with friable soils	Observed. Suitable habitat present and known occurrences from the vicinity. Sign of American badger were observed in various locations within the study area (e.g., potential burrows and burrows with bones) by Dudek biologists during the 2021 field surveys.	High potential to occur. Suitable habitat present and known occurrences from the vicinity.	High potential to occur. Several burrows of appropriate dimensions for badger observed by Dudek biologists during 2021 field surveys, An American badger skull and carcass was found along the northern portion of the study area by Dudek biologists during the 2021 field surveys.
San Joaquin kit fox	<i>Vulpes macrotis mutica</i>	FE/ST	Grasslands and scrublands, including those that have been modified; oak woodland, alkali sink scrubland, vernal pool, and alkali meadow	Moderate potential to occur. Smattering of CNDDDB occurrences in the study area vicinity and the study area is at the northern edge of the range.	Moderate potential to occur. Smattering of CNDDDB occurrences in the study area vicinity and the study area is at the northern edge of the range.	Moderate potential to occur. Smattering of CNDDDB occurrences in the study area vicinity and the study area is at the northern edge of the range.

Notes: CNDDDB = California Natural Diversity Database; USFWS = U.S. Fish and Wildlife Service; CDFW = California Department of Fish and Wildlife.

The Clifton Court Forebay Dam study area is located 10 miles northwest of the City of Tracy in Contra Costa County, and includes the area between Clifton Court Forebay and the surrounding waterways, California Aqueduct, Old River, Italian Slough, and West Canal. This area includes access roads, DWR facilities, developed and disturbed habitat, and a variety of native and non-native vegetation communities.

The Dyer Dam study area is located just east of the City of Livermore in Alameda County, and includes the areas surrounding Dyer Reservoir and the South Bay Aqueduct, including access roads, DWR facilities, disturbed habitat, and a variety of native and non-native vegetation communities.

The Patterson Dam study area is located just east of the City of Livermore in Alameda County, and includes the areas surrounding the Patterson Reservoir and South Bay Aqueduct, including access roads, DWR facilities, disturbed habitat, and a variety of native and non-native vegetation communities.

Status Legend

Federal

BCC: USFWS—Birds of Conservation Concern

FC: Candidate for federal listing as threatened or endangered

FD: Federally delisted; monitored for 5 years

FE: Federally listed as endangered

FT: Federally listed as threatened

FPE: Federally proposed for listing as endangered

FPT: Federally proposed for listing as threatened

FPD: Federally proposed for delisting

State

FP: CDFW Fully Protected species

SE: State listed as endangered

ST: State listed as threatened

SCE: State candidate for listing as endangered

SCT: State candidate for listing as threatened

SCD: State candidate for delisting

SSC: California Species of Special Concern

WL: CDFW Watch List species

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Appendix C1

Archaeological Resources Inventory Report Clifton Court Forebay (Confidential)

Please contact Sara Paiva-Lowry (Sara.Paiva-Lowry@water.ca.gov) at DWR for additional information.

Appendix C2

Archaeological Resources Inventory Report Dyer Reservoir and Dam and Patterson Reservoir and Dam (Confidential)

Please contact Sara Paiva-Lowry (Sara.Paiva-Lowry@water.ca.gov) at DWR for additional information.

Appendix D1

Built Environment Inventory and Evaluation Report
Clifton Court Forebay

DRAFT

**Built Environment Inventory and Evaluation Report for the
Delta Dams Rodent Burrow Remediation Project at
Clifton Court Forebay
Contra Costa County, California**

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OCTOBER 2021

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Acronyms and Abbreviations

Acronym	Definition
APE	area of potential effect
CCalC	Central California Information Center
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CRHR	California Register of Historic Resources
CVP	Central Valley Project
Delta	Sacramento–San Joaquin River Delta
DWR	California Department of Water Resources
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
Project	Delta Dams Rodent Burrow Remediation Project
Reclamation	Bureau of Reclamation
SHPO	State Historic Preservation Officer
SWP	California State Water Project

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1 Executive Summary

This built environment inventory and evaluation report documents historical resources inventory efforts conducted by Dudek for the Delta Dams Rodent Burrow Remediation Project (Project) at Clifton Court Forebay located in the southwestern portion of Contra Costa County. The purpose of the Project is to address and remediate burrow holes in the earthen embankments of the reservoir. Proposed improvements also include removal of trees, and repairs to the intake channel for Clifton Court Forebay. The Project Area of Potential Effect (APE) falls within Public Lands Survey System Sections 13, 24, and 25 of Township 1 South, Range 3 East, and Sections 7, 8, 17, 18, 19, 20, and 30 of Township 1 South, Range 4 East, Mount Diablo Baseline Meridian, of the Clifton Court Forebay U.S. Geological Survey 7.5-minute quadrangle. This built environment inventory and evaluation report was conducted in compliance with the California Environmental Quality Act and National Historic Preservation Act Section 106.

A records search of the Project site and surrounding 1 mile was completed by Northwest Information Center and Central California Information Center staff on November 30, 2020, and December 23, 2020. Dudek conducted an intensive, pedestrian-level cultural survey of the APE on January 13, 2021. One resource, Clifton Court Forebay (recorded in both P-07-003122 and P-07-004698), constructed between 1967 and 1969, was identified within the APE. Both records indicated that Clifton Court Forebay is eligible under National Register of Historic Places/California Register of Historical Resources Criteria A/1 and C/3, retains the requisite integrity to convey its significance, and is a contributing component to the California Aqueduct (1960–1974) and the California State Water Project (1959–1974).

This report includes a summary of the results of the California Historical Resources Information System record search, archival research efforts, historical context development, survey inventory, and previous findings and provides an analysis and discussion of potential adverse effects. This report concludes that Clifton Court Forebay is considered an individually eligible historic property under Section 106 of the National Historic Preservation Act and a historical resource under the California Environmental Quality Act. Preparation of a detailed effects assessment indicates that the proposed Project would have a less-than-significant impact on historical resources under the California Environmental Quality Act and no adverse effect on historic properties in the APE under Section 106.

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2 Introduction

2.1 Project Description and Location

Clifton Court Forebay is located in southeast Contra Costa County, on the west side of California’s Central Valley at the southwestern edge of the Sacramento–San Joaquin River Delta (Delta), approximately 10 miles northwest of the City of Tracy and adjacent to Byron Road. The Project site lies in the Clifton Court Forebay U.S. Geological Survey 7.5-minute quadrangles, which fall on Public Lands Survey System Sections 13, 24, and 25 of Township 1 South, Range 3 East, and Sections 7, 8, 17, 18, 19, 20, and 30 of Township 1 South, Range 4 East, Mount Diablo Baseline Meridian (Figure 1, Project Location – Clifton Court Forebay, all figures are provided at the end of the report). The forebay is surrounded on the northwest, north, and east sides by the Italian Slough, the Old River, and the West Canal. Water from the Delta enters the forebay through a gated intake control structure at the southeast end of the reservoir. This structure connects the forebay to the West Canal. Other related California State Water Project (SWP) nearby features include the California Aqueduct intake channel, located along the southwest side of the forebay reservoir, the Delta Fish Protective Facility (Skinner Fish Facility), and a control gate structure.

2.1.1 Project Description

The California Department of Water Resources (DWR) Delta Dams Rodent Burrow Remediation Project (Project) would involve rodent burrow remediation (burrow collapse, excavation, compaction, and backfilling), erosion prevention measures, restoration measures, ongoing monitoring, and permanent measures to prevent future burrowing where warranted. These measures are described in DWR’s proposed Rodent Burrow Maintenance and Monitoring Plan. Initial remediation actions would be taken in 2021 and 2022. Ongoing monitoring would continue in future years, and additional remediation and restoration measures may be warranted.

Clifton Court Forebay is located 10 miles northwest of the City of Tracy in Contra Costa County. Clifton Court Forebay Dam is an earthen dam that is subject to rodent burrowing that leads to piping and internal erosion. A burrow that intercepts the phreatic surface (water level) within the dam can cause erodible material from the dam embankment to migrate and be carried away. This “piping” action progresses upstream, elongating the pipe, until it reaches the reservoir. Once connection is made to the reservoir, the piping can cause a catastrophic breaching of the dam, ultimately leading to dam failure.

Burrowing activity has been identified at locations in all portions of the approximately 8-mile-long Clifton Court Forebay Dam. The most extensive burrowing—and therefore the most severe damage—occurs mostly along three segments (in the northwest corner, along the central portion of the western side, and along central and eastern portions of the southern side), while less widespread individual burrow holes and burrow clusters occur throughout all reaches of the dam. Burrow remediation activities are expected to affect a total of 37.5 acres of the downstream face of Clifton Court Forebay Dam. Rodent burrow remediation work to restore the dam embankments and complete burrow prevention measures would take place over 1 to 2 years. After construction, any materials not used or reused in the Project would be hauled off site and reused, disposed of in a landfill, or recycled at a recycling facility. Construction would include clearing and grubbing of trees and shrubs, including any stumps. Cleared and grubbed vegetation would be removed from the site and disposed of at an approved location. Construction would occur continuously during daylight hours between May and October in each year that construction takes place, with no work occurring for 24 hours following a rain event.

Where shallow ruts and near-surface deformations occur, DWR would fill and compact these areas with native soil of similar type to that of the downstream dam embankment slope. This would require use of lightweight and heavy construction equipment such as skid-steer, dozer, backhoe, skip-loader, soil compactor, excavator, and water truck. Fill material would be delivered to the site from a stockpile location using dump trucks or light-duty trucks. No export of soil is anticipated for excavation and recompaction of the dam face, but some limited import may be needed while armoring the dam. Rock, bedding material, mesh, or other suitable materials required for armoring would be imported to the site via the existing or proposed construction access roads and staged in staging areas or access roads.

Clifton Court Forebay Dam has a seepage collection system consisting of perimeter drainage channels and several collection sumps. The drainage channels capture seepage water and convey it into the sumps, which continuously pump water back into the forebay. Sump No. 4 is located at the northwest end of the dam and several large trees within its footprint are proposed to be removed in the fall of 2021 to prevent leaves and limbs from obstructing the intake pump screens.

DWR has identified a high-priority repair area at the Clifton Court Forebay intake channel to restore the slope and install permanent improvement measures to prevent animal burrowing. The repairs include excavation, grouting, backfill, and recompaction; installation of PVC-coated steel wire mesh and bedding material; and placement of armoring rock. This work would occur on the downstream slope (channel side) from the downstream crest (at approximately 16.5 feet above mean sea level) to an elevation of 4 feet, and be performed during low tide conditions to avoid working directly within waters. Clearing and grubbing would occur on the downstream slope to remove debris, vegetation, and existing riprap remains from original construction of the dam. Restoration of the dam intake channel slope would require excavating to a depth of approximately 2 feet. After excavation has exposed subgrade, any holes or cavities that remain would be grouted as needed. Grouting is expected to be performed on a limited basis and as determined by the field engineer. Once grouting is complete, the excavated areas would be backfilled and recompacted in lifts, back to the original design slope. The embankment slope would be backfilled with a combination of impervious native soil, cementitious-soil slurry, or similar embankment material. It is anticipated that any excavation and recompaction of the dam's face would result in minor import or export of materials. Following the recompaction effort, a layer of bedding material (6 inches thick) and wire mesh would be placed over the restored embankment slope. The bedding material and PVC-coated steel wire mesh would be placed on the entire remediation area. An 18-inch-thick layer of large armoring rock would be placed over the bedding material and PVC wire mesh to deter future animal burrowing and prevent erosion within the intake channel slope due to wave action.

2.1.2 Project Location, Access, and Staging

Clifton Court Forebay is located in Contra Costa County, California. The primary access to the dam is via Byron Highway to Clifton Court Road, and a secondary access is provided from Byron Highway via the Skinner Fish Facility entrance. The primary access point provides access to the west, north, and east dam segments. Typical access to the south dam segment is also from Clifton Court Road, but this access point is subject to traffic load restrictions because it passes over the intake control structure bridge. Thus, the additional access point through the Skinner Fish Facility entrance would provide access to the southern dam embankment and intake channel for heavy haul trucks or construction equipment. Clifton Court Forebay Dam is approximately 8 miles long, impounds 28,653 acre-feet, and serves as the intake point and northernmost terminus of the California Aqueduct. The dam embankment has a maximum height of 30 feet and a crest width of 20 feet. The overall crest length of the dam is 36,500 feet (6.9 miles).

DWR has identified 11 staging areas around the perimeter of the dam totaling approximately 10.4 acres. Staging areas would be used to stockpile material needed to implement the burrow remediation, including filling of ruts and deformations. The materials would include rock, bedding material, wire mesh, or other materials required for armoring and/or backfilling the burrow holes.

In addition to the access provided by the dam's paved crest roadway, existing maintenance roads may be used along the dam toe. An additional maximum of 10.6 acres of permanent toe access roads may be necessary for construction and long-term operations and maintenance. It is anticipated that any excavation and recompaction of the dam's face will require import. Rock, bedding material, wire mesh, or other materials required for armoring and/or backfilling the burrow holes, will be imported to the site via the existing crest and maintenance access roads. Placement of materials will be achieved from the dam crest and toe.

2.1.3 Construction Equipment

The following construction equipment would be used to implement the proposed dam remediation efforts:

- concrete truck
- skid-steer
- scraper
- grader
- dozer
- backhoe
- mobile grout mixing plant
- concrete pump truck
- skip-loader
- soil compactor
- excavator
- dump truck
- water truck

2.2 Regulatory Setting

This study was completed in compliance with federal cultural resources laws and regulations, including Section 106 of the National Historic Preservation Act (NHPA). Under Section 106, historic and archaeological districts, sites, buildings, structures, and objects are assigned significance based on their exceptional value or quality in illustrating or interpreting history, architecture, archaeology, engineering, and culture. The sections below provide the critical federal and state regulatory framework by which historic properties and historic resources are identified and evaluated, as well as the rubric by which adverse effects under NHPA Section 106 and significant impacts under the California Environmental Quality Act (CEQA) are evaluated.

2.2.1 Federal

National Historic Preservation Act of 1966

The NHPA established the National Register of Historic Places (NRHP) and the President's Advisory Council on Historic Preservation, and provided that states may establish State Historic Preservation Officers (SHPOs) to carry out some of the functions of the NHPA. Most significantly for federal agencies responsible for managing cultural resources, Section 106 of the NHPA directs that

[t]he head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP.

Section 106 also affords the President's Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking (16 U.S. Code 470[f]).

The content of Title 36 of the Code of Federal Regulations, Part 800, implements Section 106 of the NHPA. It defines the steps necessary to identify historic properties (those cultural resources listed in or eligible for listing in the NRHP), including consultation with federally recognized Native American tribes to identify resources with important cultural values; to determine whether or not they may be adversely affected by a proposed undertaking; and to outline the process for eliminating, reducing, or mitigating the adverse effects.

The President's Advisory Council on Historic Preservation provides methodological and conceptual guidance for identifying historic properties. In Title 36 of the Code of Federal Regulations, Part 800.4, the steps necessary for identifying historic properties are as follows:

- Determine and document the area of potential effect (APE) (36 CFR [Code of Federal Regulations] 800.16[d]).
- Review existing information on historic properties within the APE, including preliminary data.
- Confer with consulting parties to obtain additional information on historic properties or concerns about effects to these.
- Consult with Native American tribes (36 CFR 800.3[f]) to obtain knowledge on resources that are identified with places where they attach cultural or religious significance.
- Perform appropriate fieldwork (including phased identification and evaluation).
- Apply NRHP criteria to determine resource eligibility for NRHP listing.

Fulfilling these steps is generally thought to constitute a reasonable effort to identify historic properties within the APE for an undertaking. The obligations of a federal agency must also assess whether an undertaking will have an adverse effect on cultural resources. An undertaking will have an adverse effect when:

an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative (36 CFR Part 800.5[1]).

The process of determining whether an undertaking may have an adverse effect requires the federal agency to confer with consulting parties to appropriately consider all relevant stakeholder concerns and values. Consultation regarding the treatment of a historic property may result in a Programmatic Agreement and/or Memorandum of

Agreement between consulting parties that typically include the lead federal agency, SHPO, and other applicable parties if they agree to be signatories to these documents. Treatment documents—whether resource-specific or generalized—provide guidance for resolving potential or realized adverse effects to known historic properties or to those that may be discovered during implementation of an undertaking. In all cases, avoidance of adverse effects to historic properties is the preferred treatment measure, and it is generally the burden of the federal agency to demonstrate why avoidance may not be feasible.

National Register of Historic Places

The resources identified within the APE have been previously evaluated in consideration of NRHP designation criteria.

NRHP guidelines for the evaluation of historic significance were developed to be flexible and to recognize the accomplishments of all who have made significant contributions to the nation's history and heritage. Its criteria are designed to guide state and local governments, federal agencies, and others in evaluating potential entries in the NRHP. For a property to be listed in or determined eligible for listing, it must be demonstrated to possess integrity and to meet at least one of the following criteria:

- A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. That are associated with the lives of persons significant in our past; or
- C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. That have yielded, or may be likely to yield, information important in prehistory or history.

Integrity is defined in NRHP guidance, "How to Apply the National Register Criteria," as "the ability of a property to convey its significance. To be listed in the NRHP, a property must not only be shown to be significant under the NRHP criteria, but it also must have integrity" (Andrus and Shrimpton 2002). NRHP guidance further asserts that properties be completed at least 50 years ago to be considered for eligibility. Properties completed fewer than 50 years before evaluation must be proven to be "exceptionally important" (criteria consideration) to be considered for listing.

2.2.2 State

California Environmental Quality Act

As described further below, the following CEQA statutes and State of California CEQA Guidelines (CEQA Guidelines) are of relevance to the analysis of archaeological, historic, and tribal cultural resources:

- California Public Resources Code Section 21084.1 and CEQA Guidelines Section 15064.5(a) define "historical resources." In addition, CEQA Guidelines Section 15064.5(b) defines the phrase "substantial adverse change in the significance of an historical resource." It also defines the circumstances when a project would materially impair the significance of an historical resource.
- California Public Resources Code Sections 21083.2(b)-(c) and CEQA Guidelines Section 15126.4 provide information regarding the mitigation framework for archaeological and historic resources, including examples of preservation-in-place mitigation measures; preservation-in-place is the preferred manner of mitigating impacts to significant archaeological sites because it maintains the relationship between artifacts and the archaeological context and may also help avoid conflict with religious or cultural values of groups associated with the archaeological site(s).

More specifically, under CEQA, a project may have a significant effect on the environment if it may cause “a substantial adverse change in the significance of an historical resource” (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5[b]). If a site is either listed or eligible for listing in the CRHR, or if it is included in a local register of historic resources or identified as significant in a historical resources survey (meeting the requirements of California Public Resources Code, Section 5024.1[q]), it is a historical resource and is presumed to be historically or culturally significant for purposes of CEQA (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5[a]). The lead agency is not precluded from determining that a resource is a historical resource even if it does not fall within this presumption (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5[a]).

A “substantial adverse change in the significance of an historical resource” reflecting a significant effect under CEQA means “physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired” (CEQA Guidelines Section 15064.5[b][1]; California Public Resources Code Section 5020.1[q]). In turn, CEQA Guidelines Section 15064.5(b)(2) states the significance of an historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or
2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
3. Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

Pursuant to these sections, the CEQA inquiry begins with evaluating whether a project site contains any “historical resources,” then evaluates whether that project will cause a substantial adverse change in the significance of a historical resource such that the resource’s historical significance is materially impaired.

California Register of Historical Resources

In California, the term “historical resource” includes but is not limited to “any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California” (California Public Resources Code Section 5020.1[j]). In 1992, the California legislature established the California Register of Historic Resources (CRHR) “to be used by state and local agencies, private groups, and citizens to identify the state’s historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change” (California Public Resources Code Section 5024.1[a]). The criteria for listing resources on the CRHR were expressly developed to be in accordance with previously established criteria developed for listing in the NRHP, enumerated below. According to California Public Resources Code Section

5024.1(c)(1-4), a resource is considered historically significant if it (i) retains “substantial integrity,” and (ii) meets at least one of the following criteria:

- 1 Is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage.
- 2 Is associated with the lives of persons important in our past.
- 3 Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
- 4 Has yielded, or may be likely to yield, information important in prehistory or history.

In order to understand the historic importance of a resource, sufficient time must have passed to obtain a scholarly perspective on the events or individuals associated with the resource. A resource less than 50 years old may be considered for listing in the CRHR if it can be demonstrated that sufficient time has passed to understand its historical importance (see 14 CCR 4852[d][2]). The criteria for the CRHR are nearly identical to those for the NRHP, and properties listed or formally designated as eligible for listing in the NRHP are automatically listed in the CRHR, as are the state landmarks and points of interest. The CRHR also includes properties designated under local ordinances or identified through local historical resource surveys.

2.3 Area of Potential Effect

The APE is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties. Determination of the APE is influenced by a project’s setting, the scale and nature of the undertaking, and the different kinds of effects that may result from the undertaking (36 CFR 800.16[d]).

The built environment APE for the Project is shown in Figure 3, Clifton Court Forebay – Cultural Resources, Built Environment – Area of Potential Effects. The APE for this Project follows the maximum possible area of potential impacts resulting from the proposed Project (see Figure 2), including all construction, repairs, easements, and staging areas located in the Project area. Based on the construction proposed for this Project, the APE encompasses the extent of the one historic-era built environment structure located in the Project area of direct impact: Clifton Court Forebay. Clifton Court Forebay has been previously recorded and is over 45 years old. It is discussed in detail in this report.

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3 Research and Field Methods

3.1 Literature Review

In preparation of the historical context, significance evaluation, integrity discussion, and application of criteria of adverse effect sections of this report, Dudek first conducted extensive archival research on the Project area, DWR, and the SWP. These research efforts are summarized below.

3.1.1 California Historical Resources Information System Record Search

A records search of the APE, including a 1-mile buffer was completed by Central California Information Center (CcaIC) and Northwest Information Center (NWIC) staff on November 30, 2020, and December 23, 2020. While the APE lies entirely within Contra Costa County, the 1-mile buffer falls partially into San Joaquin County, necessitating a search at both the NWIC and the CcaIC. These searches included their collections of mapped prehistoric, historical, and built-environment resources; California Department of Parks and Recreation Site Records; technical reports; archival resources; and ethnographic references. Additional consulted sources included the NRHP, California Inventory of Historical Resources/CRHR and listed Office of Historic Preservation Archaeological Determinations of Eligibility, California Points of Historical Interest, California Historical Landmarks, and California Department of Transportation Bridge Survey information. A complete overview of the Dudek record search can be found in the Archaeological Resources Inventory Report for the Delta Dams Safety of Dams Project: Clifton Court Forebay, Contra Costa County, California, prepared by Dudek for DWR (Giacinto et al. 2021).

Previously Conducted Cultural Resources Studies

CcaIC and NWIC records indicate that 83 previous cultural resources technical investigations have been conducted within 1 mile of the Project site. Of these, 16 studies intersect the current Clifton Court Forebay Project site (Table 1).

Table 1. Clifton Court Forebay – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
<i>Previous Technical Studies Intersecting the Project Site</i>			
S-008942	J. T. Ruckle	1974	Archeology of the California State Water Project
S-010040	Allan Bramlette, Mary Praetzellis, Adrian Praetzellis, and David A. Fredrickson	1988	Archaeological and Historical Resources Within the Los Vaqueros/Kellogg Study Area, Contra Costa and Alameda Counties, California
S-010040a	Allan G. Bramlette, Mary Praetzellis, Adrian Praetzellis, Katherine M. Dowdall, Patrick Brunmeier, and David A. Fredrickson	1991	Archaeological Resources Inventory for Los Vaqueros Water Conveyance Alignments, Contra Costa County, California
S-011826	Dorothea J. Theodoratus, Mary Pyle Peters, Clinton	1980	Montezuma I and II Cultural Resources

Table 1. Clifton Court Forebay – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
	M. Blount, Pamela J. McGuire, Richard D. Ambro, Michael Crist, Billy J. Peck, and Myrna Saxe		
S-016419	G. James West	1994	A Class III Archaeological Survey of the South Delta Water Management Program Area, San Joaquin and Contra Costa Counties, California
S-035187	Tiffany A. Schmid	2008	Archaeological Survey Report, Clifton Court Forebay Delta Maintenance Project
S-038654	Rebecca H. Gilbert	2012	Department of Water Resources, Archaeological Survey Report, Clifton Court Forebay Pump, Sump and Seep Maintenance Project
S-038655	Rebecca Gilbert and Tiffany Schmid	2012	Department of Water Resources, Archaeological Survey Report, Clifton Court Forebay Beaver Den Repair Project
S-038656	Rebecca H. Gilbert and Tiffany A. Schmid	2012	Department of Water Resources, Archaeological Survey Report, Clifton Court Forebay Seepage Monitoring Station Repair Project
S-046747	Monica Nolte	2015	Confidential, Department of Water Resources, Cultural Resources Technical Report, Geotechnical Drilling near Clifton Court Forebay, Contra Costa County, California
S-046748	Rebecca H. Gilbert	2012	Cultural Resources Inventory, Evaluation and Finding of Effect Report for the Clifton Court Forebay Fishing Facility Project, Contra Costa County, California
S-046748a	Rebecca H. Gilbert	2012	Department of Water Resources Archaeological Survey Report Clifton Court Forebay Pump, Sump, and Seep Maintenance Project
S-046748b	AECOM	2013	Updated Cultural Resources Inventory, Evaluation and Finding of Effect Report for the Clifton Court Forebay Fishing Facility Project, Contra Costa County, California
S-046748c	William Guthrie	2012	COE_2012_1129_001: Determination of Eligibility and Effect that Issuing a Permit (Undertaking) would have on Cultural Resources within the Area of Potential Effects (APE) for the Clifton Court Forebay Fishing Facility Project
S-046749	Meg Scantlebury	2013	Addendum 1 to the Built Historical Resources Evaluation Report for the Bay Delta Conservation Plan Project, Sacramento, Yolo, Solano, San Joaquin, Contra Costa, and Alameda Counties, California
SJ-02391	West, J. G.	1994	A Class III Archaeological Survey of the South Delta Water Management Program Area, San Joaquin and Contra Costa Counties, California.
Previous Technical Studies within 1 Mile of the Project Site			
S-006113	U.S. Bureau of Reclamation, Mid-Pacific Region, Office of Environmental Quality	1983	Class II Archaeological Survey, San Luis Drain and Alternatives, Central Valley Project, San Luis Unit, California, 1983

Table 1. Clifton Court Forebay – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
S-010508	G. James West	1982	Class II Archaeological Survey, Kellogg Unit Reformulation, Contra Costa County, California
S-011849	G. James West and Barry G. Scott	1990	A Class II Archaeological Survey of the South Delta Water Management Program Area, San Joaquin and Contra Costa Counties, California
S-012275	Melinda Romano	1990	Archaeological Survey and Cultural Resources Inventory, Brentwood Alternative, California, PGT-PG&E Pipeline Expansion Project
S-012800	Allan Bramlette, Mary Praetzellis, Adrian Praetzellis, Margaret Purser, and David A. Fredrickson	1990	Archaeological and Historical Resources Inventory for the Vasco Road and Utility Relocation Project, Contra Costa and Alameda Counties
S-016210	Paul Bouey	1992	Test excavations at PEP 11-24 (letter report)
S-017993	Brian Hatoff, Barb Voss, Sharon Waechter, Stephen Wee, and Vance Bente	1995	Cultural Resources Inventory Report for the Proposed Mojave Northward Expansion Project
S-017993a	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix A - Native American Consultation
S-017993b	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix B - Looping Segments - Class 1
S-017993c	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix C - Monitoring and Emergency Discovery Plan
S-017993d	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix D - General Construction Information
S-017993e	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix E - Archaeological Site Records
S-017993f	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix F - Historic Features Evaluation Forms
S-017993g	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix G - Railroad Crossing Evaluation Forms
S-017993h	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix H - Crossing Diagrams and Plan View Maps
S-017993i	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix I - Railroad Depot NRHP Nomination Forms and Related Records
S-017993j	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix J - Looping Segment and Compressor Station Site Records
S-017993k	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix K - Historic Site Records / Isolate Forms
S-017993l	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix L - Photo-documentation
S-017993m	Woodward-Clyde Consultants	1995	Proposed Mojave Northward Expansion Project: Appendix M - Curricula Vitae of Key Preparers

Table 1. Clifton Court Forebay – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
S-018762	Allen G. Pastron	1989	Cultural Resources Evaluation of the Proposed Mountain House Planned Community, Alameda and San Joaquin Counties, California
S-023674	Michael J. Moratto, Richard M. Pettigrew, Barry A. Price, Lester A. Ross, Randall F. Schalk, Rick Atwell, Andrew Bailey, Gary Bowyer, Robert U. Bryson, Tim Canaday, Dianne Gardner, William Hildebrandt, Kurt T. Katsura, Clayton G. Lebow, Pat Mikkelsen, Scott Mumma, Lynda Sekora, Nancy D. Sharp, Craig Skinner, Lou Ann Speulda, Sharon Waechter, and Judith A. Willig	1994	Archaeological Investigations, PGT-PG&E Pipeline Expansion Project, Idaho, Washington, Oregon, and California: Volume 1 Project Overview, Research Design and Archaeological Inventory
S-023674a	William R. Hildebrandt, Patricia J. Mikkelsen, Amy G. Gilreath, Sharon A. Waechter, John E. Berg, Paul D. Bouey, C. Kristina Roper, Randall T. Milliken, Ricky G. Atwell, Andrew J. Bailey, Kelly McGuire, Clayton G. Lebow, Kurt T. Katsura, and Jill Onken	1995	Volume IIC, Book 1 and 2 Summary Reports: Prehistoric Sites, California
S-023674b	Gary C. Bowyer, Lou Ann Speulda, Lynda J. Sekora, Lester A. Ross, Andrew J. Bailey, David Conca, Fred Crisson, David De Vries, Charles M. Hodges, Michael Ostrogorsky, Nancy Renk, and David G. Weatherby	1995	Volume III, Summary Reports: Historic Sites, Archaeological Investigations, PGT- PG&E Pipeline Expansion Project, Idaho, Washington, Oregon, and California

Table 1. Clifton Court Forebay – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
S-023674c	Ricky G. Atwell, William R. Hildebrant, Clayton G. Lebow, Patricia Mikkelsen, Michael J. Moratto, Richard M. Pettigrew, Lester A. Ross, Randall F. Schalk, Lynda J. Sekora, Lou Ann Speulda, Gary C. Bowyer, Charles M. Hodges, Deborah Jones, Michael Ostrogorsky, and Nancy D. Sharp	1995	Volume IV, Synthesis of Findings: Archaeological Investigations, PGT- PG&E Pipeline Expansion Project, Idaho, Washington, Oregon, and California
S-023674d	Robert U. Bryson, Craig E. Skinner, Richard M. Pettigrew, Kenneth R. Bethard, Gary C. Bowyer, Catherine S. Fowler, Amy J. Gilreath, Douglas R. Harro, Williams R. Hildebrandt, Sally Ishikawa, Patricia Mikkelsen, Janet M. Mitchell, Michael J. Moratto, Scott Mumma, Margaret Newman, Kathryn Puseman, Matthew J. Root, Linda Scott-Cummings, Nancy D. Sharp, Nancy A. Stenholm, Gerald Upshaw, Philip R. Watson, and Eric Wohlgemuth	1995	Volume V, Technical Studies: Archaeological Investigations, PGT-P&E Pipeline Expansion Project, Idaho, Washington, Oregon, and California

Source: California Historical Resources Information System Record search at NWIC and CCalC, December 23, 2020.

Previously Recorded Cultural Resources

The CCalC and NWIC records searches identified four previously recorded cultural resources within the Clifton Court Forebay Project site: P-07-003093, P-07-003122, P-07-004507, and P-07-004698. These resources are described in further detail below. There are an additional 44 cultural resources within a 1-mile radius of the Project site (Table 2).

Table 2. Clifton Court Forebay – Previously Recorded Resources

Primary ID	Trinomial	Name	Type	Age	Attributes	CHRS Status Code
Previously Recorded Resources Intersecting the Project Site						
P-07-003093/ P-39-004856	CA-CCO-000822H	West Canal	Structure	Historic	Canal	6: Ineligible
P-07-003122	None	Clifton Court Forebay	Structure	Historic	Reservoir	3D: Appears Eligible
P-07-004507	None	GandA-809-62H; Italian Slough, Middle River, and West Canal Levee	Structure, Site	Historic	Roadbed; Canal; Levee	none listed
P-07-004698	CA-CCO-000842H	Delta Field Division Facilities: Clifton Court Forebay, Skinner Delta Fish Protective Facility, Harvey O. Banks Pumping Plant	Building, Structure, Element of district	Historic	Ancillary building; Public utility building; Engineering structure; Canal	3D: Appears Eligible
Previously Recorded Resources within 1 Mile of the Project Site						
P-01-001783	CA-ALA-000623H	Southern Pacific Railroad	Structure	Historic	Railroad grade; Power line; Engineering structure; Bridge	—
P-01-010435	None	Segment of the Delta Mendota Canal and Intake Channel (No.27)	Structure, District	Historic	Canal	—
P-01-010446	CA-ALA-000595H	Segment of PG&E Distribution Line (No. 7)	Structure	Historic	Engineering structure	—
P-01-010447	CA-ALA-000596H	Segment of the Tracy-Contra Costa-Ygnacio Transmission Line (No. 5)	Structure, Element of district	Historic	Engineering structure	—
P-01-010448	CA-ALA-000597H	Segment of the Tracy-Los Vaqueros Transmission Line (No. 6)	Structure	Historic	Engineering structure	—
P-01-010449	CA-ALA-000598H	Segment of Hurley-Tracy Transmission Line (No. 4)	Structure	Historic	Engineering structure	—

Table 2. Clifton Court Forebay – Previously Recorded Resources

Primary ID	Trinomial	Name	Type	Age	Attributes	CHRS Status Code
P-01-010450	CA-ALA-000599H	Segment of Mountain House Road (No. 3)	Structure	Historic	Road	—
P-01-010451	CA-ALA-000600H	Segment of Byron Bethany Road (No.2)	Structure	Historic	Road	—
P-01-010951	None	Delta Mendota Canal Construction Spoil Piles	Structure	Historic	Engineering structure	—
P-01-010952	None	Alternative Intake Channel	Structure	Historic	Canal	—
P-01-010953	None	Tracy Fish Facility	Object	Historic	Ancillary building; Government building; Fish collection structure	—
P-01-011471	None	Livermore Yacht Club (No. 15)	Building, District	Historic	Multiple family property; Ancillary building; 1-3 story commercial building; Canal	—
P-07-000072	CA-CCO-000130	CCO-130	Site	Prehistoric	Habitation debris	—
P-07-000085	CA-CCO-000143	CCO-143	Site	Prehistoric	Lithic scatter; Shell bead	—
P-07-000086	CA-CCO-000144	CCO-144	Site	Prehistoric	Unknown	—
P-07-000413	CA-CCO-000653	PEP 11-24	Site	Prehistoric	Lithic scatter; Burials	—
P-07-000813	CA-CCO-000733H	Southern Pacific Railroad	Building, Structure	Historic	Railroad grade; Industrial building; Engineering structure; Bridge	—
P-07-002546	None	PG&E Substation (No. 22)	Building, Structure	Historic	Ancillary building; Public utility building; Engineering structure	—
P-07-002547	CA-CCO-000738H	Byron Bethany Irrigation District Main Canal (No. 9)	Structure	Historic	Canal	—
P-07-002548	CA-CCO-000739H	Segment of PG&E Distribution Line No. 7	Structure	Historic	Engineering structure	—
P-07-002549	CA-CCO-000740H	Segment of the Tracy-Contra Costa-Ygnacio	Structure	Historic	Engineering structure	—

Table 2. Clifton Court Forebay – Previously Recorded Resources

Primary ID	Trinomial	Name	Type	Age	Attributes	CHRS Status Code
		Transmission Line (No. 5)				
P-07-002550	CA-CCO-000741H	Segment of the Tracy-Los Vaqueros Transmission Line (No. 6)	Structure	Historic	Engineering structure	—
P-07-002551	CA-CCO-000742H	Segment of Hurley-Tracy Transmission Line (No. 4)	Structure	Historic	Engineering structure	—
P-07-002552	CA-CCO-000743H	Segment of Byron Bethany Road (No. 2)	Structure	Historic	Road	—
P-07-002558	None	Segment of the Delta Mendota Canal and Intake Channel (No. 27)	Structure, District	Historic	Canal	—
P-07-002924	CA-CCO-000795H	Segment of Mountain House Road (No. 3)	Structure	Historic	Road	—
P-07-002981	None	Delta Mendota Canal Construction Spoil Piles	Structure	Historic	Engineering structure	—
P-07-002982	None	Alternative Intake Channel	Structure	Historic	Canal	—
P-07-002983	None	Tracy Fish Collection Facility	Building, Structure	Historic	Ancillary building; Government building; Fish collection structure	—
P-07-003091	None	Intake Channel to Delta Pumping Plant: State Water Project	Structure	Historic	Canal	—
P-07-004508	None	ISO-709-53	Other	Prehistoric	Isolated chert artifacts	—
P-07-004512	CA-CCO-000829H	COTP0106-210	Structure, Site	Historic	Farmstead; Trash scatter	—
P-07-004516	None	GandA-609-17H	Site	Historic	Glass bottles; Irrigation Ditch	—
P-07-004517	None	Ganda-609-18H	Site	Historic	Glass bottles	—
P-07-004518	None	Ganda-609-19H	Site	Historic	Glass scatter	—
P-07-004519	None	GandA-609-20H	Site	Historic	Glass scatter	—

Table 2. Clifton Court Forebay – Previously Recorded Resources

Primary ID	Trinomial	Name	Type	Age	Attributes	CHRS Status Code
P-07-004520	None	GandA-609-21H	Site	Historic	Glass scatter	—
P-07-004730	None	1940 canal	Structure	Historic	Canal	—
P-39-004309	None	Byron-Bethany Road; AKA Bethany Rd., Co. Rd. 2388; TRWP-30	Structure	Historic	Road	—
P-39-004310	None	Segment of PG&E Distribution Line (No 7); Sierra and San Francisco Power Company Distribution Line	Structure	Historic	Engineering structure	—
P-39-004312	None	Byron Bethany Irrigation District Main Canal	Structure	Historic	Canal	—
P-39-004348	CA-SJO-000282H	Grant Line Canal	Structure	Historic	Canal	—
P-39-004886	None	Victoria Canal and Levees	Structure	Historic	Engineering structure; Canal	—
P-39-005265	None	ISO-609-22H	Site	Historic	Trash scatter	—

Source: California Historical Resources Information System Record search at NWIC and CCalC, December 23, 2020.

P-07-003093/P-39-004856, West Canal

The West Canal travels along the east side of Clifton Court Forebay and extends about 3.5 miles from the west end of the Grant Line/Fabian and Bell Canal to the west end of the Victoria and North Canal. It was initially recorded in 2003 by Madeline R. Bowen at Jones & Stokes Associates as part of the Cultural Resources Inventory and Evaluation Report for the South Delta Improvement Program, Contra Costa and San Joaquin Counties, CA. According to this record, the West Canal was constructed ca. 1890 as a cut-off to the Old River until the construction of Clifton Court Forebay, at which point it became classified as a canal. The report associated with the record concludes that the West Canal “does not appear to meet the criteria for listing in the NRHP or the CRHR” (Bowen 2003, p. 2) However, it also concludes that “an argument could be made for eligibility under Criterion A of the NRHP or Criterion 1 of the CRHR for association with events that made a significant contribution to patterns of history in the Sacramento-San Joaquin Delta in the area of irrigation and land development” (Bowen 2003, p. 2). According to the DPR form, by the time of the 2003 record, the canal had lost its integrity of setting, design, materials, and workmanship, which were compromised over time.

P-07-003122, Clifton Court Forebay

Clifton Court Forebay was initially recorded in January 2012 by DWR and re-recorded and evaluated in May 2013 by Patricia Ambacher of AECOM as part of the Cultural Resources Inventory, Evaluation and Findings of Effect Report for the Clifton Court Forebay Fishing Facility Project. In the 2013 site record by Ambacher, she recommended that the forebay “appears to meet the Criteria A/1 and C/3 of the NRHP and the CRHR at the state level of significance as a contributing element to the California Aqueduct.” The California Aqueduct had been determined eligible under Criteria A/1 and C/3 of the NRHP and the CRHR and had received SHPO concurrence in July 2012 for its relationship to the SWP and for its engineering and complex design (Donaldson 2012, p. 1). Ambacher recommended Clifton Court Forebay was also eligible as a “critical component of the SWP” (Ambacher 2013, p. 3) regulating water flow into the California Aqueduct.

Clifton Court Forebay was constructed between 1967 and 1969, which fall within the California Aqueduct’s period of significance (1960–1974) (Ambacher 2013, pp. 2–5). Further, Ambacher writes that Clifton Court Forebay is a contributor and “is a character-defining feature of the California Aqueduct” because it was a critical and planned element of the SWP, as the location where the California Aqueduct begins (Ambacher 2013, p. 4). She also writes that as a character-defining feature of the California Aqueduct, Clifton Court Forebay “serves as a focal point of the aqueduct with regards to facilitating regulation of the surges a drawdown created during peak pumping periods,” and “the feature gates, which are a character-defining feature of the [Clifton Court Forebay] . . . can be closed to prevent backflow into the Delta at low tides” (Ambacher 2013, p. 4). Overall, Clifton Court Forebay “contributes to the common engineering objective of the Aqueduct” (Ambacher 2013, p. 5). At the time of this record, Clifton Court Forebay also retained all aspects of integrity necessary to convey its significance.

P-07-004507, Italian Slough, Middle River, and West Canal Levee

The levee includes three parts, the Italian Slough east levee, the southern levee for a portion of Middle River, and the West Canal west levee, and was initially recorded in 2015 by Margaret Kress of DWR as part of the Revised Archeological Survey Report for the Houston Canal and West Canal Erosion Repair Project: OM-DFD 2014-014, Sacramento, California and 2019 by J. Lang and B. Cox of Garcia and Associates in the Cultural Resources Inventory for the San Joaquin Valley Right-of-Way Maintenance Environmental Assessment Project prepared for Western Area Power Administration, Folsom, California. The site record documents the canal levees surrounding Clifton Court Forebay on the west, northwest, north, and east sides, and dates the West Canal to ca. 1890 and Italian Slough as early as ca. 1870 (Kress 2015, p. 1). The site record prepared for the same resource by Garcia and Associates gives measurements for the levee structure, citing it as approximately 60 feet wide at its base, 10 to 20 feet wide at its top, and 10 to 15 feet higher on the water side (Lang and Cox 2009, p. 1). Neither record formally evaluates the significance of the Italian Slough, Middle River, and the West Canal levee structure.

P-07-004698, Delta Field Division Facilities: Clifton Court Forebay, Skinner Delta Fish Protective Facility, Harvey O. Banks Pumping Plant

The Delta Field Division Facilities, constructed 1963–1969, include Clifton Court Forebay, John E. Skinner Delta Fish Protective Facility, and the Harvey O. Banks Pumping Plant (Banks Pumping Plant), which are located within the Bay–Delta Conservation Plan Project study area. The site record was prepared by Monte Kim and James Williams of ICF International as part of the Built Historical Resources Evaluation Report for the Bay Delta Conservation Plan Project (Kim and Williams 2013, p. 1). This site record appears to re-record Clifton Court Forebay as part of the Delta Field Division Facilities. The record includes the Skinner Fish Facility, a fish protection and data

collection facility with 14 associated buildings. This is used to keep fish out of the Banks Pumping Plant located downstream. The record also includes the Harvey O. Banks (Delta) Pumping Plant, which consists of an 11-pump pumping station, an intake channel, and an electrical switchyard. The Delta Field Divisions Facilities were initially recorded by ICF International in 2013 for Addendum 1: Built Historical Resources Evaluation Report for the Bay Delta Conservation Plan Project. According to the site record (Kim and Williams 2013, p. 2):

The significance of this subsystem of the California State Water Project, constructed between 1963 and 1969, is due to the important role that its three components played as part of an expansive, engineered water-conveyance system, which was designed to store water in Northern California and distribute it to urban and agricultural areas elsewhere in the state. These three facilities of the Delta Field Division also appear to be eligible for NRHP and CRHR listing as contributing elements to a potential California State Water Project Historic District.

This Kim and Williams (2013) site record was created at roughly the same time and arrives at the same conclusion as the Ambacher (2013) evaluation: that the Delta Field Division Facilities are eligible for their relationship to the larger SWP system. The Kim and Williams (2013) record notes components of the Delta Field Division Facilities had not yet achieved the 50-year threshold at the time of recording, but that those constructed prior to 1969—Clifton Court Forebay, the Skinner Fish Facility, and the Harvey O. Banks Pumping Plant—appeared to be eligible at the state level of significance for listing in the NRHP under Criteria A and C, and the CRHR under Criteria 1 and 3. They are also potentially eligible as contributing elements of a suggested California State Water Project Historic District (Kim and Williams 2013, p. 10). This historic district has only been suggested and has not been formally studied or defined.

3.1.2 Other Relevant Studies

California Department of Water Resources—Provided Reports

On September 2, 2021, DWR provided Dudek with four additional reports related to Clifton Court Forebay and the proposed Project. These reports are listed in Table 3 and summarized below the table.

Table 3. California Department of Water Resources—Held Previously Conducted Technical Studies

Report Source	Authors	Year	Title
<i>Previous Technical Studies Intersecting the Project Site</i>			
DWR-provided	Nolte, M.	2015	Cultural Resources Technical Report. Geotechnical Drilling Near Clifton Court Forebay.
DWR-provided	Kress, M.	2015	Cultural Resources Clearance for OMDFD- 2015-004: CCF Gate Refurbishment
DWR-provided	Nolte, M.	2016	Cultural Resources Clearance for OM-DFD-2016-042: Clifton Court Forebay Fence Replacement –Phase I
DWR-provided	Prince-Buitenhuys	2020	Cultural Resources Review OM-DFD-2020-011 BAPP V-Ditch and Culvert Clearing CR-DFD-2020-008

Source: Reports provided to Dudek Built Environment staff on September 2, 2021.

Cultural Resources Technical Report. Geotechnical Drilling Near Clifton Court Forebay (2015).

This cultural resources technical report was prepared by DWR's Environmental Planning-Archaeology department in 2015 in support of a project proposing to conduct geotechnical exploration near the northeastern extent of Clifton Court Forebay. The project was prepared to comply with NHPA Section 106 and CEQA requirements. The Clifton Court Forebay is eligible for the NRHP and CRHR and constitutes a historic resource under CEQA and a historic property under Section 106. The project, as proposed, would not result in changes to the aspects of integrity or significance of the Clifton Court Forebay. Therefore DWR recommended that the project would result in No Significant Impacts to Historical Resources under CEQA (Section 15064.5), and a Finding of No Adverse Effect under Section 106 (36 CFR 800.5[b]).

Cultural Resources Clearance for OMDFD-2015-004: CCF Gate Refurbishment (2015)

This memorandum was prepared by DWR's Environmental Planning-Archaeology department in 2015 to satisfy CEQA requirements in support of a project that proposed to remove and repair all five radial gates at Clifton Court Forebay. This project was conducted after emergency repairs in 2013, when Gate No. 2 had a catastrophic failure. Refurbishment of the radial gate features entailed sandblasting, recoating, seal replacement, and new anchorages, which would take place off site, and repairs to the gate assembly and new anchor tendons at Gates Nos. 1, 3, and 5. The memorandum found that because Clifton Court Forebay was eligible for the NRHP and CRHR and the radial gates were considered character-defining features, that Clifton Court Forebay constituted a historic resource under CEQA. The memorandum further posed that repairs and refurbishments to the radial gates would be accomplished using like materials and returning the original gates back to working condition, and the outcome was "no significant impacts to historical resources."

Cultural Resources Clearance for OM-DFD-2016-042: Clifton Court Forebay Fence Replacement –Phase I (2016)

This memorandum was prepared by DWR's Environmental Planning-Archaeology department in 2016 to satisfy CEQA requirements in support of a project that proposed to place up to 5,000 feet of right-of-way fencing along the southeastern property line of Clifton Court Forebay. The project also included vegetation removal and gravel road construction along the levee toe, as well as minor erosion repair along the levee crest. The memorandum recognized that because Clifton Court Forebay was eligible for the NRHP and CRHR, it constituted a historic resource under CEQA. According to the memorandum, further study was not conducted because the proposed work would not affect either historic built environment resources.

Cultural Resources Review OM-DFD-2020-011 BAPP V-Ditch and Culvert Clearing CR-DFD-2020-008 (2020)

This memorandum was prepared by DWR's Environmental Planning-Archaeology department in 2020 in support of a project that proposed to remove accumulated dirt from road-adjacent ditches at the Banks Pumping Plant lower intake channel. The project proposed to use a high pressure water hose to remove the dirt for a 2-mile-long segment of ditch; then dirt would be removed with a skid steer and loader bucket and/or front end loader. The report investigated the project's potential impacts to the Banks Pumping Plant, which was recorded as a component of the California State Water Project Delta Field Division Facilities (P-07-004698), and had been previously recorded in 2013 by JRP Consulting (Kim and Williams 2013) and recommended eligible for the CRHR and NRHP under Criteria A/1 and C/3. The proposed project activities were deemed to have no significant impact to historical resources for the purposes of CEQA regarding the Banks Pumping Plant or the Delta Field Division Facilities (P-07-004698) as a whole.

Additional Reports and Records

Dudek has concluded that because Clifton Court Forebay was previously recommended eligible as a contributing component of the California Aqueduct, the following DPR record and all records pertaining to the California Aqueduct are also relevant. This record was shared with Dudek through a separate record search by Southern San Joaquin Valley Information Center staff on November 11, 2020.

P-15-015820, California Aqueduct (Kern County)

The Kern County segments of the California Aqueduct were initially recorded in 2008 by Three Girls and a Shovel LLC, and were re-recorded multiple times: in 2009 by JRP Historical Consulting LLC, in 2011 by AECOM, in 2012 by Daly & Associates, in 2013 by ESA, in 2016 by Applied Earthworks Inc., and in 2015 by ASM Affiliates Inc. Site records for other segments of the California Aqueduct, recorded in Fresno County as P-10-006207 and in Kings County as P-16-000266, are also held by the Southern San Joaquin Valley Information Center, while other counties' segments are held by their respective information centers. Each recording was for the same resource (the California Aqueduct), but they were separate, as-needed segments for different projects. In the 2011 AECOM record by Patricia Ambacher of AECOM, she recommended the California Aqueduct as eligible under NRHP Criteria A and C and CRHR Criteria 1 and 3, with a period of significance spanning 1960–1974, the period of construction (Ambacher 2011, p. 2). The California Aqueduct was also recommended eligible under Criterion Consideration G for its exceptional significance, because at this time it did not yet meet the 50 year threshold for consideration. Ambacher proposed that the California Aqueduct was the “largest and most significant” (Ambacher 2011, pp. 5, 25) of the water conveyance systems in the SWP, and “profoundly altered” (Ambacher 2011, p. 25) the distribution of water across California, facilitating population increases and agricultural development of the San Joaquin Valley and Southern California. Ambacher also noted that it was significant due to its open trapezoidal design, concrete lining, and alignment and engineered relationship to the surrounding topography. In 2012, SHPO concurred with a finding of individual eligibility for the entirety of the California Aqueduct (Donaldson 2012, pp. 1–2). This determination automatically listed it in the CRHR.

3.2 Archival Research

California Department of Water Resources

In preparation of this report, DWR shared Bulletin 200, as well as multiple internal documents, PowerPoint presentations, maps, fact sheets, and department learning tools with the built environment staff at Dudek. The Bulletin 200 series is a comprehensive, six-volume bulletin that recounts the conceptualization, history, planning, design, operation, customers and users, and planned future expansion for the SWP. It was completed and published in 1974, the same year the SWP was deemed complete. Each volume discusses a different subject pertaining to the larger SWP system:

- Volume I, “History, Planning, and Early Progress” (DWR 1974a)
- Volume II, “Conveyance Facilities” (DWR 1974b)
- Volume III, “Storage Facilities” (DWR 1974c)
- Volume IV, “Power and Pumping Facilities” (DWR 1974d)
- Volume V, “Control Facilities” (DWR 1974e)
- Volume VI, “Project Supplements” (DWR 1974f)

Bulletin 200 and the various other bulletins and reports shared by DWR were used in the preparation of the general DWR historical context statement, as well as the resource-specific historical context, both of which are in Section 4, Historical Overview.

California Water Libraries Collection, University of California Davis Library

Many DWR, California Department of Public Works, and Bureau of Reclamation (Reclamation) reports, bulletins, and manuals were available through University of California Davis' California Water Libraries collection, available as digitized PDFs through the Internet Archive (archive.org) website. Any bulletin or report not provided by DWR was found through this library collection. Historical information obtained from this collection was used in the preparation of the general DWR historical context statement and the SWP-specific historical context, both of which are in Section 4.

Water Resources Collections & Archives, Special Collections and Archives, University of California Riverside Orbach Science Library

General background information and primary sources, reports, maps, and photographs related to the history of water management and infrastructure in California are held by the Water Resources Collections & Archives. Though a digital collection was available, neither the Orbach Science Library nor the Special Collections and Archives at University of California Riverside were open to researchers due to COVID-19 closures and in-person visit restrictions, and as such, this collection was not fully available to Dudek staff for research. Digital collections were used in the preparation of the general DWR historical context statement in Section 4. Dudek recommends future study of this collection when it becomes available to the public.

California Water Library

The California Water Library is a digital repository that provides public access to reports, articles, essays, research, white papers, and other materials published by the State of California, federal agencies, and environmental stakeholders. Dudek used this repository to find state-published water bulletins that were otherwise unavailable from the collections listed above. Digital collections were used in the preparation of the general DWR historical context statement in Section 4.

Los Angeles County Library

Dudek utilized a local county library in order to gain access to physical books and newspaper articles not provided through other venues. These items were used in the preparation of the general DWR historical context statement in Section 4.

3.3 Field Survey

3.3.1 Methods

During the surface reconnaissance for archaeological resources, William Burns, MA, and Nicholas Hanten, MA, completed a thorough photo documentation of Clifton Court Forebay in the Project APE on January 13, 2021. Dudek Architectural Historians Kathryn Haley, MA, and Kate G. Kaiser, MSHP, conducted an in-depth review of the photo documentation. The photo documentation was adequate to show specific structural details and to contextualize

Clifton Court Forebay within the land surrounding the APE. Ms. Haley and Ms. Kaiser were able to view the character-defining features, spatial relationships, observed alterations, and historic landscape features via the photo documentation. All field notes, photographs, and records related to the current study are on file at the Dudek office in Auburn, California.

3.3.2 Results

During the course of the pedestrian survey, Dudek identified one structure over 45 years old: Clifton Court Forebay (P-01-003122, constructed 1967–1969), which has been previously recorded. Fieldwork photographs are not included in this report and may be found in Appendix A. Clifton Court Forebay and its relationship to the Project APE are indicated in Figure 2. Section 6, Application of Criteria of Adverse Effect, provides a detailed physical description of Clifton Court Forebay within the Project area and the associated significance evaluation under all applicable NRHP and CRHR criteria and integrity requirements. Photographs of the California Aqueduct from Dudek’s January 2021 site visit may be found in Appendix A.

3.4 Interested Party Correspondence

On May 11, 2021, Dudek Architectural Historian Kate G. Kaiser sent electronic contact letters to the Contra Costa Historical Society, the East Contra Costa Historical Society, Museum of the San Ramon Valley, Alameda Architectural Preservation Society, the Museum on Main in Pleasanton, and the Alameda County Historical Society. The letters briefly described the proposed Project and requested information about cultural resources near the proposed Project area. Dudek received a response from the Contra Costa Historical Society on May 25, 2021. The historical society assumed that Dudek was asking that they conduct research into the proposed Project area. They did not identify any known cultural resources in the proposed Project area, but outlined research opportunities available through their facility. Dudek responded to the historical society on May 27, 2021, provided clarification regarding our correspondence, and thanked them for the information regarding research opportunities available through their facility. Copies of all correspondence to and from interested parties are located in Appendix B.

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4 Historical Overview

The following historic context provides an overview of the history of the Project area, development summary of the APE, and specific relevant information on the built environment resource in the APE.

4.1 General Historic Context

The subject property is located on the edge of the San Joaquin Valley at the southeasternmost corner of Contra Costa County where it meets San Joaquin and Alameda Counties. The San Joaquin Valley region of California's Central Valley has been settled since the prehistoric era. Spanish explorers first arrived in the valley in 1772 and named it San Joaquin de los Tulares after the rushes and wetland plants that grew abundantly there. Despite multiple explorations to the region, the Spanish did not establish any permanent settlements in the area (ARG 2000; Lewis et al. 1979; Tinkham 1880).

Following more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain in 1821. In 1822, the Mexican legislative body in California decreed California ports open to foreign merchants. Beginning in 1828, trappers including Jedediah Smith and John Work traveled to the San Joaquin Valley to trap beaver at the French Camp settlement (south of present-day Stockton). Many pioneers arriving in Central California during the 1840s passed through French Camp before making plans to stay permanently in the valley, including the founder of Stockton, Charles M. Weber, who passed through in 1841. Weber, along with his business partner, William Gulnac, applied for one of the many extensive land grants distributed by the Mexican government in the interior of the state during this period in an effort to increase the population inland from the more settled coastal areas. Despite this, the wetlands acreage that once surrounded the subject property was never distributed as part of a Mexican land grant (Hoover et al. 2002, pp. 370–371).

The Mexican-American War ended with the Treaty of Guadalupe Hidalgo in 1848, ushering California into its American Period. The APE for the Project is located in Contra Costa County which was designated among the 27 original counties of California on February 18, 1850. The early economic profile of the area surrounding the APE during this period is closely tied to the Delta and its shipping potential as a physical outlet into the San Francisco Bay. Shipping and freighting lines in the valley transported and outfitted hopeful California Gold Rush miners heading from San Francisco into the Sierra Nevada goldfields. When the goldfields later dried up, shipping and transportation continued as a major industry, but many new arrivals also refocused towards other economic opportunities presented by the region. Agriculture emerged as a prosperous industry that benefited from the fertile, alluvial soil and temperate climate in the valley. During the later nineteenth century, land in the valley became valuable enough that companies such as the Old River Land and Reclamation Company purchased large swaths of marshlands in the San Joaquin Valley and converted it for use as farmland. The process of creating earthen levees and manually draining the delta wetlands through the use of dredges and pumps was known as land reclamation (Hoover et al. 2002, p. 369; The Evening Mail 1898, p. 2).

4.2 Water Management in California—Development of the State Water Project

The history associated with water management facilities in California is as vast and complex as the systems themselves. To best understand the development of DWR and the SWP, it is important first to understand the

context of water management policy and construction in California. The SWP was shaped by the successes and shortfalls of numerous water management policies and projects at the local, state, and national level over many decades. The following sections are intended to give a broad context of water development in California from the Spanish and Mexican periods, to the mining and agriculturally dominated water needs in the nineteenth century, to the engineered water reclamation solutions of the early twentieth century, and finally to the events and planning which led to the founding of DWR and implementation of the SWP.

4.2.1 Early Water Development

Beginning in the Spanish era (circa 1769 to 1823), the larger missions and pueblos established by the Spanish were located along rivers or coastal creeks. Various missions used neophyte laborers to exploit local water supplies, dig wells, divert streams, and dam reservoirs for irrigation and livestock uses. Spanish law granted missions a right to adequate water supply for their residents and irrigation and the result was often a collection of small-scale earthen dams and stone- or wood-lined *zanjas* (canals or ditches) associated with each mission. After Mexico gained independence in 1823, little changed with respect to water rights and supply, as the rights afforded to secular ranchos were derived from those used by the missions, presidios, and pueblos of Spanish and Mexican settlements. The cattle hide and tallow trade in Alta California rose as a major industry because cattle could graze on the unimproved, arid lands of the vast rancho holdings, and although ranchos typically had small, irrigated gardens, most never built substantial irrigation systems (Hanak et al. 2011, p. 21–22; JRP and Caltrans 2000, p. 11).

New water demands and uses emerged with the onset of the Gold Rush. First, the population of California exploded during this period, quadrupling from roughly 92,000 before 1849, to 380,000 by 1860. Second, water was a key tool in a type of industrial-scale gold mining called hydraulicking. Hydraulic miners in the Sierra Nevada foothills diverted water from high elevation streams through flumes and penstocks to create hydraulic pressure, then used that pressurized water to blast hillsides to expose gold. Hydraulic mining also generated competition for water resources that ultimately led to disputes like *Irwin v. Phillips* (1855), in which the California Supreme Court sided with appropriation rights used by most miners, rather than riparian rights (Cooper 1968, p. 36; Hanak et al. 2011, pp. 22–23; JRP and Caltrans 2000, pp. 11–12).¹

Hydraulic mining created environmental problems because mining debris floated downstream, which caused waterways to build up with debris and then overflow their banks and flood adjacent land. Some private landowners along rivers running through valley lands built their own flood protection levees, but these early efforts were small scale and failed during seasonal floods made worse by hydraulic mining debris. Major flooding in 1862 and again in 1865–1866 inundated farmland and pasture with mining waste-laden water. In 1868, the California legislature approved local reclamation districts so that landowners could fund flood control projects, one of the first water management strategies enacted at the state level. This new policy, however, was ultimately ineffectual because it was still more economical to push floodwaters to neighboring land than to build a system of soundly engineered levees (Hanak et al. 2011, pp. 23–25; JRP and Caltrans 2000, p. 12).

After the 1865–1866 floods, and other factors such as wheat market volatility and extended droughts, irrigated agriculture started to replace cattle raising and dry-farmed crops in the San Joaquin and Sacramento Valleys. As early as 1873, President Ulysses S. Grant directed the U.S. Army Corps of Engineers to study San Joaquin Valley

¹ Appropriation rights or the rule of prior appropriation held that the right to water is “based on actual use, not ownership of land, and there are no place-of-use restrictions. Moreover, in times of shortage, water is apportioned on the basis of first-in-time, first-in-right” (Hanak et al. 2011, p. 23). Riparian rights in California were derived from English common law, guaranteeing the rights of any landowner to surface water sources within or adjacent to their lands (Hanak et al. 2011, p. 23; Pisani 1984, pp. 34, 218, 246).

and Sierra Nevada water resources for their potential as irrigation sources. The study concluded that a system of canals that could transport water from the Sacramento Valley to the San Joaquin Valley for irrigation was warranted. A few years later, newly appointed State Engineer William Hammond Hall started California's first comprehensive study of water resources by launching a 5-year study of Sacramento Valley rivers in 1878, the results of which led to the first flood control plan for the Sacramento Valley in the 1880s (Cooper 1968, pp. 42–43; JRP and Caltrans 2000, pp. 12–13; USACE 1990, pp. 4–5).

California cities continued to grow, using surface water and groundwater as sources for municipal water supply as the nineteenth century drew to a close. Some cities contracted with private water companies to provide water to their citizens, while other communities and some agricultural landowners formed mutual water companies to serve their needs. Larger cities like Los Angeles and San Francisco initially depended on private water companies as well, but by the end of the century both were developing plans and acquiring reservoir sites and water rights for what would become massive, municipally owned, inter-basin water supply systems. The population of California continued to increase exponentially in the late 1880s and 1890s, in both urban and rural areas, as more rail lines connected to the state to other parts of the nation and West Coast agriculture and industry grew. With the passage of the Wright Irrigation Act in 1887, local irrigation districts finally had the legal toolkit to fund, build, and operate conveyance systems for themselves. Some of these districts were formed and built as wholly new systems under the act and others took over and expanded upon earlier irrigation schemes and networks (DWR 1957, p. 24; Hanak et al. 2011, pp. 30–31; JRP and Caltrans 2000, pp. 14, 21–23).

4.2.2 Twentieth Century Water Management Planning

At the turn of the twentieth century, California cities started to recognize their water needs were outpacing what was readily available. The state and federal government also began making efforts to ensure water supplies, as well as regulate water rights. The U.S. Congress passed the Reclamation Act in 1902, beginning large-scale federal investment in dams and reservoir projects for irrigation in the American West. With this, the “federal government promoted occupation of undeveloped land with construction of irrigation systems and their fair distribution of water through reclamation” and established the Bureau of Reclamation (Reclamation) (Herbert et al. 2004, p. 2-3). A year later, the California Supreme Court struck down the historical rule of absolute ownership of groundwater and modified groundwater rights to “safe yield” water extraction that did not affect other users in *Katz v. Walkinshaw*.² The California legislature also took steps towards state-sponsored flood control when it created the State Reclamation Board in 1911 to assist in management of the San Joaquin and Sacramento rivers. Lawmakers continued to refine state water policy, this time revising water rights laws by passing the Water Commission Act in 1914, and the following year creating the State Water Commission (later the State Water Resources Control Board) to oversee permits and diversion claims for surface water throughout the state (Cooper 1968, p. 50; Hanak et al. 2011, pp. 32, 38; Herbert et al. 2004, p. 2-4).

As the new state water regulations were enacted, several California cities had already begun to turn to imported water by the early decades of the twentieth century. San Diego was among several cities that started purchasing privately developed reservoirs outside of city boundaries to supplement water supplies and provide for projected growth. Others, like Los Angeles and San Francisco, embarked on large-scale engineered water projects that would

² “Safe yield,” also called sustainable yield, is defined in DWR Bulletin 118 as “the amount of groundwater that can be continuously withdrawn from a basin without adverse impact” (DWR 2003, p. 99). Bulletin 118 also further describes the 1903 *Katz v. Walkinshaw* decision as a rejection of English Common Law doctrine of groundwater rights and adoption of the Doctrine of Correlative Rights. The decision reflected that the Common Law approach was unsuitable for the natural water conditions in California and that overlaying rights holders or appropriative rights holders should not be able to pump water in excess of what a groundwater basin could sustain on a yearly basis.

bring water from more distant sources, like the 233-mile (later extended to 419 miles) Los Angeles Aqueduct, the initial phase of which was built between 1908 and 1913. The U.S. Congress passed the Raker Act in 1913, which allowed San Francisco to dam the Tuolumne River into the Hetch Hetchy Reservoir and transport water 167 miles to the Bay Area (1914–1934). In 1922, California entered the Colorado River Compact to supply several southern California cities with water from the Colorado River. The Metropolitan Water District of Southern California was formed in 1927 to bring Colorado River water to Los Angeles, as well as to suburbs not serviced by the Los Angeles Department of Water and Power. Oakland and the East Bay cities formed the East Bay Municipal Utility District in 1923 to supply the nine member cities with water from the Mokelumne River (Cooper 1968, pp. 52, 59–68; DWR 1957, pp. 24–26; Hanak et al. 2011, pp. 33–36; Herbert et al. 2004, p. 2-3).

Meanwhile, a major drought struck the state in 1917 that left San Joaquin Valley farmers who relied on surface water for irrigation at a disadvantage compared with cities, especially those served by new large, inter-basin systems. In 1919, Colonel Robert B. Marshall of the U.S. Geological Survey published a study that was the first to propose moving water from the northern Sacramento Valley to the southern San Joaquin Valley by way of an integrated system of reservoirs and canals. The state legislature created the Department of Public Works in 1921 and authorized a series of studies that incorporated elements of Marshall's proposal in developing the first comprehensive plans for redistributing water from more abundant sources in northern California watersheds to agricultural areas farther south. Ultimately, a lack of state funding led Reclamation to implement this concept as the Central Valley Project (CVP) more than a decade later. Meanwhile, multiple federal and state agencies produced a series of reports on various watersheds capabilities, and, in 1930, State Engineer Edward Hyatt proposed the first State Water Plan. The plan proposed seven management units based upon the geographic regions of the state (e.g., Great Central Valley, San Francisco Bay Basin), and which units to address first because of the acute water needs of those regions. The plan proposed 24 reservoirs, 13 of which would have hydroelectric power features. The plan stressed immediate development for certain plan features: the Kennett Reservoir (Shasta Dam), Contra Costa Conduit, San Joaquin River-Kern County canal, Madera canal, Magunden-Edison pumping system, San Joaquin River pumping system, the Delta cross channel, and Friant Reservoir. Other plan components, like Oroville Reservoir, would be included in the Feather River Project, within the larger program ultimately known as the State Water Project. For Southern California, Hyatt recommended importing Colorado River Water, leaving Northern and Central California water for irrigation purposes (Cooper 1968, pp. 60–68; DPW 1930, pp. 37, 44-45; DWR 1974a, p. 11; Hanak et al. 2011, pp. 33–36; Herbert et al. 2004, p. 2-6).

Hyatt's State Water Plan was approved by the state legislature and authorized as the CVP in 1933. It passed voter referendum by a slim margin as it was opposed by major energy companies, area-of-origin advocates, conservationists, and senior water-rights holders. Although voters approved \$170,000,000 in bonds to pay for the initial project components, California was in the middle of a multi-year drought and the Great Depression and bonds did not sell. The Roosevelt administration responded by funding the CVP as a New Deal federal reclamation project to be implemented by Reclamation. Congressional approval of the CVP allowed construction to begin in 1937 and Reclamation moved forward with five elements of Hyatt's plan for initial construction: Kennett Dam (now Shasta Dam), Contra Costa Conduit, Friant Dam, Madera Canal, and the Friant-Kern Canal, with the expectation that more units that could be added over time. The project was hampered by diversion of resources to the war effort and did not make its first water deliveries until 1944, but progress continued until Northern California water made it to the southern San Joaquin Valley end of the system in 1951. Reclamation's administration of the CVP brought certain acreage and water user limitations, intended to support small farmers. This policy had worked well for small farms in the East and Midwest, but it was problematic in California where much of the CVP service area was held in established large land holdings and corporate ranches. Also, as California's population boomed during and after World War II, leading municipal and industrial users, who had been largely excluded in favor of agricultural interests

in the CVP, to chafe against the acreage limitations (Cooper 1968, pp. 149, 152–153; DWR 1957, p. 26; DWR 1974a, p. 6; Hanak et al. 2011, pp. 45, 47–48; Herbert et al. 2004, p. 2-9; JRP and Caltrans 2000, p. 74).

4.2.3 Construction and Implementation of the State Water Project

Planning for a state water delivery system to complement the CVP and address some of its shortfalls began in 1945 with the State Water Resources Act. This authorized the State Water Resource Control Board, formerly the State Water Resource Board, to conduct investigations of the water resources of California, including 1951 Bulletin No. 1, *Water Resources of California* (SWRB 1951), and 1955 Bulletin No. 2, *Water Utilization and Requirements of California*. These two studies formed the basis for 1957 Bulletin No. 3, *The California Water Plan*, which presented a plan for the “practical development of California’s water resources, both by local projects and a major State project to meet the State’s ultimate needs” (DWR 2006, p. 11). As the statewide investigations progressed, State Engineer A.D. Edmonston began planning for their implementation and in 1951 he presented the state legislature with the Feather River Project that had its origins as part of Hyatt’s plan. The Feather River Project included a dam on the river near Oroville, two powerplants, a Delta cross-channel, an electric transmission system, an aqueduct between the Delta and Santa Clara and Alameda Counties, and an aqueduct “to transport water from the Delta to the San Joaquin Valley and Southern California” (DWR 1974a, p. 7). That year the state legislature authorized the “Feather River and Sacramento-San Joaquin Delta Diversion Projects” using the State Central Valley Project Act (DWR 1974a, p. 7). The Feather River Project was revised and resubmitted in 1955 and in 1957. After the 1955 revision, the California legislature referred the Feather River Project report to engineering contractors, the Bechtel Corporation, for independent review. The Bechtel Corporation issued their own report that agreed the engineered elements were sound. Modifications proposed by the Bechtel Corporation were incorporated in the 1957 plan, shortly after California created a new state agency, the DWR, to manage the project (Cooper 1968, pp. 190–193; DWR 1974a, p. 7; DWR 2006, pp. 11–12; Hanak et al. 2011, p. 49; Herbert et al. 2004, pp. 2-12, 2-13).

Political groups in both Northern and Southern California began to voice opposition to the massive water project during this period as well. State Assemblywoman Pauline Davis, representing seven Northern California counties, rallied behind inclusion of county-of-origin rights in state law (Water Code Sections 10500–10506). In Southern California, the Metropolitan Water District opposed any project that would not guarantee water deliveries and requested a constitutional amendment to that effect. The City of San Francisco and Bay Area cities also perceived the project as a threat to expanding their municipal water supply systems. The project’s biggest and most vocal proponents, however, were farmers from the San Joaquin Valley and Santa Clara County. The most high-profile and influential supporter was Edmund G. “Pat” Brown, then the state’s attorney general, who believed a statewide water system was essential for the state’s future and pushed for its approval. His support for the SWP helped him win election as California governor in 1958 and the project would ultimately be one of his proudest legacies (Cooper 1968, p. 209; Herbert et al. 2004, p. 2-14).

As both the political battle and SWP project planning continued, winter storms in 1955 caused flooding throughout Northern and Central California. Major rainfalls on December 18 and 19 flooded the Eel River, Russian River, and San Lorenzo River near the coast. On December 21 and 22 an intense rainfall period raised water levels in watersheds north of San Francisco and caused flooding throughout the Bay Area, as well as the northern and coastal communities of Klamath, Orick, Pepperwood, Weott, Myers Flat, Shively, Healdsburg, Cloverdale, Guerneville, Santa Cruz, Ben Lomond, and Soquel. Continuous rainfall not only caused flooding directly, rising river levels caused other flood control measures to fail. On Christmas Eve night, the Gum Tree Levee on the Feather River broke, sending a 21-foot wave into Yuba City, killing 38 people and inundating Yuba City in 8 feet of water. Flood damages reached more than \$200 million in direct

losses alone. The floods were declared a national emergency and the California legislature responded by making emergency appropriation funding available to the newly created DWR to start components of the Feather River Project, touting the flood control aspects of the project. Construction began on Oroville facilities in May 1957 (DWR 1974a, p. 8; Herbert et al. 2004, p. 2-13; JRP and Caltrans 2000, p. 82; USACE 1956, p. 11).

With site preparation work at Oroville underway, negotiations to resolve conflicts over water law in the state legislature using a constitutional amendment fell short. By the end of 1958, discussions had reached a stalemate as amendment proponents were unable to satisfy the various factions in the state legislature, and unable to get the two-thirds majority vote. SWP proponents then discovered an alternate solution that required only a majority vote while still offering Southern Californians the assurance they needed that the system would be constructed as planned. The state would issue bonds to fund the SWP that specified in its financial language every major storage and conveyance facility to be constructed. Because the state constitution prohibited the legislature from amending bond terms while the debt remained to be paid, this effectively guaranteed the system's construction. With this in mind, state legislators pushed forward a more bi-partisan solution: the California Water Resources Development Bond Act, called the Burns-Porter Act (Cooper 1968, pp. 221–223; Herbert et al. 2004, p. 2-16)

The Burns-Porter act included \$1.75 billion in general obligation bond funds for the first phase of construction of the SWP, to be paid by water and power users. It also included several additional acts, passed as a package, to assurances and concessions to Northern Californian opponents. These include, but weren't limited to, the Davis-Grunsky Act, which made assurances to Northern Californians that water from their home areas would be available for future, local water projects, and the Davis-Dolwig Act, which provided for recreational facilities and fish and wildlife enhancement projects, such as fish hatcheries, as integral components of the SWP. These acts were passed in 1959 along with the Burns-Porter Act. In 1960, the Metropolitan Water District entered negotiations with DWR for what would become the prototype water service contract. The SWP would go on to service 31 agencies under contracts for long-term water supplies, from Plumas County to the state's southern border with Mexico. Just days after Metropolitan Water District signed its service contract, voters ratified the Burns-Porter Act by a margin of nearly 174,000 votes in the 1960 election. Southern California provided the critical support for the bond issue as every county in the north state voted against the measure, with the exception of Butte County where Oroville Dam was to be constructed (Cooper 1968, pp. 224, 241; DWR 1974a, pp. 8, 21; DWR 2006, pp. 16, 25; Hanak et al. 2011, p. 49; JRP and Caltrans 2000, p. 82).

Because the Burns-Porter Act served as a guarantee of construction for Southern Californians, it named specific facilities for development and their locations. Rather than a vague order for construction, the DWR would be held to the SWP construction plans. The SWP called for construction of the Oroville and Upper Feather River dams and reservoir facilities; the California Aqueduct, as well as all associated infrastructure such as conduits, tunnels, pumping facilities, dams, and reservoirs, as needed; a few specifically defined branch aqueducts; levees and control structures; and water conservation and supply measures in the Delta. The San Luis Unit of the CVP was authorized by Congress in 1959, to be jointly operated by Reclamation and DWR. The constitutionality of Burns-Porter was challenged in courts, but in the end, DWR's authority to issue bonds and create water service contracts was affirmed. DWR went on to execute water supply contracts for a total of nearly 3.5 million acre-feet of the original 4 million acre-feet projected minimum project yield (DWR 1974a, pp. 9, 12–13; DWR 2006, p. 22; Water Code Sections 12934.d.1–7).

Construction had already begun on the Oroville facilities in 1957 under the emergency funding and a few select projects, such as the South Bay Aqueduct, Bethany Reservoir, and Frenchman Dam and were started before 1960. Construction on the remainder of the SWP system began after Burns-Porter was passed in 1960. The work was staged from north to south, organized into regional divisions, and was completed in 1974. Exhibit A, below, shows the mapped locations of all the SWP project components completed between 1959 and 1974, and their dates of completion (Exhibit A) (DWR 2006, p. 22; Herbert et al. 2004, p. 2-21).

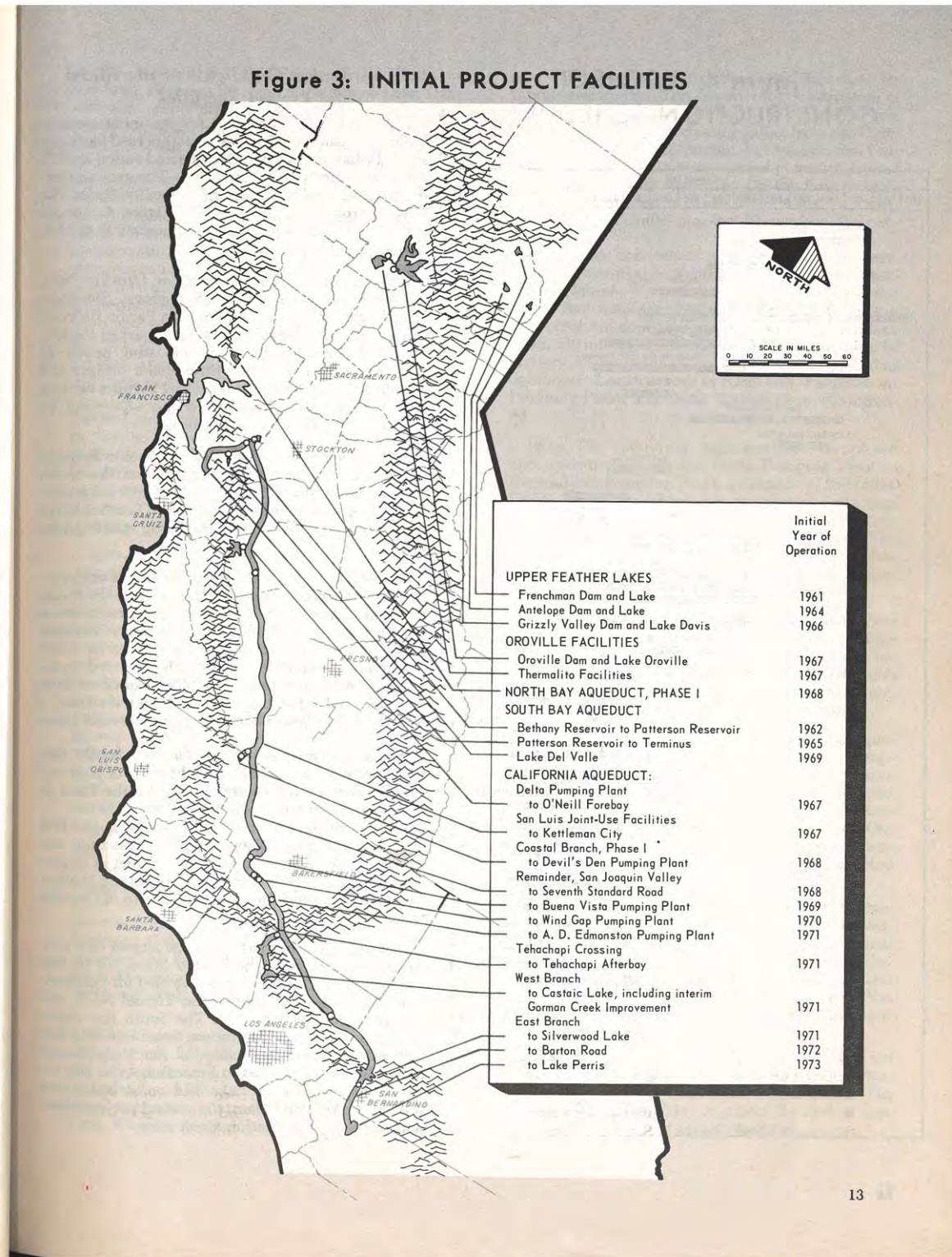


Exhibit A. SWP project components and their dates of completion (DWR 1974g, p. 13).

The engineering involved in the construction of the SWP was unparalleled for its time and the project overall was exceptionally large in physical scale, as was the scale of planning and management required. For example, the Oroville Dam was 770 feet tall at the crest, and at 6,920 feet it was more than 1 mile long and required 80 million cubic yards of fill material (DWR 2006, p. 26). While earth fill dam technology had been around for millennia, advancements in soil science and innovative engineering techniques allowed the height of Oroville Dam to be substantially taller and longer than ever before. Other aspects of the SWP's engineering importance are reflected in the fact that the California Aqueduct measures 444 miles long, which rivals the length of the CVP canal system, but SWP designs also account for earthquake fault crossings, challenging terrain crossings, and subsidence and seismic issues, in addition to incorporating automation technology to operate all components. This fully automated remote monitoring and control system allowed DWR operators to control dozens of pumping plants, check structures, and other miscellaneous facilities from five regional control centers and the Project Operations Control Center in Sacramento. DWR also borrowed the Project Management Information System used by Reclamation and other federal agencies to manage project components, plans and specifications, right-of-way acquisition, and construction activities, as well as to administer its 31 water supply contracts from one database application (DWR 1974e, pp. 1, 7; DWR 2006, p. 29; Herbert et al. 2004, pp. 2-21, 4-5-4-7).

As the initial phase of construction drew to a close in the 1970s, the SWP began to gain national recognition as a feat of modern engineering. In 1967, Oroville Dam was named one of the seven wonders of engineering in California by the California Society of Professional Engineers. The American Society of Civil Engineers (ASCE) gave Oroville Dam and the Hyatt Powerplant an award for outstanding engineering achievement in 1969 and the National Society of Professional Engineers named the SWP to its top 10 engineering achievements of 1971. The American Public Power Association gave the Delta Pumping Plant the First Honor Award and the Oroville-Thermalito Hydroelectric powerplants the Honor Award that same year. The ASCE not only gave SWP the ASCE Outstanding Civil Engineering Award for 1971, it later ranked the SWP in the top 100 Greatest Engineering Achievements of the twentieth century in 2000, and a Civil Engineering Monument of the Millennium in 2001 (DWR 2006, p. 29; Herbert et al. 2004, p. 2-27).

4.2.4 The State Water Project After 1974: Realization and Expansion

Water from Northern California finally reached Southern California via the California Aqueduct after the Edmonston Pumping Plant was completed in 1971, and within two years, regular water deliveries were being made throughout the state. The initial construction phase concluded in 1974 and DWR made efforts to expand the SWP as planned in Phase II. However, with the advent of environmental regulation starting in the 1960s that gained substantial legislative traction in the early 1970s, the proposed expansion projects of SWP Phase II were analyzed and debated more intensely than projects completed during the first phase (DWR 1974a, pp. 78-83, 91; Hanak et al. 2011, p. 56).

As the environmental movement grew more powerful throughout California and the nation, the state and federal government enacted several laws aimed at environmental and natural resources protection, including CEQA (1970), the National Environmental Policy Act (1970), California Endangered Species Act (1970), California Wild and Scenic Rivers Act (1972), Clean Water Act (1972), and Federal Endangered Species Act (1973). The outcome was that the SWP expansion projects had to meet new standards for environmental analysis and mitigation that delayed or in some cases limited the ability of the DWR to expand the SWP in the late 1970s and 1980s. For example, some rivers in Northern California slated for SWP reservoirs were added to the Wild and Scenic Rivers list and had to remain undeveloped. Other projects, such as the Peripheral Canal, Sites Reservoir, and the Los Banos Grande Reservoir, also lacked public support for development because of their projected environmental impacts. This resulted in implementation of only a few SWP expansion projects after 1974, which led to a lower annual water yield than originally planned (DWR 2006, p. 34; Hanak et al. 2011, pp. 56-60).

Droughts in 1976–1977 and another between 1987 and 1994 forced DWR to curtail water deliveries to both urban and agricultural customers. In response, DWR purchased land in Kern County on the Kern Fan Element in 1988 to bank water for droughts, but development of this water bank was delayed by legal and environmental disputes. Starting in the mid-1990s, DWR worked with a select group of SWP water contractors to create the Monterey Amendment, which resulted in restructuring water supply contracts. The Monterey Amendment was a statement of principles that allowed water storage excess during wet years, established protection for water contractors against sudden rate increases during drought years, and allowed contractors to take more water from Castaic Lake and Lake Perris in Southern California. Another result of the Monterey Amendment was the development of the 1 million acre-foot Kern Water Bank and its subsequent transfer to the privately controlled Kern Water Bank Authority. Over the years, the Monterey Amendment faced several legal challenges by environmental groups, requiring revised environmental documentation as recently as 2016. Other successful SWP Phase II expansions to the system include the Coastal Branch Aqueduct (constructed 1993–1998) and the East Branch Aqueduct Extensions (constructed 1998–2003 and 2005–2018), and their associated pumping plants, dams, and reservoirs (DWR 2006, pp. 44–45; DWR 2019, pp. 10, 319; Folmer 2018; Hanak et al. 2011, p. 67; WEF 2021).

Today, the main components of the SWP system date to the Phase I (1959–1974) construction and operate as initially intended. The SWP provides flood control, power generation, recreation opportunities, and fish and wildlife habitat, as well as serving its primary purpose—providing agricultural and municipal water supply for California. In efforts to meet its mission: “to sustainably manage the water resources of California, in cooperation with other agencies, to benefit the state’s people and protect, restore, and enhance the natural and human environments,” DWR continues to fulfill 29 water supply contracts for public agencies and local water districts across the state. With ever-increasing water demands, DWR remains charged with the challenge of planning for future SWP expansion and enhancement, while also continuing its operations, maintenance. And repair of the existing system (DWR 2019, pp. 3–6, 10, 236–237; DWR 2021).

4.3 Historic Development of Clifton Court Forebay

The historical development of Clifton Court Forebay is discussed at length in the P-07-003122 Clifton Court Forebay DPR record (Ambacher 2013), the P-07-004698 Delta Field Division Facilities DPR record (Kim and Williams 2013), and the Clifton Court Forebay entry in the 1974 Bulletin 200: California State Water Project, Volume III Storage Facilities context (DWR 1974c). The DPR entries are appended to this report in Appendix A, Clifton Court Forebay DPR Update. Below is a brief summary of this historical context.

The development of Clifton Court Forebay began with early land reclamation efforts in the San Joaquin Delta wetlands. In 1898, the Old River Land and Reclamation Company set out to drain and convert 4,000 acres of company-owned land located west of Union Island and south of the Byron Tract, also both reclaimed lands, for use as farmland. This newly reclaimed area was surrounded on three sides by earthen levees and canals and was named the Clifton Court Tract (Kim and Williams 2013, p. 3; The Evening Mail 1898, p. 2).

In 1960, financing for the SWP was approved by the voters of California as a result of the Burns-Porter Act, which authorized \$1.75 billion in general obligation bonds to assist with funding for necessary water facilities for the SWP. The unique configuration and location of the Clifton Court Tract was identified as an ideal site for a storage component of the SWP to be located at the head of the California Aqueduct, which serves as the primary delivery system of the SWP. The purpose of Clifton Court Forebay was to provide storage for off-peak pumping and to regulate the flow into the Delta Pumping Plant. This management lessens potential surges and drawdown during the height of pumping periods (Ambacher 2013, p. 3; Kim and Williams 2013, p. 3; DWR 1974c, p. 201).

Preliminary planning for Clifton Court Forebay was underway early in 1965, which sought to locate a low, 30-foot dam within the existing levees of the Clifton Court Tract (Exhibit B). Construction of the 28,653-acre-foot reservoir began on December 12, 1967, and was completed during December 1969 (Exhibits C and D). Clifton Court Forebay has served in its capacity as an importance storage component of the SWP since the time of its construction into the present (Kim and Williams 2013, p. 3; DWR 1974c, p. 201).

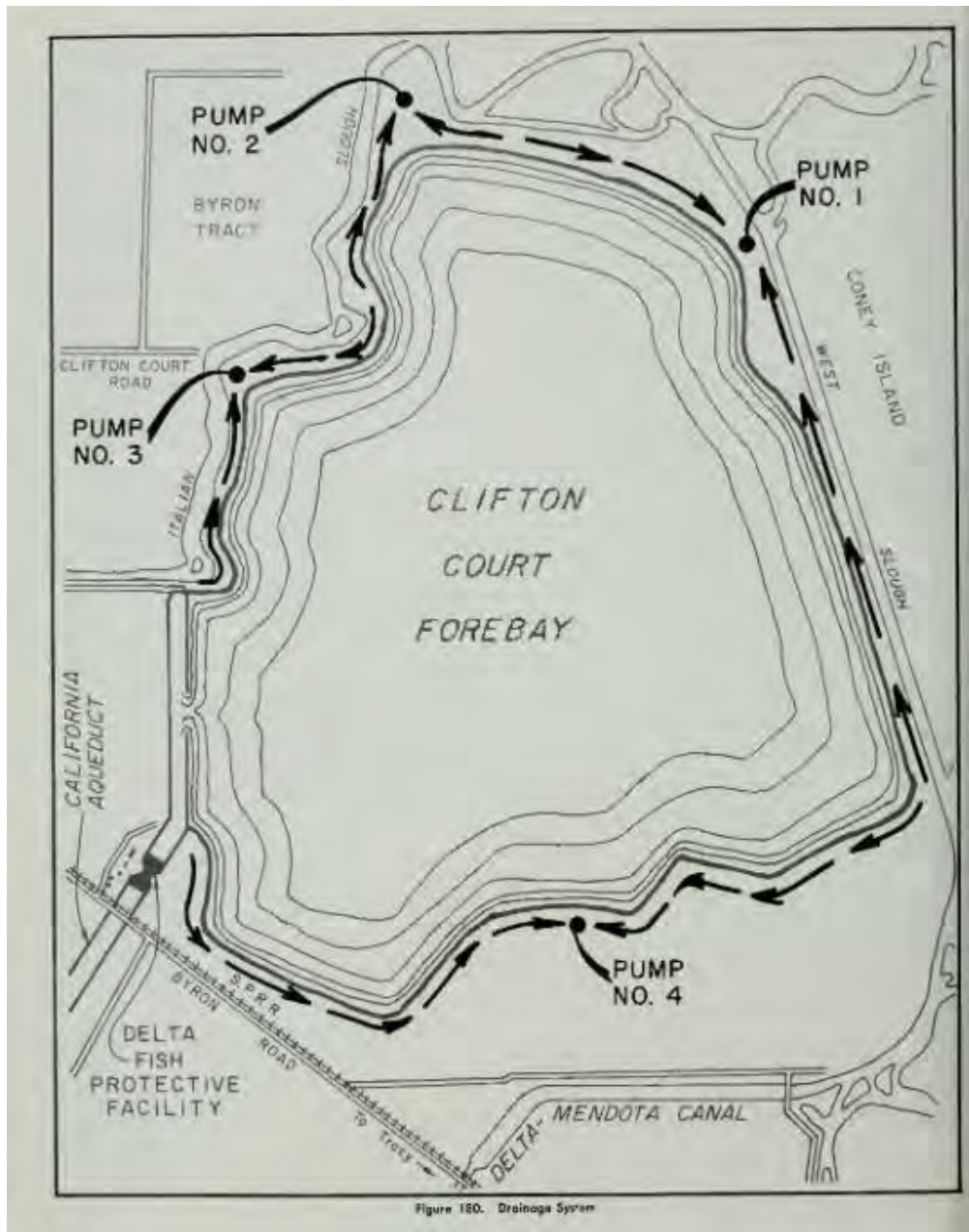


Exhibit B. Illustration of Clifton Court Forebay showing the related pump and drainage systems (DWR 1974c, p. 210).



Exhibit C. 1969 aerial view looking northwest over the Clifton Court Forebay construction site showing the land divisions within the Clifton Court Tract before the completion of the project (DWR 1969).



Exhibit D. 1969 aerial view looking northwest over the Clifton Court Forebay construction site showing the inlet structure and its five control gates in the foreground (DWR 1969).

5 Results of Identification and Evaluation Efforts

Clifton Court Forebay was initially recorded in January 2012 by DWR and re-recorded and evaluated in May 2013 by Patricia Ambacher of AECOM (P-07-003122) as part of the Cultural Resources Inventory, Evaluation and Findings of Effect Report for the Clifton Court Forebay Fishing Facility Project (Ambacher 2013, pp. 1–5). It was re-recorded the same year, in 2013, as a component of the Delta Field Division Facilities (P-07-004698), constructed 1963–1969, by Monte Kim and James Williams of ICF International as part of the Built Historical Resources Evaluation Report for the Bay Delta Conservation Plan Project (Kim and Williams 2013, p. 1). The Delta Field Division Facilities included Clifton Court Forebay, Skinner Fish Facility, and the Harvey O. Banks Pumping Plant. Both records evaluated Clifton Court Forebay using NRHP and CRHR criteria and determined significance for listing in the NRHP under Criteria A and C and the CRHR under Criteria 1 and 3. Both records also recommended that Clifton Court Forebay was potentially a contributing component to a larger potential district.³ In Ambacher (2013), the district proposed is the California Aqueduct, and in Kim and Williams (2013) the suggested district is the California State Water Project Historic District.

This report serves to update the prior documentation and evaluation of this resource, as approaches to evaluating elements of the SWP have evolved since Clifton Court Forebay was recorded in 2013. The evaluation affirms that Clifton Court Forebay is eligible for listing in the NRHP and CRHR individually and as a component of the SWP, as part of its original phase of construction, 1959–1974. Contributing components of Clifton Court Forebay include its earth fill construction and materials, its shallow depth, its five-bay radial gate, and its overall role in the SWP as the functional headwaters of the California Aqueduct. Clifton Court Forebay is, therefore, considered a historic resource for the purposes of CEQA. See the DPR form update in Appendix A for a full evaluation and integrity discussion of Clifton Court Forebay.

5.1 Site Description

Clifton Court Forebay is a shallow reservoir formed by an earth fill dam, located approximately 10 miles northwest of the City of Tracy in the southwest corner of Contra Costa County. It is located along the southwestern edge of the Delta and at the head of the Northern San Joaquin Division of the California Aqueduct. It is part of the Delta Field Division facilities located in this area. Clifton Court Forebay was constructed between 1967 and 1969, provides storage for off-peak pumping, and permits regulation of flows into the Harvey O. Banks (Delta) Pumping Plant.

Clifton Court Forebay Dam was constructed inside the levee of the Clifton Court Tract. The dam is of notable construction because it encircles the forebay as a levee on the northwest, north, east, and south sides, leaving only the southwest side free for the California Aqueduct intake channel, rather than forming a single monolithic dam and utilizing surrounding topography to form the reservoir. The dam measures 30 feet tall above its foundation, though this height is only 14 feet above mean sea level. It measures 20 feet wide and 36,500 feet long, or 6.9 miles, at the dam crest. The waterside slope of the dam levee is treated with a cement-soil slurry, while the outer side of the dam levee is compacted native soil, ballasted with uncompacted soil and organic materials on the outer edge. The reservoir measures approximately 2.6 miles long and 2.1 miles wide, its maximum operating storage volume is 28,653 acre-feet, and its minimum operating storage volume is 13,965 acre-feet.

³ Several previous significance evaluation records created for components of the SWP have suggested the potential for a SWP-related historic district. It is important to note that to date, no such historic district has ever been formally documented or defined.

Water from the Delta enters Clifton Court Forebay through a gated intake control structure at the southeast end of the reservoir. This structure connects Clifton Court Forebay with the West Canal, which is a channel of the Old River. The inlet works is a five-bay concrete structure and each bay features 20-foot-wide and 25.5-foot-tall radial gates housed in a reinforced concrete bay structure. Atop the inlet works is a 10-foot-wide vehicle bridge stop log slots and a platform. There is a channel to the side of the inlet works covered in riprap.

There are also four pumps stationed around the forebay reservoir intended to dewater the outer sides of the dam levee (those that do not face the interior reservoir). This is needed because there are canals with levees on the opposite side, and drainage channels and ditches that form between Clifton Court Forebay Dam and the West Canal, the Old River, Italian Slough, the California Aqueduct, or the pumping plant intake channel that are 14 feet below sea level and must be kept clear of water.

Water leaves the forebay through the southwestern end of the reservoir, through a designed breach in the dam, which opens to an earth-lined channel in the east levee of the Harvey O. Banks Pumping Plant intake channel. The Harvey O. Banks Pumping Plant, intake channel, control gates, and the Skinner Fish Facility (P-07-004698) fall outside of the Project APE.

5.2 National Register of Historic Places/California Register of Historic Resources Statement of Significance

Clifton Court Forebay (P-07-003122) was initially recorded in January 2012 by DWR, and was re-recorded and evaluated in May 2013 by Patricia Ambacher. In 2013, Ambacher recommended that Clifton Court Forebay appeared eligible as a contributing resource to the California Aqueduct, which has already been determined eligible for the NRHP and CRHR under Criteria A/1 and C/3 and Criterion Consideration G as the largest and most significant of the water conveyance systems developed as part of the SWP and for its complex design necessary to redistribute water throughout the State of California on a massive level (Donaldson 2012, pp. 1–2). Clifton Court Forebay was constructed from 1967 to 1969, within the period of significance for the California Aqueduct (1960–1974) established by Ambacher. Ambacher posed that Clifton Court Forebay was eligible under NRHP/CRHR Criteria A/1 as a “character-defining feature of the California Aqueduct” (Ambacher 2013, p. 4) because it was a critical and planned element of the SWP, as the location where the California Aqueduct begins. She also posed that Clifton Court Forebay was eligible under NRHP/CRHR Criteria C/3 because the forebay was a functional, designed necessity for the continued operation of the California Aqueduct that facilitated regulation of surges and drawdown in peak pumping periods, as well as preventing backflow into the Delta at low tides by closing its intake gates. A complete significance statement may be found in the Ambacher (2013) DPR forms for Clifton Court Forebay, and an update to this record is included in this report as Appendix A.

Clifton Court Forebay was also evaluated in August 2013 by Monte Kim and James Williams in conjunction with the other Delta Field Division Facilities (P-07-004698): the John E. Skinner Delta Fish Protective Facility and the Harvey O. Banks (Delta) Pumping Plant. The Kim and Williams (2013) record also poses that these facilities are eligible under NRHP/CRHR Criteria A/1 and C/3 due to the important role that these facilities played as part of an expansive, engineered water-conveyance system, which was designed to store and distribute water to customers of the SWP throughout the state (Kim and Williams 2013, p. 2). Kim and Williams also pose that the Delta Field Division Facilities are eligible as contributing components to a potential SWP historic district.

Both Ambacher's 2013 evaluation and Kim and Williams's 2013 evaluation found that Clifton Court Forebay was not eligible under either Criteria B/2 or D/4.

Dudek's review of the CHRIS record search results, the BERD, and other repositories and databases indicates that neither of these findings have been concurred with by SHPO. The purpose of Dudek's recordation of Clifton Court Forebay is to update prior documentation and evaluation of this resource, as approaches to evaluating elements of the SWP have evolved since 2013. It should be noted, that Clifton Court Forebay is a key structural feature of the SWP and feeds the California Aqueduct, which was determined eligible in 2012 (Donaldson 2012, pp. 1-2). However, the Clifton Court Forebay is eligible as an individual property/resource within its own right as a critical and planned element of the SWP and as the functional California Aqueduct headwaters. Without the Clifton Court Forebay, the California Aqueduct could not function as it does. It is also eligible individually for its design, facilitating water flow from the Delta into the California Aqueduct.

During the 2021 field visit to Clifton Court Forebay, Dudek found that the forebay retains its character-defining features: design as a shallow reservoir bound by a 6.9-mile-long earth fill dam, compacted and uncompacted native soil materials, five-bay radial gate intake structure, and historical association with the California Aqueduct and its role within the larger SWP. Clifton Court Forebay also appears to retain all aspects of integrity necessary to convey its significance that were called out in both the Ambacher (2013) and Kim and Williams (2013) records.

Therefore, Clifton Court Forebay is individually eligible under NRHP/CRHR Criteria A/1 for its association with California Aqueduct and as a critical component of the SWP system that distributes water throughout the state, as well as under NRHP/CRHR Criteria C/3 for its design as the functional headwater/reservoir, regulating the surges and drawdown for the California Aqueduct during peak pumping periods and preventing backflow into the Delta during low tide. Clifton Court Forebay is individually eligible as a component of the SWP as part of its original phase of construction, 1959-1974.

5.3 Integrity Discussion

Clifton Court Forebay retains sufficient integrity to convey its significance under NRHP/CRHR Criteria A/1 and C/3 as an individual historic property/resource. It retains integrity of location in its original location, situated between the Old River, the West Canal, and Italian Slough in the southwestern portion of the Delta. It retains integrity of setting as it retains its historically appropriate, agricultural and sparsely populated setting in the reclaimed Delta marshlands. Integrity of design is retained as it retains the character-defining features of the low, 6.9-mile-long earth fill dam encircling the forebay; the shallow depth reservoir; compacted soil, uncompacted soil and organics, and cementitious soil slurry materials; the five-bay radial gate intake structure; and its historical association with the SWP system. Integrity of materials and workmanship are retained as the original materials and construction techniques are visible and all repairs have been undertaken with in-kind materials. Clifton Court Forebay is still able to convey the feeling of a twentieth century large scale public works project and can still convey a sense of the time and space in which it was constructed. Finally, Clifton Court Forebay retains integrity of association as it retains its association with DWR and its historical associations with the California Aqueduct as a contributing component of the largest conveyance system in the SWP. Clifton Court Forebay, therefore, retains the requisite level of integrity to convey significance under Criteria A/1 and C/3.

5.4 Character-Defining Features

Character-defining features of Clifton Court Forebay include the following:

- The low, 6.9-mile-long dam of earth fill construction, encircling nearly all of the forebay structure
- The shallow average depth of the forebay reservoir
- The combination of compacted soil, uncompacted soil mixed with organics, and cementitious soil slurry that comprise the materials of the earth fill dam Clifton Court Forebay
- The five-bay radial gate intake structure in the southeastern corner of the reservoir
- The historical association with the California Aqueduct as its functional headwaters and with the SWP as a statewide system

6 Application of Criteria of Adverse Effect

6.1 Physical Effects of the Proposed Project

The Project would entail rodent burrow and shallow rut remediation to Clifton Court Forebay Dam, which includes filling and compacting areas where these occur and the clearing and grubbing of vegetation. Tree removal, vegetation clearing, and grubbing activities are proposed in the ditch separating Clifton Court Forebay from the surrounding channels, near Sump No. 4. The Project would also include a high-priority repair to the intake channel. The intake channel repairs include excavation, grouting, backfill, and recompaction; installation of PVC-coated steel wire mesh and bedding material; and placement of armoring rock to deter further animal burrowing. This work would occur between the downstream crest and the downstream slope within the intake channel.

6.2 Clifton Court Forebay

6.2.1 Summary of Resource Significance

Clifton Court Forebay is individually eligible under NRHP/CRHR Criteria A/1 and C/3; historical and architectural significance are expressed through the following major character-defining features:

- The low, 6.9-mile-long dam of earth fill construction encircling nearly all of the forebay structure
- The shallow average depth of the forebay reservoir
- The combination of compacted soil, uncompacted soil mixed with organics, and cementitious soil slurry that comprise the materials of the earth fill dam Clifton Court Forebay
- The five-bay radial gate intake structure in the southeastern corner of the reservoir
- The historical association with the California Aqueduct as its functional headwaters and with the SWP as a statewide system

6.2.2 Analysis of Potential Adverse Effect

The proposed Project activities were analyzed in consideration of the adverse effect examples provided in Title 36 of the Code of Federal Regulations, Part 800.5(a)(2). The Project will have **no adverse effect** on Clifton Court Forebay within the APE. For a detailed assessment of potential adverse effects please refer to Table 4.

Table 4. Application of Criteria of Adverse Effects for Clifton Court Forebay

Examples of adverse effects. Adverse effects on historic properties include, but are not limited to:	Evaluation
(i) Physical destruction of or damage to all or part of the property;	<i>No Adverse Effect.</i> The Project would not demolish all or part of Clifton Court Forebay.
(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous	<i>No Adverse Effect.</i> The purpose of this Project is to remediate rodent burrows, remove trees near a sump, and repair the intake channel and Clifton Court Forebay so it continues to function as part of the SWP.

Table 4. Application of Criteria of Adverse Effects for Clifton Court Forebay

Examples of adverse effects. Adverse effects on historic properties include, but are not limited to:	Evaluation
material remediation, and provision of handicapped access, that is not consistent with the Secretary’s Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;	<p>The construction activities geared toward repairing rodent burrows and shallow ruts in the earthen reservoir embankment have been identified all around the 6.9-mile-long dam, and projected repairs areas will encompass 64.58 acres of the downstream dam face. The proposed fill materials for the rodent burrows would be substantially similar in appearance to the existing reservoir embankment.</p> <p>The removal of trees and vegetation grubbing at Sump No. 4 would have no effect on Clifton Court Forebay and would not constitute an adverse effect to the structure.</p> <p>The high-priority repair to the intake channel in the southeast corner of Clifton Court Forebay will not affect a character-defining features of the intake channel (the intake gates or housing bay structure), nor will new materials in the intake channel be visible from the intake gate or affect its setting. The forebay itself and its intake gates (a character-defining feature of Clifton Court Forebay) will continue to look and function as they do currently. Overall, the proposed repairs appear to be consistent with the Secretary’s Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines and would not constitute an adverse effect to Clifton Court Forebay or its character-defining features.</p>
(iii) Removal of the property from its historic location;	<i>No Potential to Effect.</i> No changes in location are proposed for this Project.
(iv) Change of the character of the property’s use or of physical features within the property’s setting that contribute to its historic significance;	<i>No Adverse Effect.</i> No changes to the use of Clifton Court Forebay are proposed. No changes to the physical features of the structure’s setting which contribute to its historic setting are proposed.
(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property’s significant historic features;	<i>No Potential to Effect.</i> Clifton Court Forebay’s historic integrity would not be diminished by the introduction of new visual, atmospheric, or audible elements.
(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and	<i>No Potential to Effect.</i> Not applicable
(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property’s historic significance.	<i>No Potential to Effect.</i> Clifton Court Forebay will not be transferred out of DWR’s ownership or control as part of the proposed Project.

6.3 Finding of No Adverse Effect

The NRHP- and CRHR-eligible Clifton Court Forebay would not be adversely impacted as a result of the proposed Project. Therefore, Dudek recommends a Finding of **No Adverse Effect to historic properties**.

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7 Summary of Findings

As a result of archival research, review of previous records for Clifton Court Forebay (P-07-003122 and P-07-004698), and the established eligibility finding for the California Aqueduct and SHPO concurrence in 2012 (Donaldson 2021, pp. 1–2), one previously recorded built environment property/resource over 45 years in age was identified within the Project APE: Clifton Court Forebay. Table 5 summarizes these findings. Previous evaluations indicate that Clifton Court Forebay is eligible as a district contributor to a historic district for the California Aqueduct that has been recommended but never defined or formalized (Ambacher 2013, pp. 2–5). Another previous evaluation indicated that Clifton Court Forebay was eligible as a “contributing element to a potential California State Water Project Historic District” (Kim and Williams 2013, p. 2). Presently a historic district for the SWP has also not yet been defined or formalized.

To clear up and better define the eligibility parameters, Dudek finds the Clifton Court Forebay individually eligible under NRHP/CRHR Criteria A/1 and C/3. It is important for its association with the California Aqueduct (1960–1974) and as a component of the larger SWP (1959–1974). As such, Clifton Court Forebay is considered a historic property under Section 106 of the NHPA and a historical resource under CEQA. Preparation of a detailed effects assessment in Section 6.3 of this report indicates that the proposed Project would have a less-than-significant impact on historical resources under CEQA and no adverse effect on historic properties in the APE under Section 106.

Table 5. Summary of Findings

APE Map Figure	Property Name	Property Type	NRHP Significance Criteria	Previous CHRS code (if applicable)	Current CHRS code	Section 106 Finding of Effects
3	Clifton Court Forebay (1967–1969)	Dam and Reservoir	A/1, C/3	3D: Appears eligible for NRHP as a contributor to a NRHP-eligible district through survey evaluation (Ambacher 2013) 3D (Kim and Williams 2013)	3S: Appears eligible for NRHP as an individual property through survey evaluation 3CS: Appears eligible for CRHR as an individual property through survey evaluation	No adverse effect

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8.2 List of Preparers

Kathryn Haley, MA, Co-author, Senior Architectural Historian and Built Environment Project Lead

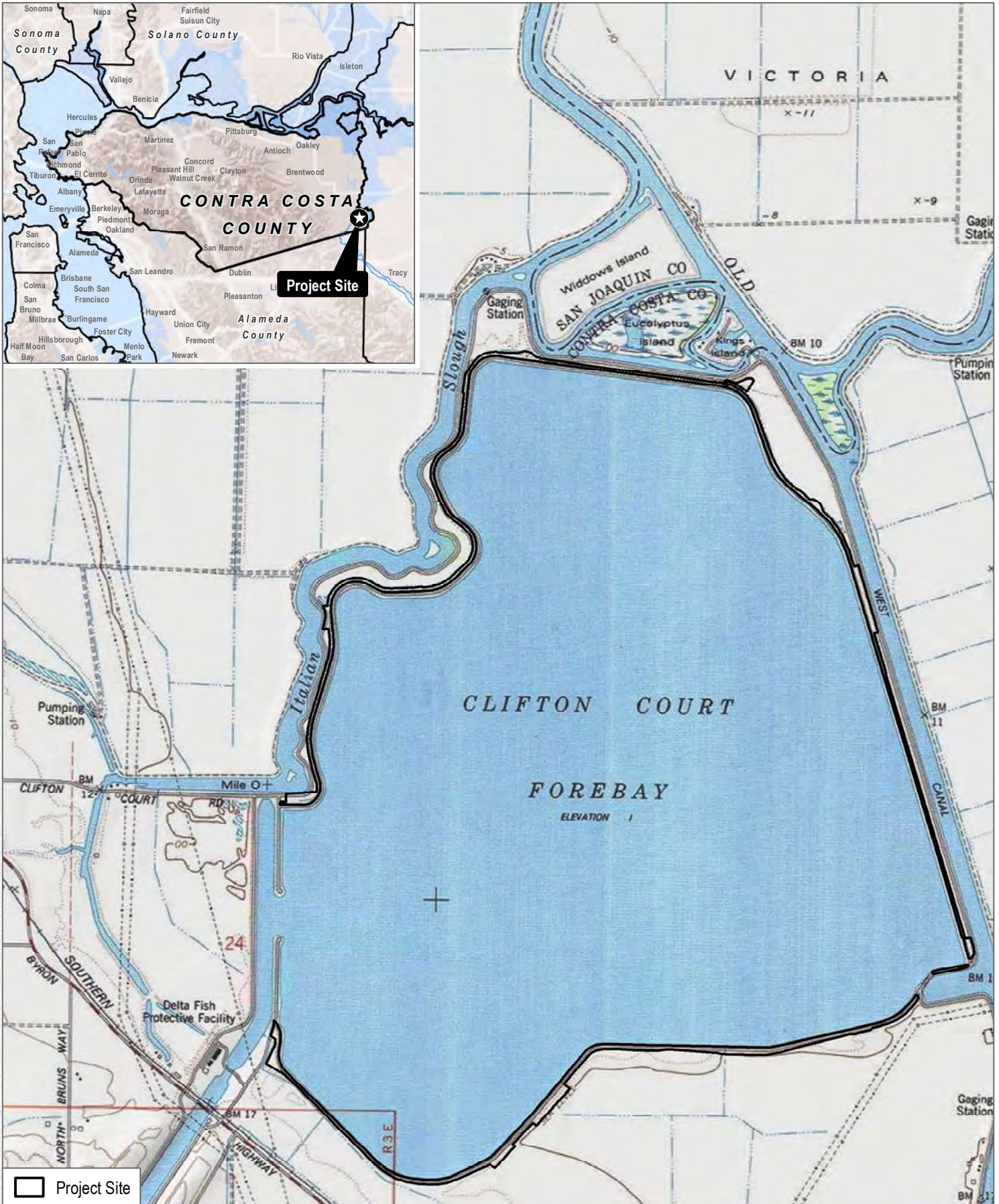
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Publications

Nicole Sanchez-Sullivan, Technical Editor

Hannah Wertheimer, Technical Editor



BASEMAP SOURCE: DWR 1/8/2021; USGS 7.5-Minute Series Clifton Court Forebay Quadrangle

FIGURE 1

Project Location - Clifton Court Forebay

Delta Dams Rodent Burrow Remediation Project



0 1,000 2,000 Feet

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SOURCE: DWR 2021-05-12; ESRI World Imagery

FIGURE 2
Proposed Activities at Clifton Court Forebay
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: DWR 2021/05/13; Contra Costa County 2020; USGS 2020; ESRI World Imagery

FIGURE 3

Clifton Court Forebay - Cultural Resources - Built Environment - Area of Potential Effects



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Appendix A

Clifton Court Forebay DPR Update

*Recorded by: Kate G. Kaiser

*Date: 9/21/2021

Continuation

Update

CHRIS Record search results indicate that there are two duplicate records for Clifton Court Forebay:

Clifton Court Forebay (P-07-003122) was initially recorded in January 2012 by DWR, and was re-recorded and evaluated in May 2013 by Patricia Ambacher. In 2013, Ambacher recommended that Clifton Court Forebay appeared eligible as a contributing resource to the California Aqueduct. While the California Aqueduct has separately been determined eligible and received SHPO Concurrence, the Clifton Court Forebay eligibility has not received concurrence from the SHPO to date.

Concurrently with the Ambacher report and record, Clifton Court Forebay was also evaluated in August 2013 by Monte Kim and James Williams as part of the Delta Field Division Facilities (P-07-004698), which also included the John E. Skinner Delta Fish Protective Facility and the Harvey O. Banks (Delta) Pumping Plant.

Dudek's review of the CHRIS record search results, the BERD, and other repositories and databases indicates that neither of these findings have been concurred with by SHPO. The purpose of Dudek's recordation of Clifton Court Forebay is to update the prior documentation and evaluation of this resource, as approaches to evaluating elements of the SWP have evolved since 2013. The Clifton Court Forebay is eligible as an individual property/resource within its own right as a critical and planned element of the California State Water Project and as the functional California Aqueduct headwaters. Without the Clifton Court Forebay, the California Aqueduct could not function as it does. It is also eligible individually for its design, facilitating water flow from the Delta into the California Aqueduct.

Dudek recommends that one of these records and primary numbers be retired to avoid future confusion. Dudek also research also indicates that the Clifton Court Forebay receive an updated CHRS code of 3S, 3CS. Previous site records are appended behind the 2021 update record.

State of California & The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-07-003122 and P-07-004698
HRI # _____
Trinomial _____
NRHP Status Code 3S, 3CS

Other Listings _____
UPDATED 09/2021 Review Code _____ Reviewer _____ Date _____

Page 1 of 14 *Resource Name or #: (Assigned by recorder) Clifton Court Forebay

P1. Other Identifier: Delta Field Division Facilities

*P2. Location: Not for Publication Unrestricted

*a. County Contra Costa and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Clifton Court Forebay, Calif. Date 1978

T 01S; R 03E; Sections 13, 24 and 25; Mt. Diablo B.M.

T 01S; R 04E; Sections 7, 8, 17, 18, 19, 20 and 30; Mt. Diablo B.M.

c. Address not applicable City not applicable Zip not applicable

d. UTM: (Give more than one for large and/or linear resources) Zone 10S, 625258.06 mE/ 4189068.74 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)

Clifton Court Forebay is located in southeast Contra Costa County, on the west side of California's Central Valley at the southwestern edge of the Sacramento-San Joaquin River Delta (Delta), approximately 10 miles northwest of the City of Tracy and adjacent to Byron Road. (See Continuation Sheet)

*P3a. Description: (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Clifton Court Forebay is a shallow reservoir formed by an earth fill dam, located approximately 10 miles northwest of the City of Tracy in the southwest corner of Contra Costa County. It is located along the southwestern edge of the Delta and at the head of the Northern San Joaquin Division of the California Aqueduct. It is part of the Delta Field Division facilities located in this area. Clifton Court Forebay was constructed between 1967 and 1969, provides storage for off-peak pumping, and permits regulation of flows into the Harvey O. Banks (Delta) Pumping Plant. (See Continuation Sheet)

*P3b. Resource Attributes: (List attributes / codes) HP22. Lake/river/reservoir

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



*P4. Resources Present: Building
 Structure Object Site District
 Element of District Other
(Isolates, etc.)

*P5b. Description of Photo: (view, date, accession #) Clifton Court Forebay, looking east (IMG_3783)

*P6. Date Constructed/Age and Source: Historic Prehistoric
Both 1967-1969 (DWR 1974c)

*P7. Owner and Address:
California Department of Water Resources
1416 Ninth Street, Room 604
Sacramento, California 95814

*P8. Recorded by: (Name, affiliation, and address) Kate Kaiser, MSHP,
Architectural Historian, Dudek
853 Lincoln Way, Suite 208
Auburn, CA 95603

*P9. Date Recorded: 01/13/2021

*P10. Survey Type: (Describe)
Intensive-level survey

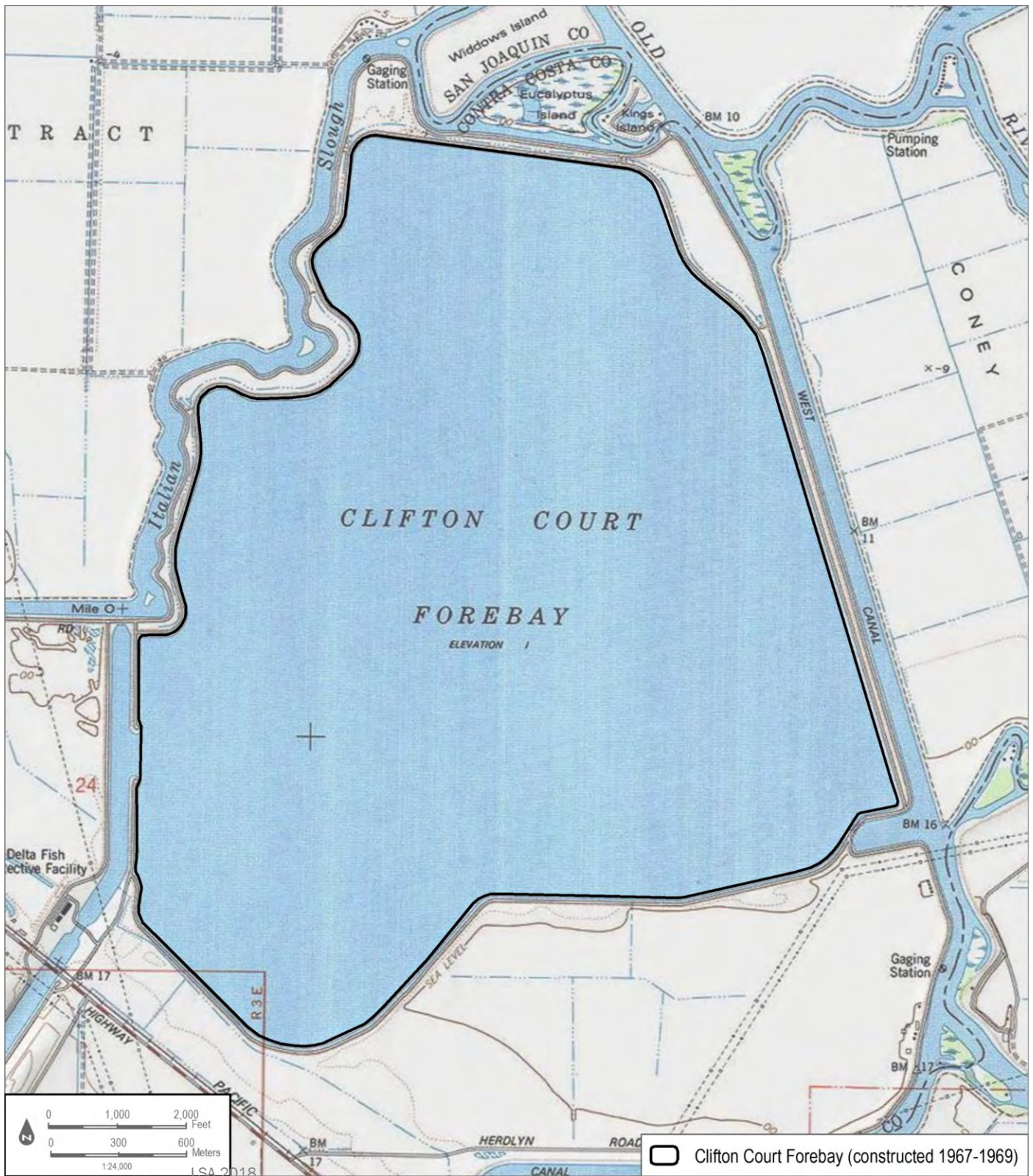
*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Kaiser, K. and K. Haley. 2021. Built Environment Inventory and Evaluation Report for the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay Contra Costa County, California. Prepared by Dudek for California Department of Water Resources, April 2021

*Attachments: NONE Location Map Continuation Sheet Building, Structure, and Object Record Archaeological Record
 District Record Linear Feature Record Milling Station Record Rock Art Record Artifact Record Photograph Record Other (List): _____

LOCATION MAP

Page 2 of 14 *Resource Name or # (Assigned by recorder) Clifton Court Forebay

*Map Name: Clifton Court Forebay, Calif *Scale: 1:24,000 *Date of map: 1978



BUILDING, STRUCTURE, AND OBJECT RECORD

*Resource Name or # (Assigned by recorder) Clifton Court Forebay *NRHP Status Code 3S, 3CS
Page 3 of 14

B1. Historic Name: Clifton Court Forebay
B2. Common Name: Clifton Court Forebay
B3. Original Use: Storage
B4. Present Use: Storage
*B5. Architectural Style: Utilitarian
*B6. Construction History: (Construction date, alterations, and date of alterations)

1959 – Burns-Porter Act enables funding for Clifton Court Forebay as part of the SWP
1965 – Clifton Court Forebay planning begins
1967 – Construction begins
1969 – Construction concludes
1974 – Construction of the California Aqueduct concludes and Clifton Court Forebay begins to operate as intended

*B7. Moved? No Yes Unknown Date: _____ Original Location: _____

*B8. Related Features:

B9a. Architect: California Department of Water Resources b. Builder: Gordon H. Ball Enterprises
*B10. Significance: Theme Water Development and Supply in California Area Engineering
Period of Significance 1967-1969 Property Type Dam and Reservoir Applicable Criteria A/1, C/3
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Dudek finds the Clifton Court Forebay individually eligible under NRHP/CRHR Criteria A/1 and C/3. It is important for its association with the California Aqueduct (1960–1974) and as a component of the larger SWP (1959–1974). As such, Clifton Court Forebay is considered a historic property under Section 106 of the NHPA and a historical resource under CEQA. Clifton Court Forebay is individually eligible under NRHP/CRHR Criteria A/1 and C/3; historical and architectural significance are expressed through the following major character-defining features:

- The low, 6.9-mile-long dam of earth fill construction encircling nearly all of the forebay structure
- The shallow average depth of the forebay reservoir
- The combination of compacted soil, uncompacted soil mixed with organics, and cementitious soil slurry that comprise the materials of the earth fill dam Clifton Court Forebay
- The five-bay radial gate intake structure in the southeastern corner of the reservoir
- The historical association with the California Aqueduct as its functional headwaters and with the SWP as a statewide system

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes) _____

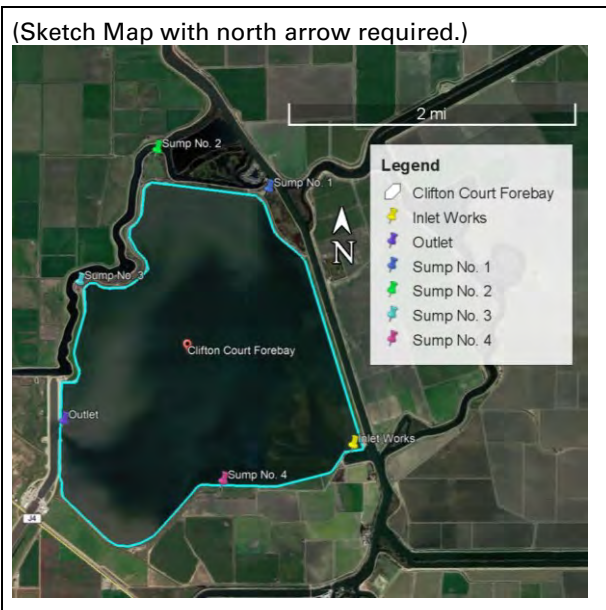
*B12. References:

(See Continuation Sheet)

B13. Remarks:

*B14. Evaluator: Kate Kaiser, MSHP
*Date of Evaluation: 04/07/2021

(This space reserved for official comments.)



CONTINUATION SHEET

Property Name: Clifton Court Forebay

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P2e. Additional Location Data (Continued):

The forebay lies in the *Clifton Court Forebay, Calif.* U.S. Geological Survey 7.5-minute quadrangles, which fall on Public Lands Survey System Sections 13, 24, and 25 of Township 1 South, Range 3 East, and Sections 7, 8, 17, 18, 19, 20, and 30 of Township 1 South, Range 4 East, Mount Diablo Baseline Meridian (Figure 1, Project Location – Clifton Court Forebay, all figures are provided at the end of the report). The forebay is surrounded on the northwest, north, and east sides by the Italian Slough, the Old River, and the West Canal. Water from the Delta enters the forebay through a gated intake control structure at the southeast end of the reservoir. This structure connects the forebay to the West Canal. Other related California State Water Project (SWP) nearby features include the California Aqueduct intake channel, located along the southwest side of the forebay reservoir, the Delta Fish Protective Facility (Skinner Fish Facility), and a control gate structure.

*P3a. Description (Continued):

Clifton Court Forebay Dam (Figures 3-10) was constructed inside the levee of the Clifton Court Tract. The dam is of notable construction because it encircles the forebay as a levee on the northwest, north, east, and south sides, leaving only the southwest side free for the California Aqueduct intake channel, rather than forming a single monolithic dam and utilizing surrounding topography to form the reservoir. The dam measures 30 feet tall above its foundation, though this height is only 14 feet above mean sea level. It measures 20 feet wide and 36,500 feet long, or 6.9 miles, at the dam crest. The waterside slope of the dam levee is treated with a cement-soil slurry, while the outer side of the dam levee is compacted native soil, ballasted with uncompacted soil and organic materials on the outer edge. The reservoir measures approximately 2.6 miles long and 2.1 miles wide, its maximum operating storage volume is 28,653 acre-feet, and its minimum operating storage volume is 13,965 acre-feet.

Water from the Delta enters Clifton Court Forebay through a gated intake control structure at the southeast end of the reservoir. This structure connects Clifton Court Forebay with the West Canal, which is a channel of the Old River. The inlet works is a five-bay concrete structure and each bay features 20-foot-wide and 25.5-foot-tall radial gates housed in a reinforced concrete gate-bay structure. Atop the inlet works is a 10-foot-wide vehicle bridge stop log slots and a platform. There is a channel to the side of the inlet works covered in riprap.

There are also four pumps stationed around the forebay reservoir intended to dewater the outer sides of the dam levee (those that do not face the interior reservoir). This is needed because there are canals with levees on the opposite side, and drainage channels and ditches that form between Clifton Court Forebay Dam and the West Canal, the Old River, Italian Slough, the California Aqueduct, or the pumping plant intake channel that are 14 feet below sea level and must be kept clear of water.

Water leaves the forebay through the southwestern end of the reservoir, through a designed breach in the dam, which opens to an earth-lined channel in the east levee of the Harvey O. Banks Pumping Plant intake channel. The Harvey O. Banks Pumping Plant, intake channel, control gates, and the Skinner Fish Facility (P-07-004698) fall outside of the Project APE.



Figure 3. Clifton Court Forebay, looking west towards California Aqueduct intake channel (IMG_3800)

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Property Name: Clifton Court Forebay
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Figure 4. Clifton Court Forebay, view looking northeast (IMG_3808)



Figure 5. Clifton Court Forebay at California Aqueduct intake, looking north (IMG_3840)

CONTINUATION SHEET

Property Name: Clifton Court Forebay

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Figure 6. Clifton Court Forebay, gated intake control structure, looking southwest (IMG_3917)



Figure 7. Clifton Court forebay, gated intake control structure, looking northwest (IMG_3924)

CONTINUATION SHEET

Property Name: Clifton Court Forebay

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Figure 8. Clifton Court forebay, showing levee structure from access road, looking west (IMG_3949)



Figure 9. Clifton Court forebay, looking northeast (IMG_3786)

CONTINUATION SHEET

Property Name: Clifton Court Forebay

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Figure 10. Clifton Court forebay, looking southwest(IMG_0785)

*B10. Significance (Continued):

Historic Context: Development of Clifton Court Forebay

The historical development of Clifton Court Forebay is discussed at length in the P-07-003122 Clifton Court Forebay DPR record (Ambacher 2013), the P-07-004698 Delta Field Division Facilities DPR record (Kim and Williams 2013), and the Clifton Court Forebay entry in the 1974 Bulletin 200: California State Water Project, Volume III Storage Facilities context (DWR 1974c). Please refer to the original DPR records appended to the end of this update for a complete context.

The development of Clifton Court Forebay began with early land reclamation efforts in the San Joaquin Delta wetlands. In 1898, the Old River Land and Reclamation Company set out to drain and convert 4,000 acres of company-owned land located west of Union Island and south of the Byron Tract, also both reclaimed lands, for use as farmland. This newly reclaimed area was surrounded on three sides by earthen levees and canals and was named the Clifton Court Tract (Kim and Williams 2013, p. 3; The Evening Mail 1898, p. 2).

In 1960, financing for the SWP was approved by the voters of California as a result of the Burns-Porter Act, which authorized \$1.75 billion in general obligation bonds to assist with funding for necessary water facilities for the SWP. The unique configuration and location of the Clifton Court Tract was identified as an ideal site for a storage component of the SWP to be located at the head of the California Aqueduct, which serves as the primary delivery system of the SWP. The purpose of Clifton Court Forebay was to provide storage for off-peak pumping and to regulate the flow into the Delta Pumping Plant. This management lessens potential surges and drawdown during the height of pumping periods (Ambacher 2013, p. 3; Kim and Williams 2013, p. 3; DWR 1974c, p. 201).

Preliminary planning for Clifton Court Forebay was underway early in 1965, which sought to locate a low, 30-foot dam within the existing levees of the Clifton Court Tract (Figure 11). Gordon H. Ball Enterprises was chosen as the general contractor in early 1967, and construction of the 28,653-acre-foot reservoir began on December 12, 1967, and was completed during December 1969 (Figure 12 and 13). The Clifton Court Forebay has served in its capacity as an importance storage component of the SWP since the time of its construction into the present (Kim and Williams 2013, p. 3; DWR 1974c, p. 201).

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Property Name: Clifton Court Forebay
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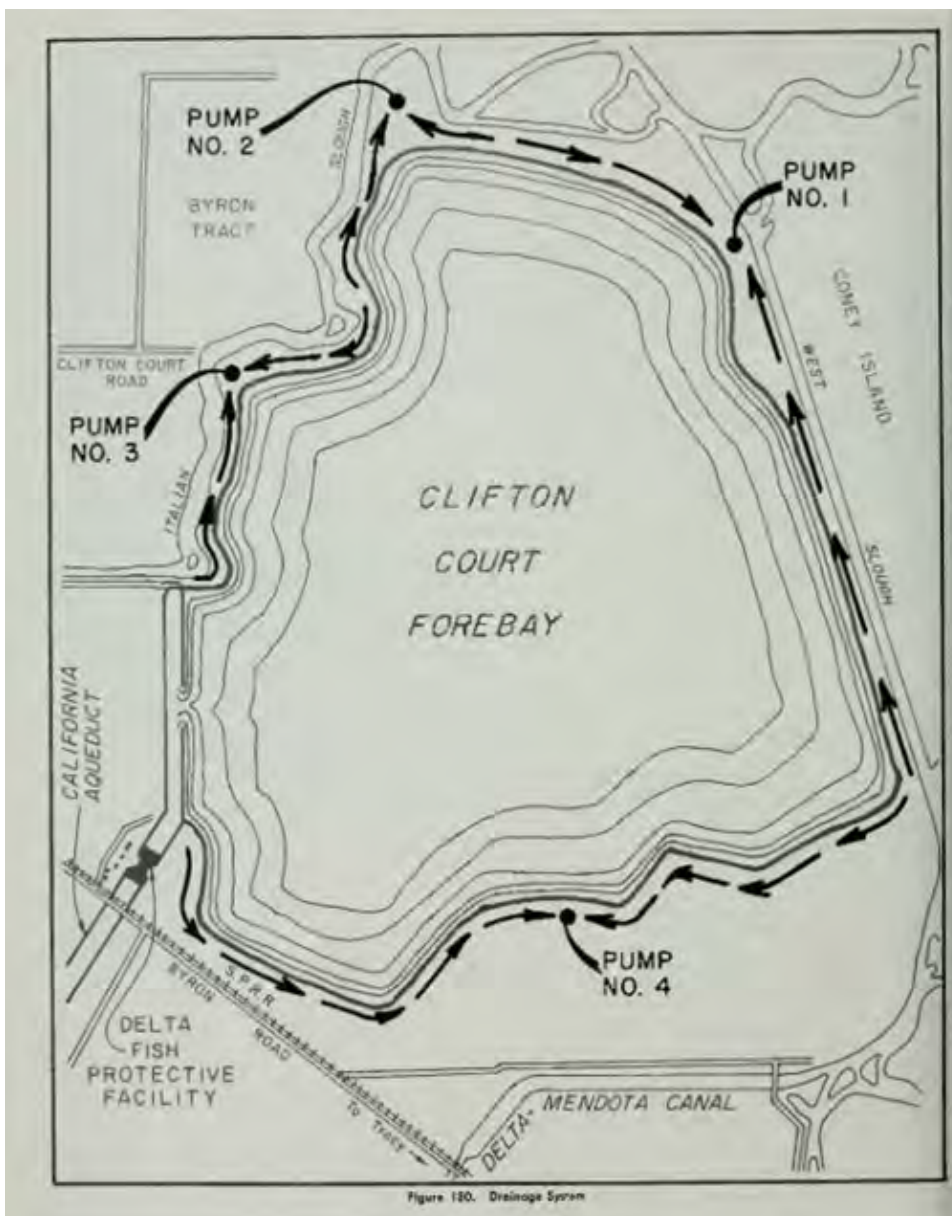


Figure 11. Illustration of Clifton Court Forebay showing the related pump and drainage systems (DWR 1974c, p. 210).

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Property Name: Clifton Court Forebay

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Figure 12. Exhibit C. 1969 aerial view looking northwest over the Clifton Court Forebay construction site showing the land divisions within the Clifton Court Tract before the completion of the project (DWR n.d.).



Figure 13. 1969 aerial view looking northwest over the Clifton Court Forebay construction site showing the inlet structure and its five control gates in the foreground (DWR n.d.).

National Register of Historic Places/California Register of Historic Resources Statement of Significance

Clifton Court Forebay (P-07-003122) was initially recorded in January 2012 by DWR and was re-recorded and evaluated in May 2013 by Patricia Ambacher. In 2013, Ambacher recommended that Clifton Court Forebay appeared eligible as a contributing resource to the California Aqueduct, which has already been determined eligible for the NRHP and CRHR under Criteria A/1 and C/3 and Criterion Consideration G as the largest and most significant of the water conveyance systems developed as part of the SWP and for its complex design necessary to redistribute water throughout the State of California on a massive level (Donaldson 2012, pp. 1–2). Clifton Court Forebay was constructed from 1967 to 1969, within the period of significance for the California Aqueduct (1960–1974) established by Ambacher. Ambacher posed that Clifton Court Forebay was eligible under NRHP/CRHR Criteria A/1 as a “character-defining feature of

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Property Name: Clifton Court Forebay

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the California Aqueduct" (Ambacher 2013, p. 4) because it was a critical and planned element of the SWP, as the location where the California Aqueduct begins. She also posed that Clifton Court Forebay was eligible under NRHP/CRHR Criteria C/3 because the forebay was a functional, designed necessity for the continued operation of the California Aqueduct that facilitated regulation of surges and drawdown in peak pumping periods, as well as preventing backflow into the Delta at low tides by closing its intake gates. A complete significance statement may be found in the Ambacher (2013) DPR forms for Clifton Court Forebay, appended to this DPR update.

Clifton Court Forebay was also evaluated in August 2013 by Monte Kim and James Williams in conjunction with the other Delta Field Division Facilities (P-07-004698): the John E. Skinner Delta Fish Protective Facility and the Harvey O. Banks (Delta) Pumping Plant. The Kim and Williams (2013) record also poses that these facilities are eligible under NRHP/CRHR Criteria A/1 and C/3 due to the important role that these facilities played as part of an expansive, engineered water-conveyance system, which was designed to store and distribute water to customers of the SWP throughout the state (Kim and Williams 2013, p. 2). Kim and Williams also pose that the Delta Field Division Facilities are eligible as contributing components to a potential SWP historic district. Kim and Williams' evaluation is also appended to this DPR update.

Both Ambacher's 2013 evaluation and Kim and Williams's 2013 evaluation found that Clifton Court Forebay was not eligible under either Criteria B/2 or D/4.

Dudek's review of the CHRIS record search results, the BERD, and other repositories and databases indicates that neither of these findings have been concurred with by SHPO. The purpose of Dudek's recordation of Clifton Court Forebay is to update this prior documentation and evaluation of this resource as approaches to evaluating elements of the SWP has evolved since 2013. It should be noted, that Clifton Court Forebay is a key structural feature of the SWP and feeds the California Aqueduct, which was determined eligible in 2012 (Donaldson 2012, pp. 1–2). However, the Clifton Court Forebay is eligible as an individual property/resource within its own right as a critical and planned element of the SWP and as the functional California Aqueduct headwaters. Without the Clifton Court Forebay, the California Aqueduct could not function as it does. It is also eligible individually for its design, facilitating water flow from the Delta into the California Aqueduct.

During the 2021 field visit to Clifton Court Forebay, Dudek found that the forebay retains its character-defining features: design as a shallow reservoir bound by a 6.9-mile-long earth fill dam, compacted and uncompacted native soil materials, five-bay radial gate intake structure, and historical association with the California Aqueduct and its role within the larger SWP. Clifton Court Forebay also appears to retain all aspects of integrity necessary to convey its significance that were called out in both the Ambacher (2013) and Kim and Williams (2013) records.

Therefore, Clifton Court Forebay is individually eligible under NRHP/CRHR Criteria A/1 for its association with California Aqueduct and as a critical component of the SWP system that distributes water throughout the state, as well as under NRHP/CRHR Criteria C/3 for its design as the functional headwater/reservoir, regulating the surges and drawdown for the California Aqueduct during peak pumping periods and preventing backflow into the Delta during low tide. Clifton Court Forebay is individually eligible as a component of the SWP as part of its original phase of construction, 1959–1974.

Integrity Discussion

Clifton Court Forebay retains sufficient integrity to convey its significance under NRHP/CRHR Criteria A/1 and C/3 as an individual historic property/resource. It retains integrity of location in its original location, situated between the Old River, the West Canal, and Italian Slough in the southwestern portion of the Delta. It retains integrity of setting as it retains its historically appropriate, agricultural and sparsely populated setting in the reclaimed Delta marshlands. Integrity of design is retained as it retains the character-defining features of the low, 6.9-mile-long earth fill dam encircling the forebay; the shallow depth reservoir; compacted soil, uncompacted soil and organics, and cementitious soil slurry materials; the five-bay radial gate intake structure; and its historical association with the SWP system. Integrity of materials and workmanship are retained as the original materials and construction techniques are visible and all repairs have been undertaken with in-kind materials. Clifton Court Forebay is still able to convey the feeling of a twentieth century large scale public works project and can still convey a sense of the time and space in which it was constructed. Finally, Clifton Court Forebay retains integrity of association as it retains its association with DWR and its historical associations with the California Aqueduct as a contributing component of the largest conveyance system in the SWP. Clifton Court Forebay, therefore, retains the requisite level of integrity to convey significance under Criteria A/1 and C/3.

Character-Defining Features

Character-defining features of Clifton Court Forebay include the following:

- The low, 6.9-mile-long dam of earthfill construction, encircling nearly all of the forebay structure
- The shallow average depth of the forebay reservoir
- The combination of compacted soil, uncompacted soil mixed with organics, and cementitious soil slurry that comprise the

CONTINUATION SHEET

Property Name: Clifton Court Forebay

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- materials of the earthfill dam Clifton Court Forebay
- o The five-bay radial gate intake structure in the southeastern corner of the reservoir
- o The historical association with the California Aqueduct as its functional headwaters and with the SWP as a statewide system

*B12. References (Continued):

- Ambacher, P. 2011. "P-16-000266/P-15-015820/P-10-006207 (California Aqueduct)." DPR 523-series forms on file at the CHRIS Southern San Joaquin Valley Information Center, California State University, Bakersfield. Prepared by AECOM for DWR. With updates from Daly 2012, Ehringer 2013, Baloian 2016 and Carey et al 2016.
- Ambacher, P. 2013. "P-07-003122 (Clifton Court Forebay)." DPR 523-series forms on file at the CHRIS Northwest Information Center, Sonoma State University, Rohnert Park, CA. Prepared by AECOM for DWR.
- Andrus, P.W. and R.H. Shrimpton. 2002. "How to Apply the National Register Criteria for Evaluation." National Register Bulletin 15. Accessed April 1, 2019. <https://www.nps.gov/nr/publications/bulletins/pdfs/nrb15.pdf>
- ARG (Architectural Resources Group). 2000. Revised Draft Downtown Stockton Historic Resources Survey, Volumes I and II. Prepared for the City of Stockton Community Development Department. September 2000.
- Bowen, M.R. 2003. "P-07-003093 (West Canal, Contra Costa County)" and "P-39-004856 (West Canal, San Joaquin County)." DPR 523-series forms on file at the CHRIS Northwest Information Center, Sonoma State University, Rohnert Park, CA and at the Central California Information Center, California State University Stanislaus, Turlock, CA. Prepared by Jones & Stokes for DWR.
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Property Name: Clifton Court Forebay

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Property Name: Clifton Court Forebay

Page 14 of 14

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State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-07-003122
HRI # _____
Trinomial _____
NRHP Status Code 3D
Other Listings _____
Review Code _____ Reviewer _____ Date _____

*Resource Name or # (Assigned by recorder) Clifton Court Forebay

P1. Other Identifier: Clifton Court Forebay

***P2. Location:** Not for Publication Unrestricted

***a. County** Contra Costa

and (P2b and P2c or P2d. Attach a Location Map as necessary.)

***b. USGS 7.5' Quad** Clifton Court Forebay **Date** 2009 **T1S; R** See Cont. Sheet; **¼ of Sec** See Cont. Sheet; **B.M.**

c. Address _____ City _____ Zip _____

d. UTM: (give more than one for large and/or linear resources) Zone _____; _____ mE/ _____ mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate)

LOCATED ON THE NORTH SIDE OF CA 4 WEST, 50 MILES SOUTH OF THE CITY OF SACRAMENTO NEAR THE TOWN OF BYRON

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

Clifton Court Forebay (CCF) is a shallow, 28,653-acre-foot reservoir (**Photograph 1**). CCF is approximately 2.6 miles long and 2.1 miles wide. It is an earthen reservoir with a 15 foot high dam. The dam surrounding the CCF has a 3:1 waterside slope, a 3:1 landside slope, and a paved crown approximately 20 feet wide. The waterside slope of the dam is treated with sprayed concrete or mortar (**Photograph 2**). Several concrete block mattresses and concrete ramps on the waterside provide access to the CCF for DWR management and maintenance purposes. The waterside and landside slope of the outer levee along Old River/West Canal is 3:1. An unpaved gravel road approximately 20 feet wide comprises the crown of the outer levee (**Photograph 3**). (See Continuation Sheet)

***P3b. Resource Attributes:** (List attributes and codes) HP22. Reservoir

***P4. Resources Present:** Building Structure Object Site District Element of District Other (Isolates, etc.)

P5b. Description of Photo: (View, date, accession #) Photograph 1, Overview, camera facing southwest, May 9, 2012

***P6. Date Constructed/Age and Sources:**

Historic Prehistoric Both

1969 / CA Dept. of Water Resources

***P7. Owner and Address:**

CA Dept. of Water Resources

1416 9th Street

Sacramento, CA 95814

***P8. Recorded by:** (Name, affiliation, address)

Patricia Ambacher

AECOM

2020 L Street, Suite 400

Sacramento, CA 95811

***P9. Date Recorded:**

May 9, 2012

***P10. Survey Type:** (Describe)

Intensive



***P11. Report Citation:** (Cite survey report and other sources, or enter "none.") AECOM. Cultural Resources Inventory, Evaluation and Finding of Effect Report for the Clifton Court Forebay Fishing Facility Project, August 2012.

***Attachments:** NONE Location Map Sketch Map Continuation Sheet Building, Structure, and Object Record Archaeological Record

District Record Linear Feature Record Milling Station Record Rock Art Record Artifact Record Photograph Record

Other (list) DPR 523 for Clifton Court Forebay, January 2012

DPR 523A (1/95)

***Required Information**

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
BUILDING, STRUCTURE, AND OBJECT RECORD

Primary # P-07-003122
HRI # _____

Page 2 of 10

*NRHP Status Code 3D

*Resource Name or # (Assigned by recorder) Clifton Court Forebay

B1. Historic Name: Clifton Court Forebay
B2. Common Name: Clifton Court Forebay
B3. Original Use: Reservoir B4. Present Use: Reservoir

*B5. Architectural Style: Utilitarian

*B6. Construction History: (Construction date, alteration, and date of alterations) 1969

*B7. Moved? No Yes Unknown Date: _____ Original Location: _____

*B8. Related Features: California Aqueduct

B9. Architect: Unknown b. Builder: Unknown

*B10. Significance: Theme Water Conveyance Area California

Period of Significance 1960-1974 Property Type Reservoir Applicable Criteria A/1 and C/3

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The CCF appears to meet the Criteria A/1 and C/3 of the National Register of Historic Places (NRHP) and the California Register of Historical Resources (CRHR) at the state level of significance as a contributing element to the California Aqueduct. The California Aqueduct was determined eligible by the State Historic Preservation Officer on July 3, 2012, at the state level of significance under NRHP Criterion A as the largest and most significant of the water conveyance systems developed as part of the State Water Project (SWP). The district was also determined eligible under NRHP Criterion C for its complex design. The period of significance is 1960-1974, the years of construction.

The SWP was a massive project in the state of California that includes aqueducts, canals, pipelines, and storage and pumping facilities. The purpose of the SWP was to address efforts to control the distribution of water to meet California's rising population and the demands for this resource.

State Water Project

The idea of a statewide water project was first discussed in 1919, when Lt. Robert B. Marshall, chief hydrographer of the U.S. Geological Survey, proposed to California's governor a redistribution of water from the Sacramento River to the San Joaquin Valley and then over the Tehachapi Mountains to southern California. Marshall's plan was met with resistance, but it served as the basis for what eventually became the SWP (Cooper 1968:50-52; DWR 2011). (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References: See Continuation Sheet

B13. Remarks:

*B14. Evaluator: Patricia Ambacher

*Date of Evaluation: March 22, 2013

(This space reserved for official comments.)



Page 3 of 10

*Recorded by P. Ambacher, AECOM

*Resource Name or # (Assigned by recorder) Clifton Court Forebay

*Date May 9, 2012

Continuation Update

Location (cont)

Range 3E, Sections 12, 13, 24, and 25 and Range 4E, Sections 7, 8, 17, 18, 19, 20, and 30

Description (cont)

At the southeast corner of the CCF, a radial gate structure consisting of five radial gates, each 20 feet wide controls the flow of water into the CCF (**Photograph 4 and 5**). A concrete apron enclosed by wing walls is located on the CCF-side of the radial gate structure (**Photograph 6**). The wing walls are approximately 100 feet long. A one lane bridge over the gates can accommodate light vehicle traffic (**Photograph 7**).

To the west of the radial gates are two buildings (**Photograph 8**). One is square in plan with a flat roof and sheathed entirely in corrugated metal. The primary entrance has a flush, metal, single-entry door. The second building is a CMU building, rectangular in plan with a flat roof sheathed in corrugated metal. Doors are single-entry, flush metal doors.

Southeast of CCF is a small boat dock exists along the outer levee (**Photograph 9**).

Significance (cont)

Planning for the SWP began in earnest after World War II, during a period when California experienced a population surge. Local governments and water officials quickly realized that their water supplies could not meet the growing demand of their communities. Farmers were also draining regional groundwater basins to irrigate their land (DWR 2011). State engineer Arthur D. Edmonston published a proposal that suggested building a multipurpose dam, reservoir, and power plant on the Feather River, northeast of the small town of Oroville in the northern Sacramento Valley; an aqueduct to transport water from the Delta to Santa Clara and Alameda Counties; and a second aqueduct to serve the San Joaquin Valley and southern California (DWR 2011).

The storage of water would reduce flooding hazards, and the stored water could be released into the Sacramento River at planned intervals and then deposited into the Sacramento–San Joaquin Delta. Here it would be able to check the flow of salt water from the San Francisco Bay, which during droughts had seeped as far inland as Sacramento. The project would be paid for in part by the electricity generated at the dam's power plant. Edmonston also proposed constructing a giant aqueduct fed by massive, custom-designed pumps that would force the water from the Delta southward, where it could be used to water the dry southern valley and the cities of southern California after pumps lifted it over the Tehachapi Mountains at the southern end of the San Joaquin Valley (DWR 1974a:7). Financing for the SWP was approved by the voters of California in 1960 as a result of the Burns-Porter Act (DWR 2010).

This act authorized the issuance of \$1.75 billion in general obligation bonds to assist with funding for building necessary water facilities for the SWP. Construction began shortly thereafter, and the first phase of the SWP was completed between 1961 and 1974 (DWR 1974a:8; Cooper 1968:201–204; JRP and Caltrans 2000:82; Rarick 2005:205–228).

Clifton Court Forebay and the California Aqueduct

The CCF is a 28,653-acre-foot reservoir designed to regulate the flow of water that enters the California Aqueduct and the SWP Harvey O. Banks Pumping Plant (Banks Pumping Plant). The CCF's regulation reduces the surges and drawdown created during peak-pumping periods. The CCF features gates that can be closed to prevent backflow into the Delta during low tides (DWR 1974b:201). Construction of the CCF began on December 12, 1967, and was completed in 1969 (DWR 2012:8). The CCF is at the head of the California Aqueduct, a critical component of the SWP. The California Aqueduct serves as the primary delivery system of the SWP. The main line of the California Aqueduct has five divisions: North San Joaquin, San Luis, South San Joaquin, Tehachapi, and the East Branch (previously the Mojave and Santa Ana Divisions). It stretches 444 miles, from the CCF to Perris Reservoir in Riverside County (DWR 1974a:52). The Banks Pumping Plant also delivers water to the South Bay Aqueduct (Golze 1965:7).

The California Aqueduct and the CCF were essential to the development of California. The water serves users in the San Joaquin Valley where the aqueduct allowed thousands of acres of land to be cultivated, thereby dramatically increasing

California's agricultural efforts in the region and propelling the state to the top in nationwide agricultural production. In Southern California, the aqueduct serves municipal users by supplying drinking water.

The SWP is the largest state-built water conveyance system in the United States, spanning more than 600 miles between northern and southern California. In 2001, the American Society of Civil Engineers recognized the SWP as one of the greatest American engineering achievements of the 20th century, listing it as one of only 10 internationally ranked "Monuments of the Millennium" for its remarkable engineering aspects and for the positive impact it had on regional economic trade and development. Today, the SWP provides drinking water for 25 million people; irrigates approximately 750,000 acres; and features 34 storage facilities, 20 pumping plants, four pumping-generating plants, five hydroelectric power plants, and 700 miles of open canals and pipelines (American Society of Civil Engineers 2011; DWR 2010).

The CCF is a character-defining feature of the California Aqueduct. The CCF was built in between 1967 and 1969 as part of the California Aqueduct and the SWP. The California Aqueduct had a tremendous impact on the agricultural industry of California and allowed farmers to cultivate large new tracts of land, particularly in the western and southern San Joaquin Valley (Jelinek 1982:89). The CCF was a critical and planned element of the SWP and is where the 444 mile long aqueduct begins. As a contributor to the California Aqueduct, which is notable for the political and planning process of the public works project that provided benefits statewide, the CCF appears to meet Criterion A of the NRHP and Criterion 1 of the CRHR for its facilitation of a comprehensively planned and publicly sanctioned water conveyance public works project that facilitated development throughout California, and for its complex design necessary to redistribute water throughout California.

The CCF and the California Aqueduct are associated with many individuals who contributed to the planning and implementation of the project. Within certain contexts those individuals could be considered significant under NRHP/CRHR Criterion B/2. One notable person associated with the California Aqueduct and the SWP is Governor Edmund G. "Pat" Brown. Brown was instrumental in spurring political and public support for the construction of the SWP and the California Aqueduct and its completion was one of his most significant accomplishments as governor. Brown was committed to California's future growth and development and the SWP and the California Aqueduct were crucial to his vision of California. He took an active role in drafting the legislation for the SWP and succeeded in putting the Burns-Porter Act before the voters in 1960 (Hundley 2001:283). The SWP and the California Aqueduct, however, were one of several significant accomplishments in Brown's career as governor. He was also responsible for the Fair Housing Act, Fair Unemployment Act, the master plan for higher education in California and the expansion of the state highway system. Each of these is also important for their association for Governor Brown.

According to *National Register Bulletin 32: Guidelines for Evaluating and Documenting Properties Associated with Significant Persons*, an eligible property must be directly associated with the significant individual and be the best property to represent the person's significance. The CCF does not appear significant under NRHP/CRHR Criterion B/2 for its association with Governor Brown because it is not the best representation of Brown's significance. His significance can be tied to other properties, including places such as his former office or home. Those are the properties where Brown conducted his work, which included the planning and drafting of critical legislation that brought the California Aqueduct to fruition. The CCF was part of the larger California Aqueduct project, one of several important initiatives that Governor Brown undertook for the betterment of California as would have been his directive under the Governor's office. The CCF is not the place where important decisions were made. The CCF and the California Aqueduct symbolizes Brown's dedication to California's development, but the symbolic value of the California Aqueduct is not a substitute for direct association. Nor is it the best representation or only surviving property that can convey Brown's significance. The CCF also has no direct association with Governor Brown and does not appear as an individual structure to meet NRHP/CRHR Criterion B/2.

Under NRHP/CRHR Criterion C/3 the CCF is a character-defining feature of the California Aqueduct: a significant and distinguishable engineering entity significant for its type, period and method of construction. Therefore, it appears eligible under this requirement of NRHP/CRHR Criterion C/3. The CCF serves as a focal point of the aqueduct with regards to facilitating regulation of the surges and drawdown created during peak-pumping periods. The CCF features gates, which are a character-defining feature of the CCF, that can be closed to prevent backflow into the Delta during low tides (DWR 1974b:201). The construction of the CCF was a planned and necessary part of the aqueduct. The CCF is historically a functionally-related element of the aqueduct. The aqueduct was an extensively planned system intended to facilitate development, particularly agriculture interests, of the entire state. The period that followed World War II was a period of

tremendous growth, particularly in California. This period also saw an increase in agricultural production in California making it the major source of food for the United States (Cooper 1968:177). The CCF is united historically by both plan and physical development to the California Aqueduct and contributes to the common engineering objective of the aqueduct. Therefore, under Criterion C/3 the CCF is a character-defining feature of the California Aqueduct and a contributing resource to the aqueduct. Other character-defining features of the CCF include its embankment slope, depth, and size. Because the CCF lacks individual distinction for its type, period, and method of construction it does not appear individually significant under NRHP/CRHR Criterion C/3.

Under NRHP/CRHR Criterion D/4 the CCF is not likely to yield information important to history because it is not the principal source of important information. Therefore, the CCF does not appear to meet this criterion.

Because the CCF is less than 50 years old, it is also evaluated under NRHP Criterion Consideration G and the CRHR special consideration for properties less than 50 years old. As an individual structure it does not appear that its design value or its consideration as part of the planned system is immediately recognized as historically significant in the engineering profession. However, when taken in context with the initial phase of construction of the California Aqueduct (1960-1974), the contributing CCF is a feature of a planned comprehensive water redistribution system that helped shape the development of much of California following the mid-20th century. Water development is an important and ongoing historic theme within the history of the west. Added to this is the magnitude of planned change to the California landscape brought about by this single engineered public works project and the ability for the California Aqueduct to meet the definition of "exceptional importance" at the statewide level is clear. The general understanding of the exceptional importance of this system is evidenced in the ASCE listing it as one of only 10 internationally ranked "Monuments of the Millennium" for its remarkable engineering aspects, as well as for the positive impact it had on regional economic trade and development.

In addition to being significant, the CCF also retains integrity of location, design, materials, workmanship, setting, feeling, and association. The CCF retains integrity of location because it is in its original location. The design of the CCF is not altered because the form, plan, and style have not changed. Integrity of materials is retained because no new materials have been introduced. Integrity of workmanship is also retained and is expressed in the utilitarian construction methods of the CCF. Lastly, the CCF retains integrity of setting, feeling and association because there is limited development around the resource and it retains its rural sense of place of time. Overall, the CCF retains a high degree of integrity and its ability to convey its significance as a character-defining feature of the California Aqueduct.

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_____. 1974b. *California State Water Project Vol. III: Storage Facilities*. Bulletin No. 200. Sacramento.

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*Recorded by P. Ambacher, AECOM

*Resource Name or # (Assigned by recorder) Clifton Court Forebay

*Date May 9, 2012 Continuation Update

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Photographs (cont)



Photograph 2. Treated portion of dam, camera facing west



Photograph 3. Gravel levee road, camera facing west



Photograph 4. Radial gates, camera facing southwest



Photograph 5. Radial gates, camera facing southwest



Photograph 6. Concrete wing walls, camera facing southwest

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*Recorded by P. Ambacher, AECOM

*Resource Name or # (Assigned by recorder) Clifton Court Forebay

*Date May 9, 2012

Continuation Update



Photograph 7. Bridge, camera facing northeast



Photograph 8. Buildings, camera facing southwest

Page 10 of 10

*Recorded by P. Ambacher, AECOM

*Resource Name or # (Assigned by recorder) Clifton Court Forebay

*Date May 9, 2012

Continuation Update



Photograph 9. Boat ramp/dock, camera facing south

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-07-003122
HRI #
Trinomial
NRHP Status Code 7

Other Listings
Review Code

Reviewer

Date

Page 1 of 3

Resource Name or #: Clifton Court Forebay

P1. Other Identifier: N/A

P2. Location: Not for Publication Unrestricted

a. County: Contra Costa

b. USGS 7.5' Quad: Clifton Court Forebay, CA Date: 2009 (see Continuation Sheet) ; M.D. B.M.

c. Address: N/A

City: N/A

Zip: N/A

d. UTM: Zone: 10

e. Other Locational Data:

From Sacramento, take I-5 south approximately 50 miles to slight CA-4-W and follow for approximately 20 miles. Clifton Court Forebay is located on the north side of CA-4-W

P3a. Description:

Clifton Court Forebay (CCF) is part of the California State Water Project. CCF is a shallow, 28,653-acre-foot reservoir at the beginning of the California Aqueduct. CCF serves as a storage facility for off-peak pumping and permits regulation of flows into the Harvey O. Banks Pumping Plant. Waters enter from West Canal (a channel of Old River) in the east and exit into the Intake Channel to Delta Pumping Plant to the west, where water then flows into the California Aqueduct. Construction began on December 12, 1967 and was completed two years later on December 17, 1969 (DWR 1974). (see continuation sheet)

P3b. Resource Attributes: HP22 – Reservoir

P4. Resources Present: Building Structure Object Site District Element of District Other (Isolates, etc.)

P5a. Photo or Drawing



P5b. Description of Photo:
01/25/2012; View to North;
Original kept at DWR

P6. Date Constructed/Age and
Sources: Historic
 Prehistoric Both
Construction Completed 1969

P7. Owner and Address:
California Department of Water
Resources
1416 9th Street
Sacramento, CA 95814

P8. Recorded by:
Rebecca H. Gilbert
California Department of Water
Resources
3500 Industrial Blvd.
West Sacramento, CA 95691

P9. Date Recorded: 01/30/2012

P10. Survey Type: Systematic
surface survey.

P11. Report Citation: (see continuation sheet)

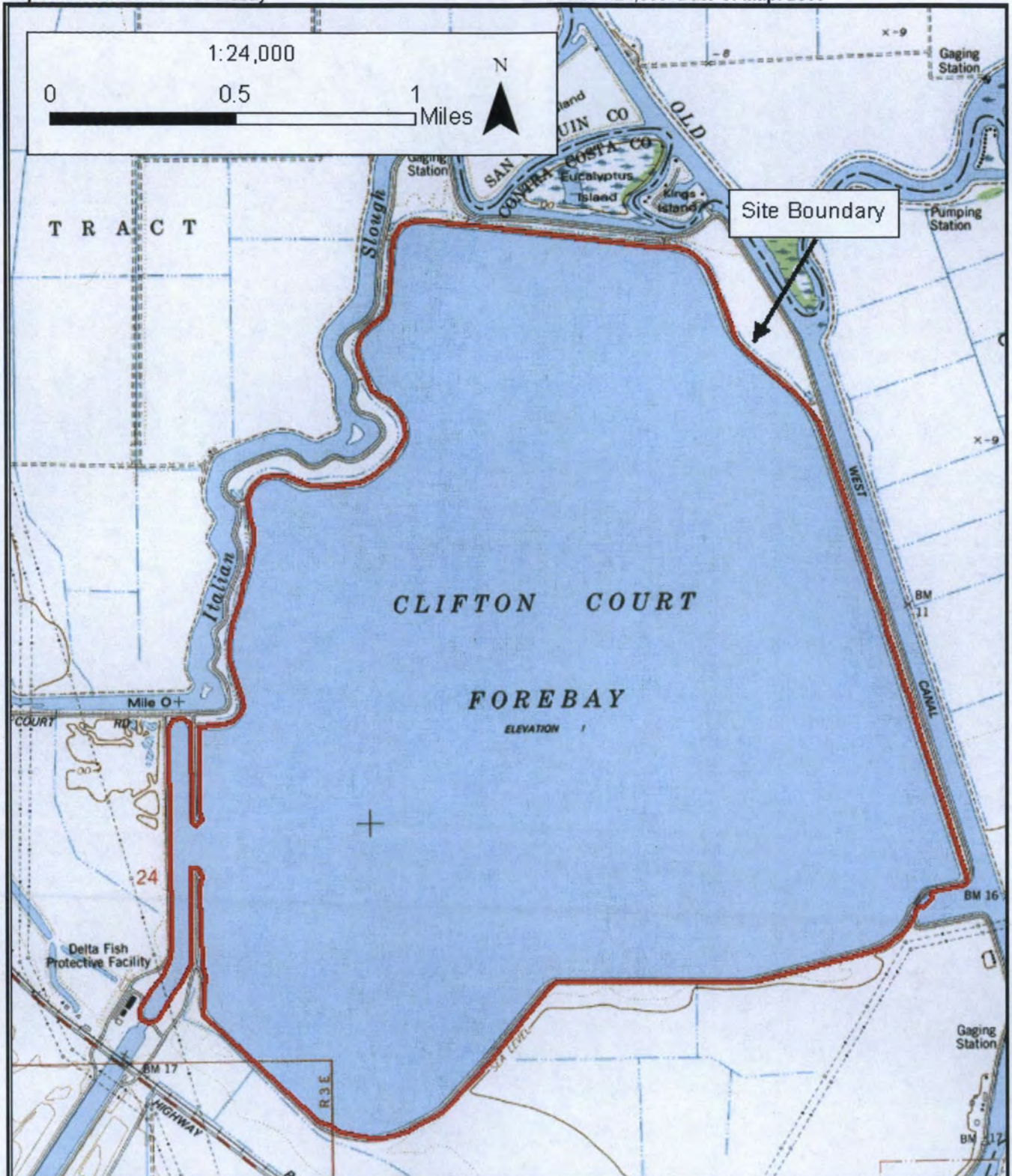
Attachments: NONE Location Map Sketch Map Continuation Sheet Building, Structure, and Object Record
 Archaeological Record District Record Linear Feature Record Milling Station Record Rock Art Record
 Artifact Record Photograph Record Other (List):

DPR 523A (1/95)

FEB - 3 2012

Map Name: Clifton Court Forebay

Scale: 1:24,000 Date of Map: 2009



Recorded by: Rebecca H. Gilbert

Date: 01/30/2012

Continuation

Update

P2b. Location:

Township 1 South, Range 3 East, Sections 12, 13, 24, and 25
Township 1 South, Range 4 East, Sections 7, 8, 17, 18, 19, 20, and 30

P3a. Description:

The State Water Project's first phase of construction completed all initial features between 1961 and 1972. It began delivering water to Alameda County in 1962 through the South Bay Aqueduct, and in 1968, the project began irrigating land in the San Joaquin Valley through the northern half of the California Aqueduct. Northern water reached areas south of the Tehachapis by 1972 (DWR 2011; Herbert, Webb, and Blosser 2004).

The State Water Project's branch canals, which carry water to areas off the main California Aqueduct, include the North Bay Aqueduct, the South Bay Aqueduct, the Coastal Branch Aqueduct, and the Cross Valley Canal (DWR 2011; Herbert, Webb, and Blosser 2004).

Today, the State Water Project has the capacity to supply around 4.2 million acre-feet of water to about 20 million people throughout the State, and enough water to irrigate approximately 660,000 acres of land. Twenty-nine public agencies that cover a quarter of the State's area and two-thirds of its population contract for water through the State Water Project. The State Water Project, stretching from the northern foothills of the Sierra Nevada to the San Diego County, consists of 34 storage facilities, reservoirs and lakes that together have a gross capacity of more than 5.8 million acre-feet. The project includes 20 pumping plants as well as 4 pumping-generating plants, and 5 hydroelectric power plants that produce over 6.5 billion kilowatt hours of power, making it the fourth-largest generator of electricity in the State and the largest user of its own power. It also includes 701 miles of open canals and pipelines (including the 444-mile-long California Aqueduct) that convey water from Northern California, over the Tehachapis, to Riverside County in Southern California (DWR 2011; Herbert, Webb, and Blosser 2004).

The State Water Project represents one of the boldest, complex, and successful water development projects ever undertaken. Not only is the State Water Project the largest state-built, multi-purpose water project in the nation, it was the first of its kind. Within the context of state politics and the planning, economics, and engineering of civil works, the State Water Project is recognized as a great achievement on the state and national scale (Herbert, Webb, and Blosser 2004).

CCF marks the beginning of the 444-mile-long California Aqueduct.

P11. Report Citation:

California Department of Water Resources (DWR)

1974 *California State Water Project. Volume II: Conveyance Facilities.* Bulletin Number 200, Department of Water Resources, Sacramento.

2011 <http://www.water.ca.gov/swp/benefits.cfm>. Accessed on July 27, 2011.

Herbert, R. T., T. Webb, and A. Blosser

2004 *Historic properties Inventory and Evaluation: Oroville Facilities, Butte County, California.* Prepared by JRP Historical Consulting for California Department of Water Resources, Sacramento.

Gilbert, R. H.

2012 *Archaeological Survey Report: Clifton Court Forebay Pump, Sump, and Seep Maintenance Project.* California Department of Water Resources, Sacramento.

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-07-004698

HRI #

Trinomial CA-CCO-000842H

NRHP Status Code 3D

see also P-01-011649 CA-ALA-000683H

Other Listings
Review Code

Reviewer

Date

Page 1 of 20

*Resource Name or #: MPTO_002_001

P1. Other Identifier: California State Water Project, Delta Field Division Facilities

***P2. Location:** Not for Publication Unrestricted

***a. County:** Contra Costa and Alameda

***b. USGS 7.5' Quad:** Clifton Court Forebay **Date:** 2012 **T** **R** 9E; $\frac{1}{4}$ of $\frac{1}{4}$ of Sec. **B.M.**

c. Address: 5280 Bruns Rd.

City: Byron

Zip: 94514

d. UTM: Zone: 10 S 623473.81 mE/ 4187410.56 mN

e. Other Locational Data: See Continuation Sheet

Elevation: 0-247 feet AMSL

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

The subject property consists of three components of the Delta Field Division of the California State Water Project (SWP): (1) the Clifton Court Forebay (CCF), (2) the John E. Skinner Delta Fish Protective Facility (Skinner Fish Facility), and (3) the Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant). While the Delta Field Division encompasses more than a dozen SWP facilities in the Delta and Bay Area regions, the current evaluation addresses only the three Delta Field Division facilities located within the Bay-Delta Conservation Plan Project study area. Located in a rural area of Contra Costa and Alameda counties, within the western Sacramento-San Joaquin Delta and the Diablo Foothills, these three facilities work together as a cohesive subsystem of the SWP, drawing and storing Delta fresh water and delivering it via pumps to the head of the California Aqueduct.

Clifton Court Forebay

Situated at the head of the California Aqueduct in the southeastern corner of Contra Costa County, CCF is a SWP facility used to retain Sacramento-San Joaquin Delta water before distributing it via the California and South Bay aqueducts. CCF is bounded on the north and west by the Italian Slough; on the northeast and southeast by Old River; on the east by an artificial channel, and on the south by CCF's intake channel, private crop fields, (see Continuation Sheet.)

***P3b. Resource Attributes:** HP4. Ancillary building, HP9. Public utility building, HP11. Engineering structure, HP20. Canal

***P4. Resources Present:** Building Structure Object Site District Element of District Other (Isolates, etc.)

P5a. Photograph 1.



P5b. Description of Photo:
Overview of CCF. Camera facing northeast. 7/29/13.

***P6. Date Constructed/Age and Sources:** 1969 Historic Prehistoric Both

***P7. Owner and Address:**
State of California
5280 Bruns Rd.
Byron, CA

***P8. Recorded by:**
Monte Kim & James Williams
ICF International
630 K Street, Suite 400
Sacramento, CA 95814

***P9. Date Recorded:** 7/29/13

***P10. Survey Type:** Intensive

***P11. Report Citation:** Addendum 1: Built Historical Resources Evaluation Report for the Bay Delta Conservation Plan Project (ICF 2013)

***Attachments:** NONE Location Map Sketch Map Continuation Sheet Building, Structure, and Object Record Archaeological Record District Record Linear Feature Record Milling Station Record Rock Art Record Artifact Record Photograph Record Other (List):

DPR 523A (1/95)

*Required Information

BUILDING, STRUCTURE, AND OBJECT RECORD

Page 2 of 20

*NRHP Status Code 3D see also P-01-011649 CA-ALA-000683H

*Resource Name or #: MPTO_002_001

- B1. Historic Name:** Clifton Court Forebay, John E. Skinner Delta Fish Protective Facility, Harvey O. Banks Delta Pumping Plant
B2. Common Name: Clifton Court Forebay, Skinner Fish Facility, Banks Pumping Plant
B3. Original Use: Water storage and conveyance, wildlife management **B4. Present Use:** Same
***B5. Architectural Style:** N/A
***B6. Construction History:** Clifton Court Forebay completed 1969, Skinner Fish Facility completed 1968 with additions between 1980 and 2006, Banks Pumping Plant completed 1969 with additions between 1987 and 2010. See section P3a for additional details.
***B7. Moved?** No Yes Unknown **Date:** N/A **Original Location:** N/A
***B8. Related Features:** See section P3a.
B9a. Architect: California Department of Water Resources **b. Builder:** California Department of Water Resources
***B10. Significance: Theme:** Water Conveyance Development in California During The Second Half of The Twentieth Century
Area: Sacramento-San Joaquin Delta **Period of Significance:** 1963-1969
Property Type: reservoir, engineering structure, industrial building, ancillary building
Applicable Criteria: NRHP Criteria A and C and CRHR Criteria 1 and 3.

The study-area components of the Delta Field Division of the California State Water Project—the Clifton Court Forebay, the John E. Skinner Delta Fish Protective Facility, and the Harvey O. Banks Pumping Plant—appear to be eligible for listing in the National Register of Historic Places (NRHP) at the state level of significance under Criteria A and C and the California Register of Historical Resources (CRHR) under Criteria 1 and 3. The significance of this subsystem of the California State Water Project, constructed between 1963 and 1969, is due to the important role that its three components played as part of an expansive, engineered water-conveyance system, which was designed to store water in Northern California and distribute it to urban and agricultural areas elsewhere in the state. These three facilities of the Delta Field Division also appear to be eligible for NRHP and CRHR listing as contributing elements to a potential California State Water Project Historic District.

As the second of two major multi-purpose water systems in California, the SWP was developed to provide, among other services, flood control, drinking and irrigation water for ill-served sections of the state, and water quality maintenance in the Sacramento-San Joaquin Delta. A major feat of engineering, the SWP consists of dozens of associated water storage and conveyance facilities whose coordinated operations provide water to millions of users through much of the state. Its federally operated counterpart, the Central Valley Project (CVP), preceded the SWP by several years, delivering water to the San Joaquin Valley by 1951. The California Department of Water Resources (DWR) constructed the first phases of the SWP in the late 1950s, ultimately building an integrated system that began with a hydro-electric dam on Northern California's Feather River and delivering water to Southern California in 1972 (JRP 2000, 74,75,80, 82). (See Continuation Sheet)

B11. Additional Resource Attributes: HP39. Other (Levee, wildlife management facility)

***B12. References:**
See continuation sheet.

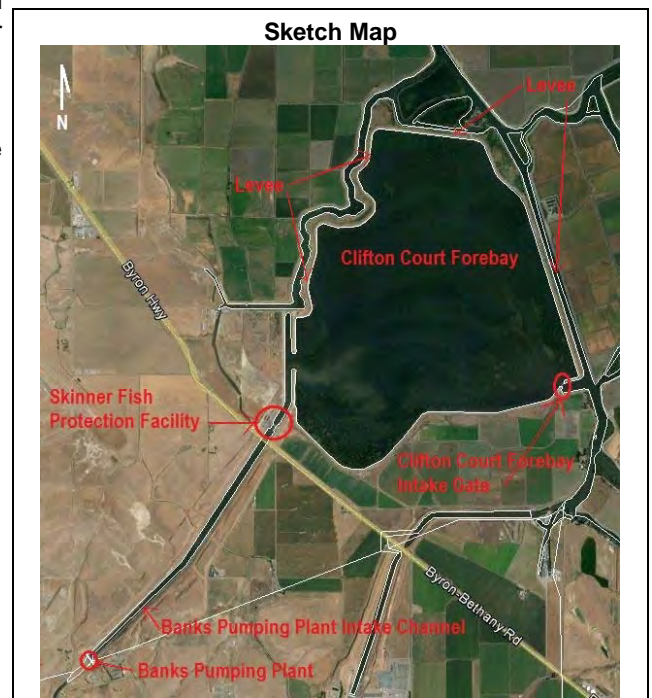
B13. Remarks:

***B14. Evaluators:**

James Williams and Monte Kim, Ph.D.
ICF International, 630 K Street, Suite 400, Sacramento, CA

***Date of Evaluation:** August 2, 2013

(This space reserved for official comments.)



*Recorded by: Monte Kim and James Williams

*Date: August 2, 2013

Continuation Update

*P2e. **Other Locational Data** (continued): APNs: Contra Costa County: 001-031-007, 001-031-009, 001-031-011, 001-031-012, 001-031-021, 001-041-012, 001-041-024, 001-041-035, 001-041-039, 001-041-040, 001-081-028, 001-091-005, 001-101-007, 002-250-005; Alameda County: 99B-7010-5

*P3a. **Description** (continued):

and the Skinner Fish Facility. CCF's major components are a levee system, an intake channel and control gate, and an outlet channel.

Approximately 7.5 miles of 30-foot-high earthen levees hold as much as 28,653 acre feet of water in the reservoir. These barriers, constructed within the existing Clifton Court Tract levees in 1969, measure approximately 20 feet wide at the crown. The levee crown features an asphalt-paved access road, which is also used as a publicly-accessible bicycle route. Measurements for the base width of the levees were unavailable, but measurements using Google Earth suggest that the levees are as much as 145 feet across at the base. According to a 2012 Department of Water Resources (DWR) description, the levees are composed of three principal materials. DWR built the interior banks of a compacted mixture of silty and sandy clays, while a compacted mix of "clays, sands, and silts" form the outside slopes. "Waste materials, such as peats and soft organics" serve as "ballast" on the exterior slope, stabilizing the structure where necessary (DWR 2012, 19). Additional gravel and riprap covering protect the levees from erosion in some sections of the barrier. Minor associated features include at least three centrifugal pumps (Photo 2) situated on the levee's exterior slope. Placed at irregular intervals along the embankment, the pumps draw seepage and surface water from an earthen drainage ditch (Photo 3) that runs parallel to much of the northern section of the levee (DWR 1974b, 202). Water pumped from the ditch flows into the forebay from concrete discharge openings built into the interior slope of the levee. In addition, there are at least two concrete-block boat ramps (Photo 4) on the inside of the embankment.

The CCF draws water from the Old River via a 900-foot artificial intake channel situated at the southeastern corner of the forebay. Water courses west from the confluence of the Old River and the West Canal to the end of the manmade inlet, where an intake mechanism regulates flows into the CCF using five steel radial gates (Photos 5 and 6). The steel and concrete gate assembly fills a 200-foot gap in the embankment and merges with the earthen levee slopes by way of two pairs of concrete wing walls—one on the inside of the forebay and the other on the outside. Four vertical concrete supports hold a concrete-bedded roadway and platform. The supports appear to separate the five 20-foot-wide inflow gates. The tops of the arched radial floodgate control structures emerge above the north side of platform with their convex sides facing south. The barriers are connected by 25-foot steel arms to an axis on the inside of the forebay. Operators open the intake system by mechanically pivoting the floodgates upward toward the interior of the CCF. Two adjoined single-story outbuildings sit atop the levee to the immediate southwest of the intake structure. The larger of the two is a 30-by-12-foot concrete building with a shed roof and two openings on its south façade. A smaller flat-roofed building clad in standing seam steel is located adjacent to the west wall of the larger building. It measures approximately 7 feet square (Photo 6).

A 575-foot wide, uncontrolled outlet sits on the west side of the CCF (Photo 7). It empties into the northernmost section of the Banks Pumping Plant intake channel, running south for approximately 3,200 feet before heading southwest for an additional 900 feet to the Skinner Fish Facility.

John E. Skinner Delta Fish Protective Facility

The Skinner Fish Facility is a fish protective and data collection facility located just north of the area where the Byron Highway crosses the California Aqueduct (Photo 8). In addition to the site's fish protection and collection mechanisms, the facility includes 14 associated buildings built between 1968 and 2008 (NETR Online, 1966, 1979, 1987, 1993; Google Earth 1993, 2002, 2004, 2006, 2008). Buildings at the site are clustered into three groupings: one just west of an intake channel, and two east of the channel, separated by a service roadway. The fish protection mechanism is situated mostly above and within the channel near the center of the facility (See Figure 1). The Skinner Fish Facility is bounded on the north by the CCF, on the south by the Byron Highway, and on the east and west by crop fields.

The centerpiece of the facility is the 1968-built fish protection mechanism (Figure 2 and Photo 9), installed to keep fish out of the Banks Pumping Plant downstream. Most of this steel and concrete structure straddles the concrete- and dirt-lined

*Recorded by: Monte Kim and James Williams

*Date: August 2, 2013 Continuation Update

***P3a. Description (Continued):**

channel. Further upstream is a trash boom. This metal structure extends diagonally and southward from its anchor point on the northwest bank of the canal. A main beam supports a truss-like structure that floats on the water. Beneath the water level, a debris screen filters trash from the water and discourages large fish from entering the facility's intake (California State Water Project 2011). Immediately downstream, the canal narrows slightly and a system of seven aquatic intake gates with a 15-by-170-foot walkway crosses the waterway. Beyond the walkway an array of subaquatic pipes open into the facility's primary louvered diversion system. The louvers are composed of seven, 80-foot arrays of vent-like metal panels arranged in a zigzag alignment and partially submerged in the water (California State Water Plan 2013). This system creates turbulence near the water's surface, which gently leads fish into the relatively calm depths and then into submerged pipelines that carry them to one of two secondary louvers, both situated to the immediate west of the channel. The secondary louvers are situated in a pair of 145-foot-long pools that widen gradually to a maximum of 35 feet. The northern ends of these pools open to pipelines that carry the fish to seven tanks located just west of the secondary louvers (Google Earth; California State Water Project 2011). According to the California State Water Project, these concrete tanks are 20 feet in diameter and hold water from 10 to 12 feet deep. DWR empties the collection tanks twice daily, taking the collected fish by truck to upstream locations on the Sacramento and San Joaquin rivers (California State Water Project 2011).

Immediately to the west of the primary louvers is a gantry crane in its resting location (Photo 9). Likely used to maintain the primary louvers, the moveable crane stands an estimated 70 feet tall on two pairs of legs, approximately 90 feet apart. Placed the same distance from one another are two parallel tracks running above the primary louvers for the width of the canal. The crane and track system likely allows operators to move the crane over the louvers and into a position suitable for conducting maintenance from above the channel.

The easternmost group of buildings is just east of the channel. Four buildings make up this grouping. Three of these likely composed the facility's original 1968 building complex. Building 1 is a two- or three-story, flat-roofed, building constructed on a rectangular ground plan (Photos 10 and 11). Its mostly-concrete walls include what appear to be corrugated metal panels on portions of the east elevation and most of the south-facing main façade. A covered entry sits below the large metal panel on this wall. It includes full-length, metal-framed, fixed-pane windows and a covered breezeway that adjoins the building to Building 2. Large vents punctuate the east wall above and below the four metal panels placed on that wall. Building 2 (Photo 11), relatively small in comparison, is built in a style similar to that of Building 1. The concrete-block, single-story building sits on a rectangular plan and features an east-facing main façade. There are covered entryways at either end of the main façade. Both entries include an assembly consisting of a standard door, fixed-pane windows (ceiling-height in the case of the northern entry), and translucent glass or plastic panels built into sections of the window frame. To the south of Building 2 is Building 3 (Photo 12). This warehouse is of concrete-block construction and includes a flat roof and two open bays on its south side. On the west side of the building is an extension featuring a standing-seam metal south wall. Building 4 sits west of Building 1. It is a metal warehouse built between 1987 and 1993 (Photo 10).

The second grouping of modern, utilitarian buildings sits to the southeast of the protection mechanism, north of a set of tanks and other associated equipment, and west of several large shipping containers (Photo 13). Two of these buildings were erected between 1993 and 2002, and the remaining three were completed between 2002 and 2004 (Google Earth 1993, 2002, and 2004). Four of the 5 buildings in this group are visible from the public right-of-way. Near the southeastern corner of the fish protection mechanism are Buildings 5 and 6, which are rectangular, utilitarian buildings aligned parallel to each other in a north-south orientation. Of these, only Building 5 is visible from the right-of-way. The prefabricated, portable building includes a flat roof and what appears to be plywood siding. Building 7 stands just south of Buildings 5 and 6. Built between 2002 and 2004, it includes a corrugated-metal gabled roof and horizontal-plank siding. Building 8 sits to its east and is of similar, if not identical, construction. Finally, Building 9 is the southernmost building in this grouping. This circa-2002 building includes a shed roof and a rectangular plan.

The third grouping of buildings is similarly composed of four modern, utilitarian buildings. Buildings 10 and 11 date to around 2004 (Photo 14). Building 10 is a large metal warehouse with a low-pitched, gabled roof. Located to the south is Building 11, a portable trailer building. Building 12 (Photo 15) sits to the east of Building 10. The circa-2008 building possesses a flat roof and is situated near several containers and other associated equipment (Google Earth, 2004, 2006, 2008).

*Recorded by: Monte Kim and James Williams

*Date: August 2, 2013 Continuation Update

***P3a. Description (Continued):**

Harvey O. Banks Delta Pumping Plant

The Banks Pumping Plant sits on the Alameda-Contra Costa county line in the Diablo Foothills approximately 2.5 miles southwest of the CCF. The resource consists of an eleven-pump pumping station, a 2.5 mile intake channel, and an electrical switchyard. As access to the site was limited, this evaluation of the resource was completed mostly by use of aerial images.

Water approaches the Banks Pumping Plant through a 3.3-mile-long intake channel (Photo 16). Constructed in two phases between 1963 and 1967 (DWR 1974c, 133), the riprap-lined, compacted earth channel begins at the CCF, traveling southward through the Skinner Fish Facility before passing under the former Mococo Line tracks and Byron Highway. From the south side of the highway, the canal flows southwest for a mile, before changing its course slightly northward. It then continues for another mile, before terminating at the Banks Pumping Plant. Between the highway and the pumping plant, the canal cuts between low hills that rise gradually in elevation. Two asphalt access roads flank the canal segment. The intake channel is of varied width and depth. It generally narrows and deepens as it approaches the pumping plant, although the canal widens to create a forebay where it meets the pump (DWR 1974c, 130-131).

At its southern end, the canal meets the Banks Pumping Plant building (Photo 17). Operational by 1967 and completed in 1969, the pumping plant sits at the end of an artificial ravine excavated from the Diablo Foothills. Aerial photographs show that the excavated bowl in which the pump station sits is roughly octagonal in shape, with an opening at its northeast to accommodate the intake channel. The steep, terraced walls of the bowl descend to a level base, on which the pump facility sits. The pump plant is composed of two principal parts: a reinforced concrete substructure and a steel-framed, concrete-walled superstructure that houses the pumps and other associated equipment. The superstructure sits near the intake channel water level and includes a multi-panel trash gate on its face and steel intake gates and suction elbows built within to manage water flow into the pumps (DWR 1974c, 194, 196). Secured to this base is the superstructure. A rectangular, flat-roofed, modern-style building houses the pumps and sits above a system of intake gates along the base of the building's long side. Supported by a steel frame, the building measures approximately 500 feet by 60 feet and appears to reach the equivalent of two stories high (Google Earth 2013; Aquaforia 2008). A mostly featureless main elevation faces the canal. The façade is divided into 24 precast concrete wall panels of nearly uniform size (DWR 1974c, 192-193). Only the segments at the ends of the façade break the pattern, each measuring approximately half the width of the others. Near either end of the front of the building, large bays with what appear to be metal roll-up doors punctuate the façade (Aquaforia 2008). Between 1987 and 1993, DWR completed an addition at the western end of the building that housed four new pumps (DWR 1996; NETR Online). This addition maintains the appearance of the original building and is only apparent in the seam between the old and new section of the roof. A projection standing half the height of the rest of the building extends to the east (Aquaforia 2008). Eleven centrifugal pumps are housed within the superstructure, situated in concrete casings formed in the floor of the concrete substructure (DWR 1974c., 198). These pumps ultimately feed water into 11 corresponding primary discharge lines measuring 13.5 and 15 feet in diameter. The discharge pipelines transfer water 244 vertical feet into the neighboring hillside and empty their contents into the California Aqueduct. From there, the water flows to Bethany Reservoir and beyond (DWR 1974c, 196).

To the south and southeast of the Banks Pumping Plant in the hills above the facility sits an associated Delta Field Division building complex at 5280 Bruns Road in Byron. Due to the inaccessibility of the complex, several of the descriptions below are limited and based mostly on aerial photography available online. Building 1 is located between the southern edge of the ravine and a large parking lot. Built in circa 1966, it sits on an irregular ground plan and is oriented roughly east-west. Buildings 2, 3, 4, 5, and 6 are grouped to the northeast of Building 1 and are arranged around a relatively small parking area. All of these buildings were constructed between 1963 and 1966 (DWR 1988; NETR Online). Each of these has a narrow, rectangular ground plan, and Buildings 2, 3, 4, and 5 are oriented roughly east-to-west. The long side of Building 6 runs perpendicular to the long sides of the other four buildings in the group. Arranged in an L shape to the northeast and northwest of this group of buildings, there are at least nine small outbuildings or other minor structures. Historic aerial photos show that these were installed or erected sometime between 1987 and 2005, with the first of these buildings in place by 1987 (NETR Online). (Please see Figure 3 for the layout of the buildings at the Banks Pumping Plant facility).

*Recorded by: Monte Kim and James Williams

*Date: August 2, 2013

Continuation

Update

***P3a. Description (Continued):**

South of Buildings 4 and 5 is Building 7 (Photo 18), erected as part of the original 1963-1969 complex (NETR Online). Building 7 is a split-level, shed-roofed building with two stories erected on an irregular ground plan. Partially visible from the public right-of-way, the modernistic, utilitarian building includes concrete exterior walls punctuated by a ribbon of fixed-pane windows that nearly meet the west elevation's roofline. The visible portion of the south elevation is an uninterrupted concrete wall. To the south of Building 7 is Building 8. Aerial photographs show that the rectangular building is part of the original 1963-1969 complex. Its materials and architectural style are similar to the original 1968 Skinner Fish Facility buildings and Banks Pumping Plant Building 11 (see below). Building 9 (Photo 18) sits east of Building 7. It is a modern, metal-clad, gable warehouse dating to sometime between 1987 and 1993 (NETR Online). Building 10 is set far apart from the rest of the complex, sitting in the southwestern corner of the site. Aerial photos show that it was built by 1966. The gable-roofed building includes two flat-roofed extensions—one at the north, the other at the east. To its west is a large, cylindrical tank. Building 11 is a security booth at the complex's Kelso Road entrance (Photo 20). Likely completed with the Banks Pumping Plant's original buildings, the booth bears a stylistic resemblance to Banks Pumping Plant Building 7 and Skinner Fish Facility Buildings 1 and 2. Built with elements of the International Style, the security booth includes a rectangular plan, a flat roof and rough-hewn brick walls. The window and door assembly on the south and east walls include two ribbons of three, vertically-oriented, metal-framed, fixed-pane windows that meet at the junction of the east and south walls. Built into the frames beneath each window are opaque metal, plastic or glass panels, much like those found elsewhere in this complex and at the Skinner fish facility. The south window frame extends to incorporate a standard entry door, above which is another opaque panel built into the frame. A metal security fence adjoins the east wall and extends eastward across the adjacent entry roadway.

North of Building 10 and south of the pumping plant is an electrical switchyard. Aerial photographs suggest that the substation was under construction in 1966 (NETR Online 1966, 1979). In 2010, DWR expanded the switchyard, doubling it to its current size (Google Earth 2010, 2013).

***B10. Significance (continued):**

California's era of comprehensive multi-purpose water systems was decades in the making. By the early twentieth century, a number of persistent, water-related problems convinced planners that statewide management was necessary to address growing urban and rural water needs and saltwater intrusion in the Delta, among other issues. Although state authorities began to consider the feasibility of statewide water projects by the 1870s, it was not until 1919 that USGS Chief Geographer Robert B. Marshall issued the "first substantive blueprint" for a statewide water system. The fundamental elements of Marshall's proposal were a dam on the upper Sacramento River and a pair of north-south canals that flanked the Central Valley. Marshall believed the system could achieve four pressing goals that would remain among the primary concerns of state water planners for decades: irrigating arid sections of the San Joaquin Valley, delivering water to Bay Area cities, improving the navigability of the Sacramento River, and halting the salt water intrusion that plagued southern Delta users. Despite an apparent need for comprehensive water planning, California voters rejected Marshall's proposal three times (Rice et al 1996, 581-583; JRP 2000, 72-73).

Following this political defeat, elements of Marshall's plan reemerged in a series of reports that State Engineer Edward Hyatt issued between 1927 and 1931. By 1931, Hyatt envisioned a large system of dams, reservoirs and canals designed to "exchange" water between the northern and southern Central Valley, in addition to facilities for the transfer of Colorado River water to Southern California (JRP 2000, 73-74; DWR 1974a, 5). Two years later, the California State Legislature approved the Central Valley Project Act of 1933, subjecting a \$170 million bond measure for the project to a public referendum that December. Although voters approved the measure, the state bonds proved too difficult to market in the early years of the Great Depression (DWR 1974a, 6).

In 1935, the federal government agreed to take on the Central Valley Project as a job-creating component of President Franklin Delano Roosevelt's New Deal. Plans for construction began under the direction of the Bureau of Reclamation, Delta Division. The Bureau embraced Hyatt's expansive vision of the CVP, but opted in the short term to complete a scaled-down first phase of the project that consisted primarily of five integrated components designed to deliver water to Contra Costa County and the San Joaquin Valley. Under the initial plan, Shasta Dam served to store Upper Sacramento River water while also offering flood control on the lower reaches of that waterway. Water released from Shasta Dam in dry months flowed south, via the Sacramento River, into the Delta before being pumped into the Delta-Mendota Canal (DMC) at the Tracy Pumping Station (now C.W. "Bill" Jones Pumping Plant). The DMC mostly conveyed water to the San

***B10: Significance** (Continued):

Joaquin Valley, although the Bureau diverted a minor portion of DMC water to the Contra Costa Canal. The majority of the DMC water found its way to the San Joaquin Valley where it replaced water transferred south from CVP's Friant Dam via the Friant-Kern Canal. Wartime demands on resources postponed the completion of CVP until 1951, when the system made its first water deliveries. Subsequent additions would expand CVPs capacity and reach (JRP 2000, 74).

State Water Project

When CVP water diversions began in the early 1950s, many potential water users did not have access to CVP water (Rice et al 1996, 583; JRP 2000, 80). In the San Joaquin Valley many farmers remained outside CVP's service area or, in some cases, their large land holdings of more than 160 acres exceeded the acreage limit federal law placed on parcels receiving water from the CVP (JRP 2000, 80). In addition, since Southern California voters had largely rejected the CVP, the federal project did not initially expand to that section of the state. Meanwhile, rapid postwar population growth stressed the existing water supply in Southern California, underlining the region's need for expanded water service (Rice et al 1996, 583; JPR 2000, 80). Growing demand for water distribution paired with State Engineer A.D. Edmonston's belief that freshwater flowing from Northern California rivers into the San Francisco Bay constituted a "maldistribution" of valuable water resources (Ambacher 2011, 4).

It was primarily to address these growing water needs in the San Joaquin Valley and Southern California that the State Legislature authorized the Water Resources Board and its successor, the Department of Water Resources (DWR), to conduct a series of three studies. Reports issued in 1951 and 1955 consisted of data collected on the state's water supply and projected water needs (DWR 1974a, 7; DWR 1957, xxv). The series culminated in 1957 with DWR's *Bulletin No. 3: The State Water Plan* (DWR 1974a, 7). Supervised by State Engineer A.D. Edmonston, *Bulletin No. 3* outlined the elements of a state-operated multi-purpose water system that would, among other functions, control floodwaters, generate hydroelectric power, distribute drinking and irrigation water, maintain proper levels of salinity in the Delta, and maintain the navigability of major aquatic routes (DWR 1957, xxv). This network of dams, reservoirs, canals, and other facilities would operate across most of the state, serving the Sacramento and San Joaquin Valleys, the San Francisco Bay Area, and Southern California.

Initial efforts to secure legislative approval of for the State Water Plan fell short. However, with Edmund "Pat" Brown's 1958 election to the governorship, proponents of Edmonston's ambitious proposal gained new ground. Early in his first term, Brown and a Democratic legislative majority mended the divisions between several competing parties to build a coalition of interests willing to back the plan (Chall 1981, viii-ix; Schiesl 2003). Through the resulting bill, the Burns-Porter Act of 1959, the State Legislature authorized DWR to implement the 1957 plan. The department's SWP-related mandate included flood control responsibilities, the distribution of water according to "local needs," and "augment[ing]" Delta water levels (DWR 1974a, 8). To fund the massive project, the bill required that the State subject a \$1.75 billion bond measure to approval by public vote. A December 1960 referendum narrowly achieved this, garnering much of its support in Southern California (Ambacher 2011, 4; JRP 2000, 82).

In 1961, the Legislature approved the Davis-Dolwig Act, expanding SWP's objectives. The law required that state planners conceive SWP projects "in a manner consistent with the full utilization of their potential for the enhancement of fish and wildlife and to meet recreational needs" (Legislative Analyst's Office 2009). Davis-Dolwig's recreational use mandate coincided with a postwar expansion in Delta-region recreational uses of the area's waterways for sport fishing and recreational boating.

Feather River Project

Edmonston intended the system outlined in 1957's *Bulletin No. 3* to supplement what became the first phase of the SWP. Six years before that report was issued, the Central Valley Act of 1951 authorized Edmonston's Feather River Project (FRP), a plan designed largely to store Northern California water in the Delta and transfer it to other parts of the state. FRP included a dam, reservoir, and power plant on the Feather River near Oroville; a dam, afterbay, and electrical transmission system downstream at Thermalito; a Delta Cross-Channel to better manage the flow of water through the Delta; an aqueduct serving Alameda and Santa Clara counties; and another to deliver water to the San Joaquin Valley and Southern California, what would become the California Aqueduct (DWR 1974a, 7). In 1955, engineers modified the plan to add the San Luis Reservoir and extend the Alameda and Santa Clara County aqueduct to San Benito County in

***B10: Significance** (Continued):

Southern California (DWR 1974a, 7). Clifton Court Forebay was not originally part of this system, but rather was conceived as the endpoint and storage reservoir for the proposed, and ultimately never constructed, Peripheral Canal (Werner 1965, 4).

A devastating flood visited Northern California in 1956, bringing spectacular disaster to Yuba City on the Feather River. The event convinced state authorities of the pressing need for Feather River flood control. Construction began on the Oroville Dam the following year (DWR 1974a, 8). DWR began construction on downriver FRP facilities only after the Burns-Porter bonds met voter approval in 1960 (Schiesl 2003). The South Bay Aqueduct was completed quickly between 1960 and 1962. The state began construction of the project-area portions of the Feather River Project, as well as many elements of the wider SWP in the 1960s. DWR began building the Banks Pumping Plant in 1963. The plant's operation began in 1967, two years before the facility was complete. Skinner Fish Facility opened in 1968, while the Clifton Court Forebay first came into use in 1969. (For a more complete discussion of these resources, please see below.)

Most of the initial phase of SWP construction, including that of the subject resources, came between 1961 and 1972 (JRP 2000, 82). The South Bay Aqueduct was the first component to reach completion, delivering water to Alameda County users in 1962 (JRP 2000, 82; DWR 2001). In 1968, the California Aqueduct began serving irrigators in the San Joaquin Valley. The 1971 opening of A.D. Edmonston Pumping Plant north of Los Angeles allowed for the 444-mile aqueduct's first deliveries south of the Tehachapi Mountains by 1972 (DWR 2013; JRP 2000, 82-83). In all, SWP operates 34 reservoirs, 20 pumping stations, 5 hydro-electric plants, and a 700-mile-long network of canals (Ambacher 2011, 5). Agreements with CVP have instituted a degree of integration between the two major water distribution systems (JRP 2000, 83). By 2011, SWP reached 25 million users and irrigated about 7,500,000 acres of crop land (Ambacher 2011, 5).

Harvey O. Banks Delta Pumping Plant

Completed in 1969, the Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant) sits approximately 4.5 miles south of Byron at the head of the California Aqueduct. The DWR facility draws water from the Sacramento-San Joaquin Delta, by way of Clifton Court Forebay, lifting it via pipeline 244 feet up the Mount Diablo Foothills into the California Aqueduct. Water discharged from the Banks Pumping Plant is mostly destined for use in the southern San Joaquin Valley and Southern California, although a portion of it is distributed to Alameda and Santa Clara counties through the South Bay Aqueduct.

Construction on the Banks Pumping Plant, its intake channel, and the associated John E. Skinner Delta Fish Protective Facility (Skinner Fish Facility) began in 1963. By 1966, the pumping facility and four associated buildings were nearly complete and the plant's intake channel was largely excavated. The facility was SWP's first major pumping plant. DWR used its "architectural motif" as the model for several subsequent SWP pumping plants (DWR 1974c, 194) Banks Pumping Plant began pumping water in 1967, two years before DWR completed Clifton Court Forebay (Lodi Sentinel-News). In its first years of operation, the pumping facility drew water through its 3-mile-long intake channel from a direct connection to Italian Slough. Seven massive centrifugal pumps with a collective maximum capacity of 4.1 billion gallons per day drew water from the slough. The 1969 completion of CCF allowed for a better-managed intake of water (Werner 1965, 2; DWR 1974b, 201). By storing water collected from the Old River in the forebay, DWR could effectively manage water flows to and from the pumps and limit pumping to the off-peak electrical hours between 10:00 PM and 8:00 AM, saving on the plant's operating costs (Werner 1965, 2).

DWR expanded the Banks Pumping Plant in 1991, adding four pumps and increasing the plant's capacity to 6.7 billion gallons per day (DWR 1988). The original incarnation of the plant included space within the facility for the addition of new pumps. The agency expanded the pump building at its northwest end sometime between 1987 and 1993 (DRW 1988; Historicaerials.com). Subsequent expansion efforts bought the current number of total pumps at the facility to 11 (DWR 1996). Banks Pumping Plant's current capacity is approximately 6.9 billion gallons per day (U.S. Bureau of Reclamation 2011, 23-5).

The Banks Pumping Plant appears to be a contributor to the study-area subsection of the Delta Field Division of the California State Water Project, which appears eligible at the state level of significance under NRHP Criteria A and C, and

***B10: Significance** (Continued):

CRHR Criteria 1 and 3. It also appears eligible as a contributor to a potential California State Water Project Historic District. Although the facility has incurred several alterations since DWR completed it in the late 1960s, it retains sufficient integrity to convey its historical identity as a pumping plant. Buildings and structures constructed subsequent to the initial construction of the Banks Pumping Plant are not considered to be contributors to the study-area subsection of the Delta Field Division at this time. The facility, as a component of the Delta Field Division, appears to meet Criterion A/1 because of its association with the SWP and its role of storing Northern California water and distributing it to urban and rural agricultural areas of need elsewhere in the state, which allowed the region to sustain the marked population growth and economic development during the postwar period. The facility also appears to meet Criterion C/3 because of its engineering value as an important component of an expansive, multi-purpose water conveyance system, which was designed to exacting standards to achieve a coordinated flow of water. It also appears eligible because of the important role it has played as a critical component of the SWP, which is significant for its scale and complexity as a water conveyance system and its impact on increasing California's population and expanding its economy.

John E. Skinner Delta Fish Protective Facility

Situated on relatively high land on the former Clifton Court Tract, the Skinner Fish Facility site was in agricultural production as early as the turn of the twentieth century and remained in use as farmland until at least 1959 (NETR Online). In 1968 DWR opened Skinner Fish Facility southwest of the CCF on the Banks Pumping Plant intake channel. A product of the Davis-Dolwig Act's requirement that SWP facilities planning take into account "the enhancement of fish and wildlife," the plant initially was jointly operated by DWR and the Department of Fish and Game (Legislative Analyst's Office 2009; Bay-Delta Fishery 1981, 1). By DWR's account, the Skinner Fish Facility diverts 15 million fish per year from the Banks Pumping Plant downstream. The facility serves a secondary role as a data collection operation. DWR technicians count and measure fish from dozens of species in twice-daily sample collections (DWR 2011).

Construction began on the intake channel by 1963, and the fish protection mechanism and the first buildings associated with the resource appeared between then and the facility's 1968 opening (DWR, 1974c, 195; NETR Online). DWR added a new secondary fish diversion louver and a new collection tank in 1980 (Bay-Delta Fishery 1981, 1). Other than the mechanism on the channel, the construction of buildings and structures at the site was limited to the west side of the channel until the late 1980s or early 1990s. Expansion on the eastern side of complex continued until about 2008 and included the addition of 12 buildings and additional equipment (NETR Online 1987, 1993; Google Earth 1993, 2002, 2004, 2006, 2008).

The Skinner Fish Facility appears to be a contributor to the study-area subsection of the Delta Field Division of the California State Water Project, which appears eligible at the state level of significance under NRHP Criteria A and C, and CRHR Criteria 1 and 3. It also appears eligible as a contributor to a potential California State Water Project Historic District. Although the fish facility has incurred several alterations since DWR completed it in the late 1960s, it retains sufficient integrity to convey its historical identity as a fish protection complex. Buildings and structures built subsequent to the original facility are not considered contributors at this time. The original facility, as a component of the Delta Field Division, appears to meet Criterion A/1 because of its association with the SWP's primary role of storing Northern California water and distributing it to urban and rural agricultural areas of need elsewhere in the state, which allowed the region to sustain the marked population growth and economic development during the early postwar period. The facility also appears to meet Criterion C/3 because of its engineering value as an important component of an expansive, multi-purpose water conveyance system, which was designed to exacting standards to achieve a coordinated flow of water. The facility does not appear to be eligible in its own right under Criterion C/3, however. Preceded by 17 years by the nearby and similarly-designed Tracy Fish Collection Facility, the Skinner Fish Facility is not novel within the Delta region. In addition, available sources do not suggest that the Skinner Fish Facility is individually significant as an engineering structure. However, the Skinner Fish Facility is a critical component of the SWP, which is significant for its scale and complexity as a water conveyance system and its impact on increasing California's population and expanding its economy.

Clifton Court Forebay

DWR created the CCF as part of the SWP in 1969 by inundating the agricultural fields of what had been the Clifton Court Tract. Owing to its relatively soft organic soils, the mostly marshy Clifton Court Tract was reclaimed relatively late in the process of California Delta reclamation. In the late nineteenth century the introduction of powerful mechanical dredging equipment allowed southern and western Delta landowners to construct levees and subsequently drain water from their

***B10: Significance** (Continued):

marshy land holdings. Settlers erected levees on the tract by 1901 (San Francisco Call 25 Feb 1901), and the land was in agricultural production by 1906 (San Francisco Call 18 Jan 1907). In 1916 there was at least one cattle ranch on the tract, operated by Martin Lund (Pacific Rural Press 1916, 336). Aerial photographs of the tract suggest that the land remained divided into crop fields as late as 1966 (NETR Online 1966), when the primary crop there was asparagus (Bauer 1965, 1).

Two levees protect the CCF from uncontrolled inundation. On the north, northwest, and east, turn-on-the-twentieth-century levees hold back the waters of the Italian Slough, Old River, and West Canal. United States Geological Survey Maps indicate that this barrier was in place by 1914, though it likely dated to the tract's earliest reclamation (NETR Online). Around 1969, construction crews began work on the forebay, erecting a new levee on the south and southwest end that roughly paralleled the existing levees on the north, northwest, and the east. In 1969, after completing the intake system, crews intentionally breached the original West Canal levee, allowing Delta waters to fill the tract (DWR 1974c, 213). Although engineers intended the CCF to regulate flows from the SWP's planned Peripheral Canal, DWR completed the canal before the final approval of the canal. Planners believed that the CCF's premature completion in 1969 would allow the department to save on construction costs and eliminate the need to enlarge the Italian Slough for the Banks Pumping Plant intake (Werner 1965, 4-5).

While state water resource engineers conceived the forebay primarily as part of the SWP water conveyance system, the reservoir served a secondary function as a recreation facility. To fulfill the recreational use mandate of the Davis-Dolwig Act, the State Division of Parks and Beaches (DPB) proposed facilities at the CCF to accommodate fishing and other recreational activities. In 1966 DPB issued a report outlining the forebay's potential extensive recreational use, with "water-associated recreation as its central theme" (Bauer 1966, 25). More expansive than the CCF's current recreational function, the 1966 conception of the facility included a variety of options ranging from "beaches, boat ramps, picnic and camp areas to recreational innovations, such as mechanical water-ski tows, a giant slide and fishing villages" (Bauer 1966, 25). DPB believed that such a facility would have drawn urban users from the East Bay, Sacramento, Stockton, Fairfield, and Davis areas (Bauer 1966, 25). Current recreation uses are modest compared to early plans for the forebay and are limited mostly to fishing from the banks and bicycling or hiking along the levee-top service roadway.

The CCF appears to be a contributor to the study-area subsection of the Delta Field Division of the California State Water Project, which appears to be eligible at the state level of significance under NRHP Criteria A and C, and CRHR Criteria 1 and 3. It also appears eligible as a contributing element to a potential California State Water Project Historic District. The facility, as a component of the Delta Field Division of the SWP, appears to meet Criterion A/1 because of its association with the SWP and its role of storing Northern California water and distributing it to urban and rural agricultural areas of need elsewhere in the state, which allowed the region to sustain the marked population growth and economic development during the early postwar period. The facility also appears to meet Criterion C/3 because of its engineering value as an important component of an expansive, multi-purpose water conveyance system, which was designed to exacting standards to achieve a coordinated flow of water. It is a critical component of the SWP, which is significant for its scale and complexity as a water conveyance system and its impact on increasing California's population and expanding its economy.

Although the portion of the Delta Field Division within the Bay-Delta Conservation Plan Project Area of Potential Effect is currently less than 50 years of age, most of it was initially constructed prior to 1969, falling within the period for which built resources are considered for historic significance for the purposes of the Bay Delta Conservation Plan Project. In conclusion, the components of the Delta Field Division presently under evaluation—the Clifton Court Forebay, the John E. Skinner Delta Fish Protective Facility, and the Harvey O. Banks Delta Pumping Plant—appear to be eligible at the state level of significance for listing in the National Register of Historic Places and the California Register of Historical Resources under NRHP Criteria A and C, and CRHR Criteria 1 and 3. These three components of the Delta Field Division also appear to be contributing elements to a potential California State Water Project Historic District. None of these components of the Delta Field Division appear to be significant under NRHP Criterion B or CRHR Criterion 2. Although former California Governor Edmund Brown was a well-known proponent of the SWP, he was only one of many individuals who worked to complete the project. Ultimately, his efforts, as well as those of other individuals with an association with the SWP, lack the level of singular importance and direct association necessary for listing in the NRHP under Criterion B and the CRHR under Criterion 2. The Delta Field Division facilities addressed in this evaluation also do

***B10: Significance** (Continued):

not appear to be significant under NRHP Criterion D or CRHR Criterion 4 as a source or likely source of important historical information, nor do they appear likely to yield important information about historic construction methods, materials, or technologies. Additionally, these Delta Field Division facilities were evaluated in accordance with Section 15064.5(a) (2)-(3) of the California Environmental Quality Act (CEQA) Guidelines using the criteria outlined in Section 5024.1 of the California Resources Code, and they do not appear to be historical resources for the purposes of CEQA

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*Resource Name or # MPTO_002_001

see also P-01-011649 CA-ALA-000683H

*Recorded by: Monte Kim and James Williams

*Date: August 2, 2013 Continuation Update

***B12. References** (continued):

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Figures:



Figure 1. Aerial view of John E. Skinner Delta Fish Protective Facility. Source: Google Earth Pro, 2013.

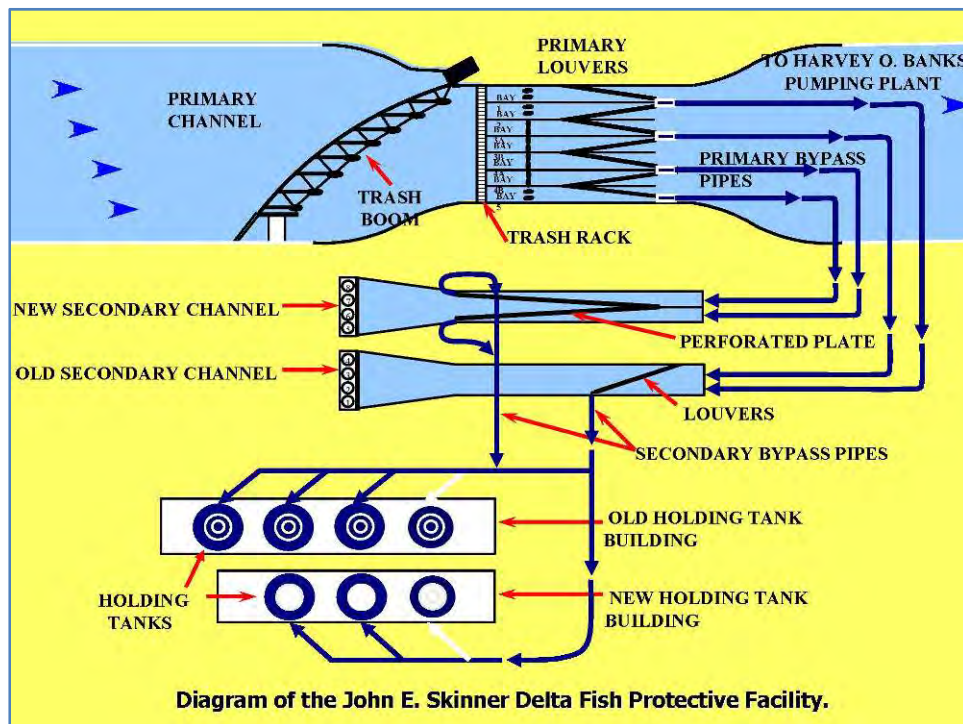


Figure 2. Skinner Fish Facility protective mechanism schematic. Source: Daryl Hayes.



Figure 3. Aerial view of Harvey O. Banks Delta Pumping Plant. Source: Google Earth Pro, 2013.

***P5a. Photographs (continued):**



Photograph 2. Representative mechanical pump at Clifton Court Forebay. View to northwest.



Photograph 3. Drainage ditch, retaining pool, and pump outside Clifton Court Forebay. View to northeast.



Photograph 4. Representative boat ramp at Clifton Court Forebay. View to north.



Photograph 4. Outside view of Clifton Court Forebay intake gate. View to west.



Photograph 6. Inside view of intake gates. View to south.



Photograph 7. Overview of public access peninsula and discharge channel on west side of Clifton Court Forebay. View to south.



Photograph 8. Overview of Skinner Fish Facility. View to north.



Photograph 9. Overview of fish protection mechanism. View to north.



Photograph 10. Skinner Facility Buildings 2, 4, and 1 (L to R). View to north.



Photograph 11. Skinner Facility Buildings 2, 4, and 1 (L To R). View to north.



Photograph 12. Skinner Facility Building 3. View to north.



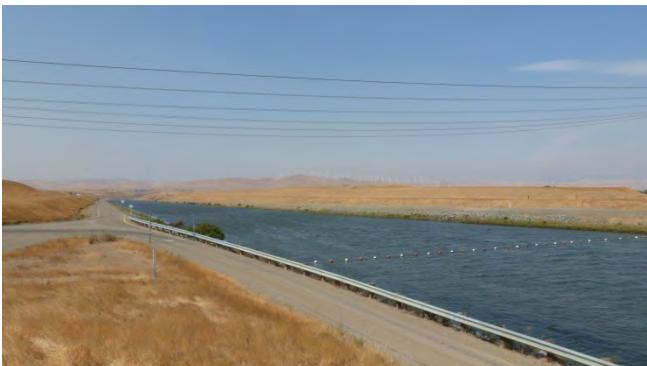
Photograph 13. Skinner Facility Buildings 7, 8, and 9. View to north.



Photograph 14. Skinner Facility Buildings 10 and 11. View to north.



Photograph 15. Skinner Facility buildings with Building 12 at the far right.



Photograph 16. Banks Plant intake channel. View to west.



Photograph 17. Banks Pumping Plant. View to southwest. Source: Aquaforia, 2008.

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*Resource Name or # MPTO_002_001

see also P-01-011649 CA-ALA-000683H

*Recorded by: Monte Kim and James Williams

*Date: August 2, 2013

Continuation Update



Photograph 18. Banks Plant Building 7. View to north.



Photograph 19. Banks Plant Building 9. View to north.



Photograph 20. Banks Plant Building 11. View to northwest.

L1. Historic and/or Common Name: Clifton Court Forebay Levees

L2a. Portion Described: Entire Resource Segment Point Observation **Designation:**

b. Location of point or segment: (Provide UTM coordinates, legal description, and any other useful locational data. Show the area that has been field inspected on a Location Map) North, east, west levees, between forebay intake gate and discharge channel.

L3. Description: (Describe construction details, materials, and artifacts found at this segment/point. Provide plans/sections as appropriate.)

See section P3a.

L4. Dimensions: (In feet for historic features and meters for prehistoric features)

a. Top Width: 20 feet

b. Bottom Width: 145 feet

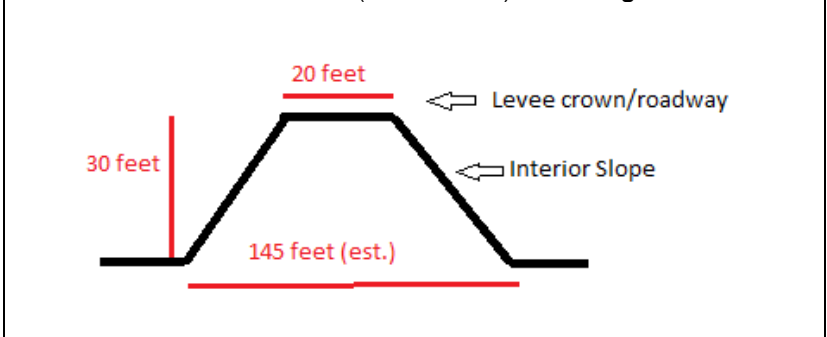
c. Height or Depth: 30 feet

d. Length of Segment: 5.5 miles

L5. Associated Resources:

Clifton Court Forebay, intake gate

L4e. Sketch of Cross-Section (include scale) **Facing:**



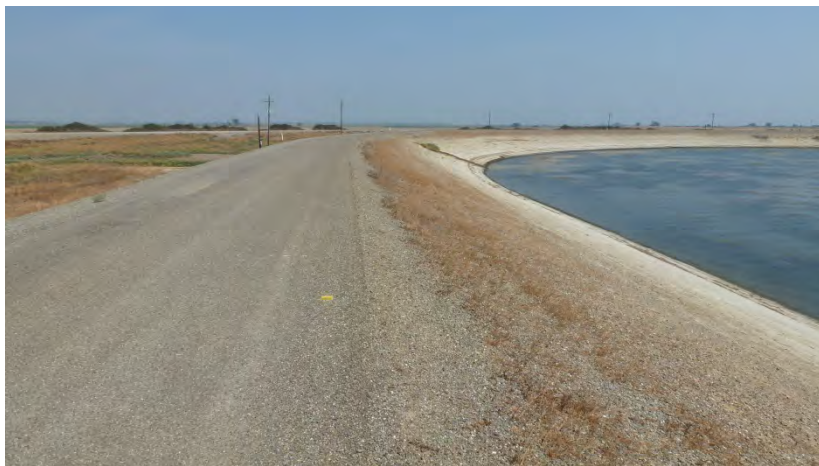
L6. Setting: (Describe natural features, landscape characteristics, slope, etc., as appropriate.)

The resource is in the rural, agricultural western Delta region, with Delta waterways to the north and east and agricultural land and a DWR fish protection to the south and west.

L7. Integrity Considerations:

There are no significant alterations.

L8a. Photograph, Map or Drawing



L8b. Description of Photo, Map, or Drawing
(View, scale, etc.)

Clifton Court Forebay levee, view to north from near public parking area. Taken July 29, 2013.

L9. Remarks:

L10. Form Prepared by:

James Williams and Monte Kim,
ICF International, 630 K Street, Suite 400
Sacramento, CA 95814

L11. Date: August 2, 2013

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Resource Name or #: MPTO_002_001

see also P-01-011649 CA-ALA-000683H

L1. Historic and/or Common Name: Harvey O. Banks Delta Pumping Plant Intake Channel

L2a. Portion Described: Entire Resource Segment Point Observation **Designation:**

b. Location of point or segment: (Provide UTM coordinates, legal description, and any other useful locational data. Show the area that has been field inspected on a Location Map) Observed from Byron Highway crossing.

L3. Description: (Describe construction details, materials, and artifacts found at this segment/point. Provide plans/sections as appropriate.)

See section P3a.

L4. Dimensions: (In feet for historic features and meters for prehistoric features)

a. Top Width: 300 feet

b. Bottom Width: Not available

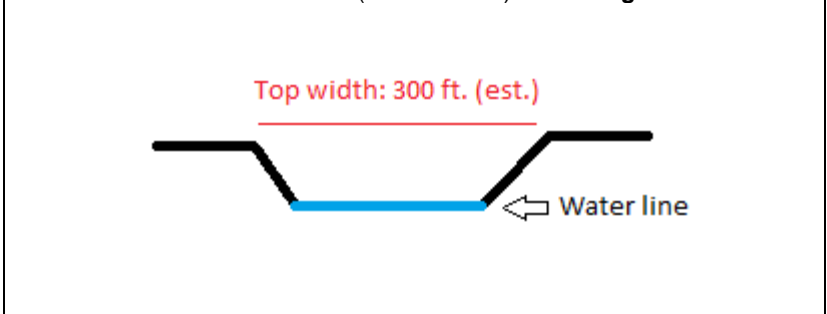
c. Height or Depth: Not available

d. Length of Segment: 2.5 miles

L5. Associated Resources:

Harvey O. Banks Delta Pumping Plant, John E. Skinner Delta Fish Protective Facility, Clifton Court Forebay

L4e. Sketch of Cross-Section (include scale) **Facing:**



L6. Setting: (Describe natural features, landscape characteristics, slope, etc., as appropriate.)

The channel begins near Clifton Court Forebay in rural Contra Costa County, flowing southwest toward the Diablo Foothills. Its southern portion passes through an artificial ravine excavated from the foothills.

L7. Integrity Considerations:

There are no apparent significant alterations.

L8a. Photograph, Map or Drawing



L8b. Description of Photo, Map, or Drawing

(View, scale, etc.)

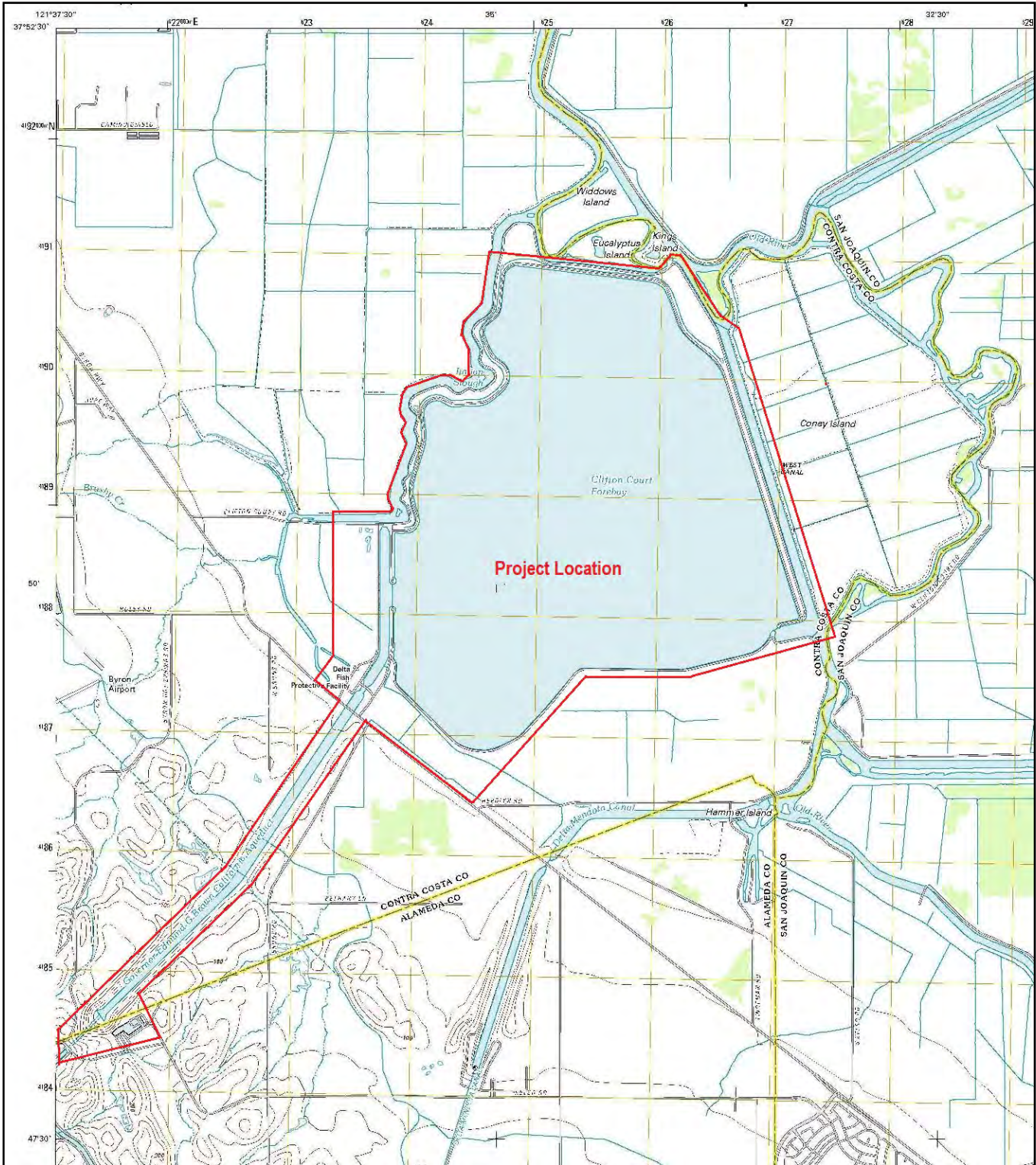
Intake channel, view to southwest. Taken from just east of the Byron Highway on July 29, 2013.

L9. Remarks:

L10. Form Prepared by:

James Williams and Monte Kim
ICF International, 630 K Street, Suite 400
Sacramento, CA 95814

L11. Date: August 2, 2013



Appendix B

Interested Party Correspondence

Kate G. Kaiser

Sent:
To:
Cc:
Subject:

Attachments:

Dear Alameda Architectural Preservation Society,

I am reaching out today on behalf of Dudek and the California Department of Water Resources (DWR) to provide you with some information about the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, in Contra Costa County and Alameda County and the Dyer and Patterson Reservoirs in Alameda County. As part of the cultural resources study for the proposed project, Dudek is consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be within the proposed project areas. Please see the attached letters and maps for more information about the nature and location of the project, and please feel free to contact me should you have questions or information regarding cultural or historical resources in this area.

Kate G. Kaiser, MSHP

Architectural Historian

DUDEK

O: 626.204.9815 C: 760.814.4664

www.dudek.com

May 12, 2021

Alameda Architectural Preservation Society
P.O. Box 1677
Alameda, CA 94501
aaps@alameda-preservation.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay*

To the Alameda Architectural Preservation Society:

Dudek has been retained by the Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay (Proposed Project). Clifton Court Forebay is located at the southwestern edge of the Sacramento–San Joaquin River Delta, approximately 10 miles northwest of the City of Tracy and adjacent to Byron Road. The Proposed Project is located along the 8-mile dam embankment (see Figure 1, enclosed).

Clifton Court Forebay has been subject to ongoing rodent burrowing throughout its service life. Rodent burrows are a recognized hazard to dams and levees as they can be associated with potential failure modes for dams by promoting piping and internal erosion that can ultimately lead to dam failure. The Project proposes rodent burrow repairs and restoration measures, as well as permanent measures to prevent future burrowing. DWR also proposes to repair shallow ruts and near-surface deformations by filling these areas with native soil and compacting it.

As part of our study, we are consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be affected by the Proposed Project. Your efforts in this process will provide invaluable information for the proper identification and treatment of such resources.

If you have any questions or comments regarding cultural resources in the proposed project area, please direct your response to:

Dudek
Attn: Kate Kaiser
Phone: 626-204-9815
Email: kkaiser@dudek.com

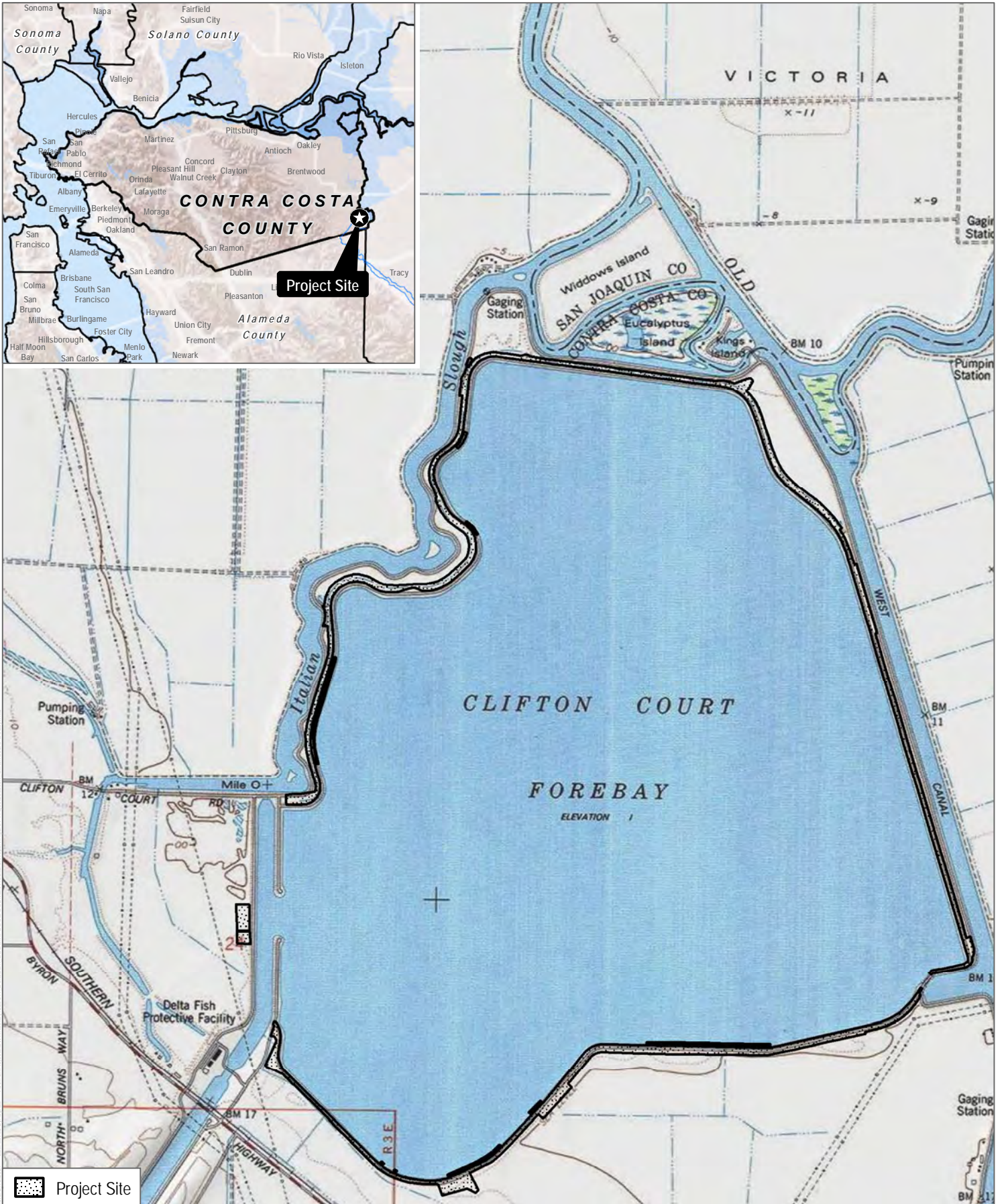
All comments, emails, or letters received will be included in the reports generated by this study. Thank you very much for your time regarding our request.

Sincerely,



Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Clifton Court Forebay Project Location



BASEMAP SOURCE: DWR 2020; USGS 7.5-Minute Series Clifton Court Forebay Quadrangle

FIGURE 1
 Project Location - Clifton Court Forebay
 Delta Dams Rodent Burrow Remediation Project

May 12, 2021

Alameda Architectural Preservation Society
P.O. Box 1677
Alameda, CA 94501
aaps@alameda-preservation.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Dam and Patterson Reservoir and Dam*

To the Alameda Architectural Preservation Society:

Dudek has been retained by the Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Patterson Reservoir (Proposed Project). Dyer Reservoir is located in the Altamont Hills, approximately 7 miles northeast of the City of Livermore in Alameda County; and Patterson Reservoir is approximately 1 mile east of the City of Livermore (see Map Figures 1 and 2, enclosed).

Both the Dyer Dam (2012) and Patterson Dam (1962) embankments have been subject to ongoing rodent burrowing throughout their service life. Rodent burrows are a recognized hazard to dams and levees as they can be associated with potential failure modes for dams by promoting piping and internal erosion that can ultimately lead to dam failure. The Project proposes rodent burrow repairs and restoration measures, as well as permanent measures to prevent future burrowing. DWR also proposes to repair shallow ruts and near-surface deformations by filling these areas with native soil and compacting it.

As part of our study, we are consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be affected by the Proposed Project. Your efforts in this process will provide invaluable information for the proper identification and treatment of such resources.

If you have any questions or comments regarding cultural resources in the proposed project area, please direct your response to:

Dudek
Attn: Kate Kaiser
Phone: 626-204-9815
Email: kkaiser@dudek.com

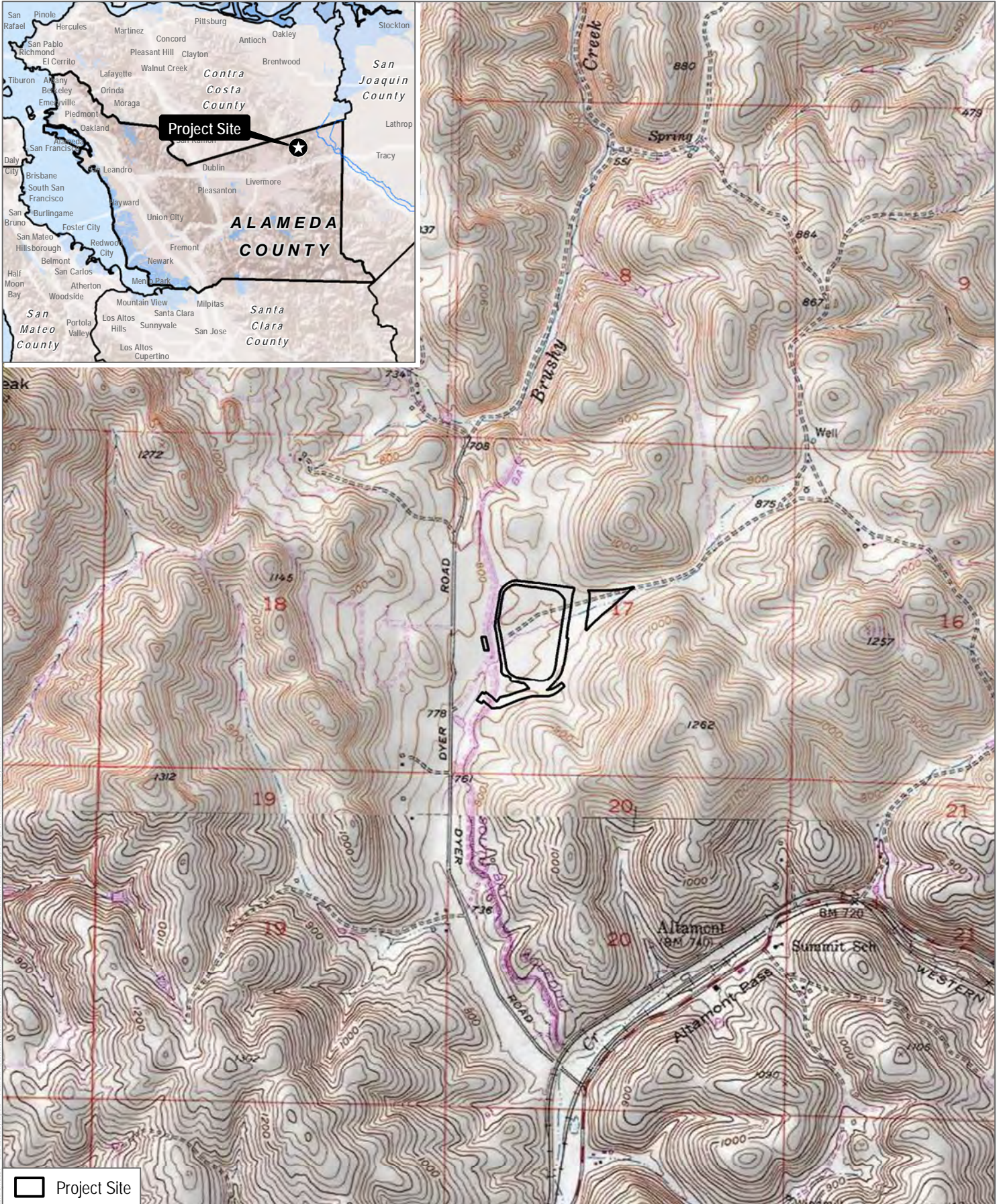
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Sincerely,



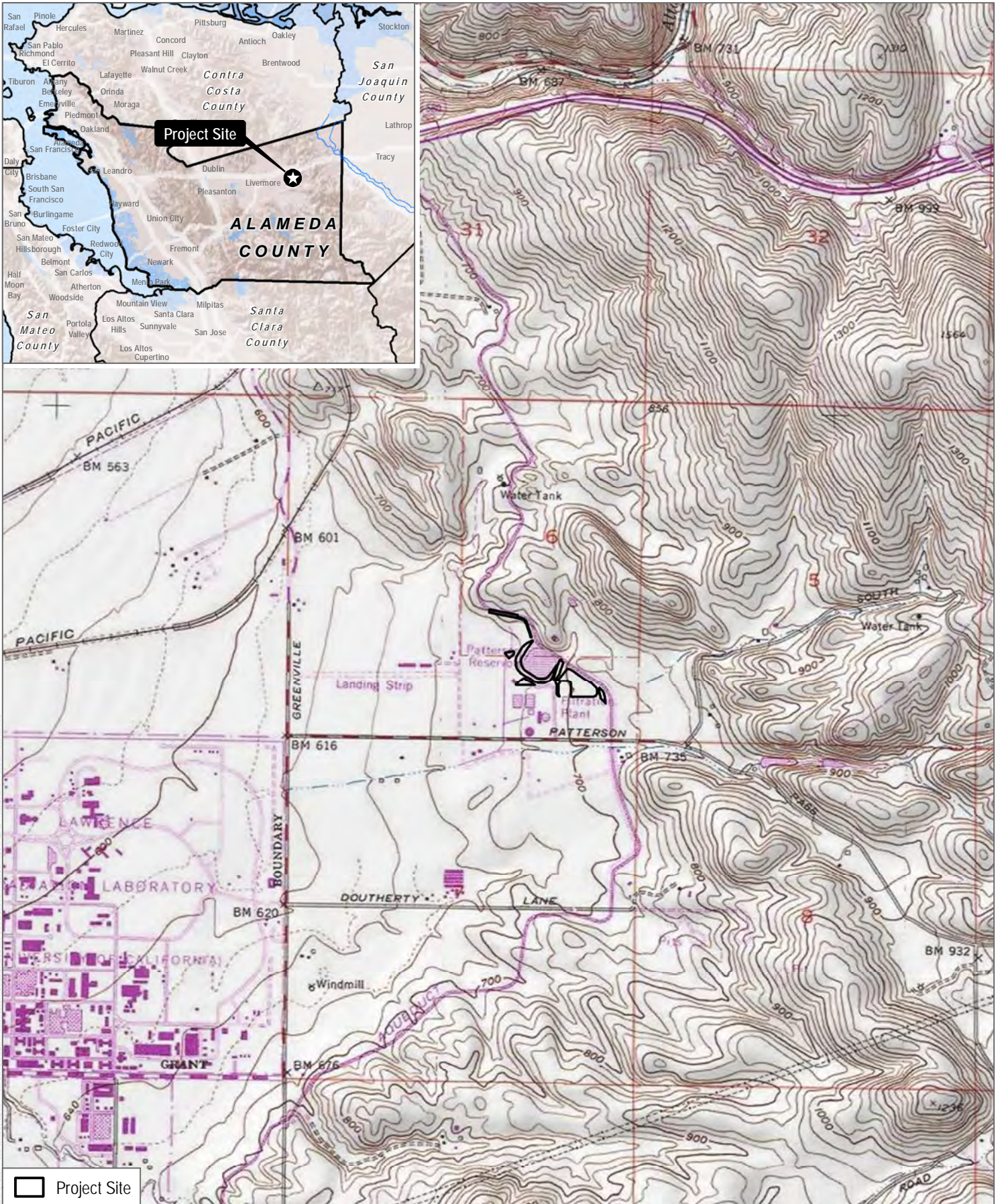
Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Dyer Dam Project Location and Figure 2. Patterson Dam Project Location



BASEMAP SOURCE: DWR 12/28/2020; USGS 7.5-Minute Series Byron Hot Springs Quadrangle

FIGURE 1
 Project Location - Dyer Reservoir
 Delta Dams Rodent Burrow Remediation Project



BASEMAP SOURCE: DWR 12/11/2020; USGS 7.5-Minute Series Altamont Quadrangle

FIGURE 2

Project Location - Patterson Reservoir

Delta Dams Rodent Burrow Remediation Project

Kate G. Kaiser

Sent:
To:
Cc:
Subject:

Attachments:

Hello Alameda County Historical Society,

I am reaching out today on behalf of Dudek and the California Department of Water Resources (DWR) to provide you with some information about the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, in Contra Costa County and Alameda County and the Dyer and Patterson Reservoirs in Alameda County. As part of the cultural resources study for the proposed project, Dudek is consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be within the proposed project areas. Please see the attached letters and maps for more information about the nature and location of the project, and please feel free to contact me should you have questions or information regarding cultural or historical resources in this area.

Kate G. Kaiser, MSHP

Architectural Historian

DUDEK

O: 626.204.9815 C: 760.814.4664

www.dudek.com

May 12, 2021

Alameda County Historical Society
P.O. Box 13145
Oakland, CA 94661
info@AlamedaCountyHistory.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay*

To the Alameda County Historical Society:

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Clifton Court Forebay has been subject to ongoing rodent burrowing throughout its service life. Rodent burrows are a recognized hazard to dams and levees as they can be associated with potential failure modes for dams by promoting piping and internal erosion that can ultimately lead to dam failure. The Project proposes rodent burrow repairs and restoration measures, as well as permanent measures to prevent future burrowing. DWR also proposes to repair shallow ruts and near-surface deformations by filling these areas with native soil and compacting it.

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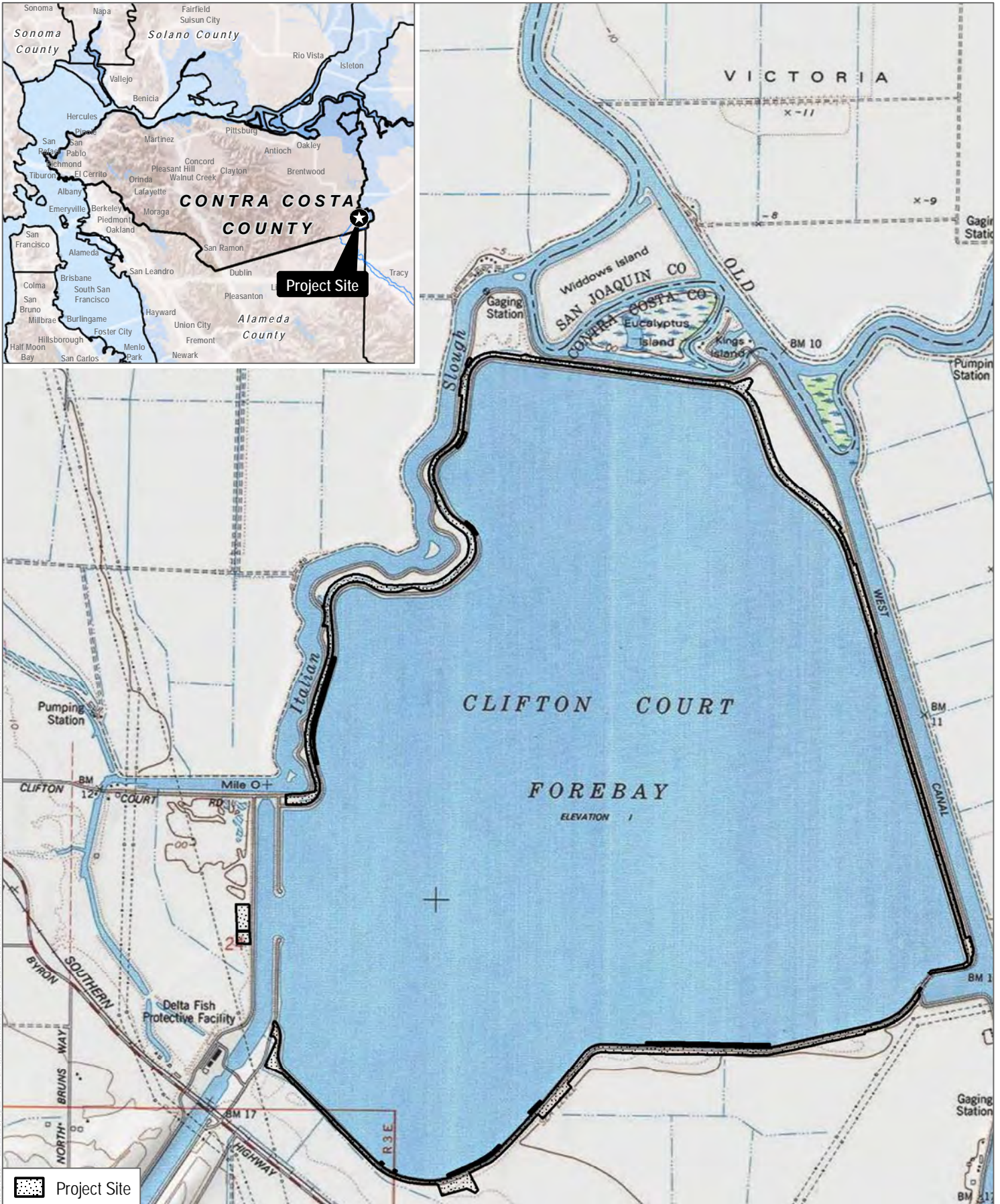
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Kate Kaiser, MSHP
Architectural Historian

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FIGURE 1
 Project Location - Clifton Court Forebay
 Delta Dams Rodent Burrow Remediation Project

May 12, 2021

Alameda County Historical Society
P.O. Box 13145
Oakland, CA 94661
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Subject: *Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Dam and Patterson Reservoir and Dam*

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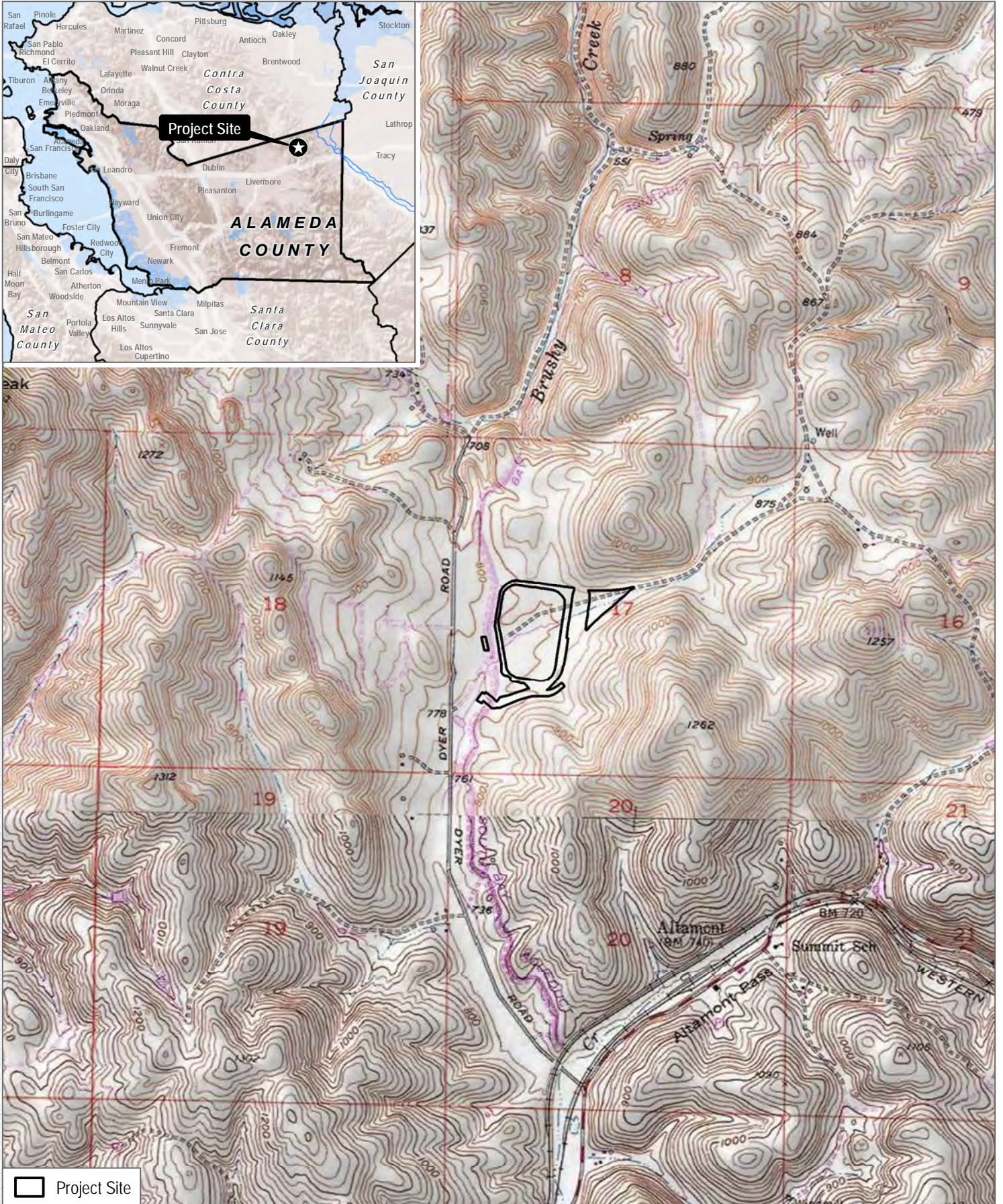
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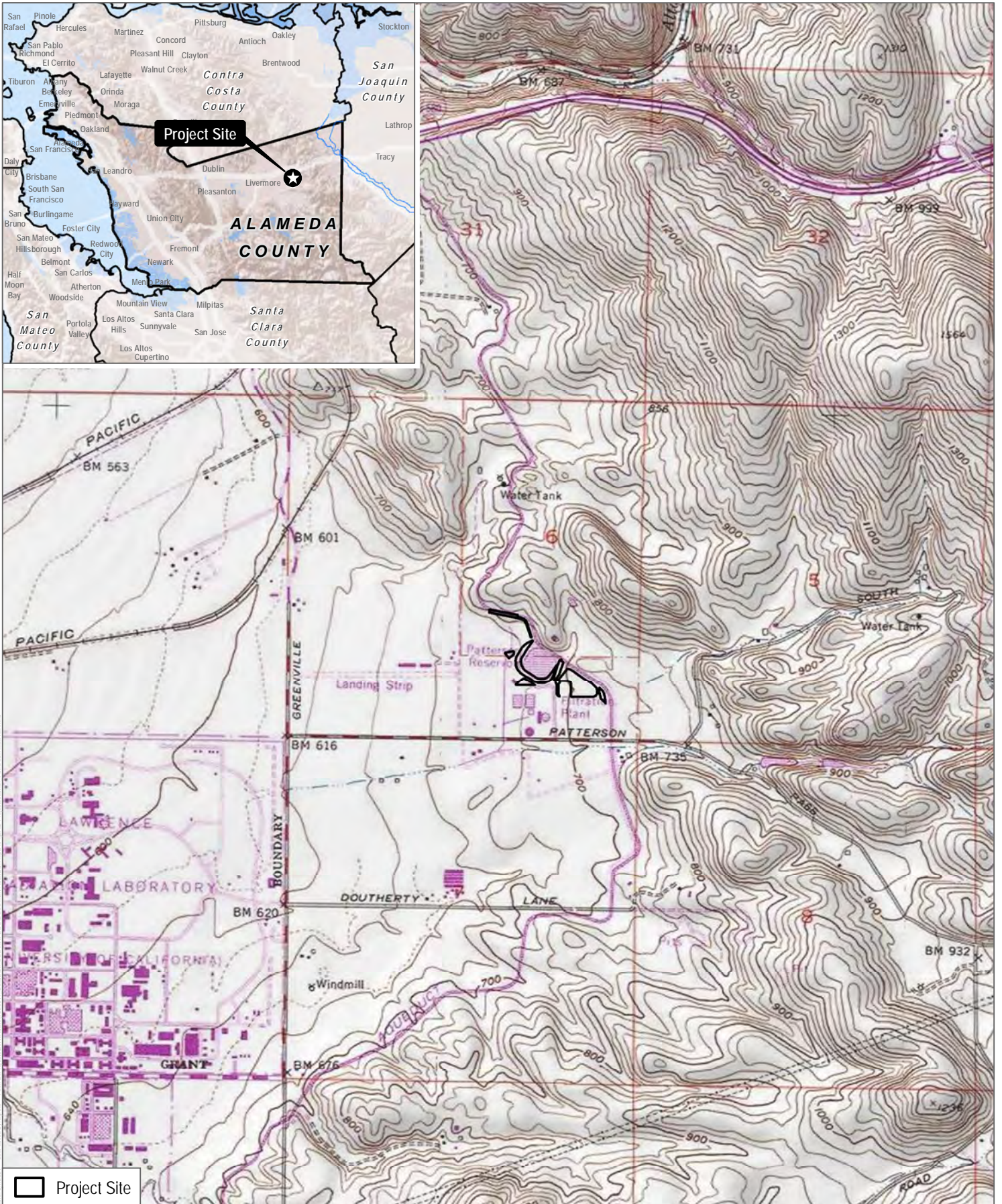
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BASEMAP SOURCE: DWR 12/11/2020; USGS 7.5-Minute Series Altamont Quadrangle

FIGURE 2
 Project Location - Patterson Reservoir
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Kate G. Kaiser

Sent:
To:
Cc:
Subject:

Attachments:

Dear Contra Costa Historical Society Staff,

I am reaching out today on behalf of Dudek and the California Department of Water Resources (DWR) to provide you with some information about the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, in Contra Costa County. As part of the cultural resources study for the proposed project, Dudek is consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be within the proposed project area. Please see the attached letter and map for more information about the nature and location of the project, and please feel free to contact me should you have questions or information regarding cultural or historical resources in this area.

Kate G. Kaiser, MSHP

Architectural Historian

DUDEK

O: 626.204.9815 C: 760.814.4664

www.dudek.com

May 12, 2021

Contra Costa Historical Society
724 Escobar Street
Martinez, CA 94553
info@cocohistory.org

Subject: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay

To the Contra Costa Historical Society staff:

Dudek has been retained by the California Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay (Proposed Project). Clifton Court Forebay is located at the southwestern edge of the Sacramento-San Joaquin River Delta, approximately 10 miles northwest of the City of Tracy and adjacent to Byron Road. The Proposed Project is located along the 8-mile dam embankment (see Figure 1, enclosed).

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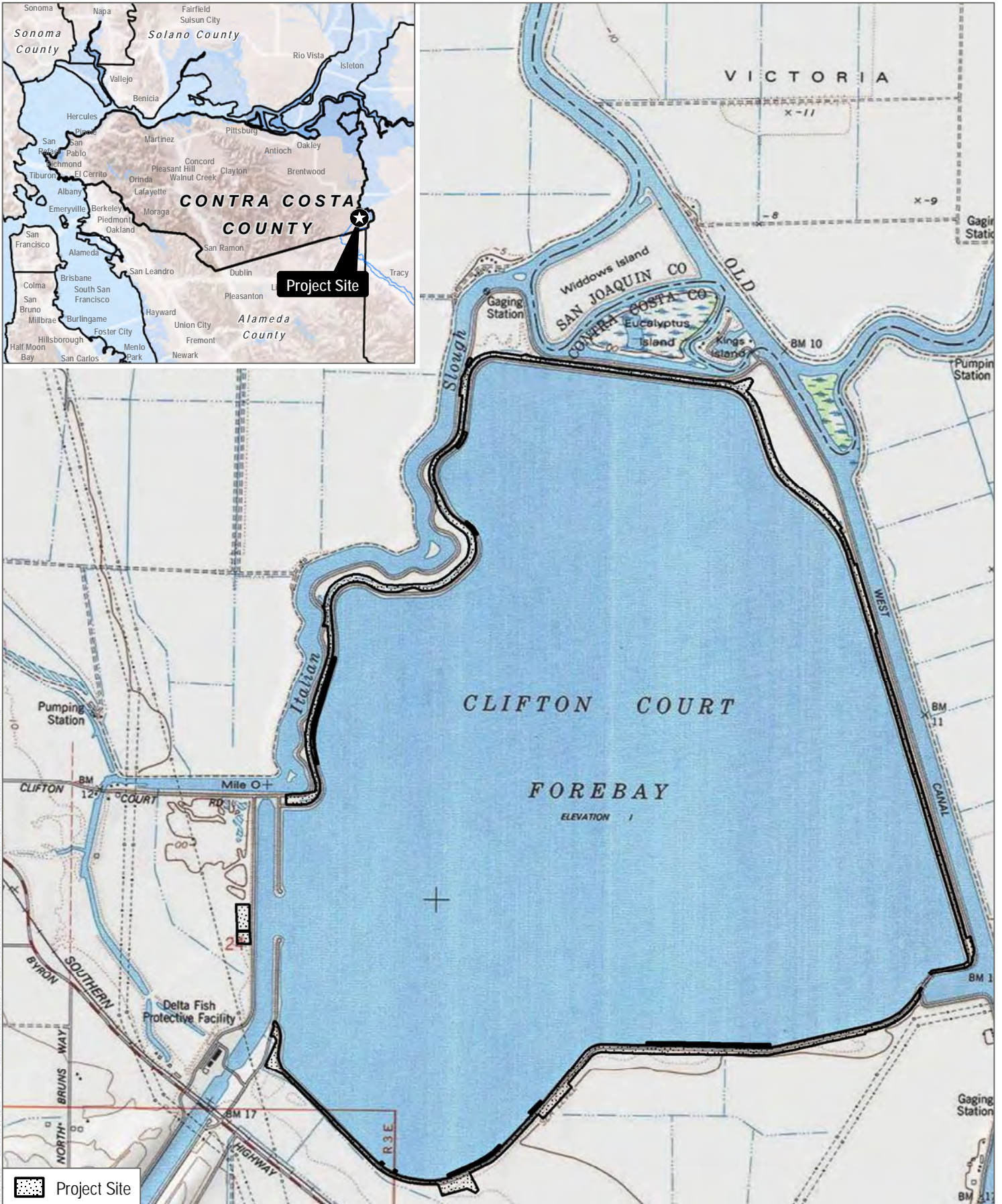
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Sincerely,



Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Clifton Court Forebay Project Location



BASEMAP SOURCE: DWR 2020; USGS 7.5-Minute Series Clifton Court Forebay Quadrangle

FIGURE 1
 Project Location - Clifton Court Forebay
 Delta Dams Rodent Burrow Remediation Project

From: [Katie Haley](#)
To: cchistry@cocohistory.org
Cc: [Kate G. Kaiser](#)
Subject: RE: Outreach Request: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay
Date: Thursday, May 27, 2021 4:57:37 PM

Hi Mr. McCarron,

Thank you for your response to our letter. Apologies if the intent of our outreach letter led you to assume that we wanted your organization to assess potential project impacts and/or conduct research on our behalf. The intent of this correspondence was to just reach out to your organization as a notification about this proposed project, and inquire if you were aware of any immediate concerns regarding cultural resources in the proposed project area. This type of notification letter is sent as part of the process for conducting cultural resources investigations under Section 106 Historic Preservation Act, specifically 36 CFR Part 800.4 (3) *Identification of historic properties*.

Thanks for letting us know about the research options available through the historical society.

Best Regards,

Katie

Kathryn Haley, MA

Historic Built Environment Lead



C: 916.539.2202

www.dudek.com

From: Contra Costa County Historical Society <cchistry@cocohistory.org>

Sent: Tuesday, May 25, 2021 11:09 AM

To: Kate G. Kaiser <kkaiser@dudek.com>

Subject: RE: Outreach Request: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay

Please see attached.

Michael C. McCarron

Executive Director

Contra Costa County Historical Society

724 Escobar Street, Martinez, CA 94553

T: 925-229-1042 F: 925-229-1772

www.cocohistory.com

[Take a Tour of the History Center](#)



From: Kate G. Kaiser [<mailto:kkaiser@dudek.com>]
Sent: Wednesday, May 12, 2021 1:34 PM
To: Contra Costa County Historical Society
Cc: Katie Haley
Subject: Outreach Request: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay

Dear Contra Costa Historical Society Staff,

I am reaching out today on behalf of Dudek and the California Department of Water Resources (DWR) to provide you with some information about the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, in Contra Costa County. As part of the cultural resources study for the proposed project, Dudek is consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be within the proposed project area. Please see the attached letter and map for more information about the nature and location of the project, and please feel free to contact me should you have questions or information regarding cultural or historical resources in this area.

Kate G. Kaiser, MSHP
Architectural Historian


O: 626.204.9815 C: 760.814.4664
www.dudek.com



Contra Costa County Historical Society
724 Escobar Street
Martinez, CA 94553-1122
Phone: 925-229-1042
Fax: 925-229-1772

May 25, 2021

Kate Kaiser
Dudek
1102 R Street
Sacramento, California 95811

Re: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay

Dear Ms. Kaiser:

We have received your request for information and comments on the area to be impacted by the subject project. Though there may well be impacts to cultural resources in the area, the Contra Costa Historical Society is not able to say at this time, due to the fact that actual research time is involved in any response to such a request.

I understand that many of the agencies from which such commentary is solicited are public agencies whose mission it is to do such work. The Contra Costa County Historical Society is a private, non-profit organization founded in 1951 for the discovery, preservation, and dissemination of knowledge about the history of Contra Costa County and the State of California. Unfortunately, it does not have the wherewithal to provide such information without compensation for our research time.

That said, the Society's History Center is certainly a resource open to your own researchers or able to provide research on a fee basis. The Society operates the largest archive of historical documents and artifacts in Contra Costa County, with a primary field of study encompassing the entire geography and history of the County. Our staff and volunteers frequently assist land-use professionals in using our archival materials to prepare environmental assessments of projects within the boundaries of the County.

Our fee structure for such research is as follows:

For members (annual corporate membership \$500.00), there is no charge.

For non-member professionals conducting research on behalf of your company - \$75 per year or \$35 per hour

For research conducted by our staff on your behalf - \$50 per hour.

I am sure you will appreciate our situation. In order to gather the information you would like or even verifying that we have no such information, we must expend research time and energy. Please let me know how you would like us to proceed.

Sincerely,

Michael C McCarron
Executive Director

Kate G. Kaiser

Sent:
To:
Cc:
Subject:

Attachments:

Dear East Contra Costa Historical Society,

I am reaching out today on behalf of Dudek and the California Department of Water Resources (DWR) to provide you with some information about the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, in Contra Costa County. As part of the cultural resources study for the proposed project, Dudek is consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be within the proposed project area. Please see the attached letter and map for more information about the nature and location of the project, and please feel free to contact me should you have questions or information regarding cultural or historical resources in this area.

Kate G. Kaiser, MSHP

Architectural Historian

DUDEK

O: 626.204.9815 C: 760.814.4664

www.dudek.com

May 12, 2021

Ms. Kathy Leighton
East Contra Costa Historical Society
3890 Sellers Avenue
Brentwood, CA 94513
resourceroom@eastconstracostahistory.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay*

To Ms. Kathy Leighton:

Dudek has been retained by the Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay (Proposed Project). Clifton Court Forebay is located at the southwestern edge of the Sacramento–San Joaquin River Delta, approximately 10 miles northwest of the City of Tracy and adjacent to Byron Road. The Proposed Project is located along the 8-mile dam embankment (see Figure 1, enclosed).

Clifton Court Forebay has been subject to ongoing rodent burrowing throughout its service life. Rodent burrows are a recognized hazard to dams and levees as they can be associated with potential failure modes for dams by promoting piping and internal erosion that can ultimately lead to dam failure. The Project proposes rodent burrow repairs and restoration measures, as well as permanent measures to prevent future burrowing. DWR also proposes to repair shallow ruts and near-surface deformations by filling these areas with native soil and compacting it.

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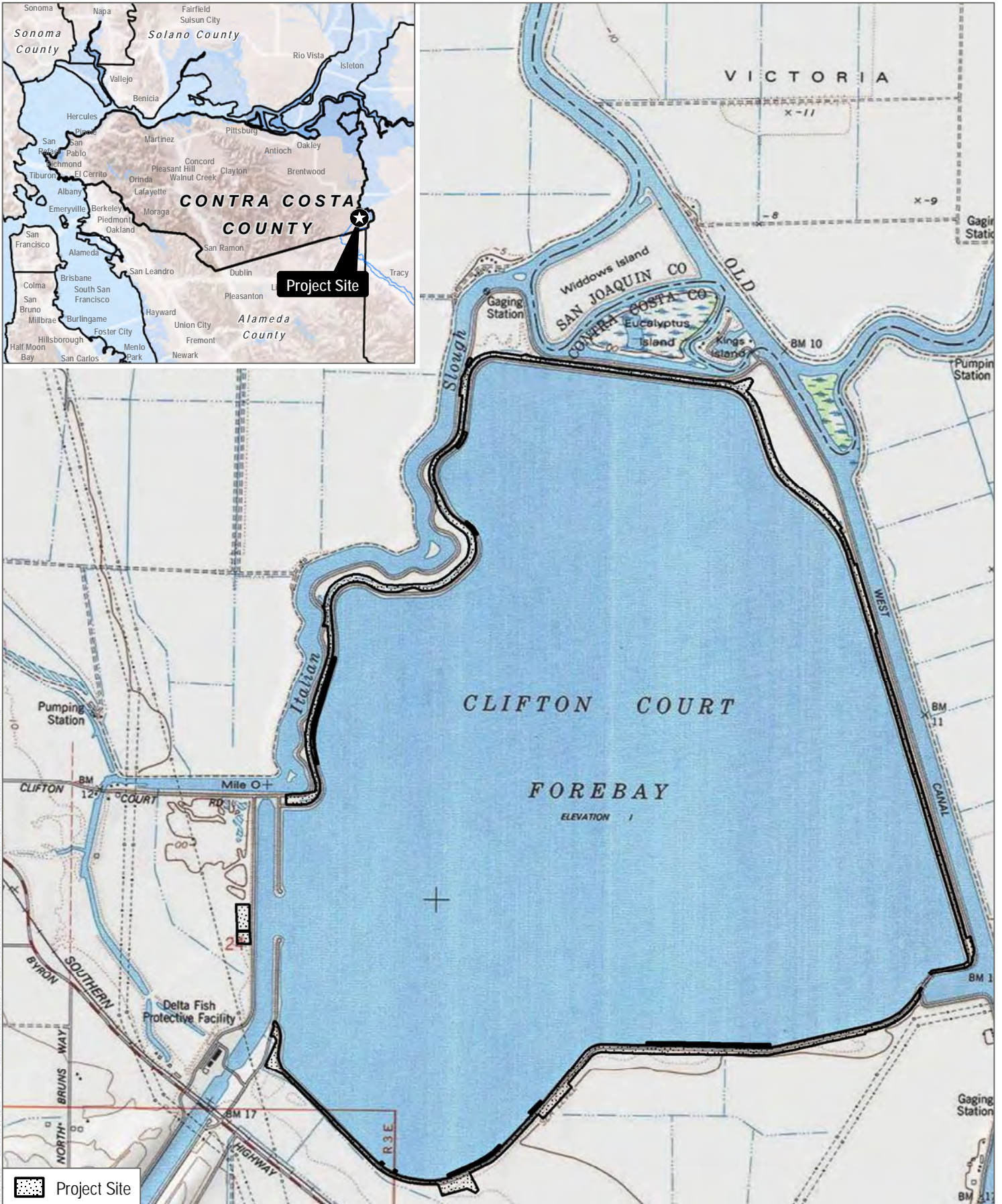
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Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Clifton Court Forebay Project Location



BASEMAP SOURCE: DWR 2020; USGS 7.5-Minute Series Clifton Court Forebay Quadrangle

FIGURE 1
 Project Location - Clifton Court Forebay
 Delta Dams Rodent Burrow Remediation Project

Kate G. Kaiser

Sent:
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Cc:
Subject:

Attachments:

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Architectural Historian

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www.dudek.com

May 12, 2021

Mr. Ken MacLennan
Museum on Main
603 Main Street
Pleasanton, CA 94566
curator@museumonmain.org

Subject: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay

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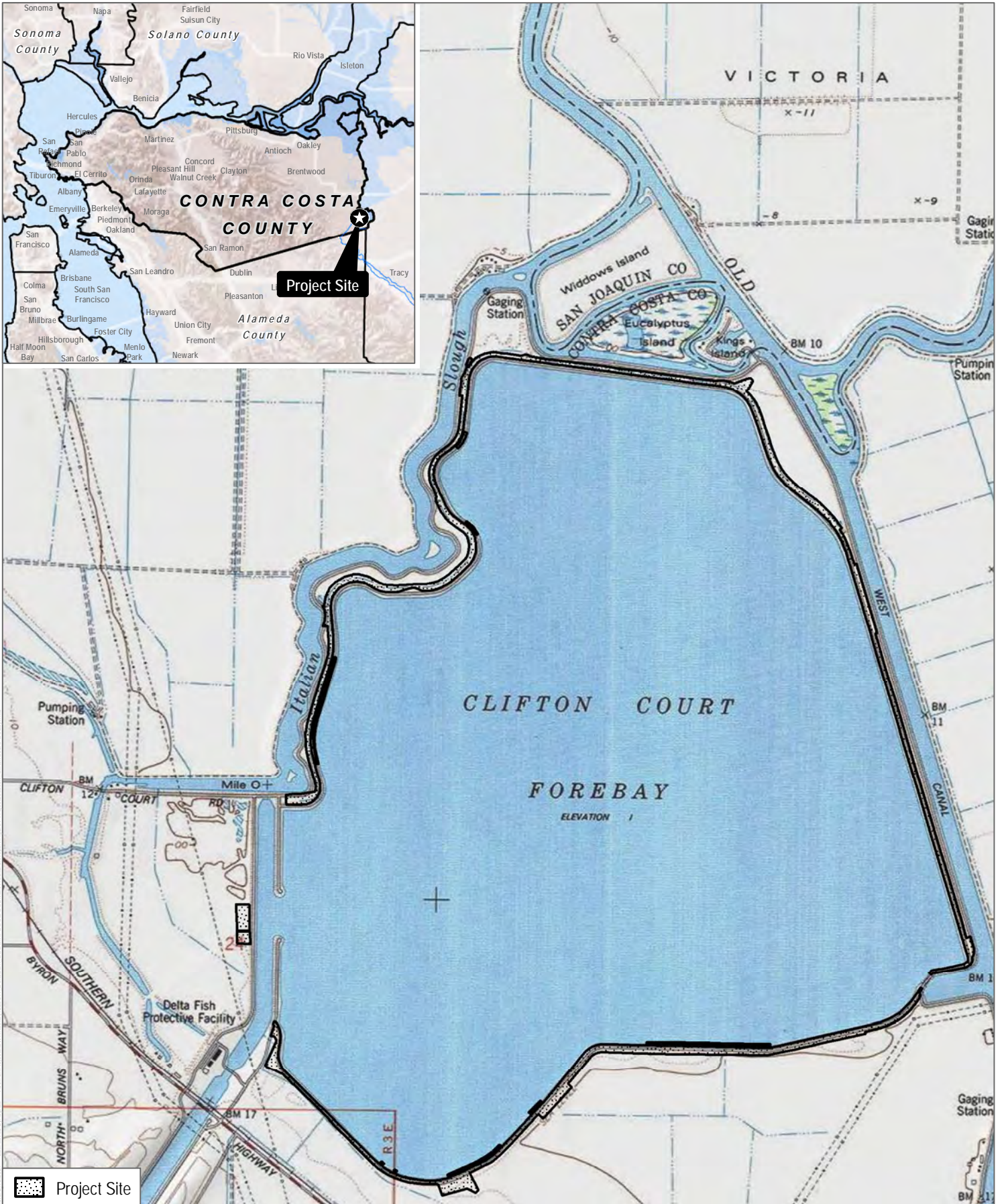
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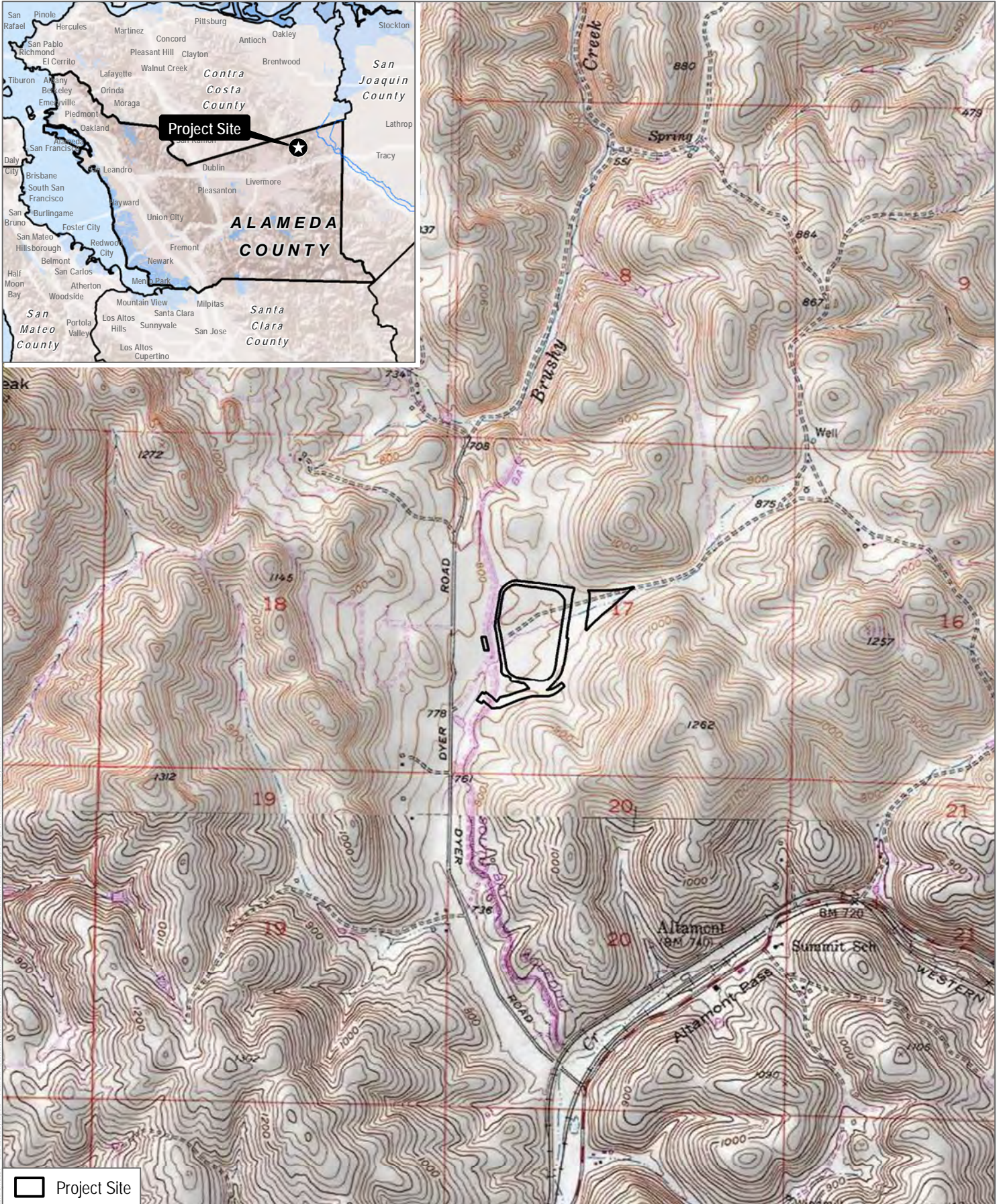
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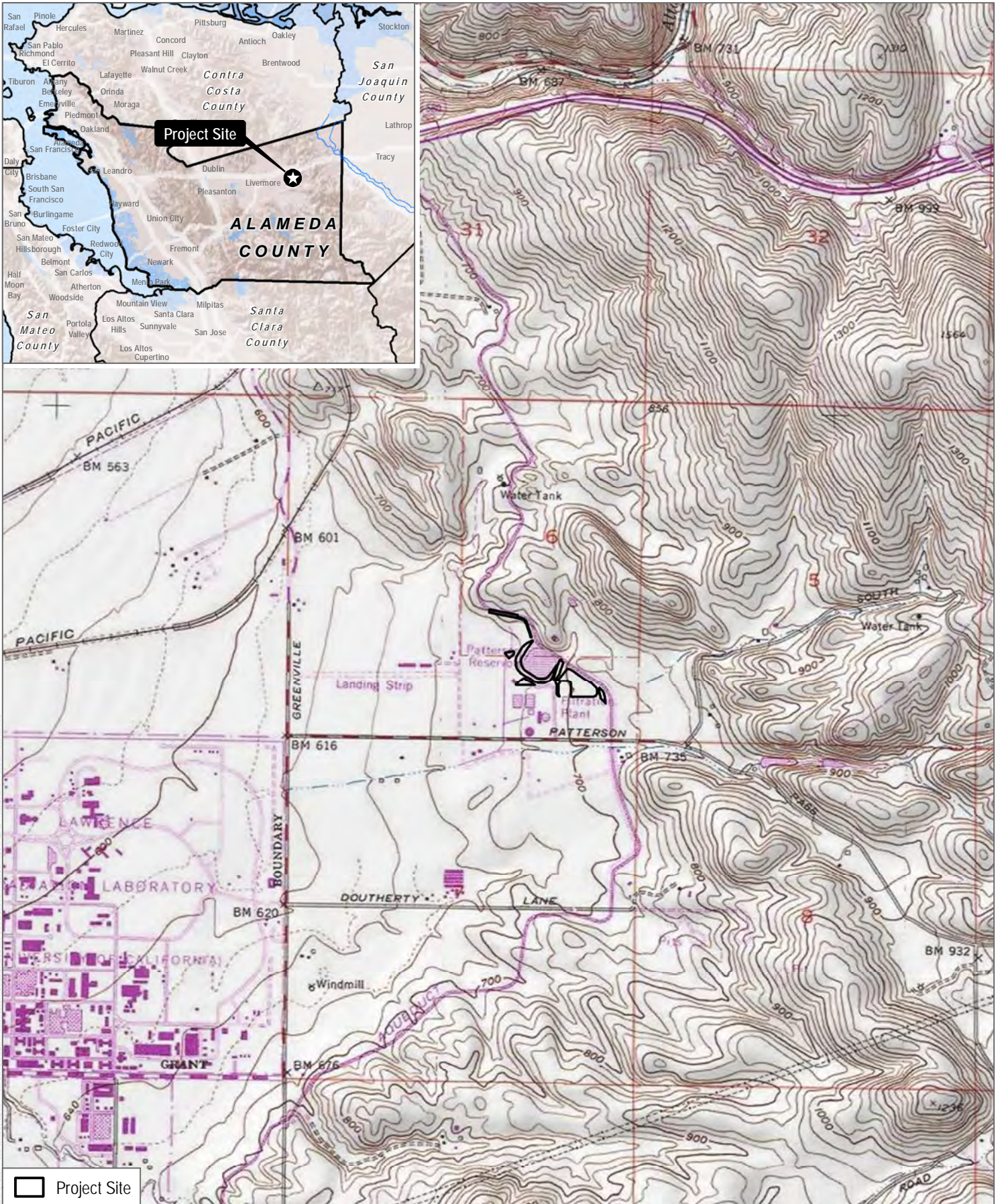
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BASEMAP SOURCE: DWR 12/28/2020; USGS 7.5-Minute Series Byron Hot Springs Quadrangle

FIGURE 1
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FIGURE 2

Project Location - Patterson Reservoir

Delta Dams Rodent Burrow Remediation Project

Kate G. Kaiser

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Cc:
Subject:

Attachments:

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Architectural Historian

DUDEK

O: 626.204.9815 C: 760.814.4664

www.dudek.com

May 12, 2021

Museum of the San Ramon Valley
P.O. Box 39
Danville, CA 94526
info@museumsrv.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay*

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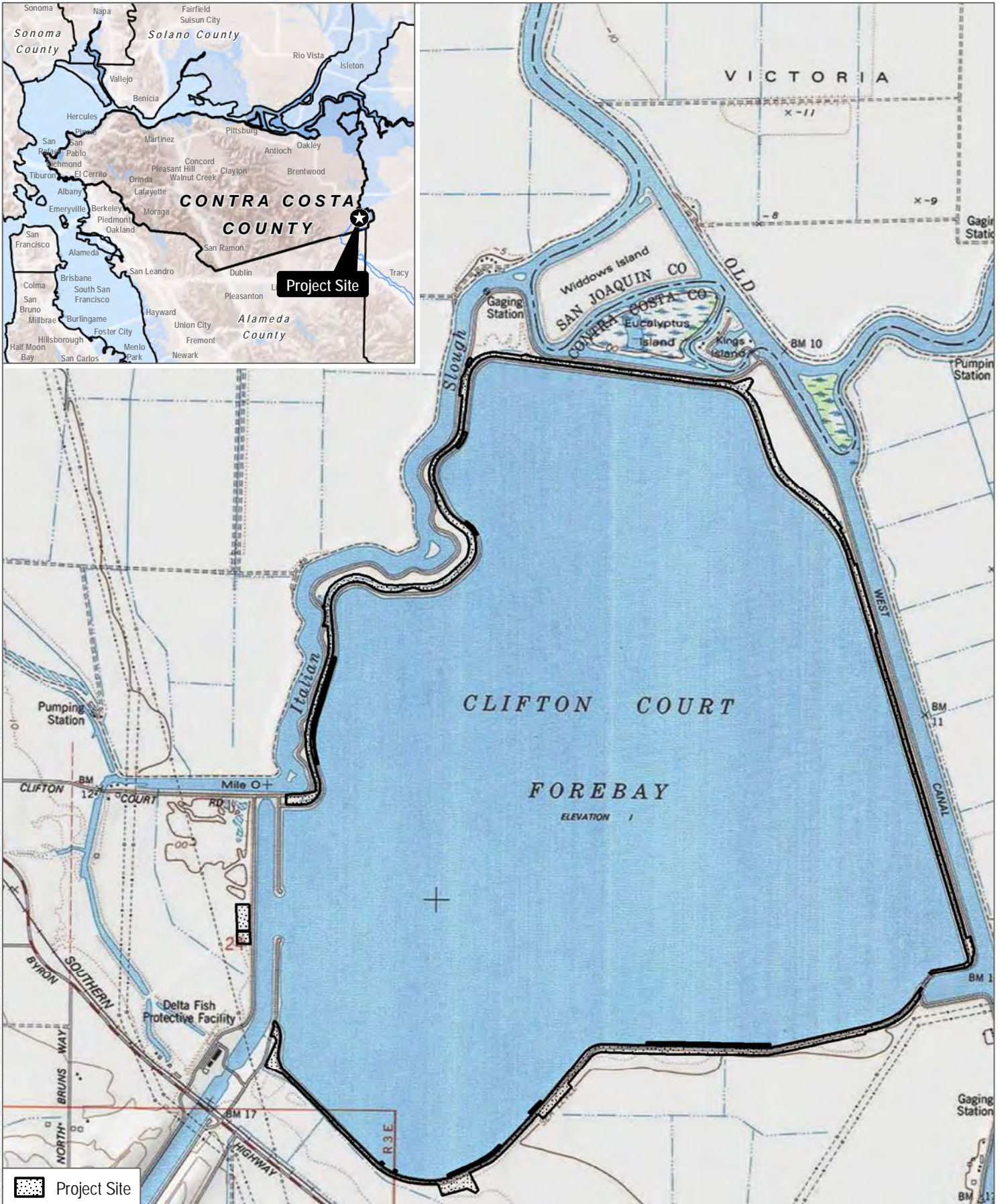
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FIGURE 1
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 Delta Dams Rodent Burrow Remediation Project

Appendix D2

Built Environment Inventory and Evaluation Report
Dyer Reservoir and Dam and Patterson Reservoir and Dam

DRAFT

**Built Environment Inventory and Evaluation Report for the
Delta Dams Rodent Burrow Remediation Project at
Dyer Reservoir and Dam
and
Patterson Reservoir and Dam
Alameda County, California**

Prepared for:

California Department of Water Resources

1416 Ninth Street, Room 604

Sacramento, California 95814

Contact: Sara Paiva-Lowry

Prepared by:

DUDEK

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Acronyms and Abbreviations

Acronym	Definition
APE	area of potential effect
CEQA	California Environmental Quality Act
CRHR	California Register of Historical Resources
CVP	Central Valley Project
Delta	Sacramento–San Joaquin River Delta
DWR	California Department of Water Resources
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NWIC	Northwest Information Center
Project	Delta Dams Rodent Burrow Remediation Project
SWP	California State Water Project

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1 Executive Summary

This built environment inventory and evaluation report documents the historical resources inventory efforts conducted by Dudek for the Delta Dams Rodent Burrow Remediation Project (Project) at Dyer Reservoir and Dam and Patterson Reservoir and Dam located east of Livermore, in Alameda County. The Project would involve rodent burrow remediation (burrow collapse, excavation, compaction, and backfilling), erosion prevention measures, ongoing monitoring, and permanent measures to prevent future burrowing where warranted at both Dyer Dam and Patterson Dam, as well as address other issues including erosion control, drainage channel improvements, and vegetation control. . The Project's area of potential effect (APE) falls within Public Lands Survey System Section 17 of Township 2 South, Range 3 East of the Byron Hot Springs U.S. Geological Survey 7.5-minute quadrangle for Dyer Reservoir and Section 6 of Township 3 South, Range 3 East of the Altamont U.S. Geological Survey 7.5-minute quadrangle for Patterson Reservoir. This built environment inventory and evaluation report was conducted in compliance with the California Environmental Quality Act (CEQA) and National Historic Preservation Act Section 106.

A records search of the Project site and surrounding 1 mile was completed by Northwest Information Center staff on December 23, 2020, and Dudek conducted an intensive, pedestrian-level cultural survey of the APE on January 5, 2021. One previously recorded resource, the South Bay Aqueduct (P-01-011603), was identified within the Project APE. The South Bay Aqueduct's record was from 1994 and updated in 2004; however, the evaluation within the record was out of date and has been updated to reflect the findings in this report. Patterson Reservoir had not been previously recorded or evaluated. Dyer Reservoir is located in the APE, but did not require formal recordation or significance evaluation as it was added to the existing California State Water Project (SWP) system between 2009 and 2012, and is not yet 45 years of age.

Two built environment historical resources required documentation as part of this study: (1) the South Bay Aqueduct (P-01-011603), constructed between 1958 and 1969, and (2) Patterson Reservoir, constructed between 1960 and 1962. The South Bay Aqueduct (P-01-011603) was re-evaluated and is eligible under Criterion A/1 for its connection and role within the larger SWP system and its association with the historical event of the first water delivery in the SWP. The South Bay Aqueduct is also eligible under Criterion C/3 for its role in the testing and application of conveyance system technology for the SWP before it was standardized and implemented elsewhere. The period of significance for the South Bay Aqueduct is its period of construction, 1958–1969. Patterson Reservoir is eligible under Criterion A/1 as a component of the South Bay Aqueduct. Patterson Reservoir shares the period of significance for the South Bay Aqueduct, 1958–1969.

This report includes a summary of the results of the California Historical Resources Information System record search, archival research efforts, historical context development, survey inventory, and previous findings, and provides an analysis and discussion of potential adverse effects. This report concludes that the South Bay Aqueduct and Patterson Reservoir are considered historic properties under Section 106 of the National Historic Preservation Act and historical resources under CEQA. Preparation of a detailed effects assessment concludes that the proposed Project would have a less-than-significant impact on historical resources under CEQA and no adverse effect on historic properties in the APE under Section 106.

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2 Introduction

2.1 Project Description and Location

The California Department of Water Resources (DWR) Delta Dams Rodent Burrow Remediation Project (Project) would involve rodent burrow remediation (burrow collapse, excavation, compaction, and backfilling), erosion prevention measures, ongoing monitoring, and permanent measures to prevent future burrowing where warranted. These measures are described in DWR’s proposed Rodent Burrow Maintenance and Monitoring Plan. Initial remediation actions would be taken in 2021 and 2022. Ongoing monitoring would continue in future years, and additional remediation and restoration measures may be warranted.

Dyer Reservoir is located in the Altamont Hills, approximately 7 miles northeast of Livermore in Alameda County; and Patterson Reservoir is approximately 1 mile east of Livermore. Dyer Dam and Patterson Dam are earthen dams that are subject to rodent burrowing that leads to piping and internal erosion. A burrow that intercepts the phreatic surface (water level) within a dam can cause erodible material from the dam embankment to migrate and be carried away. This “piping” action progresses upstream, elongating the pipe, until it reaches the reservoir. Once connection is made to the reservoir, the piping can cause a catastrophic breaching of the dam, ultimately leading to dam failure.

2.1.1 Dyer Reservoir and Dam

Location

Dyer Reservoir is located in the Altamont Hills in Alameda County, approximately 7 miles northeast of Livermore in Alameda County (Figure 1, Project Location – Dyer Reservoir; all map figures are located at the end of this report). It is located in Section 17 of Township 2 South, Range 3 East of the Byron Hot Springs U.S. Geological Survey 7.5-minute quadrangle. Dyer Reservoir is an approximately 525-acre-foot “on-peak” storage facility along the Dyer Canal segment of the South Bay Aqueduct. Dyer Reservoir and Dam can be accessed from Dyer Road via the existing entrance road serving the reservoir facility. Within the larger California State Water Project (SWP) system, Dyer Reservoir receives water from Bethany Reservoir via the South Bay Aqueduct and the Brushy Creek Pipeline and discharges water back to the South Bay Aqueduct via Dyer Canal. The South Bay Aqueduct conveys water to Alameda and Santa Clara Counties. Water from the South Bay Aqueduct flows into Dyer Reservoir via a 78-inch-diameter steel pipe at the northwest corner. This intake is the terminus of the Brushy Creek Pipeline that extends from the South Bay Pumping Plant to Dyer Reservoir. Water from Dyer Reservoir is discharged to the Dyer Canal segment of the South Bay Aqueduct through a reinforced concrete outlet control structure at the southern end of the reservoir and flows by gravity from the reservoir into the South Bay Aqueduct to provide water supply for Bay Area communities. The spillway is located on the southeast end of the reservoir.

Project Description

Dyer Dam is a relatively small dam, and rodent burrowing within its downstream embankment is relatively dense. DWR’s Division of Safety of Dams classifies Dyer Dam as high hazard, indicating that its failure is likely to result in the loss of at least one human life. These factors make Dyer Dam a candidate for excavation, recompaction, and permanent armoring with wire mesh and rock. Burrowing occurs on all sides of Dyer Dam, with the west side categorized as high priority and the north, east, and south sides categorized as medium priority. This includes significant burrowing that has been observed along the east side of the dam in a slope above the crest roadway.

While this area is not within the dam prism, repairs are warranted to remediate burrowing activity that could ultimately result in instability, potential embankment failure, and increased annual maintenance. Remediation is expected to be required on approximately 5.54 acres of the dam.

Where shallow ruts and near-surface deformations occur, these areas would be filled with native soil of similar type to that of the downstream dam embankment slope and this soil would be compacted. Depending on location, size, burrow cluster density, and depths, burrow holes may alternatively be excavated and backfilled. Then native soil, cementitious-soil slurry, low pressure grout, and/or similar embankment material would be used to backfill holes and would be compacted level with the surrounding ground. For zones where heavy construction equipment cannot be used, burrows may be filled by hand and/or lightweight equipment. Permanent armoring with wire mesh and rock would be placed on the dam embankment to deter future rodent burrowing. Equipment for these activities would include lightweight and heavy equipment such as skid-steer, grader, dozer, backhoe, skip-loader, soil compactor, excavator, and water trucks. Some fill material would be needed to offset shrinkage of the excavated and recompacted material. Imported fill materials would be delivered to the site using dump trucks or light-duty trucks.

Surface runoff is collected by a V-shaped ditch and stormwater control feature that runs parallel to the north access road west of Dyer Reservoir. Segments of the existing V-shaped ditch are unlined, while others are concrete lined. These stormwater control features have been subject to ongoing failure that can be attributed to high drainage velocities focused on the unlined segments of the V-shaped ditch design, poor foundation/embankment material, and rodent burrowing along this reach. Approximately 1,300 linear feet of the existing V-shaped ditch and stormwater control features are proposed for improvements that include regrading and concrete lining to improve drainage and reduce erosion. Remediation of the existing embankment slope includes limited excavation, backfilling and compaction, and concrete lining. Minor imported backfill, grouting, or soil-cement slurry may be used to backfill cavities, cracks, or holes. The embankment slope would be restored where it shows signs of instability and where recent internal erosion occurred during the V-shaped ditch and stormwater control feature failures.

Directly south of these ditch and stormwater control features, ongoing erosion is also occurring along a portion of the south side of Entrance Road, which intersects with the South Bay Aqueduct. At this location, erosion along Entrance Road is evident from deep furrows developing within interspersed areas of riprap. Similar to the original stabilization methods, the bank slope along the southern side of Entrance Road will be stabilized using riprap. Fill and riprap material would be delivered using dump trucks or light-duty trucks staged in staging areas or access roads. A combination of soil fill and riprap will be placed in between the existing riprap at this location to repair and stabilize the eroding slope. Additionally, accumulated sediment downstream of the culvert pipes under the road will be excavated and removed to an upland disposal location.

2.1.2 Patterson Reservoir and Dam

Location

Patterson Dam and Reservoir is located about 1 mile east of Livermore, California, on the east side of Livermore Valley (Figure 2, Project Location – Patterson Reservoir). It is located in Section 6 of Township 3 South, Range 3 East of the Altamont U.S. Geological Survey 7.5-minute quadrangle. Patterson Reservoir is a 104-acre-foot off-stream storage facility along the South Bay Aqueduct at the terminus of the Livermore Valley Canal. This reservoir, which was constructed between 1960 and 1962, provides off-line storage for the Alameda County Flood Control and Water Conservation District's Zone 7 Treatment Plant (Zone 7 Water Treatment Plant). Water enters the reservoir by flowing over a 175-foot-long reinforced concrete ogee-crest weir from the adjoining South Bay Aqueduct. Flow is controlled by regulation of the canal water surface elevation with Check Structure No. 3. Typically,

water is delivered from the reservoir to the Zone 7 Water Treatment Plant through a 42-inch-diameter outlet pipe located at the southern corner of the reservoir. Additionally, water may be delivered through a 30-inch-diameter reinforced concrete bypass pipeline directly from the canal to the treatment plant. The Patterson Dam and Reservoir facility also includes a settling basin located east of the reservoir. Downstream of Patterson Reservoir, the South Bay Aqueduct continues to deliver water to Lake Del Valle and to its terminus at the Santa Clara Terminal Reservoir in San Jose. Patterson Dam has compacted earth embankment on three sides; the fourth side is formed by the adjacent South Bay Aqueduct. The reservoir invert and interior slopes are lined with a 3-inch layer of permeable asphalt concrete. The reservoir can be drained via a 12-inch-diameter reinforced concrete drain line that is controlled with a 12-inch butterfly valve.

Project Description

Patterson Dam is a relatively small dam with relatively dense rodent burrowing within its downstream embankment. DWR's Division of Safety of Dams classifies Patterson Dam as high hazard, indicating that its failure is likely to result in the loss of at least one human life. These factors make Patterson Dam a candidate for excavation, recompaction, and permanent armoring with wire mesh and rock. All areas of Patterson Dam are subject to high-severity burrow damage. Remediation is expected to be required for the downstream dam face and the ascending slope in the east side of the facility, adjacent to the crest road access ramp. The proposed Project would entail filling shallow ruts and near-surface deformations near the ground surface with native soil of similar type to that of the downstream dam embankment slope and compacting the fill material. Depending on location, size, burrow cluster density, and depths, burrow holes may alternatively be excavated and backfilled. Then native soil, cementitious-soil slurry, low pressure grout, and/or similar embankment material would be used to backfill holes and would be compacted level with the surrounding ground. For zones where heavy construction equipment cannot be used, burrows may be filled by hand and/or lightweight equipment. Permanent armoring with wire mesh and rock would be placed on the dam embankment to deter future rodent burrowing. Due to steep downstream slope (1.5:1 to 2:1), other suitable materials may be employed for permanent armoring. The permanent armoring area may include a buffer area, as well as a cut-off trench wall that uses controlled low-strength material beyond the dam toe. Equipment for this activity would include lightweight and heavy equipment such as skid-steer, dozer, backhoe, skip-loader, soil compactor, and excavator. If needed, fill material would be delivered to the site from a stockpile location using dump trucks and/or concrete trucks.

In order to comply with a DWR Division of Safety of Dams recommendation, the proposed Project also includes improvements to the low-level outlet drainage channel. These improvements consist of vegetation removal, minor regrading of channel invert slope, and placement of permanent vegetation and erosion control. Permanent vegetation control (e.g., rock and geofabric) is proposed for approximately 180 linear feet of the trapezoidal channel downstream of the concrete outfall structure. A one-time vegetation clearing and removal is proposed for approximately 500 linear feet of the downstream drainage channel beyond the permanent drainage channel improvements within DWR's right-of-way. Minor concrete repairs are also proposed for spalled concrete and exposed rebar at the wingwall outfall structure. A permanent maintenance road would be constructed adjacent to the permanently improved drainage channel to provide better access for annual maintenance. The maintenance road would include a vehicle turnaround area and would have a gravel surface.

The proposed Project includes minor modifications and improvements to drainage features in upland areas in the northwest of Patterson Reservoir currently experiencing sheet flow. A damaged 18-inch-diameter corrugated metal pipe culvert crossing near the toe access road and a second 12-inch-diameter corrugated metal pipe culvert crossing near the maintenance building would both be replaced with improved high-density polyethylene culverts. Existing drainage features upstream and downstream of the culverts would be modified to convey water more

efficiently to the main western drainage channel. The improvements may include excavating, regrading, and/or lining of the drainage features and culverts.

2.1.3 Access, Staging, and Project Equipment

Dyer Reservoir and Dam

Dyer Dam can be accessed from Dyer Road via the existing entrance road serving the reservoir facility. Access to the entire toe of the dam and the dam facility is provided by an existing gravel road, which provides access to a paved roadway atop the crest of the dam via ramps on the north and south side of the reservoir. Existing gravel access roads and the paved crest road would provide access to the western embankment slope, while the eastern embankment slope would be accessed from the paved crest road and from the upper settling pond maintenance road.

DWR has identified three staging areas for remediation activities at Dyer Reservoir and Dam. The staging areas would be located on both existing improved areas and undisturbed areas and would total approximately 5.11 acres. Staging Area 1 is a rectangular area along the western side of the South Bay Aqueduct; Staging Area 2 is a roughly triangular area south of the southeast corner of the dam; and Staging Area 3 is a roughly triangular area east of the settling pond.

Patterson Reservoir and Dam

Patterson Dam can be accessed from Patterson Pass Road. Approximately 1 mile to the west, Patterson Pass Road intersects with Greenville Road, which then provides access to Interstate 580. Existing paved and gravel access roads within the Patterson Reservoir facility would provide access to most of the construction areas within this site. A temporary construction access area would be constructed north of the proposed staging area and existing settling pond on the east side of the reservoir, and a second temporary construction access area would be provided through the existing maintenance yard.

DWR has identified four staging areas for remediation activities at Patterson Dam and Reservoir, including an area at the existing maintenance yard south of the reservoir, a staging area on currently undisturbed land surrounding the existing settling pond east of the reservoir, and an area east of the temporary construction access area. These staging areas have a combined acreage of approximately 4.63 acres. Access to the staging areas would be from Patterson Pass Road on the existing paved and gravel access roads and from a new temporary construction access area. The paved toe and crest roads may be used to repair the downstream dam embankment slope; however, the crest road is narrow and would only be accessible to smaller vehicles and equipment. As noted previously, if this limitation of the crest road prevents use of heavy construction equipment in certain areas, burrows may be filled by hand and/or lightweight equipment.

Construction Equipment for Dyer and Patterson Dams

The following construction equipment would be used at each of the dams to implement the proposed dam remediation efforts:

- skid-steer
- dozer
- backhoe
- grader
- skip-loader
- soil compactor
- excavator
- scraper
- water truck
- dump trucks
- flatbed trucks
- concrete truck
- mobile grout mixing plant
- concrete pump truck

2.2 Regulatory Setting

This built environment inventory and evaluation report was completed in compliance with State of California and federal cultural resources laws and regulations, including Section 106 of the National Historic Preservation Act (NHPA). Under Section 106, historic and archaeological districts, sites, buildings, structures, and objects are assigned significance based on their exceptional value or quality in illustrating or interpreting history, architecture, archaeology, engineering, and culture. A number of criteria are used in demonstrating resource importance and are described below.

2.2.1 Federal

The NHPA established the National Register of Historic Places (NRHP) and the President's Advisory Council on Historic Preservation, and provided that states may establish State Historic Preservation Officers to carry out some of the functions of the NHPA. Most significantly for federal agencies responsible for managing cultural resources, Section 106 of the NHPA directs that "[t]he head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP." Section 106 also affords the President's Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking (16 U.S. Code 470[f]).

The content of Title 36 Code of Federal Regulations, Part 800, implements Section 106 of the NHPA. Specifically, it defines the steps necessary to identify historic properties (those cultural resources listed in or eligible for listing in the NRHP), including consultation with federally recognized Native American tribes to identify resources with important cultural values; to determine whether they may be adversely affected by a proposed undertaking; and to outline the process for eliminating, reducing, or mitigating the adverse effects.

The President's Advisory Council on Historic Preservation provides methodological and conceptual guidance for identifying historic properties. In Title 36 Code of Federal Regulations, Part 800.4, the steps necessary for identifying historic properties are as follows:

- Determine and document the area of potential effect (APE) (36 CFR 800.16[d]).
- Review existing information on historic properties within the APE, including preliminary data.
- Confer with consulting parties to obtain additional information on historic properties or concerns about effects to these.
- Consult with Native American tribes (36 CFR 800.3[f]) to obtain knowledge on resources that are identified with places where they attach cultural or religious significance.
- Perform appropriate fieldwork (including phased identification and evaluation).
- Apply NRHP criteria to determine resource eligibility for NRHP listing.

Fulfilling these steps is generally thought to constitute a reasonable effort to identify historic properties within the APE for an undertaking. The obligations of a federal agency must also assess whether an undertaking will have an adverse effect on cultural resources. An undertaking will have an adverse effect when:

an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative (36 CFR Part 800.5[1]).

The process of determining whether an undertaking may have an adverse effect requires the federal agency to confer with consulting parties to appropriately consider all relevant stakeholder concerns and values. Consultation regarding the treatment of a historic property may result in a Programmatic Agreement and/or Memorandum of Agreement between consulting parties that typically include the lead federal agency, State Historic Preservation Officer, and other applicable parties if they agree to be signatories to these documents. Treatment documents—whether resource-specific or generalized—provide guidance for resolving potential or realized adverse effects to known historic properties or to those that may be discovered during implementation of an undertaking. In all cases, avoidance of adverse effects to historic properties is the preferred treatment measure, and it is generally the burden of the federal agency to demonstrate why avoidance may not be feasible.

National Register of Historic Places

The resources identified within the Project APE were evaluated in consideration of NRHP designation criteria. The NRHP is the United States' official list of districts, sites, buildings, structures, and objects worthy of preservation. Overseen by the National Park Service, under the U.S. Department of the Interior, the NRHP was authorized under the NHPA, as amended. Its listings encompass all National Historic Landmarks, as well as historic areas administered by the National Park Service.

NRHP guidelines for the evaluation of historic significance were developed to be flexible and to recognize the accomplishments of all who have made significant contributions to the nation's history and heritage. Its criteria are designed to guide state and local governments, federal agencies, and others in evaluating potential entries in the NRHP. For a property to be listed in or determined eligible for listing, it must be demonstrated to possess integrity and to meet at least one of the following criteria:

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
- B. That are associated with the lives of persons significant in our past; or
- C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- D. That have yielded, or may be likely to yield, information important in prehistory or history.

Integrity is defined in NRHP guidance, How to Apply the National Register Criteria, as “the ability of a property to convey its significance. To be listed in the NRHP, a property must not only be shown to be significant under the NRHP criteria, but it also must have integrity” (Andrus and Shrimpton 2002). NRHP guidance further asserts that properties be completed at least 50 years ago to be considered for eligibility. Properties completed fewer than 50 years before evaluation must be proven to be “exceptionally important” (criteria consideration) to be considered for listing.

2.2.2 State

California Register of Historical Resources

In California, the term “historical resource” includes but is not limited to “any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California” (California Public Resources Code, Section 5020.1[j]). In 1992, the California legislature established the California Register of Historical Resources (CRHR) “to be used by state and local agencies, private groups, and citizens to identify the state’s historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change” (California Public Resources Code Section 5024.1[a]). The criteria for listing resources on the CRHR were expressly developed to be in accordance with previously established criteria developed for listing in the NRHP, enumerated below. According to California Public Resources Code Section 5024.1(c)(1-4), a resource is considered historically significant if it (i) retains “substantial integrity,” and (ii) meets at least one of the following criteria:

1. Is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage.
2. Is associated with the lives of persons important in our past.
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
4. Has yielded, or may be likely to yield, information important in prehistory or history.

In order to understand the historic importance of a resource, sufficient time must have passed to obtain a scholarly perspective on the events or individuals associated with the resource. A resource less than 50 years old may be considered for listing in the CRHR if it can be demonstrated that sufficient time has passed to understand its historical importance (see 14 CCR 4852[d][2]).

The CRHR protects cultural resources by requiring evaluations of the significance of prehistoric and historic resources. The criteria for the CRHR are nearly identical to those for the NRHP, and properties listed or formally designated as eligible for listing in the NRHP are automatically listed in the CRHR, as are the state landmarks and points of interest. The CRHR also includes properties designated under local ordinances or identified through local historical resource surveys.

California Environmental Quality Act

As described further below, the following California Environmental Quality Act (CEQA) statutes and State of California CEQA Guidelines (CEQA Guidelines) are of relevance to the analysis of archaeological, historic, and tribal cultural resources:

- California Public Resources Code Section 21083.2(g) defines “unique archaeological resource.”
- California Public Resources Code Section 21084.1 and CEQA Guidelines Section 15064.5(a) define “historical resources.” In addition, CEQA Guidelines Section 15064.5(b) defines the phrase “substantial adverse change in the significance of an historical resource.” It also defines the circumstances when a project would materially impair the significance of an historical resource.
- California Public Resources Code Section 21074(a) defines “tribal cultural resources.”
- California Public Resources Code Section 5097.98 and CEQA Guidelines Section 15064.5(e) set forth standards and steps to be employed following the accidental discovery of human remains in any location other than a dedicated cemetery.
- California Public Resources Code Sections 21083.2(b–c) and CEQA Guidelines Section 15126.4 provide information regarding the mitigation framework for archaeological and historic resources, including examples of preservation-in-place mitigation measures; preservation-in-place is the preferred manner of mitigating impacts to significant archaeological sites because it maintains the relationship between artifacts and the archaeological context and may also help avoid conflict with religious or cultural values of groups associated with the archaeological site(s).

More specifically, under CEQA, a project may have a significant effect on the environment if it may cause “a substantial adverse change in the significance of an historical resource” (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5[b]). If a site is either listed or eligible for listing in the CRHR, or if it is included in a local register of historic resources or identified as significant in a historical resources survey (meeting the requirements of California Public Resources Code, Section 5024.1[q]), it is a historical resource and is presumed to be historically or culturally significant for purposes of CEQA (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5[a]). The lead agency is not precluded from determining that a resource is a historical resource even if it does not fall within this presumption (California Public Resources Code Section 21084.1; CEQA Guidelines Section 15064.5[a]).

A “substantial adverse change in the significance of an historical resource” reflecting a significant effect under CEQA means “physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired” (CEQA Guidelines Section 15064.5[b][1]; California Public Resources Code Section 5020.1[q]). In turn, CEQA Guidelines Section 15064.5(b)(2) states the significance of an historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources; or
2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to Section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of Section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
3. Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

Pursuant to these sections, the CEQA inquiry begins with evaluating whether a project site contains any “historical resources,” then evaluates whether that project will cause a substantial adverse change in the significance of a historical resource such that the resource’s historical significance is materially impaired.

If it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (California Public Resources Code Section 21083.2[a], [b], and [c]).

California Public Resources Code Section 21083.2(g) defines a unique archaeological resource as an archaeological artifact, object, or site about which it can be clearly demonstrated that without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

Impacts to non-unique archaeological resources are generally not considered a significant environmental impact (California Public Resources Code Section 21083.2[a]; CEQA Guidelines Section 15064.5[c][4]). However, if a non-unique archaeological resource qualifies as tribal cultural resource (California Public Resources Code Sections 21074[c], 21083.2[h]), further consideration of significant impacts is required. CEQA Guidelines Section 15064.5 assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered.

2.3 Area of Potential Effect

The APE is the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties. Determination of the APE is influenced by a project’s setting, the scale and nature of the undertaking, and the different kinds of effects that may result from the undertaking (36 CFR 800.16[d]).

The built environment APE for a project’s extent includes all legal parcels within or intersected by the extent of the proposed project and construction staging areas. The built environment APE can be larger than a project’s footprint. It is delineated to take into consideration potential direct and indirect effects, such as visual, audible, or atmospheric intrusions to a property, the potential for vibration-induced damage, or isolation of a property from its setting. Visual and audible changes have the potential to adversely affect character-defining features of some built environment properties, in cases where visual context or auditory setting are important characteristics that convey the resource’s historical significance.

The built environment APE for the Project is shown in Figures 5 and 6 for the Dyer Reservoir and Patterson Reservoir, respectively. The APE for this Project follows the maximum possible area of potential impacts resulting from the proposed Project (see Figure 3, Proposed Activities at Dyer Dam, and Figure 4, Proposed Activities at Patterson Dam), including all construction, repairs, easements, and staging areas located in the Project area. Based on the

construction proposed for this Project, the APE encompassed the extent of the two historic era-built environment structures located in the Project area of direct impact—the South Bay Aqueduct and Patterson Reservoir. Dyer Reservoir is located in the APE, but did not require formal recordation or significance evaluation as it was added to the existing SWP system between 2009 and 2012, and as such is not yet 45 years of age. The South Bay Aqueduct and Patterson Reservoir are over the age of 45 and are discussed in detail in this report.

3 Research and Field Methods

3.1 Literature Review

In preparation of the historical context, significance evaluation, integrity discussion, and application of criteria of adverse effect sections of this report, Dudek first conducted extensive archival research on the Project areas, DWR, and the SWP. These research efforts are summarized below.

3.1.1 California Historical Resources Information System Record Search

A records search of the APE, including a 1-mile buffer, was completed by Northwest Information Center (NWIC) staff on December 23, 2020. This records search included their collection of mapped prehistoric, historical, and built-environment resources; California Department of Parks and Recreation Site Records; technical reports; archival resources; and ethnographic references. Additional consulted sources included the NRHP, California Inventory of Historical Resources/CRHR and listed Office of Historic Preservation Archaeological Determinations of Eligibility, California Points of Historical Interest, California Historical Landmarks, and California Department of Transportation Bridge Survey information. Dudek’s record search can be found in the Archaeological Resources Inventory Report for the Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Dam and Patterson Reservoir and Dam Alameda County, California, prepared by Dudek for DWR (Giacinto et al., forthcoming).

3.1.1.1 Previously Conducted Cultural Resources Studies

Dyer Reservoir and Dam

NWIC records indicate that 25 previous cultural resources technical investigations have been conducted within a 1-mile radius of the Project site at Dyer Reservoir and Dam. Of these, 8 studies intersect the current Project site at Dyer Reservoir and Dam (Table 1).

Table 1. Dyer Reservoir and Dam – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
<i>Previous Technical Studies Intersecting the Project Site at Dyer Reservoir and Dam</i>			
S-001519	Francis Riddell	1960	Archaeological Reconnaissance of Interim Intake Canal to Forebay Pumping Plant, Bethany Forebay Dam and Reservoir, and South Bay Pumping Plant, Alameda County, California
S-010458	Miley Paul Holman	1988	Archaeological Field Reconnaissance of Section 17, Oakland Scavengers Property, Altamont Pass, Alameda County, California (letter report)
S-011826	Dorothea J. Theodoratus, Mary Pyle Peters, Clinton M. Blount, Pamela J. McGuire, Richard D. Ambro, Michael Crist, Billy J. Peck, and Myrna Saxe	1980	Montezuma I and II Cultural Resources
S-012800	Allan Bramlette, Mary Praetzellis, Adrian Praetzellis, Margaret Purser, and David A. Fredrickson	1990	Archaeological and Historical Resources Inventory for the Vasco Road and Utility Relocation Project, Contra Costa and Alameda Counties

Table 1. Dyer Reservoir and Dam – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
S-029590	Kyle Brown, Adam Marlow, Thomas Young, James Allan, and William Self	2004	Cultural Resource Assessment of the South Bay Aqueduct Improvement and Enlargement Project, Alameda County, California.
S-029590a	Kyle Brown, Adam Marlow, Thomas Young, James Allan, and William Self	2006	Final Cultural Resource Assessment of the South Bay Aqueduct Improvement and Enlargement Project, Alameda County, California.
S-029590b	Steve Killingsworth and G. Robert Barry	2006	Geologic Report South Bay Aqueduct Enlargement Dyer Dam and Reservoir; Project Geology Report D-180
S-029590c	Milford W. Donaldson	2007	Proposed Dyer Dam and Reservoir Geoarchaeological Report, File No. COE 60508A; Regulatory Branch (200400765) Section 106 Consultation (Rnd.03) on the Proposed South Bay Aqueduct Improvement, Alameda County, California
<i>Previous Technical Studies within 1 Mile of the Project Site at Dyer Reservoir and Dam</i>			
S-000121	David A. Frederickson and Peter M. Banks	1975	An Archaeological Reconnaissance of the Proposed Altamont Landfill Site, Alameda County, California
S-002625	Miley Paul Holman	1981	An Archaeological Reconnaissance of the proposed U.S. Windpower Inc., windfarm at Altamont Pass, Alameda County, California
S-005659	Miley Paul Holman	1982	An archaeological field reconnaissance of properties being considered for windfarm development (letter report)
S-005948	Matthew R. Clark	1983	An Archaeological Field Reconnaissance of the Moller Property, Near Byron, Alameda and Contra Costa Counties, California.
S-006491	Matthew R. Clark	1983	Archaeological Reconnaissance of the Valhalla Parcel, Alameda County, California.
S-006702	Miley Paul Holman	1984	Archaeological Reconnaissance of the Egan-Elliot Proposed Windfarm, Alameda County, California (letter report)
S-006782	Donna M. Garaventa, Rebecca L. Anastasio, Robert M. Harmon, Stuart A. Guedon, and Melody E. Tannam	1984	Cultural Resources Survey Report: Proposed Replacement of the Carrol Overhead Bridge (33 C-06, Post-Mile 1.6) and East Altamont Overhead Bridge (33 C-15, Post-Mile 3.4) Located on Altamont Pass Road, County of Alameda, California
S-006782a	Stuart Guedon and Donna M. Garaventa	1984	An Evaluation of Two Bridges: Carrol Overhead (33C-06) and East Altamont (33C-15), Located on Altamont Pass Road, County of Alameda, California
S-006782b	Stuart A. Guedon	1984	Altamont Pass Road - Carrol Overhead Bridge Replacement Project (letter report)
S-006824	Colin I. Busby, Donna M. Garaventa, Rebecca L. Anastasio, Robert M. Harmon, and Stuart A. Guedon	1984	Cultural Resources Survey Report for Resurfacing and Roadway Improvement of Altamont Pass Road Between Greenville Road and the Sanitary Landfill, County of Alameda, California

Table 1. Dyer Reservoir and Dam – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
S-011826	Dorothea J. Theodoratus, Mary Pyle Peters, Clinton M. Blount, Pamela J. McGuire, Richard D. Ambro, Michael Crist, Billy J. Peck, and Myrna Saxe	1980	Montezuma I and II Cultural Resources
S-012137	Jefferson Haney	1990	An Archaeological Study of the Altamont Sanitary Landfill Expansion Project in Sections 15 and 16, Alameda County, California
S-021078	Terry L. Joslin, Ward Hill, and Clinton Blount	1998	The Werum Property (CA-ALA-522H), Historical Evaluation, Altamont Landfill and Resource Recovery Facility, Alameda County, California
S-024011	Randy Wiberg, Alisa Reynolds, and Brett Rushing	2001	Prehistoric Cultural Resources Reconnaissance of Brushy Peak Regional Preserve, Alameda County, California
S-034316	James M. Allan and Leigh Martin	2007	Archaeological Monitoring Report, Brushy Creek Area, South Bay Aqueduct Improvement and Enlargement Project, Alameda County, California
S-043685	Barb Siskin, Cassidy DeBaker, Thomas Martin, Beatrice Cox, and Jennifer Lang	2010	Cultural Resources Inventory for the San Joaquin Valley Right-of-Way Maintenance Environmental Assessment Project
S-048591	Gloriella Cardenas and Lindsay Kiel	2016	Cultural Resources Inventory Report for the Summit Wind Repower Project

Source: California Historical Resources Information System Record search at NWIC, December 23, 2020.

Patterson Reservoir and Dam

NWIC records indicate that 31 previous cultural resources technical investigations have been conducted within a 1-mile radius of the Project site at Patterson Reservoir and Dam. Of these, 1 study intersects the current Project site at Patterson Reservoir and Dam (Table 2).

Table 2. Patterson Reservoir and Dam – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
<i>Previous Technical Studies Intersecting the Project Site at Patterson Reservoir and Dam</i>			
S-022989	William Self	2000	Archaeological Assessment of City of Livermore Zone 3 Water System Improvement, Alameda County, California (letter report)
<i>Previous Technical Studies within 1 Mile of the Project Site at Patterson Reservoir and Dam</i>			
S-005006	Miley Paul Holman	1982	An archaeological field reconnaissance of property at the corner of Greenville Road and Patterson Pass Road east of Livermore, California (letter report)
S-009119	William R. Killam	1987	Cultural Resources Investigations and Intensive Survey for the Lawrence Livermore Direct Service 230-kV Transmission Line

Table 2. Patterson Reservoir and Dam – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
S-011396	—	1989	Technical Report of Cultural Resources Studies for the Proposed WTG-WEST, Inc., Los Angeles to San Francisco and Sacramento, California: Fiber Optic Cable Project
S-015762	Colin I. Busby	1993	Greenville Road Intersection Widening, City of Livermore, Alameda County, California (letter report)
S-015763	Donna M. Garaventa, Angela M. Banet, and Stuart A. Guedon	1993	Limited Project Study Report, Greenville Road/Union Pacific Railroad Bridge, City of Livermore, Alameda County, California
S-017515	—	1974	Archaeological Reconnaissance: Lawrence Livermore Laboratory, Livermore, California
S-017993	Brian Hatoff, Barb Voss, Sharon Waechter, Stephen Wee, and Vance Bente	1995	Cultural Resources Inventory Report for the Proposed Mojave Northward Expansion Project
S-017993a	—	1995	Proposed Mojave Northward Expansion Project: Appendix A - Native American Consultation
S-017993b	—	1995	Proposed Mojave Northward Expansion Project: Appendix B - Looping Segments - Class 1
S-017993c	—	1995	Proposed Mojave Northward Expansion Project: Appendix C -Monitoring and Emergency Discovery Plan
S-017993d	—	1995	Proposed Mojave Northward Expansion Project: Appendix D - General Construction Information
S-017993e	—	1995	Proposed Mojave Northward Expansion Project: Appendix E - Archaeological Site Records
S-017993f	—	1995	Proposed Mojave Northward Expansion Project: Appendix F - Historic Features Evaluation Forms
S-017993g	—	1995	Proposed Mojave Northward Expansion Project: Appendix G - Railroad Crossing Evaluation Forms
S-017993h	—	1995	Proposed Mojave Northward Expansion Project: Appendix H - Crossing Diagrams and Plan View Maps
S-017993i	—	1995	Proposed Mojave Northward Expansion Project: Appendix I - Railroad Depot NRHP Nomination Forms and Related Records
S-017993j	—	1995	Proposed Mojave Northward Expansion Project: Appendix J - Looping Segment and Compressor Station Site Records
S-017993k	—	1995	Proposed Mojave Northward Expansion Project: Appendix K - Historic Site Records / Isolate Forms
S-017993l	—	1995	Proposed Mojave Northward Expansion Project: Appendix L – Photo-documentation
S-017993m	—	1995	Proposed Mojave Northward Expansion Project: Appendix M - Curricula Vitae of Key Preparers
S-022923	William Self	2000	Archaeological Assessment of City of Livermore Zone 7 Water System Improvement, Alameda County, California (letter report)

Table 2. Patterson Reservoir and Dam – Previously Conducted Technical Studies

Report ID	Authors	Year	Title
S-022989	William Self	2000	Archaeological Assessment of City of Livermore Zone 3 Water System Improvement, Alameda County, California (letter report)
S-022990	William Self and Carrie Wills	2000	Archaeological Assessment of Zone 7 Water Agency, Patterson Pass Water Treatment Plant Ultrafiltration Facility Expansion, Alameda County, California (letter report)
S-027378	Carolyn Losee	2003	Cultural Resources Analysis for Cingular Wireless Site No. PL-932-21 "Tesla Road" (letter report)
S-027640	William Self	2003	Archaeological Survey and Assessment Report, Livermore Valley Canal Bridge Improvement Project, Alameda County, California (letter report)
S-032985	Colin I. Busby	2004	Cultural Resources Assessment (Archaeology), Greenville Road Property, North of Patterson Pass Road, Livermore Vicinity, Alameda County, California (letter report)
S-039956	David Brunzell	2011	Cultural Resources Assessment of E & B Natural Resources Management Corporation Lupin 4R Oil and Gas Exploration Project, Alameda County, California (BCR Consulting Project Number SYN1119). (Letter Report)
S-042519	Ling He	2010	Field Office Report of Cultural Resources Ground Survey Findings, 10366 Flynn Road, South Livermore, California
S-043685	Barb Siskin, Cassidy DeBaker, Thomas Martin, Beatrice Cox, and Jennifer Lang	2010	Cultural Resources Inventory for the San Joaquin Valley Right-of-Way Maintenance Environmental Assessment Project
S-051231	—	2018	Cultural Resources Technical Memorandum, Cultural Resources Study - DGN Ranch Project, Alameda County, California (letter report)

Source: California Historical Resources Information System Record search at NWIC, December 23, 2020.

3.1.1.2 Previously Recorded Cultural Resources

Dyer Reservoir and Dam

The NWIC records search identified no previously recorded cultural resources within the Project site at Dyer Reservoir and Dam or surrounding vicinity. There are 20 cultural resources within a 1-mile radius of the Project site at Dyer Reservoir and Dam (Table 3).

Patterson Reservoir and Dam

The NWIC records search identified no previously recorded cultural resources within the Project site at Patterson Reservoir and Dam. There are 6 cultural resources within a 1-mile radius of the Project site at Patterson Reservoir and Dam (Table 4).

Table 3. Dyer Reservoir and Dam – Previously Recorded Resources

Primary ID	Trinomial	Name	Type	Age	Attributes	CHRS Code
<i>Previously Recorded Resources Intersecting the Project Site at Dyer Reservoir and Dam</i>						
None						
<i>Previously Recorded Resources within 1 Mile of the Project Site at Dyer Reservoir and Dam</i>						
P-01-000050	CA-ALA-000030	Altamont 1	Site	Prehistoric	Bedrock milling feature; rock shelter; habitation debris	Not assigned
P-01-000051	CA-ALA-000031	Altamont 2, Murietta Caves	Site	Prehistoric	Bedrock milling feature; rock shelter; habitation debris	Not assigned
P-01-000052	CA-ALA-000032	Altamont 3, Murietta Caves	Site	Prehistoric	Bedrock milling feature; rock shelter	Not assigned
P-01-000053	CA-ALA-000033	Altamont 4, Murietta Caves	Site	Prehistoric	Rock shelter	Not assigned
P-01-000054	CA-ALA-000034	Altamont 5, Murietta Caves	Site	Prehistoric	Rock shelter	Not assigned
P-01-002128	CA-ALA-000522H	The Crack House	Site	Historic	Standing structures; refuse scatter	Not assigned
P-01-002129	CA-ALA-000523H	WW II Cabin	Site	Historic	Foundations; trash scatter	Not assigned
P-01-002130	CA-ALA-000524H	Field Site #8	Site	Historic	Trash scatter	Not assigned
P-01-002131	CA-ALA-000525H	[none]	Site	Historic	Foundation; trash scatter	Not assigned
P-01-010704	—	Brushy Creek Cattle Corral	Structure	Historic	Ranch; fence	Not assigned
P-01-011510	—	ISO-509-10H	Other	Historic	Glass bottle fragment	Not assigned
P-01-011511	—	ISO-509-11H	Other	Historic	Historic ceramic isolate	Not assigned
P-01-011778	—	CH-IF-02	Other	Historic	Historic trailer	Not assigned
P-01-011779	—	CH-IF-03	Other	Historic	Modified iron tank	Not assigned
P-01-011780	—	CH-IF-04	Other	Historic	1957 - 1960 Ford 600 truck	Not assigned
P-01-011781	—	CH-S-01	Other	Prehistoric, historic	Historic glass scatter; lithic scatter	Not assigned
P-01-011782	—	CH-S-02	Site	Prehistoric	Bedrock milling feature	Not assigned
P-01-011783	CA-ALA-000686	CH-S-03	Site	Prehistoric	Bedrock milling feature; rock shelter	Not assigned
P-01-011784	CA-ALA-000687/H	CH-S-04	Site	Prehistoric, historic	Rock wall; standing structures; bedrock milling feature; petroglyphs; rock shelter	Not assigned
P-01-011785	CA-ALA-000688/H	CH-S-05	Site	Prehistoric, historic	Foundation; refuse scatter; bedrock milling feature; rock shelter	Not assigned

Source: California Historical Resources Information System Record search at Northwest Information Center, December 23, 2020.

Table 4. Patterson Reservoir and Dam – Previously Recorded Resources

Primary ID	Trinomial	Name	Type	Age	Attributes	CHRS Status Code
<i>Previously Recorded Resources Intersecting the Project Site at Patterson Reservoir and Dam</i>						
None						
<i>Previously Recorded Resources within 1 Mile of the Project Site at Patterson Reservoir and Dam</i>						
P-01-002190	CA-ALA-000582H	Western Pacific Railroad	Structure	Historic	Foundations/Structure pads; Railroad grade; Power line; Engineering structure; Bridge; Tunnel; Railroad Row	7: Not Evaluated for National Register (NR) or California Register (CR) or Needs Revaluation
P-01-010629	—	Livermore Valley Canal Bridge	Structure	Historic	Bridge	Not assigned
P-01-011507	—	GandA-509-12H	Site	Historic	AH16	Not assigned
P-01-011508	CA-ALA-000676H	GandA-509-14H	Site	Historic	AH04	Not assigned
P-01-011512	—	ISO-509-13	Other	Prehistoric	AH16	Not assigned
P-01-011603	—	South Bay Aqueduct	Structure	Historic	Aqueduct	Not assigned

Source: California Historical Resources Information System Record search at Northwest Information Center, December 23, 2020.

3.2 Other Relevant Studies

After the initial record search results were returned on December 23, 2020, adjustments were made to the built environment APE for both Dyer Reservoir and Patterson Reservoir, so that the APE included the South Bay Aqueduct (P-01-011603). A summary of this record is included below.

P-01-011603, South Bay Aqueduct

Though not listed in Table 4, the South Bay Aqueduct is within the Patterson Reservoir APE and the aqueduct shares the side-wall of the reservoir itself. The South Bay Aqueduct has been recorded in segments instead of as a complete resource, which may account for the lack of a recorded segment within the Patterson Reservoir APE. According to the site record, the aboveground components, called Dyer Canal, Livermore Canal, and Alameda Canal, were initially recorded in 1993 and 1994 for the Mojave Natural Gas Pipeline, Northern Extension Project (JRP 1993). It was erroneously rerecorded in 2004 by William Self Associates Inc. as part of a cultural resource assessment study in advance of the South Bay Aqueduct Improvement and Enlargement Project. The survey was conducted from a car in a windshield survey and was primarily focused on recording seven bridges that crossed the open canal segments of the South Bay Aqueduct, rather than the aqueduct itself. In 2015, the NWIC reassigned separate designations for the bridges (P-01-010629) and the South Bay Aqueduct (P-01-011603).

The record summarizes the significance of the South Bay Aqueduct as “a conduit of considerable importance to the local economies of Alameda and Santa Clara Counties,” and the first completed component of the SWP, which “represents one of the most ambitious public works projects undertaken by the State of California and rivals the CVP [Central Valley Project] in its role in the state water delivery system.” However, because the South Bay Aqueduct was constructed between 1961 and 1965,¹ it did not meet the 50-year age threshold in 2004 and was recommended ineligible by the recorders. Despite the ineligible recommendation, the authors wrote that “in absence of the 50 year exclusion, the South Bay Aqueduct would seem to be an obvious candidate for National Register Listing, on the basis of its part in a system using bold engineering solutions and its role in the state’s economy and society.” The authors offered a rubric for consideration under Criterion Consideration G, which allows the listing of a resource less than 50 years in age if the significance of the building or structure meets a high threshold, but argued successfully that the South Bay Aqueduct alone did not meet that high threshold for Criterion Consideration G.

Because of the age of this evaluation and because the South Bay Aqueduct has achieved the necessary 45- and 50-year age thresholds, Dudek has re-evaluated the South Bay Aqueduct in Section 5.1 of this report.

3.3 Archival Research

California Department of Water Resources

In preparation of this report, DWR shared Bulletin 200, as well as multiple internal documents, PowerPoint presentations, maps, fact sheets, and department learning tools with the built environment staff at Dudek. The Bulletin 200 series is a comprehensive, six-volume bulletin that recounts the conceptualization, history, planning,

¹ Dudek has found through extensive archival research and communication with DWR that the actual construction dates for the South Bay Aqueduct are 1958 to 1969. However, the aboveground canal portions of the South Bay Aqueduct, including Dyer Canal, Livermore Canal, and Alameda Canal, were complete by 1965.

design, operation, customers and users, and planned future expansion for the SWP. It was completed and published in 1974, the same year the SWP was deemed complete. Each volume discusses a different subject pertaining to the larger SWP system, and are listed as follows:

- Volume I, “History, Planning, and Early Progress” (DWR 1974a)
- Volume II, “Conveyance Facilities” (DWR 1974b)
- Volume III, “Storage Facilities” (DWR 1974c)
- Volume IV, “Power and Pumping Facilities” (DWR 1974d)
- Volume V, “Control Facilities” (DWR 1974e)
- Volume VI, “Project Supplements” (DWR 1974f)

Bulletin 200 and the various other bulletins and reports shared by DWR were used in the preparation of the general DWR historical context statement, as well as the resource-specific historical context, both of which are in Section 4, Historic Setting, of this report.

California Water Libraries Collection, University of California Davis Library

Many DWR, Department of Public Works, and Bureau of Reclamation reports, bulletins, and manuals were available through University of California Davis’ California Water Libraries collection, available as digitized PDFs through the Internet Archive (archive.org) website. Any bulletin or report not provided by DWR was found through this library collection. Historical information obtained from this collection was used in the preparation of the general DWR historical context statement, as well as the dam and reservoir-specific historical context, both of which are in Section 4 of this report.

California State Archives

Background information about DWR and primary sources, reports, maps, and photographs related to the history of water management and infrastructure in California were gathered from several collections at the California State Archives. Though some digitized items were available, the California State Archives restricted in-person visits for researchers due to COVID-19 closures and, as such, the archives were not fully available to Dudek staff for research. Dudek recommends future study of the California State Archives holdings when they open to the public.

Water Resources Collections & Archives, Special Collections and Archives, University of California Riverside Orbach Science Library

General background information and primary sources, reports, maps, and photographs related to the history of water management and infrastructure in California are held by the Water Resources Collections & Archives. Though a digital collection was available, neither the Orbach Science Library nor the Special Collections and Archives at University of California Riverside were open to researchers due to COVID-19 closures and in-person visit restrictions, and, as such, this collection was not fully available to Dudek staff for research. Digital collections were used in the preparation of the general DWR historical context statement in Section 4 of this report. Dudek recommends future study of this collection when it becomes available to the public.

California Water Library

The California Water Library is a digital repository that provides public access to reports, articles, essays, research, white papers, and other materials published by the State of California, federal agencies, and environmental stakeholders. Dudek used this repository to find state-published water bulletins that were otherwise unavailable from the collections listed above. Digital collections were used in the preparation of the general DWR historical context statement in Section 4 of this report.

Los Angeles County Library

Dudek utilized a local county library in order to gain access to physical books and newspaper articles not provided through other venues. These items were used in the preparation of the general DWR historical context statement in Section 4 of this report.

3.4 Field Survey

3.4.1 Methods

During the surface reconnaissance for archaeological resources, William Burns, MA, and Nicholas Hanten, MA, also completed a thorough photo documentation of Patterson Reservoir and the South Bay Aqueduct in the Project APE on January 5, 2021. All field reconnaissance took place from within the DWR-owned properties at Patterson Reservoir and Dyer Reservoir, with DWR permission and staff escort. Dudek Architectural Historians Kathryn Haley, MA, and Kate Kaiser, MSHP, conducted an in-depth review of the photo documentation. The photo documentation was adequate to show specific structural details and to contextualize Patterson Reservoir and the South Bay Aqueduct within the land surrounding the APE. Ms. Haley and Ms. Kaiser were able to view the character-defining features, spatial relationships, observed alterations, and historic landscape features via the photo documentation. All field notes, photographs, and records related to the current study are on file at the Dudek office in Auburn, California.

3.4.2 Results

During the course of the pedestrian survey, Dudek identified two structures over 45 years old—the South Bay Aqueduct (1959–1969) and Patterson Reservoir (1960–1962). Segments of the South Bay Aqueduct have been previously recorded as P-01-010629; however, the portion of the South Bay Aqueduct within the Project APE has not been recorded and Patterson Reservoir has never been recorded. Fieldwork photographs are not included in this report and may be found in Appendix A, DPR Forms. All evaluated components of the Project site are indicated in the APE maps included as Figures 5 and 6. Section 6 of this report includes a detailed physical description for the segment of Patterson Reservoir and the South Bay Aqueduct within the Project APE and the associated significance evaluation for each under all applicable NRHP and CRHR criteria and integrity requirements. Photographs of Patterson Reservoir and the South Bay Aqueduct from Dudek’s December 2020 site visit may be found in Appendix A.

3.5 Interested Party Correspondence

On May 12, 2021, Dudek Architectural Historian Kate Kaiser sent electronic contact letters to the Alameda Architectural Preservation Society, the Museum on Main in Pleasanton, and the Alameda County Historical Society. The letters briefly described the proposed Project and requested information about cultural resources near the Project area. No responses have been received to date. Copies of all correspondence to and from interested parties are located in Appendix B.

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4 Historic Setting

The following historic context provides an overview of the history of the Project area, development summary of the APE, and specific relevant information on built environment resources in the APE.

4.1 Regional Historic Overview

The Alameda County region northeast of Livermore, where both Dyer and Patterson Reservoirs are located today, was never visited explicitly by Spanish Period (ca. 1769–1823) missionaries or the military, and the region did not fall within the boundaries of any established Mexican Period (ca. 1823–1848) ranchos. However, Alameda Creek, for which the county is named, and the *contra costa* or coast opposite of San Francisco, were discovered by a search party headed by Jose Francisco de Ortega, part of Gaspar de Portola’s party, and recorded by Father Juan Crespi in 1769. Alameda Creek was visited again by Pedro Fages in 1770 and 1772. European settlers have been in the general area since the establishment of Mission San Jose and an accompanying pueblo in 1797, some 20 miles distant, but the region where the Dyer and Patterson Reservoirs are located today remained unclaimed until well into the American Period (1848–present) (ASC 1997, pp. 20, 25–27; Brown et al. 2004, pp. 7–8; Kyle 2002, pp. 4–5).

After the State of California was established in 1849, the entire Project region was part of Contra Costa County until Alameda County split away in 1853. Around the same time, Robert Livermore established a post office at his Livermore Ranch (formerly Rancho Las Positas) in Livermore-Amador Valley, but the official Livermore Post Office was established in 1869. The region where Dyer and Patterson Reservoirs are located today, as well as the entirety of the Livermore-Amador Valley region, was agricultural from the outset. In the 1860s, dry-farmed wheat was dominant, while a few vineyards were established in the late 1860s. In 1869, the Western Pacific Railroad connected Sacramento and the transcontinental railroad to the Alameda Terminal, skirting to the south of the future location of Patterson Reservoir and driving the settlement of the newly founded town of Livermore. Outside of the town, however, the region continued to be used for agriculture and viticulture until the 1910s (Brown et al. 2004, p. 8; Corbett 2005, p. 2; Kyle 2002, pp. 12–13).

Growth in northeastern Alameda County was slow during the early twentieth century. In 1913, the Lincoln Highway, one of the earliest transcontinental highways, was completed over Altamont Pass (south of Dyer Reservoir) and passed through Livermore, southwest of the reservoirs. World War II also had a significant effect on population growth in Livermore Valley. In 1942, the Livermore Naval Air Station was established northeast of Livermore. In 1951, the Navy transferred control of the air station and it became the Lawrence Livermore National Laboratory the next year. Another laboratory, Sandia National Laboratories, opened in 1956 as part of a Cold War–era expansion of defense manufacturing activity in California. The population near Livermore quadrupled as a result, ballooning to over 16,000 residents, and housing and services for laboratory workers had to be built. The Bay Area Regional Transit system reached the Tri-Valley area, including Livermore and Dublin, in the late 1960s. The population doubled again to over 37,000 in the 1970s and 1980s with the expansion of the Bay Area cities and Silicon Valley and the increasing popularity of Livermore as a commuter suburb. In the 1970s, Interstate 580 and Interstate 680 were also completed, accelerating transit into Oakland and San Francisco (Brown et al. 2004, p. 8; Corbett 2005, pp. 4–6; Ullrich 2003, pp. 14–15).

4.2 Water Management in California

– Development of the State Water Project

The history associated with water management facilities in California is as vast and complex as the systems themselves. To best understand the development of DWR and the SWP, it is important first to understand the context of water management policy and construction in California. The SWP was shaped by the successes and shortfalls of numerous water management policies and projects at the local, state, and national level over many decades. The following sections are intended to give a broad context of water development in California from the Spanish and Mexican periods, to the mining and agriculturally dominated water needs in the nineteenth century, to the engineered water reclamation solutions of the early twentieth century, and finally to the events and planning that led to the founding of DWR and implementation of the SWP.

4.2.1 Early Water Development

Beginning in the Spanish era (ca. 1769–1823), the larger missions and pueblos established by the Spanish were located along rivers or coastal creeks. Various missions used neophyte laborers to exploit local water supplies, dig wells, divert streams, and dam reservoirs for irrigation and livestock uses. Spanish law granted missions a right to adequate water supply for their residents and irrigation, and the result was often a collection of small-scale earthen dams and stone- or wood-lined *zanjas* (canals or ditches) associated with each mission. After Mexico gained independence in 1823, little changed with respect to water rights and supply, as the rights afforded to secular ranchos were derived from those used by the missions, presidios, and pueblos of Spanish and Mexican settlements. The cattle hide and tallow trade in Alta California rose as a major industry because cattle could graze on the unimproved, arid lands of the vast rancho holdings, and although ranchos typically had small, irrigated gardens, most never built substantial irrigation systems (Hanak et al. 2011, pp. 21–22; JRP and Caltrans 2000, p. 11).

New water demands and uses emerged with the onset of the Gold Rush. First, the population of California exploded during this period, quadrupling from roughly 92,000 before 1849, to 380,000 by 1860. Second, water was a key tool in a type of industrial-scale gold mining called hydraulic mining. Hydraulic miners in the Sierra Nevada foothills diverted water from high-elevation streams through flumes and penstocks to create hydraulic pressure, then used that pressurized water to blast hillsides to expose gold. Hydraulic mining also generated competition for water resources that ultimately led to disputes like *Irwin v. Phillips* (1855), in which the California Supreme Court sided with appropriation rights used by most miners, rather than riparian rights (Cooper 1968, p. 36; Hanak et al. 2011, pp. 22–23; JRP and Caltrans 2000, p. 11–12).²

Hydraulic mining created environmental problems because mining debris floated downstream, which caused waterways to build up with debris and then overflow their banks and flood adjacent land. Some private landowners along rivers running through valley lands built their own flood protection levees, but these early efforts were small scale and failed during seasonal floods made worse by hydraulic mining debris. Major flooding in 1862 and again in 1865–1866 inundated farmland and pasture with mining waste-laden water. In 1868, the California legislature approved local reclamation districts so that landowners could fund flood control projects, one of the first water

² Appropriation rights or the rule of prior appropriation held that the right to water is “based on actual use, not ownership of land, and there are no place-of-use restrictions. Moreover, in times of shortage, water is apportioned on the basis of first-in-time, first-in-right” (Hanak et al. 2011, p. 23). Riparian rights in California were derived from English common law, guaranteeing the rights of any landowner to surface water sources within or adjacent to their lands (Hanak et al. 2011, p. 23; Pisani 1984, pp. 34, 218, 246).

management strategies enacted at the state level. This new policy, however, was ultimately ineffectual because it was still more economical to push floodwaters to neighboring land than to build a system of soundly engineered levees (Hanak et al. 2011, pp. 23–25; JRP and Caltrans 2000, p. 12).

After the 1865–1866 floods, and other factors such as wheat market volatility and extended droughts, irrigated agriculture started to replace cattle raising and dry-farmed crops in the San Joaquin and Sacramento Valleys. As early as 1873, President Ulysses S. Grant directed the U.S. Army Corps of Engineers to study San Joaquin Valley and Sierra Nevada water resources for their potential as irrigation sources. The study concluded that a system of canals that could transport water from the Sacramento Valley to the San Joaquin Valley for irrigation was warranted. A few years later, newly appointed State Engineer William Hammond Hall started California’s first comprehensive study of water resources by launching a 5-year study of Sacramento Valley rivers in 1878, the results of which led to the first flood control plan for the Sacramento Valley in the 1880s (Cooper 1968, pp. 42–43; JRP and Caltrans 2000, pp. 12–13; USACE 1990, pp. 4–5).

California cities continued to grow, using surface water and groundwater as sources for municipal water supply as the nineteenth century drew to a close. Some cities contracted with private water companies to provide water to their citizens, while other communities and some agricultural landowners formed mutual water companies to serve their needs. Larger cities like Los Angeles and San Francisco initially depended on private water companies as well, but by the end of the century both were developing plans and acquiring reservoir sites and water rights for what would become massive, municipally owned, inter-basin water supply systems. The population of California continued to increase exponentially in the late 1880s and 1890s, in both urban and rural areas, as more rail lines connected to the state to other parts of the nation and West Coast agriculture and industry grew. With the passage of the Wright Irrigation Act in 1887, local irrigation districts finally had the legal toolkit to fund, build, and operate conveyance systems for themselves. Some of these districts were formed and built as wholly new systems under the act and others took over and expanded upon earlier irrigation schemes and networks (DWR 1957, p. 24; Hanak et al. 2011, pp. 30–31; JRP and Caltrans 2000, p. 14, 21–23).

4.2.2 Twentieth Century Water Management Planning

At the turn of the twentieth century, California cities started to recognize their water needs were outpacing what was readily available. The state and federal government also began making efforts to ensure water supplies, as well as regulate water rights. The U.S. Congress passed the Reclamation Act in 1902, beginning large-scale federal investment in dams and reservoir projects for irrigation in the American West. With this, the “federal government promoted occupation of undeveloped land with construction of irrigation systems and their fair distribution of water through reclamation” and established the Bureau of Reclamation (Reclamation) (Herbert et al. 2004, p. 2-3). A year later, the California Supreme Court struck down the historical rule of absolute ownership of groundwater and modified groundwater rights to “safe yield” water extraction that did not affect other users in *Katz v. Walkinshaw*.³ The California legislature also took steps toward state-sponsored flood control when it created the State Reclamation Board in 1911 to assist in management of the San Joaquin and Sacramento Rivers. Lawmakers continued to refine state water policy, this time revising water rights laws by passing the Water Commission Act in

³ “Safe yield,” also called sustainable yield, is defined in DWR Bulletin 118 as “the amount of groundwater that can be continuously withdrawn from a basin without adverse impact” (DWR 2003, p. 99). Bulletin 118 also further describes the 1903 *Katz v. Walkinshaw* decision as a rejection of English Common Law doctrine of groundwater rights and adoption of the Doctrine of Correlative Rights. The decision reflected that the Common Law approach was unsuitable for the natural water conditions in California and that overlaying rights holders or appropriative rights holders should not be able to pump water in excess of what a groundwater basin could sustain on a yearly basis.

1914, and the following year creating the State Water Commission (later the State Water Resources Control Board) to oversee permits and diversion claims for surface water throughout the state (Cooper 1968, p. 50; Hanak et al. 2011, pp. 32, 38; Herbert et al. 2004, p. 2-4).

As the new state water regulations were enacted, several California cities had already begun to turn to imported water by the early decades of the twentieth century. San Diego was among several cities that started purchasing privately developed reservoirs outside of city boundaries to supplement water supplies and provide for projected growth. Others, like Los Angeles and San Francisco, embarked on large-scale engineered water projects that would bring water from more distant sources, like the 233-mile-long (later extended to 419 miles) Los Angeles Aqueduct, the initial phase of which was built between 1908 and 1913. The U.S. Congress passed the Raker Act in 1913, which allowed San Francisco to dam the Tuolumne River into the Hetch Hetchy Reservoir and transport water 167 miles to the Bay Area (1914–1934). In 1922, California entered the Colorado River Compact to supply several Southern California cities with water from the Colorado River. The Metropolitan Water District of Southern California (Metropolitan Water District) was formed in 1927 to bring Colorado River water to Los Angeles, as well as to suburbs not serviced by the Los Angeles Department of Water and Power. Oakland and the East Bay cities formed the East Bay Municipal Utility District in 1923 to supply the nine member cities with water from the Mokelumne River (Cooper 1968, pp. 52, 59–68; DWR 1957, pp. 24–26; Hanak et al. 2011, pp. 33–36; Herbert et al. 2004, p. 2-3).

Meanwhile, a major drought struck the state in 1917 that left San Joaquin Valley farmers who relied on surface water for irrigation at a disadvantage compared with cities, especially those served by new large, inter-basin systems. In 1919, Colonel Robert B. Marshall of the U.S. Geological Survey published a study that was the first to propose moving water from the northern Sacramento Valley to the southern San Joaquin Valley by way of an integrated system of reservoirs and canals. The state legislature created the Department of Public Works in 1921 and authorized a series of studies that incorporated elements of Marshall's proposal in developing the first comprehensive plans for redistributing water from more abundant sources in Northern California watersheds to agricultural areas farther south. Ultimately, a lack of state funding led Reclamation to implement this concept as the Central Valley Project (CVP) more than a decade later. Meanwhile, multiple federal and state agencies produced a series of reports on various watersheds capabilities, and, in 1930, State Engineer Edward Hyatt proposed the first State Water Plan. The State Water Plan proposed seven management units based upon the geographic regions of the state (e.g., Great Central Valley, San Francisco Bay Basin), and which units to address first because of the acute water needs of those regions. The plan also proposed 24 reservoirs, 13 of which would have hydroelectric power features. The State Water Plan stressed immediate development for certain plan features, including the Kennett Reservoir (Shasta Dam), Contra Costa Conduit, San Joaquin River-Kern County Canal, Madera Canal, Magunden-Edison Pumping System, San Joaquin River Pumping System, the Sacramento–San Joaquin River Delta (Delta) Cross Channel, and Friant Reservoir. Other plan components, like Oroville Reservoir, would be included in the Feather River Project, within the larger program ultimately known as the State Water Project. For Southern California, Hyatt recommended importing Colorado River Water, leaving Northern and Central California water for irrigation purposes (Cooper 1968, pp. 60–68; DPW 1930, pp. 37, 44–45; DWR 1974a, p. 11; Hanak et al. 2011, pp. 33–36; Herbert et al. 2004, p. 2-6).

Hyatt's State Water Plan was approved by the state legislature and authorized as the CVP in 1933. It passed voter referendum by a slim margin as it was opposed by major energy companies, area-of-origin advocates, conservationists, and senior water-rights holders. Although voters approved \$170,000,000 in bonds to pay for the initial project components, California was in the middle of a multi-year drought and the Great Depression and bonds did not sell. The Roosevelt administration responded by funding the CVP as a New Deal federal reclamation project to be implemented by Reclamation. Congressional approval of the CVP allowed construction to begin in 1937 and

Reclamation moved forward with five elements of Hyatt's plan for initial construction, including Kennett Dam (now Shasta Dam), the Contra Costa Conduit, Friant Dam, the Madera Canal, and the Friant-Kern Canal, with the expectation that more units that could be added over time. The project was hampered by diversion of resources to the war effort and did not make its first water deliveries until 1944, but progress continued until Northern California water made it to the southern San Joaquin Valley end of the system in 1951. Reclamation's administration of the CVP brought certain acreage and water user limitations, intended to support small farmers. This policy had worked well for small farms in the East and Midwest, but it was problematic in California where much of the CVP service area was held in established large land holdings and corporate ranches. Also, as California's population boomed during and after World War II, municipal and industrial users, who had been largely excluded in favor of agricultural interests in the CVP, began to chafe against the acreage limitations (Cooper 1968, pp. 149, 152–153; DWR 1957, p. 26; DWR 1974a, p. 6; Hanak et al. 2011, pp. 45, 47–48; Herbert et al. 2004, p. 2-9; JRP and Caltrans 2000, p. 74).

4.2.3 Construction and Implementation of the State Water Project

Planning for a state water delivery system to complement the CVP and address some of its shortfalls began in 1945 with the State Water Resources Act. This authorized the State Water Resource Control Board, formerly the State Water Resource Board, to conduct investigations of the water resources of California, including 1951 Bulletin No. 1, Water Resources of California (SWRCB 1951), and 1955 Bulletin No. 2, Water Utilization and Requirements of California. These two studies formed the basis for 1957 Bulletin No. 3, The California Water Plan, which presented a plan for the “practical development of California's water resources, both by local projects and a major State project to meet the State's ultimate needs” (DWR 2006, p. 11). As the statewide investigations progressed, State Engineer A.D. Edmonston began planning for their implementation and in 1951 he presented the state legislature with the Feather River Project that had its origins as part of Hyatt's State Water Plan. The Feather River Project included a dam on the river near Oroville, two powerplants, a Delta cross-channel, an electric transmission system, an aqueduct between the Delta and Santa Clara and Alameda Counties, and an aqueduct “to transport water from the Delta to the San Joaquin Valley and Southern California” (DWR 1974a, p. 7). That year the state legislature authorized the “Feather River and Sacramento–San Joaquin Delta Diversion Projects” using the State Central Valley Project Act (DWR 1974a, p. 7). The Feather River Project was revised and resubmitted in 1955 and in 1957. After the 1955 revision, the California legislature referred the Feather River Project report to engineering contractors, the Bechtel Corporation, for independent review. The Bechtel Corporation issued their own report that agreed the engineered elements were sound. Modifications proposed by the Bechtel Corporation were incorporated in the 1957 plan, shortly after California created a new state agency, DWR, to manage the project (Cooper 1968, pp. 190–193; DWR 1974a, p. 7; DWR 2006, pp. 11–12; Hanak et al. 2011, p. 49; Herbert et al. 2004, pp. 2-12, 2-13).

Political groups in both Northern and Southern California began to voice opposition to the massive water project during this period as well. State Assemblywoman Pauline Davis, representing seven Northern California counties, rallied behind inclusion of county-of-origin rights in state law (Water Code Sections 10500–10506). In Southern California, the Metropolitan Water District opposed any project that would not guarantee water deliveries and requested a constitutional amendment to that effect. The City of San Francisco and Bay Area cities also perceived the project as a threat to expanding their municipal water supply systems. The project's biggest and most vocal proponents, however, were farmers from San Joaquin Valley and Santa Clara County. The most high-profile and influential supporter was Edmund G. “Pat” Brown, then the state's attorney general, who believed a statewide water system was essential for the state's future and pushed for its approval. His support for the SWP helped him win election as California governor in 1958 and the project would ultimately be one of his proudest legacies. (Cooper 1968, p. 209; Herbert et al. 2004, p. 2-14).

As both the political battle and SWP project planning continued, winter storms in 1955 caused flooding throughout Northern and Central California. Major rainfalls on December 18 and 19 flooded the Eel River, Russian River, and San Lorenzo River near the coast. On December 21 and 22, an intense rainfall period raised water levels in watersheds north of San Francisco and caused flooding throughout the Bay Area, as well as the northern and coastal communities of Klamath, Orick, Pepperwood, Weott, Myers Flat, Shively, Healdsburg, Cloverdale, Guerneville, Santa Cruz, Ben Lomond, and Soquel. Continuous rainfall not only caused flooding directly, rising river levels caused other flood control measures to fail. On Christmas Eve night, the Gum Tree Levee on the Feather River broke, sending a 21-foot wave into Yuba City, killing 38 people and inundating Yuba City in 8 feet of water. Flood damages reached more than \$200 million in direct losses alone. The floods were declared a national emergency and the California legislature responded by making emergency appropriation funding available to the newly created DWR to start components of the Feather River Project, touting the flood control aspects of the project. Construction began on Oroville facilities in May 1957 (DWR 1974a, p. 8; Herbert et al. 2004, p. 2-13; JRP and Caltrans 2000, p. 82; USACE 1956, p. 11).

With site preparation work at Oroville underway, negotiations to resolve conflicts over water law in the state legislature using a constitutional amendment fell short. By the end of 1958, discussions had reached a stalemate as amendment proponents were unable to satisfy the various factions in the state legislature, and unable to get the two-thirds majority vote. SWP proponents then discovered an alternate solution that required only a majority vote while still offering Southern Californians the assurance they needed that the system would be constructed as planned. The state would issue bonds to fund the SWP that specified in its financial language every major storage and conveyance facility to be constructed. Because the state constitution prohibited the legislature from amending bond terms while the debt remained to be paid, this effectively guaranteed the system's construction. With this in mind, state legislators pushed forward a more bipartisan solution—the California Water Resources Development Bond Act, called the Burns-Porter Act (Cooper 1968, pp. 221–223; Herbert et al. 2004, p. 2-16)

The Burns-Porter Act included \$1.75 billion in general obligation bond funds for the first phase of construction of the SWP, to be paid by water and power users. It also included several additional acts, passed as a package, to assure and concessions to Northern Californian opponents. These include, but were not limited to, the Davis-Grunsky Act, which made assurances to Northern Californians that water from their home areas would be available for future, local water projects; and the Davis-Dolwig Act, which provided for recreational facilities and fish and wildlife enhancement projects, such as fish hatcheries, as integral components of the SWP. These acts were passed in 1959 along with the Burns-Porter Act. In 1960, the Metropolitan Water District entered into negotiations with DWR for what would become the prototype water service contract. The SWP would go on to service 31 agencies under contracts for long-term water supplies, from Plumas County to the state's southern border with Mexico. Just days after Metropolitan Water District signed its service contract, voters ratified the Burns-Porter Act by a margin of nearly 174,000 votes in the 1960 election. Southern California provided the critical support for the bond issue as every county in the north of the state voted against the measure, with the exception of Butte County where Oroville Dam was to be constructed (Cooper 1968, pp. 224, 241; DWR 1974a, pp. 8, 21; DWR 2006, pp. 16, 25; Hanak et al. 2011, p. 49; JRP and Caltrans 2000, p. 82).

Because the Burns-Porter Act served as a guarantee of construction for Southern Californians, it named specific facilities for development and their locations. Rather than a vague order for construction, DWR would be held to the SWP construction plans. The SWP called for construction of the Oroville and Upper Feather River dams and reservoir facilities; the California Aqueduct, as well as all associated infrastructure such as conduits, tunnels, pumping facilities, dams, and reservoirs, as needed; a few specifically defined branch aqueducts; levees and control structures; and water conservation and supply measures in the Delta. The San Luis Unit of the CVP was authorized

by Congress in 1959, to be jointly operated by Reclamation and DWR. The constitutionality of the Burns-Porter Act was challenged in courts, but in the end, DWR's authority to issue bonds and create water service contracts was affirmed. DWR went on to execute water supply contracts for a total of nearly 3.5 million acre-feet of the original 4 million acre-feet projected minimum project yield (DWR 1974a, pp. 9, 12–13; DWR 2006, p. 22; Water Code Sections 12934.d.1–7).

Construction had already begun on the Oroville facilities in 1957 under the emergency funding and a few select projects—such as the South Bay Aqueduct, Bethany Reservoir, and Frenchman Dam—were started before 1960. Construction on the remainder of the SWP system began after the Burns-Porter Act was passed in 1960. The work was staged from north to south, organized into regional divisions, and was completed in 1974. Exhibit A, below, shows the mapped locations of all the SWP components completed between 1959 and 1974, and their dates of completion (DWR 2006, p. 22; Herbert et al. 2004, p. 2-21).

The engineering involved in the construction of the SWP was unparalleled for its time and the project overall was exceptionally large in physical scale, as was the scale of planning and management required. For example, the Oroville Dam was 770 feet tall at the crest, and at 6,920 feet it was more than 1 mile long and required 80 million cubic yards of fill material (DWR 2006, p. 26). While earth-fill dam technology had been around for millennia, advancements in soil science and innovative engineering techniques allowed the height of Oroville Dam to be substantially taller and longer than ever before. Other aspects of the SWP's engineering importance are reflected in the fact that the California Aqueduct measures 444 miles long, which rivals the length of the CVP canal system, but SWP designs also account for earthquake fault crossings, challenging terrain crossings, and subsidence and seismic issues, in addition to incorporating automation technology to operate all components. This fully automated remote monitoring and control system allowed DWR operators to control dozens of pumping plants and check structures and other miscellaneous facilities from five regional control centers and the Project Operations Control Center in Sacramento. DWR also borrowed the Project Management Information System used by Reclamation and other federal agencies to manage project components, plans and specifications, right-of-way acquisition, and construction activities, as well as to administer its 31 water supply contracts from one database application (DWR 1974e, pp. 1, 7; DWR 2006, p. 29; Herbert et al. 2004, pp. 2-21, 4-5–4-7).

As the initial phase of construction drew to a close in the 1970s, the SWP began to gain national recognition as a feat of modern engineering. In 1967, Oroville Dam was named one of the seven wonders of engineering in California by the California Society of Professional Engineers. The American Society of Civil Engineers gave Oroville Dam and the Hyatt Powerplant an award for outstanding engineering achievement in 1969 and the National Society of Professional Engineers named the SWP to its top 10 engineering achievements of 1971. The American Public Power Association gave the Delta Pumping Plant the First Honor Award and the Oroville-Thermalito hydroelectric powerplants the Honor Award that same year. The American Society of Civil Engineers not only gave SWP its Outstanding Civil Engineering Award for 1971, it later ranked the SWP in the top 100 Greatest Engineering Achievements of the twentieth century in 2000, and a Civil Engineering Monument of the Millennium in 2001 (DWR 2006, p. 29; Herbert et al. 2004, p. 2-27).

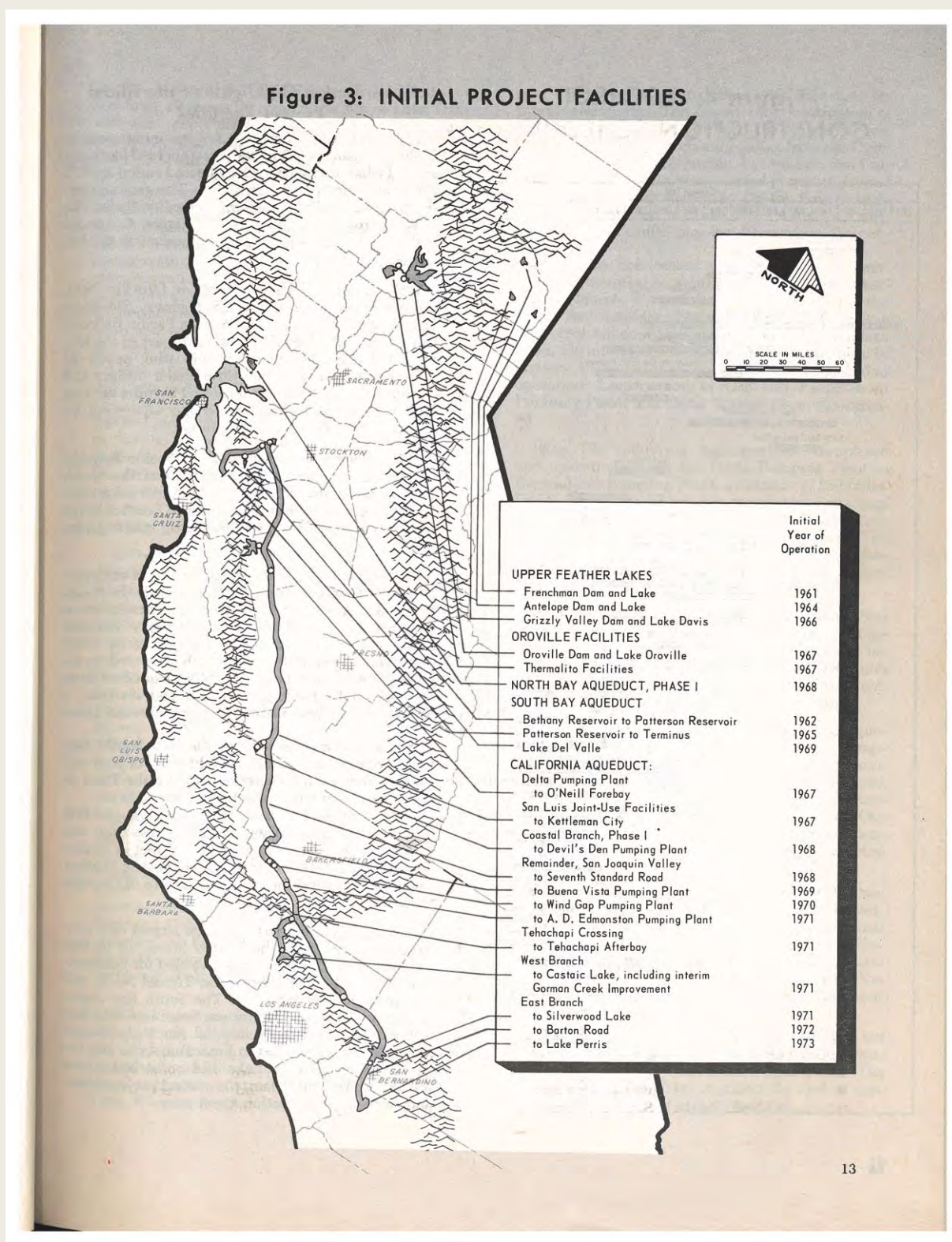


Exhibit A. SWP components and their dates of completion (DWR 1974g, p. 13).

4.2.4 The State Water Project After 1974: Realization and Expansion

Water from Northern California finally reached Southern California via the California Aqueduct after the Edmonston Pumping Plant was completed in 1971, and within 2 years, regular water deliveries were being made throughout the state. The initial construction phase concluded in 1974 and DWR made efforts to expand the SWP as planned in Phase II. However, with the advent of environmental regulation starting in the 1960s that gained substantial legislative traction in the early 1970s, the proposed expansion projects of SWP Phase II were analyzed and debated more intensely than projects completed during the first phase (DWR 1974a, pp. 78–83, 91; Hanak et al. 2011, p. 56).

As the environmental movement grew more powerful throughout California and the nation, the state and federal government enacted several laws aimed at environmental and natural resources protection, including the California Environmental Quality Act (1970), National Environmental Policy Act (1970), California Endangered Species Act (1970), California Wild and Scenic Rivers Act (1972), Clean Water Act (1972), and federal Endangered Species Act (1973). The outcome was that the SWP expansion projects had to meet new standards for environmental analysis and mitigation that delayed or in some cases limited the ability of DWR to expand the SWP in the late 1970s and 1980s. For example, some rivers in Northern California slated for SWP reservoirs were added to the Wild and Scenic Rivers list and had to remain undeveloped. Other projects, such as the Peripheral Canal, Sites Reservoir, and the Los Banos Grande Reservoir, also lacked public support for development because of their projected environmental impacts. This resulted in implementation of only a few SWP expansion projects after 1974, which led to a lower annual water yield than originally planned (DWR 2006, p. 34; Hanak et al. 2011, pp. 56–60).

Droughts in 1976–1977 and another between 1987 and 1994 forced DWR to curtail water deliveries to both urban and agricultural customers. In response, DWR purchased land in Kern County on the Kern Fan Element in 1988 to bank water for droughts, but development of this water bank was delayed by legal and environmental disputes. Starting in the mid-1990s, DWR worked with a select group of SWP water contractors to create the Monterey Amendment, which resulted in restructuring water supply contracts. The Monterey Amendment was a statement of principles that allowed water storage excess during wet years, established protection for water contractors against sudden rate increases during drought years, and allowed contractors to take more water from Castaic Lake and Lake Perris in Southern California. Another result of the Monterey Amendment was the development of the 1 million acre-foot Kern Water Bank and its subsequent transfer to the privately controlled Kern Water Bank Authority. Over the years, the Monterey Amendment faced several legal challenges by environmental groups, requiring revised environmental documentation as recently as 2016. Other successful SWP Phase II expansions to the system include the Coastal Branch Aqueduct (constructed 1993–1998) and the East Branch Aqueduct Extensions (constructed 1998–2003 and 2005–2018), and their associated pumping plants, dams, and reservoirs (DWR 2006, pp. 44–45; DWR 2019, pp. 10, 319; Folmer 2018; Hanak et al. 2011, p. 67; WEF 2021).

Today, the main components of the SWP system date to the Phase I (1959–1974) construction and the system operates as initially intended. The SWP provides flood control, power generation, recreation opportunities, and fish and wildlife habitat, as well as serving its primary purpose—providing agricultural and municipal water supply for California. In efforts to meet its mission “to sustainably manage the water resources of California, in cooperation with other agencies, to benefit the state’s people and protect, restore, and enhance the natural and human environments,” DWR continues to fulfill 29 water supply contracts for public agencies and local water districts across the state. With ever-increasing water demands, DWR remains charged with the challenge of planning for future SWP expansion and enhancement, while also continuing its operations, maintenance, and repair of the existing system (DWR 2019, pp. 3–6, 10, 236–237; DWR 2021).

4.3 Historical Development of South Bay Aqueduct and Patterson Reservoir

Patterson Reservoir is a component of the South Bay Aqueduct system in the SWP. Patterson Reservoir is a small, 100-acre-foot reservoir within the Livermore Valley Canal reach of the South Bay Aqueduct. Its planned purpose was to provide emergency water storage for the Zone 7 Water Treatment Plant and to help regulate water flowing through the South Bay Aqueduct. The Alameda County Flood Control and Water Conservation District is one of the SWP's water contractors and is entitled to a maximum of 46,000 acre-feet of water per year. The reservoir does not provide any additional services such as recreation, power generation, or fish and wildlife habitat. Its context is linked to that of the South Bay Aqueduct, which serves the "water deficient" South Bay areas from the SWP (DWR 1974a, p. 46; 1974b, p. 77; 1974c, p. 5; 2006, p. 57).

4.3.1 Planning the South Bay Aqueduct and Related Facilities

San Francisco and the Bay Area cities were some of the first in the state to secure their own municipal water from non-local sources. In 1914, the City of San Francisco began construction on the Hetch Hetchy Aqueduct (1914–1934), which brought water from the Tuolumne River to the San Francisco Bay. In 1923, Oakland and nine other East Bay cities formed the East Bay Municipal Utility District and built the Mokelumne Aqueduct (1924–1928) from the Pardee Reservoir to the San Francisco Bay. However, the South Bay cities and agricultural producers in Alameda and Contra Costa Counties, near the Delta, were unaccounted for (EBMUD 1932, pp. 3–4; JRP and Caltrans 2000, p. 73).

Attempting to make up for the deficiencies in water distribution, State Engineer Edward Hyatt presented the State Water Plan to the California legislature in 1931. Hyatt's plan called for aqueducts, canals, and conduits to transport water from Northern California to the Sacramento and San Joaquin Valleys, and included provision for the Contra Costa Conduit, which was one of the 1931 State Water Plan units proposed for immediate development and was to serve the industrial and agricultural areas along the south shore of Suisun Bay (Exhibit B) (DPW 1930, p. 44).

Hyatt's State Water Plan was approved, but fell through due to the state's inability to issue bonds during the Great Depression. It was revived in the CVP, one of President F.D. Roosevelt's emergency infrastructure programs. In the CVP, the Contra Costa Canal was posed instead. This relatively small component of the CVP was to deliver water to industrial, agricultural, and residential properties in Contra Costa County and mitigate the effects of pumping water from the Delta. Construction on the 48-mile Contra Costa Canal began in 1937 but completion was delayed until 1948 (Herbert et al. 2004, pp. 2-10–2-12; JRP and Caltrans 2000, p. 74).

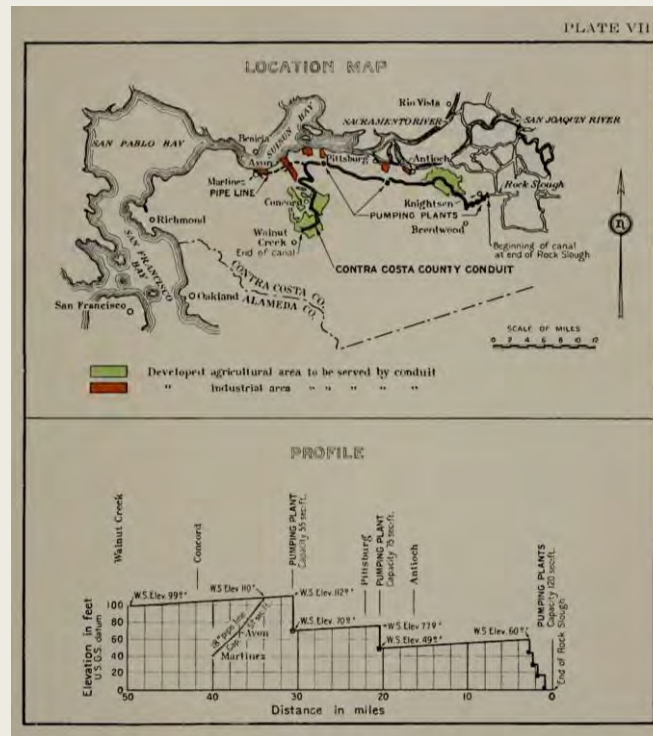


Exhibit B. Major units of state plan for development of water resources in California: Contra Costa Conduit (DPW 1930, Plate VII).

The South Bay counties, however, continued to fall short of meeting their water needs, and saltwater intrusion into their groundwater wells became a growing concern. The South Bay Aqueduct, conceptually, was proposed as part of A.D. Edmonston’s 1951 Feather River Project. As discussed in Section 4.2.3, the Feather River Project proposed a dam for the Feather River near Oroville, two powerplants, a Delta cross-channel, an electric transmission system, an aqueduct between the Delta and Santa Clara and Alameda Counties, and another aqueduct to Central and Southern California. The South Bay Aqueduct was included in the 1955 revisions to the Feather River Project and was authorized for construction in 1957 (DWR 1974a, pp. 7–8, 46; Oakland Tribune 1956, p. 1; Oakland Tribune 1957, pg. 8).

The route of the aqueduct was a point of some debate and was altered several times in the planning process. Nevertheless, design work and land acquisition for the South Bay Aqueduct began in 1958. Exploratory tests for the proposed tunnels began in summer 1958, officially kicking off construction for the South Bay Aqueduct. The project was briefly in danger in 1959, when the state legislature considered abandoning all work on the South Bay Aqueduct as a cost-saving measure; DWR, the South Bay cities, and Governor Edmund G. Brown continued to advocate for the South Bay Aqueduct, which was needed not only to serve growing South Bay cities, but also to combat saltwater intrusion into groundwater wells. The state legislature eventually funded the South Bay Aqueduct in fall 1959, and construction bids for the first reach of the aqueduct opened by October (Exhibit C). The initial project work would encompass a 2-mile-long canal segment, a pumping plant, and the Bethany Dam and Reservoir. On November 23, a groundbreaking ceremony for the South Bay Aqueduct was given by Governor Brown and DWR officials (DWR 1974b, pp. 41–44; LAT 1958, p. 31; Oakland Tribune 1958a, p. 11; 1958b, p. 19; 1959a, p. 11; 1959b p. 1; 1959c, p. 29; 1959d, p. 19; 1959e, p. 9).

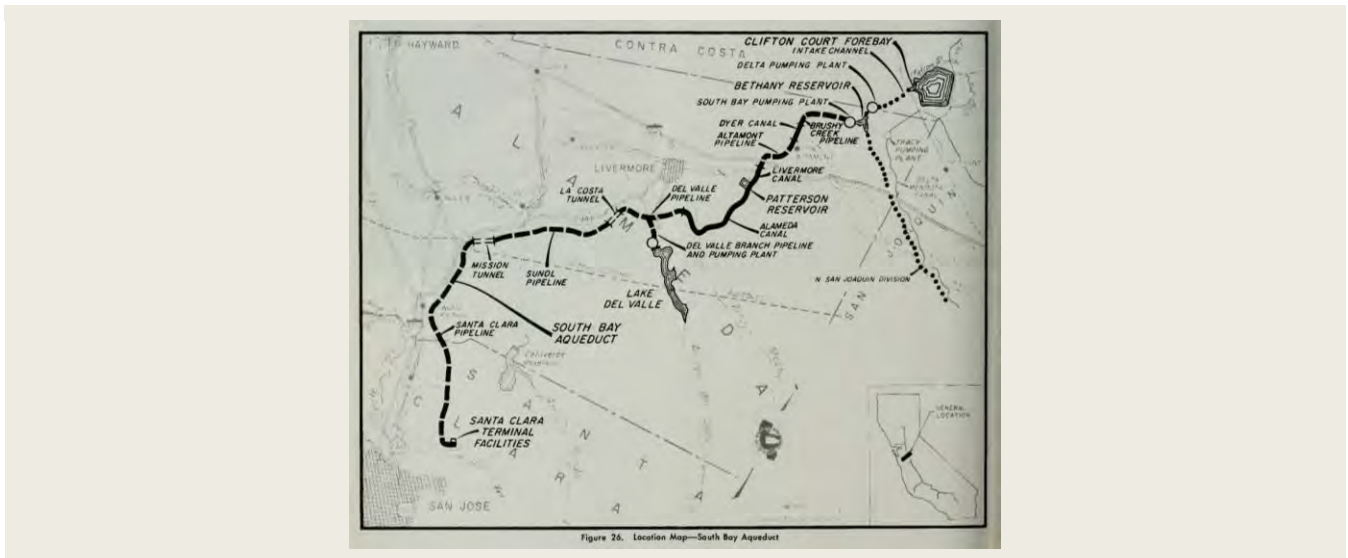


Exhibit C. The South Bay Aqueduct location map (DWR 1974b, p. 40).

The South Bay Aqueduct was already under construction, but it was also included in the SWP with the passage of the 1959 Burns-Porter Act, which specified it as “a South Bay aqueduct extending to terminal reservoirs in the Counties of Alameda and Santa Clara” (Water Code Section 12934.d.2). The Burns-Porter Act did not specifically provide for the construction of Patterson Reservoir or the pump stations and storage reservoirs along the South Bay Aqueduct that aid in its water delivery contracts and flow regulation. Still, as the South Bay Aqueduct was already underway, specifying it in the Burns-Porter Act had no effect on the progress of construction (DWR 1974a, p. 46; Oakland Tribune 1961, p. 12; Water Code Section 12934.d.2).

Because the South Bay Aqueduct was designed before the California Aqueduct, a variety of water conveyance types were piloted at the South Bay Aqueduct, before the open-air, trapezoidal, concrete-lined canal was adopted for the California Aqueduct.

4.3.2 Construction of Patterson Reservoir

The South Bay Aqueduct was completed in phases, reach by reach, starting from Bethany Reservoir. In 1960, DWR took bids for Patterson Reservoir, the 2.4-mile-long Brushy Creek First-Stage Pipeline, the 2-mile-long Dyer Canal, the 2.3-mile-long Altamont Pipeline, and a 1.8-mile portion of the Livermore Canal, constituting the first reach of the South Bay Aqueduct from the Surge Tank to Patterson Reservoir. Contractor Case-Hood (F.W. Case Corp., Hood Construction Co. Hood Northwest Pipeline Co., and Hood Flexible Pipe Cleaning Co.) from Chico won the contract for this reach and for the construction of Patterson Reservoir. The first reach contract included the construction of the Brushy Creek Pipeline, Dyer Canal, and Livermore Canal, and also included the construction of Patterson Reservoir (Exhibit D) (DWR 1974b, p. 68; Oakland Tribune 1960, p. 22; 1961, p. 12).

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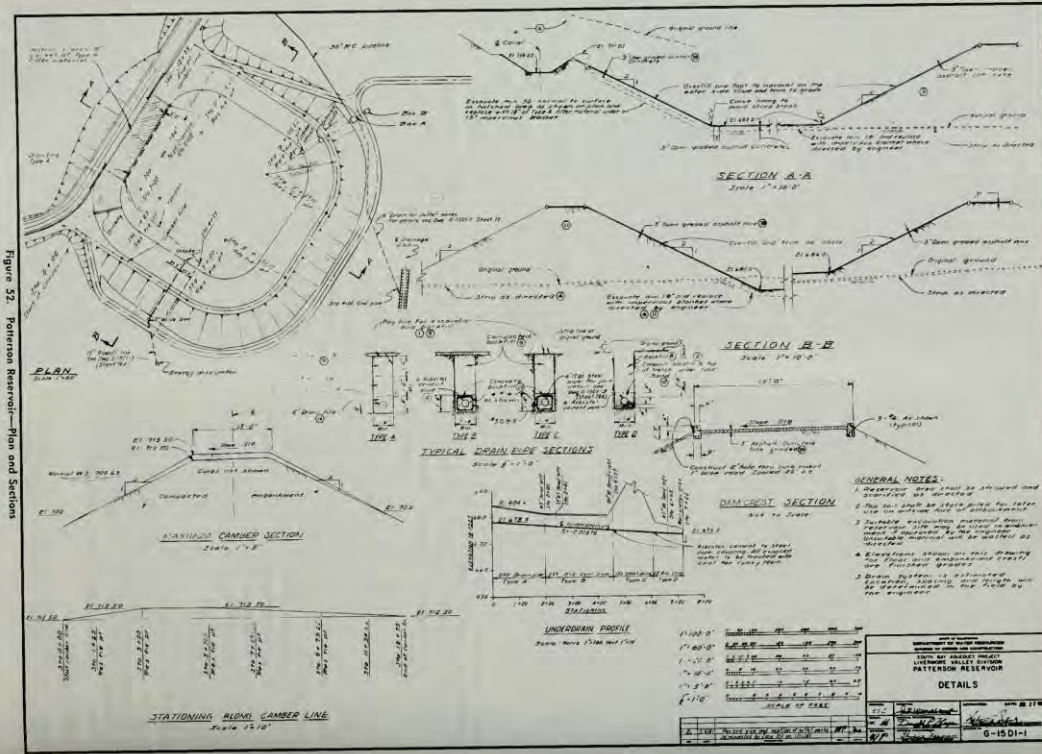
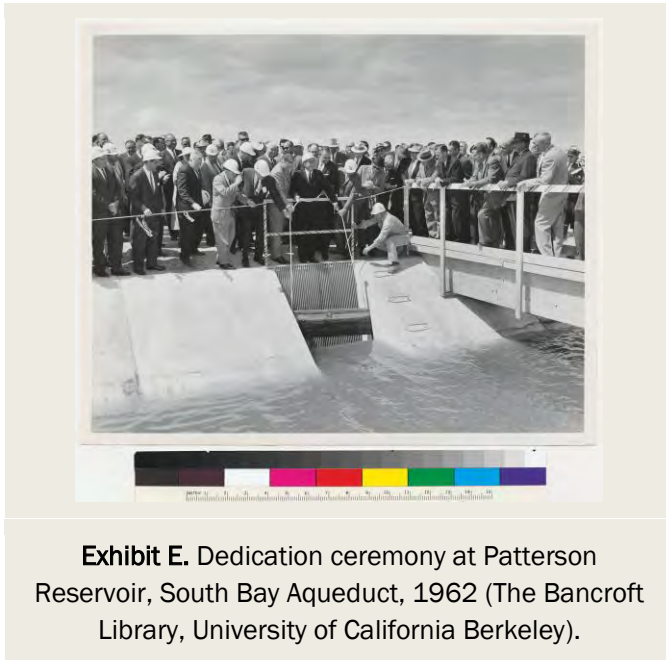


Exhibit D. Patterson Reservoir as-built sheets (DWR 1974b, p. 78).

Patterson Reservoir was a rectangular-plan compacted earth embankment-bound reservoir immediately adjacent to the South Bay Aqueduct. The reservoir was designed with an asphaltic concrete lining atop a compacted soil layer atop a sand drain blanket. However, due to the intensive cracking of this lining material, it was topped with a 3-inch-thick layer of unreinforced concrete lining instead. Water entered Patterson Reservoir via a concrete-lined weir on the north side of the reservoir near the Livermore Canal and rejoined the South Bay Aqueduct via a short canal at the south end of the aqueduct. Water deliveries were made through the 42-inch-diameter outlet at the southerly corner, which transported water first to the Zone 7 Water Treatment Plant (DWR 1974b, p. 77).

When Case-Hood finished the work at Patterson Reservoir in 1962, the Surge Tank to Patterson Reservoir reach was complete. On May 10, 1962, Governor Brown came out to dedicate the South Bay Aqueduct and celebrate the first water delivery, which was made from Patterson Reservoir to water contractor Alameda County Flood Control and Water Conservation District (Exhibit E). This was the first water delivery completed for the SWP. Contracts were let immediately after the dedication ceremony for the next segment of the South Bay Aqueduct, from Patterson Reservoir to Lake Del Valle (DWR 1974b, p. 79; Oakland Tribune 1962, p. 1; OMR 1962, p. 7).



4.3.3 Finishing the South Bay Aqueduct

Success was short-lived, as Patterson Reservoir immediately began to leak. The repair work began in 1964 and was completed by the end of the year. During repair construction, temporary earthen dams had to be placed on the South Bay Aqueduct above and below Patterson Reservoir, and another 24-inch temporary pipeline was placed to make water deliveries in the meantime. Multiple repairs, additions, and secondary facilities, including a second-stage pipeline from South Bay Pumping Plant to the Dyer Canal, were completed by contractors while construction of the South Bay Aqueduct continued (DWR 1974b, p. 79; Oakland Tribune 1964, p. 8).

While repairs to Patterson Reservoir progressed, the next reach from Patterson Reservoir to Lake Del Valle was built in stages. The 6.9-mile-long Alameda Canal was constructed from August 1962 to August 1963 by contracting firm McGuire and Hester. The Alameda Canal was the last open-air trapezoidal canal in the South Bay Aqueduct; all facilities past the Alameda Canal were pipelines or tunnels. The next section before Lake Del Valle was the Del Valle Pipeline, which was completed along with the Sunol Pipeline in March 1965. These two pipelines, along with the La Costa and Mission Tunnel finished in 1964, form a pressure conveyance system to the Santa Clara Pipeline, the final segment before the Santa Clara Terminal Facilities. The Niles and Santa Clara Division Pipeline was complete by May 1965, concluding the aqueduct conveyance component construction. Just a month later, in June 1965, the South Bay Aqueduct Terminal Facilities were completed by the Kaiser Steel Corporation. At this point, even without the completion of Lake Del Valle, the South Bay Aqueduct was operational and could make water deliveries to its three water contractors. The South Bay Aqueduct was officially dedicated on July 1, 1965, by Governor Brown, DWR Director William E. Warne, and other state officials (DWR 1974b, pp. 68, 79–113; Oakland Tribune 1965, p. 19).

Construction still continued after the dedication. Lake Del Valle, a regulatory storage reservoir that also provided flood control, recreation, and fish and wildlife enhancement benefits, was still not complete. The final design of the Del Valle Dam was approved in 1964, and construction on the dam began in 1966, concluding in 1968. The Del Valle Branch Pipeline, which connected the reservoir storage and pumping plants to the larger aqueduct, was complete by spring 1969 (DWR 1974b, p. 68; 1974c, p. 242).

The South Bay Aqueduct required several repairs, corrections, and additions as construction went on because of economic factors and increasing water demands. As one of the first components of the SWP to make water deliveries, once water districts and municipalities saw the South Bay Aqueduct's success, more groups wanted to secure their water contracts. Design changes to the South Bay Aqueduct included the two-stage construction of the Brushy Creek Pipeline, which added a second pipeline due to demand once the first South Bay Aqueduct reach became operational in 1962. Adjustments were also made to the Santa Clara Terminal Facilities, which were originally designed as a terminal dam and large reservoir, but had to be adjusted to a 2.5-million-gallon steel tank and water treatment plant after geologic and seismic conditions were deemed too unfavorable for a large reservoir. The Doolan Branch Pipeline

and Reservoir were also added in 1966 to make deliveries to southern Contra Costa County, and a tunnel extension under Highway 50 (now Interstate 580) was complete by 1966 to connect the Doolan Pipeline to the Altamont Pipeline. In addition, additional support structures like pumps and check structures had to be added at various points to the aqueduct as needed when repairs or additional construction took place. More modifications were completed after Lake Del Valle went into operation in 1968 and continued through 1969. Overall, the South Bay Aqueduct Project was completed in stages, but officially concluded in 1969 (DWR 1974b, pp. 44, 68, 79; Oakland Tribune 1964, p. 8).

The South Bay Aqueduct was constructed from 1958 to 1969 and was the first aqueduct delivery system to be completed in the SWP, predating the completion of the California Aqueduct or the Delta Pumping Plant. It was also the first SWP project to make water deliveries to contract holders, as early as 1962. Though all of the aqueducts in the SWP generally follow the same design concepts and principles, the South Bay Aqueduct was designed prior to DWR's development of the general aqueduct design, and experiences from designing and constructing the South Bay Aqueduct were later applied to the larger California Aqueduct and the North Bay Aqueduct. Differences include experiments with various canal lining materials, various siphon and check structures, various pipeline materials and designs, and the placement and number of maintenance access roads (DWR 1974b, pp. 41, 46–48).

4.3.4 South Bay Aqueduct Post-Construction and Expansion: 1969–2021

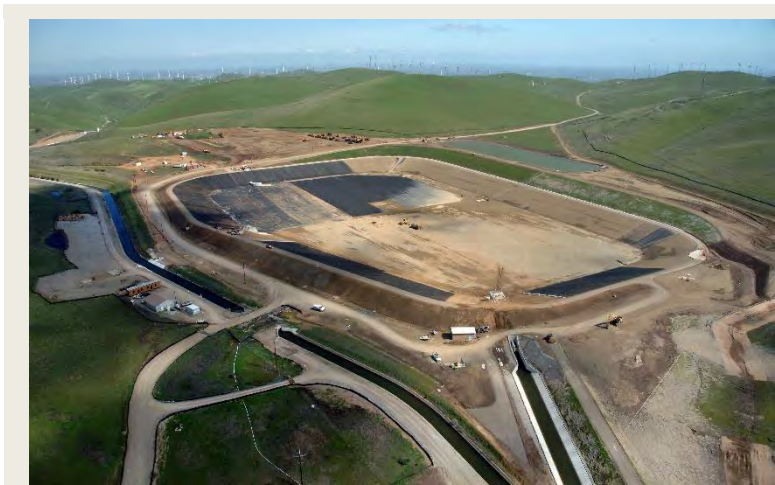


Exhibit F. Dyer Reservoir under construction, 2011 (DWR n.d.)

Patterson Reservoir, as well as segments of the South Bay Aqueduct, have been affected by earthquakes along the Calaveras fault multiple times throughout their lifespan, resulting in repairs, including in 1980, 1997, and 2001. Other improvements were to individual features of the South Bay Aqueduct, including for the South Bay Aqueduct Improvement and Enlargement Project from 2006 to 2015. This project restored the first 16.38 miles of the South Bay Aqueduct to the originally designed flow rate of 300 cubic feet per second. Part of this enlargement was to add Dyer Reservoir, another regulating reservoir, to the South Bay Aqueduct. Construction of Dyer Reservoir was completed between 2008 and 2012 (Exhibit F). This project also enlarged the South Bay

Pumping Plant, which concluded in 2014, and various modifications to Dyer Canal, Livermore Canal, Alameda Canal, and Del Valle Pipeline, such as linear raises and maintenance road repair. Notably, as part of this project, the lining and embankment for Patterson Dam was also raised and refurbished in 2015 (DWR 1974b, p. 79; 2019, p. 122; 2021; NETR 2021; Oakland Tribune 1964, p. 8).

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5 Results of Identification and Evaluation Efforts

The South Bay Aqueduct (P-01-011603) was initially previously recorded in 1993 as the South Bay Aqueduct (JRP 1993) and was partially recorded in segments instead of as a complete resource. At the time of recording, the record called South Bay Aqueduct “a conduit of considerable importance” in local counties and stressed the importance of being the first completed component of the SWP. However, because the South Bay Aqueduct did not meet the 50-year age threshold in 1993, it was recommended ineligible by the recorders. Despite the ineligible recommendation, the authors wrote that “in absence of the 50 year exclusion, the South Bay Aqueduct would seem to be an obvious candidate for National Register Listing, on the basis of its part in a system using bold engineering solutions and its role in the state’s economy and society.” Because of the age of this evaluation and because the South Bay Aqueduct has achieved the necessary 45- and 50-year age thresholds, this report re-evaluates the South Bay Aqueduct (P-01-011603) both individually and as a component of the SWP. The new evaluation affirms that the South Bay Aqueduct is eligible for listing in the NRHP and CRHR under Criteria A/1 and C/3 independently and as a component of the SWP, as part of its original phase of construction, between 1959 and 1974. The South Bay Aqueduct is considered a historical resource for the purposes of CEQA.

Patterson Reservoir has never been previously recorded or evaluated using NRHP or CRHR criteria. This report provides new documentation for Patterson Reservoir, as it meets the necessary 45- and 50-year age thresholds for evaluation and is an operation and regulatory component of the South Bay Aqueduct. Because Patterson Reservoir cannot operate independently of the South Bay Aqueduct, it was not considered individually eligible. However, Patterson Reservoir is eligible as a component of the South Bay Aqueduct under NRHP Criterion A and CRHR Criterion 1 and is considered a historical resource for the purposes of CEQA.

This report evaluates only Patterson Reservoir (1960–1962) and the South Bay Aqueduct (1959–1969), both of which are over 45 years in age. Though Dyer Reservoir is also a built environment structure within the Project APE, it was built between 2009 and 2012, and thus does not meet the 45-year age requirement of CEQA or the 50-year age requirement of NHPA. Dyer Reservoir also lacks the important historical associations or engineering merit to be considered under NRHP Criterion Consideration G. Therefore, Dyer Reservoir is not included in the significance evaluation section and is not considered a historical resource for the purposes of CEQA.

Descriptions and significance statements for the two built environment resources are presented below. A DPR form update for the South Bay Aqueduct (P-01-011603) and a DPR form set for Patterson Reservoir are located in Appendix A.

5.1 South Bay Aqueduct

5.1.1 Site Description

The South Bay Aqueduct was constructed between 1958 and 1969, and the Project APE occurs within the first reach of the South Bay Aqueduct from Surge Tank to Patterson Reservoir, which was complete and operational by 1962. The South Bay Aqueduct is within the Project APE along the Dyer Canal segment, adjacent to Dyer Reservoir, and adjacent to the APE at Patterson Reservoir in the Livermore Canal segment. The South Bay Aqueduct, in its entirety, extends 121 miles from Bethany Reservoir to the Santa Clara Terminal Facilities.

The South Bay Aqueduct segment adjacent to the Dyer Reservoir APE is a trapezoidal shaped, open-air, concrete-lined canal. Because the South Bay Aqueduct segment adjacent to Dyer Reservoir is on flat terrain, it uses an all-cut style, meaning the canal is cut directly into and below the ground surface. The bottom of the canal is 8 feet wide and the sides are sloped at a 1.5:1 ratio. The average aqueduct depth is 10 feet with a 1.5-foot freeboard and the average top width of the canal from embankment crest to embankment crest is 30 to 32 feet. The lining material is unreinforced concrete, 3 inches thick. Within the Dyer Reservoir APE, the Entrance Road ports over the South Bay Aqueduct at a road that is situated atop Check 3, a check structure. Checks share a standardized design along the length of the South Bay Aqueduct. At the check structure inlet, the South Bay Aqueduct walls invert toward the check structure at an angle, narrowing the stream as it passes through the check gates, and flare on the outlet side as well returning to the aqueduct width. Checks in open-canal sections of the South Bay Aqueduct are equipped with two radial gates and stoplog slots. Downstream of Dyer Reservoir, and the Dyer Reservoir outlet canal, also within the Dyer Reservoir APE, there is a box overchute structure spanning the South Bay Aqueduct. Overchute structures also share a standardized design along the length of the South Bay Aqueduct. They are typically 6 feet wide and have 4-foot-tall sidewalls, with no roof or cover, and are supported by two reinforced concrete piers set into the sloping inner aqueduct wall, below the embankment crest.

The South Bay Aqueduct segment adjacent to the Patterson Reservoir APE is a trapezoidal shaped, open-air, concrete-lined canal. Along its length there are four styles of aqueduct canals, depending on where they sit in relation to the terrain: deep-cut, all-cut, all-fill, and cut-and-fill or hillside styles. Because the South Bay Aqueduct segment adjacent to Patterson Reservoir is on a hillslope terrain, it uses a cut-and-fill style, meaning the canal is banked into a hillside and the uphill side is cut directly into and below the ground surface and the downhill side is built up with fill, in this case forming and sharing the wall with Patterson Reservoir. The bottom width of the canal is 8 feet and the sides are sloped at a 1.5:1 ratio. The average aqueduct is 10 feet deep with a 1.5-foot freeboard and the average top width of the canal from embankment crest to embankment crest is 30 to 32 feet. The lining material is unreinforced concrete, 3 inches thick. Within the Patterson Reservoir APE, the South Bay Aqueduct briefly shares its southwest sidewall with Patterson Reservoir, but this does not affect the design, shape, or size of the aqueduct.

5.1.2 National Register of Historic Places/California Register of Historical Resources Statement of Significance

The South Bay Aqueduct falls within the Dyer Reservoir APE and the Patterson Reservoir APE, and has been partially previously recorded in 1993 and 1994 as the South Bay Aqueduct (JRP 1993). The initial evaluation, now 26 years old, summarizes the significance of the South Bay Aqueduct as “a conduit of considerable importance to the local economies of Alameda and Santa Clara Counties,” and the first completed component of the SWP, which “represents one of the most ambitious public works projects undertaken by the State of California and rivals the CVP in its role in the state water delivery system.” However, because the South Bay Aqueduct was constructed by 1965,⁴ it did not meet the 50-year age threshold in 1994 and was recommended ineligible by the recorders. It also did not yet reach a level of significance necessary to meet Criterion Consideration G. Because of the age of this evaluation and because the South Bay Aqueduct has achieved the necessary 50-year age threshold, Dudek has re-evaluated the South Bay Aqueduct.

⁴ Dudek has found through extensive archival research and communication with DWR that the actual construction dates for the South Bay Aqueduct are 1958 to 1969. However, the aboveground canal portions of the South Bay Aqueduct, including Dyer Canal, Livermore Canal, and Alameda Canal, were complete by 1965.

National Register of Historic Places/California Register of Historical Resources Designation Criteria

The following statement of significance evaluates the South Bay Aqueduct in consideration of the NRHP and CRHR designation criteria, integrity requirements, and these guidelines.

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

The South Bay Aqueduct is significant under Criterion A/1 for its association as an integral component of the SWP (1959–1974). The SWP is significant as a massive innovative public works program recognized nationally that substantially altered water distribution throughout the State of California. The SWP facilitated population increases and agricultural development in the San Joaquin Valley and Southern California. The South Bay Aqueduct, as a component of the larger SWP system, was the first completed facility to make water deliveries. It also provided acutely needed water infrastructure that was greatly important to the communities it served. The South Bay Aqueduct was initiated in 1958 and completed by 1969. The period of significance for the SWP is 1959 to 1974, the years of construction for the first phase.

As discussed in detail in Section 4.3, the South Bay Aqueduct is representative of two significant firsts within the SWP; it was the first completed component of the SWP, and the first SWP project to make water deliveries, providing acutely needed water infrastructure important to the communities it served. As such, the South Bay Aqueduct is individually eligible for its significance under NRHP/CRHR Criterion A/1 as a key component of the SWP system.

Criterion B/2: That are associated with the lives of persons significant in our past.

To be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. While the South Bay Aqueduct is tangentially related to important figures such as Governor Edmund G. Brown and DWR Chief William E. Warne, it has no direct association to these figures and should not be considered the place where Brown or Warne produced the work they are known for. Archival research also failed to indicate direct association with any other individuals that are known to be historic figures at the national, state, or local level. As such, the South Bay Aqueduct is not known to have any historical associations with people important to the nation's or state's past. Due to a lack of identified significant associations with important persons in history, the South Bay Aqueduct is not eligible under NRHP/CRHR Criterion B/2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The South Bay Aqueduct is important for its role within the SWP, one of the most ambitious and extensive engineering projects in the State of California. The SWP features 34 storage facilities, 20 pumping plants, 4 pumping-generating plants, 5 hydroelectric power plants, and over 700 miles of open canals and pipelines. The South Bay Aqueduct comprises 121 miles of SWP's conveyance systems, as well as three of its storage facilities and two pumping plants. The South Bay Aqueduct is also important for its role as the conveyance system where designs were first tested; the results of these tests were later applied to the remainder of the SWP conveyance systems based on their engineering success and economic feasibility. Because construction of the South Bay Aqueduct was designed in 1958, partially complete by 1962, and effectively complete by 1965, design problems

were solved on the smaller South Bay Aqueduct before they were applied to the California Aqueduct. The South Bay Aqueduct is where the SWP tested the side wall-slope ratio, thickness of concrete lining, and material types for the fill structure beneath the aqueduct, based on material experiments and material failures (leaks) along the different reaches and canal segments of the aqueduct. The South Bay Aqueduct is also one of the only large-scale conveyance systems in the SWP that uses extensive pipelines and tunnels, which were later abandoned for the open-air, trapezoidal-shaped canals, as that design was more economical than tunnels or pipelines. Though open-air canals were the preferred design for larger SWP structures like the California Aqueduct, the South Bay Aqueduct embodies three types of water conveyance construction in the SWP with various open-air canals, concrete tunnels, and pipelines along its length.

Therefore, the South Bay Aqueduct is eligible as a component of the SWP for its significance under NRHP/CRHR Criterion C/3 for its innovative engineering and design values, as the pilot design for the SWP's water conveyance systems, and for acting as the test laboratory for conveyance system designs, lining materials, and other design components before they were implemented across the entire SWP.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The South Bay Aqueduct is not significant as a source, or likely source, of important historical information and it is not likely to yield important information about historic construction methods, materials, or technologies. Therefore, the South Bay Aqueduct is not eligible under NRHP/CRHR Criterion D/4.

5.1.3 Integrity Discussion

The South Bay Aqueduct segments recorded for the Project retain sufficient integrity to convey their associative significance under Criterion A/1 and C/3. South Bay Aqueduct retains integrity of location and is in its original alignment, which is one of the critical aspects of integrity required to convey significance. The aqueduct also largely retains its integrity of setting. While some sections of the South Bay Aqueduct are underground as tunnels and pipelines, where visible as an aboveground canal, it was originally located outside of dense urban areas; and located among the rolling hills and suburban or agricultural settings it was originally developed in. Though there have been several repairs and an expansion project for the South Bay Aqueduct, it still retains the basic aspects of its original design. Of the two segments of the Aqueduct examined in this report, the Patterson Reservoir section of the Project APE retains the character-defining features of the original South Bay Aqueduct design. Integrity of design and setting are diminished by the presence of the newly constructed Dyer Reservoir and within the Dyer Reservoir APE. However, when understood that the aboveground canal sections are dozens of miles long and largely retain their integrity and that the entire resource is 121 miles long and largely retains its integrity, the impact to the setting and changes to the design of the aqueduct by Dyer Reservoir are contextualized as less impactful. Integrity of materials and workmanship are retained, as the original materials and construction techniques are still visible in this segment of the South Bay Aqueduct and any material replacement or repair has been done with in-kind materials and is indistinguishable from historic-age fabric. The South Bay Aqueduct is able to convey the feeling of a twentieth century public works project completed at a massive scale and can still convey a sense of the time and space in which it was constructed, especially within the both the Dyer Dam and Patterson Dam Project areas. Finally, the segment retains integrity of association as it retains its association with its role as the location of the first water deliveries to contractors in the SWP, association with the original DWR designers and operators, and historical associations with the SWP as a whole as a component of the first conveyance system in the SWP. The South Bay Aqueduct, therefore, retains the requisite level of integrity to convey significance under Criterion A/1 and C/3.

5.1.4 Character-Defining Features

The character-defining features of the South Bay Aqueduct are limited to the following:

- Continued function as a water management and delivery structure within the larger SWP system
- Original 1958–1969 alignment
- Variety of conveyance design types, including open-air, trapezoidal, concrete-lined canals; metal pipeline; and reinforced concrete tunnel segments
- Originally constructed ancillary features of the aqueduct such as overchutes, check structures, culverts, and ladder features constructed as part of the unifying design of the SWP (1959–1974)

5.2 Patterson Reservoir

5.2.1 Site Description

Patterson Reservoir was constructed between 1960 and 1962 as part of the first reach (Surge Tank to Patterson Reservoir) of the South Bay Aqueduct. Patterson Reservoir was designed by engineers at DWR and built by Case-Hood Company contractors. The reservoir is relatively small compared with others in the SWP system—with only 100-acre-feet of capacity—and serves as emergency storage, regulatory storage, and a water delivery point to SWP water contractor Alameda County Flood Control and Water Conservation District.

The reservoir embankment perimeter height is 712.50 feet above mean sea level and the canal-side embankment is 708.72 feet above mean sea level. The inboard side slopes are at a 2:1 ratio and the embankment crest is 15 feet wide around the entire perimeter. The reservoir basin is sloped from north to south to promote drainage through a 12-inch concrete drain line controlled by a 12-inch plug valve. Aqueduct water enters the reservoir on the north side through a 175-foot-long concrete-lined weir. The entire reservoir from embankment crest to embankment crest measures 500 feet northwest–southeast and 475 feet southwest–northeast. The average depth of the reservoir is 29 feet.

5.2.2 National Register of Historic Places/California Register of Historical Resources Statement of Significance

Patterson Reservoir is an operation and regulatory component of the South Bay Aqueduct and shares the same historical and design contexts. As a component of the South Bay Aqueduct, Patterson Reservoir cannot operate independently and should not be considered individually eligible or separate from the South Bay Aqueduct. Despite its age, Patterson Reservoir has never been evaluated. As with the South Bay Aqueduct, Dudek followed the evaluation guidelines established in *Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures*, developed by JRP and the California Department of Transportation and published in December 2000 (JRP and Caltrans 2000, pp. 92–97). Dudek also researched other components of the SWP that have already been evaluated (Oroville Facilities, in Herbert et al. 2004) or determined significant (the California Aqueduct, in Donaldson 2012 and Ambacher 2011) to help craft the statement of significance. The following statement of significance evaluates Patterson Reservoir in consideration of NRHP and CRHR designation criteria, integrity requirements, and these guidelines.

National Register of Historic Places/California Register of Historical Resources Designation Criteria

The following provides an evaluation of Patterson Reservoir in consideration of NRHP and CRHR designation criteria and integrity requirements.

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

As discussed in Section 4.3, Patterson Reservoir is a component of the South Bay Aqueduct (1958–1969), and as a component of the aqueduct, is associated with important, state-level events that have made a significant contribution to the broad patterns of our history—namely, the construction and implementation of the SWP (1959–1974). For a water conveyance system “to be eligible under Criterion A, it must be found to be associated with specific important events (e.g., first long-distance transmission of hydroelectric power) or important patterns of events (e.g., development of irrigated farming)” (JRP and Caltrans 2000, p. 93). The construction of Patterson Reservoir, in its capacity as a component of the South Bay Aqueduct, is a significant first event in SWP’s history: the first water delivery to a contractor. Because the SWP was meant to be self-sufficiently funded by its own water and power sales, the 1962 water deliveries made from Patterson Reservoir also represent a significant event within the larger SWP context. The SWP is eligible under Criterion A/1 within its own right, because it profoundly altered the distribution of water across California, facilitating population increases and agricultural development in the San Joaquin Valley and Southern California. Patterson Reservoir was notably refurbished and raised during the South Bay Aqueduct Improvement and Enlargement Project from 2006 through 2015, but the reservoir retains enough integrity to convey significance under Criterion A/1.

Because of the scale of Patterson Reservoir and its role in the South Bay Aqueduct as a water regulatory body, emergency storage, and water customer delivery point, its role in the greater system does not rise to the level of individual significance. Therefore, Patterson Reservoir is eligible under NRHP/CRHR Criterion A/1 as a component of the South Bay Aqueduct. The period of significance for the South Bay Aqueduct for NRHP/CRHR Criterion A/1 is its construction period, from 1958 to 1969.

Criterion B/2: That are associated with the lives of persons significant in our past.

To be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. Archival research failed to indicate direct association with any individuals that are known to be historic figures at the national, state, or local level. As such, Patterson Reservoir is not known to have any historical associations with people important to the nation’s or state’s past. Due to a lack of identified significant associations with important persons in history, Patterson Reservoir is not eligible under NRHP/CRHR Criterion B/2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Though the South Bay Aqueduct is important for its role within the SWP and is significant as one of the most ambitious and extensive engineering projects in the State of California, Patterson Reservoir’s design and role along the South Bay Aqueduct is unremarkable and does not rise to the same level of significance. Unlike the remainder

of the South Bay Aqueduct, no new technologies were tested at Patterson Reservoir and it does not add to the overall body of engineering in the South Bay Aqueduct or the larger SWP system.

Patterson Reservoir was also refurbished, and its lining was raised for the South Bay Aqueduct Improvement and Enlargement Project (2006–2015). These alterations to design, materials, and workmanship go beyond an acceptable threshold of alteration for a working structure and diminish the ability of Patterson Reservoir to convey significance under NRHP/CRHR Criterion C/3. Therefore, Patterson Reservoir is not eligible either at the individual level or as a component of the South Bay Aqueduct under NRHP/CRHR Criterion C/3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

Patterson Reservoir is not significant as a source, or likely source, of important historical information and it is not likely to yield important information about historic construction methods, materials, or technologies. Therefore, Patterson Reservoir is not eligible under NRHP/CRHR Criterion D/4.

5.2.3 Integrity Discussion

Patterson Reservoir retains sufficient integrity to convey significance under Criterion A/1, but lacks sufficient integrity to be considered under C/3 due to material replacements and minor design alterations. Patterson Reservoir retains its original location and position along the South Bay Aqueduct's original alignment. It retains integrity of setting, retaining its rural setting among rolling hills east of Livermore, but safely outside of the boundary and setting of the urban area. There have been repairs to Patterson Reservoir since its construction, especially owing to an early grouting and leak issue that was resolved by 1964; however, major changes to the reservoir resulted from the South Bay Aqueduct Improvement and Enlargement Project (2006–2015), which impacted the integrity of design, materials, and workmanship by raising and refurbishing the reservoir. Because Patterson Reservoir is so small, these changes cannot be contextualized or reduced in importance. Despite these alterations, Patterson Reservoir is still able to convey the feeling of a twentieth century public works project and of its role within the larger South Bay Aqueduct system, and can still convey a sense of the time and space in which it was constructed. Finally, Patterson Reservoir retains integrity of association as it retains its association with the original DWR designers and operators, association with its original water supply contractors, and historical associations with the South Bay Aqueduct as the first water delivery location. Therefore, Patterson Reservoir retains the requisite level of integrity to convey significance under Criterion A/1 as a component of the South Bay Aqueduct, but lacks sufficient integrity to be considered under C/3.

5.2.4 Character-Defining Features

The character-defining features of Patterson Reservoir are limited to the following:

- Continued function as a water management and delivery structure within the larger SWP system
- The original 1960–1962 location and relationship to South Bay Aqueduct alignment

5.3 Identification and Evaluation Summary

The South Bay Aqueduct (P-01-011603) was re-evaluated and is eligible under Criterion A/1 for its connection and role within the larger SWP system and for its association with the historical event of the first water delivery in the SWP. The South Bay Aqueduct is also eligible under Criterion C/3 for its role in the testing and application of conveyance system technology for the SWP before it was standardized and implemented elsewhere. The period of significance for the South Bay Aqueduct is its period of construction, 1958 through 1969. Patterson Reservoir is eligible under Criterion A/1 as a component of the South Bay Aqueduct. Patterson Reservoir shares the period of significance for the South Bay Aqueduct, 1958 through 1969.

6 Application of Criteria of Adverse Effects

An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the NRHP (36 CFR Part 8005[a][1]).

Tables summarizing the analysis of potential adverse effects are included below for each resource: South Bay Aqueduct (Table 5) and Patterson Reservoir (Table 6).

6.1 Physical Effects of the Proposed Project

The Project would implement different remediation at the Dyer Dam site and Patterson Dam site. At Dyer Dam, the Project would involve rodent burrow and shallow rut remediation for the earthen embankments, improving the V-shaped ditch and stormwater control facility parallel to the north access road, burrow and rut repair to the unlined drainage ditch between South Bay Aqueduct and the west embankment of Dyer Reservoir, and erosion control on the south slope of the Entrance Road. These activities have the potential to affect the South Bay Aqueduct where the Entrance Road crosses the South Bay Aqueduct, and along the east wall of the South Bay Aqueduct. At Patterson Dam, the Project would involve rodent burrow and shallow rut remediation for the earthen embankments, and improvements to the low-level outlet drainage channel including vegetation removal and vegetation control.

The proposed Project has potential to affect two historic resources—the South Bay Aqueduct at both the Dyer Dam location (Refer to Figure 5. Dyer Reservoir Cultural Resources – Built Environment – Area of Potential Effect) and at the Patterson Dam location (Refer to Figure 6. Patterson Reservoir Cultural Resources – Built Environment – Area of Potential Effect), and the Patterson Reservoir only at the Patterson Dam location (Refer again to Figure 6).

6.2 South Bay Aqueduct

6.2.1 Summary of Resource Significance

The South Bay Aqueduct is eligible under NRHP/CRHR Criterion A/1 and C/3. The South Bay Aqueduct segment's historical and architectural significance are expressed through the following major character-defining features:

- Continued function as a water management and delivery structure within the larger SWP system
- Original 1958–1969 alignment
- Variety of conveyance design types, including open-air, trapezoidal, concrete-lined canals; metal pipeline; and reinforced concrete tunnel segments
- Originally constructed ancillary features such as overchutes, culverts, check structures, and ladder features constructed as part of the unifying design of the initial SWP (1959–1974)

6.2.2 Analysis of Potential Adverse Impacts

The proposed Project activities were analyzed in consideration of the adverse effect examples provided in Title 36 Code of Federal Regulations, Part 800.5(a)(2). The Project will have **no adverse effect** on the South Bay Aqueduct segments within the APE. For a detailed assessment of potential adverse effects please refer to Table 5.

Table 5. Application of Criteria of Adverse Effects for the South Bay Aqueduct

Examples of adverse effects. Adverse effects on historic properties include, but are not limited to:	Evaluation
(i) Physical destruction of or damage to all or part of the property;	<p><i>No Adverse Effect.</i></p> <p>Potential effects to the South Bay Aqueduct at the Dyer Dam site are limited to:</p> <ul style="list-style-type: none"> • proposed burrow and shallow rut remediation for the earthen embankments; • improving the V-shaped ditch and stormwater control facility parallel to the north access road; • burrow and rut repair to the unlined drainage ditch between the South Bay Aqueduct and the west embankment of Dyer Reservoir; and • erosion control along the Entrance Road, which intersects the South Bay Aqueduct and passes over a check structure. <p>At the Dyer Dam site, no changes resulting in physical destruction or damage are proposed within the South Bay Aqueduct itself. Burrow and rut repairs and improvements to the unlined drainage ditch between South Bay Aqueduct and the west embankment of Dyer Reservoir do not include changes to the South Bay Aqueduct embankment and will not result in physical destruction or damage to the South Bay Aqueduct.</p> <p>Additionally, the erosion control activities at the Entrance Road where it crosses the South Bay Aqueduct atop the check structure include sediment removal from the road slope and stabilization of the southern side of the entrance road using riprap. Sediment removal and road stabilization will not affect the South Bay Aqueduct, its embankments, or the check structure's function.</p> <p>Potential effects to the South Bay Aqueduct at the Patterson Dam site are like those at Dyer Dam. Proposed activities includes burrow and shallow rut remediation, as well as vegetation removal, erosion control, and minor repairs to the low-level drainage channel. No changes proposed will result in physical destruction or damage to the South Bay Aqueduct.</p>
(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's standards	<p><i>No Adverse Effect.</i></p> <p>At Dyer Dam, there are no proposed changes to the South Bay Aqueduct, thus Project activities will not result in the alteration of the South Bay Aqueduct. Drainage improvements only include minor regrading of channel invert slope, erosion control, and minor</p>

Table 5. Application of Criteria of Adverse Effects for the South Bay Aqueduct

Examples of adverse effects. Adverse effects on historic properties include, but are not limited to:	Evaluation
for the treatment of historic properties (36 CFR part 68) and applicable guidelines;	<p>concrete repairs including grouting and soil-cement slurry used as backfill. The concrete repairs are proposed for spalled concrete and exposed rebar at the wingwall outfall structure. Stabilization improvements to the Entrance Road are expected to have no impact that would result in alterations to the South Bay Aqueduct structure, function, sidewalls, or check structure.</p> <p>At Patterson Dam, no changes are proposed for the South Bay Aqueduct segment that shares a sidewall with Patterson Reservoir, or to the sections of the aqueduct upstream and downstream of Patterson Reservoir. At Patterson Reservoir, therefore, Project activities will not result in the alteration of the South Bay Aqueduct.</p>
(iii) Removal of the property from its historic location;	<p><i>No Adverse Effect.</i></p> <p>No changes in location are proposed the South Bay Aqueduct and any contributing structures at either Dyer Dam or Patterson Dam, as part of this Project.</p>
(iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;	<p><i>No Adverse Effect.</i></p> <p>No changes to the use of the South Bay Aqueduct are proposed at either Dyer Dam or Patterson Dam. No changes to the physical features of the South Bay Aqueduct's setting, which contribute to its historic setting, are proposed.</p>
(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;	<p><i>No Adverse Effect.</i></p> <p>The introduction of visual, atmospheric, or audible elements is not proposed at either Dyer Dam or Patterson Dam. Therefore, the South Bay Aqueduct's historic integrity would not be diminished by the introduction of visual, atmospheric, or audible elements.</p>
(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and	<p><i>No Potential to Effect.</i></p> <p>Not applicable.</p>
(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.	<p><i>No Potential to Effect.</i></p> <p>No portion of the South Bay Aqueduct, which is not owned by a federal agency, will be transferred out of DWR's ownership at either Dyer Dam or Patterson Dam as part of the proposed Project.</p>

6.3 Patterson Reservoir

6.3.1 Summary of Resource Significance

Patterson Reservoir was found eligible as a component of the South Bay Aqueduct under NRHP/CRHR Criterion A/1. Patterson Reservoir’s historical significance is expressed through the following character-defining features:

- Continued function as a water management and delivery structure within the larger SWP system
- The original 1960–1962 location and relationship to the South Bay Aqueduct alignment

6.3.2 Analysis of Potential Adverse Effects

The proposed Project activities were analyzed in consideration of the adverse effect examples provided in Title 36 Code of Federal Regulations, Part 800.5(a)(2). The Project will have **no adverse effect** on the Patterson Reservoir segments within the APE. For a detailed assessment of potential adverse effects please refer to Table 6.

Table 6. Application of Criteria of Adverse Effects for Patterson Reservoir

Examples of Adverse Effects. Adverse Effects on Historic Properties Include, but are Not Limited to:	Evaluation
(i) Physical destruction of or damage to all or part of the property;	<p><i>No Adverse Effect.</i></p> <p>At Patterson Dam and Reservoir, the Project would involve burrow and shallow rut remediation, as well as vegetation removal, erosion control, and minor repairs to the low-level drainage channel. No changes proposed will result in physical destruction or damage to the Patterson Reservoir property.</p>
(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary’s standards for the treatment of historic properties (36 CFR part 68) and applicable guidelines;	<p><i>No Adverse Effect.</i></p> <p>The main purpose of this Project is to remediate rodent burrows in the earthen embankment of Patterson Dam, so that Patterson Dam and Reservoir continues their role and function as part of the SWP. Overall, the construction activities are geared toward repairing rodent burrows and shallow ruts in the earthen reservoir embankment using materials similar to the extant reservoir embankment materials, and this appears to be consistent with the Secretary’s Standards for the Treatment of Historic Properties (36 CFR 68) and applicable guidelines. Backfill materials would consist of earthen fill of suitable specifications. The proposed rodent burrow fill materials include impervious native soil, cementitious-soil slurry, low pressure grout, and/or similar embankment material. After filling, repaired areas will be compacted level with the surrounding ground. These new materials would be substantially similar in appearance to the existing reservoir</p>

Table 6. Application of Criteria of Adverse Effects for Patterson Reservoir

Examples of Adverse Effects. Adverse Effects on Historic Properties Include, but are Not Limited to:	Evaluation
	<p>embankment. Overall, the proposed construction would not constitute an adverse effect to Patterson Reservoir.</p> <p>Additionally, the Project proposes vegetation removal, erosion control, and minor repairs with in-kind materials to the low-level drainage channel outside of the reservoir. None of these proposed vegetation removal, erosion control, or minor repair actions will result in alterations inconsistent with the Secretary’s standards for the treatment of historic properties.</p>
(iii) Removal of the property from its historic location;	<p><i>No Potential to Effect.</i></p> <p>No changes in location are proposed for this Project.</p>
(iv) Change of the character of the property’s use or of physical features within the property’s setting that contribute to its historic significance;	<p><i>No Adverse Effect.</i></p> <p>No changes to the use of Patterson Reservoir are proposed for this Project at either the Dyer Dam location or the Patterson Dam location. No changes to the physical features of Patterson Reservoir’s setting, which contribute to its historic significance, are proposed.</p>
(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property’s significant historic features;	<p><i>No Adverse Effect.</i></p> <p>The Project would not introduce visual, atmospheric, or audible elements; thus Patterson Reservoir’s historic integrity will not be diminished by the introduction of visual, atmospheric, or audible elements.</p>
(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and	<p><i>No Potential to Effect.</i></p> <p>Not applicable.</p>
(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property’s historic significance.	<p><i>No Potential to Effect.</i></p> <p>Patterson Reservoir is not owned by a federal agency and will not be transferred out of DWR’s ownership or control as part of the proposed Project.</p>

6.4 Finding of No Adverse Effect

The NRHP- and CRHR-eligible South Bay Aqueduct and Patterson Reservoir would not be adversely impacted as a result of the proposed Project. This analysis concludes a finding of **no adverse effect to historic properties**.

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7 Summary of Findings

As a result of archival research, the application of NRHP/CRHR criteria, and guidelines for evaluation of water conveyance systems, two built environment resources/properties over 45 years in age were identified within the Project APE—the South Bay Aqueduct and Patterson Reservoir. Both historic-era properties were identified as eligible for listing in the NRHP and CRHR. Preparation of a detailed effects assessment concludes that the proposed Project would have a less-than-significant impact on historical resources under CEQA and no adverse effect on historic properties in the APE under Section 106. No further documentation is required for NRHP/CRHR eligible resources when a finding of no adverse effect has been reached. Table 7 summarizes eligibility and effects findings for these historic properties.

Table 7. Summary of Findings

APE Map Figure	Property Name	Property Type	NRHP/CRHR Significance Criteria	Previous CHRS Code (if applicable)	Current CHRS Code	Section 106 Finding of Effects
5, 6	South Bay Aqueduct (1958–1969)	Conveyance System (Aqueduct)/ Component of the SWP	A/1, C/3	Not applicable	3S: Appears eligible for NR as an individual property through survey evaluation 3CS: Appears eligible for CR as an individual property through survey evaluation	No Adverse Effects
6	Patterson Reservoir (1960–1962)	Reservoir/ Component of the SWP	A/1	Not applicable	3S: Appears eligible for NR as an individual property through survey evaluation 3CS: Appears eligible for CR as an individual property through survey evaluation	No Adverse Effects

Notes: APE = area of potential effect; NRHP = National Register of Historic Places; CRHR = California Register of Historical Resources; CHRS = California Historical Resource Status; SWP = California State Water Project NR = National Register; California Register.

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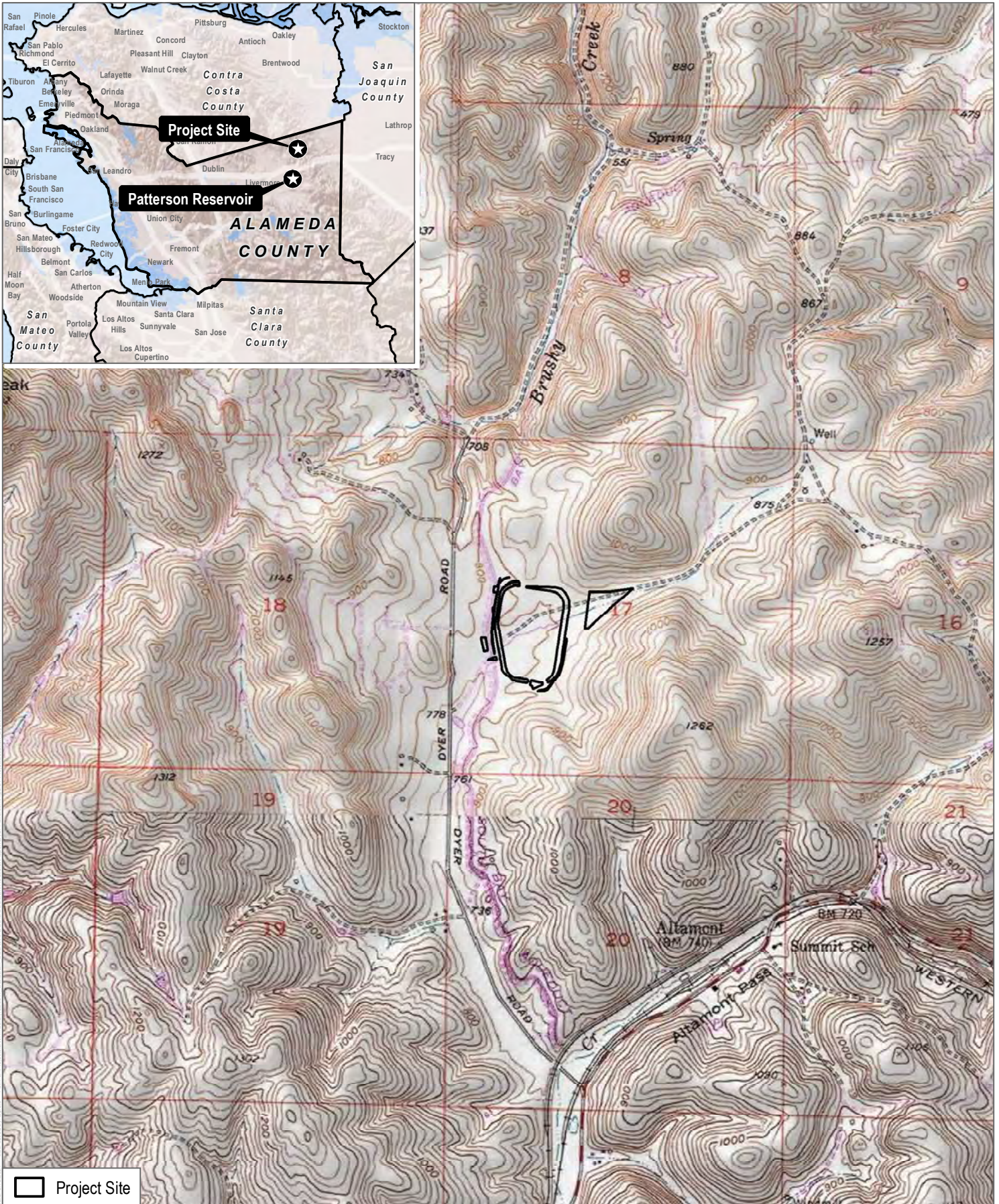
8.2 List of Preparers

Kathryn Haley, MA, Co-author, Senior Architectural Historian and Built Environment Project Lead
Kate Kaiser, MSHP, Co-author, Architectural Historian

Publications

Nicole Sanchez-Sullivan, Technical Editor
Hannah Wertheimer, Technical Editor

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BASEMAP SOURCE: DWR 05/17/2021; USGS 7.5-Minute Series Byron Hot Springs Quadrangle

FIGURE 1

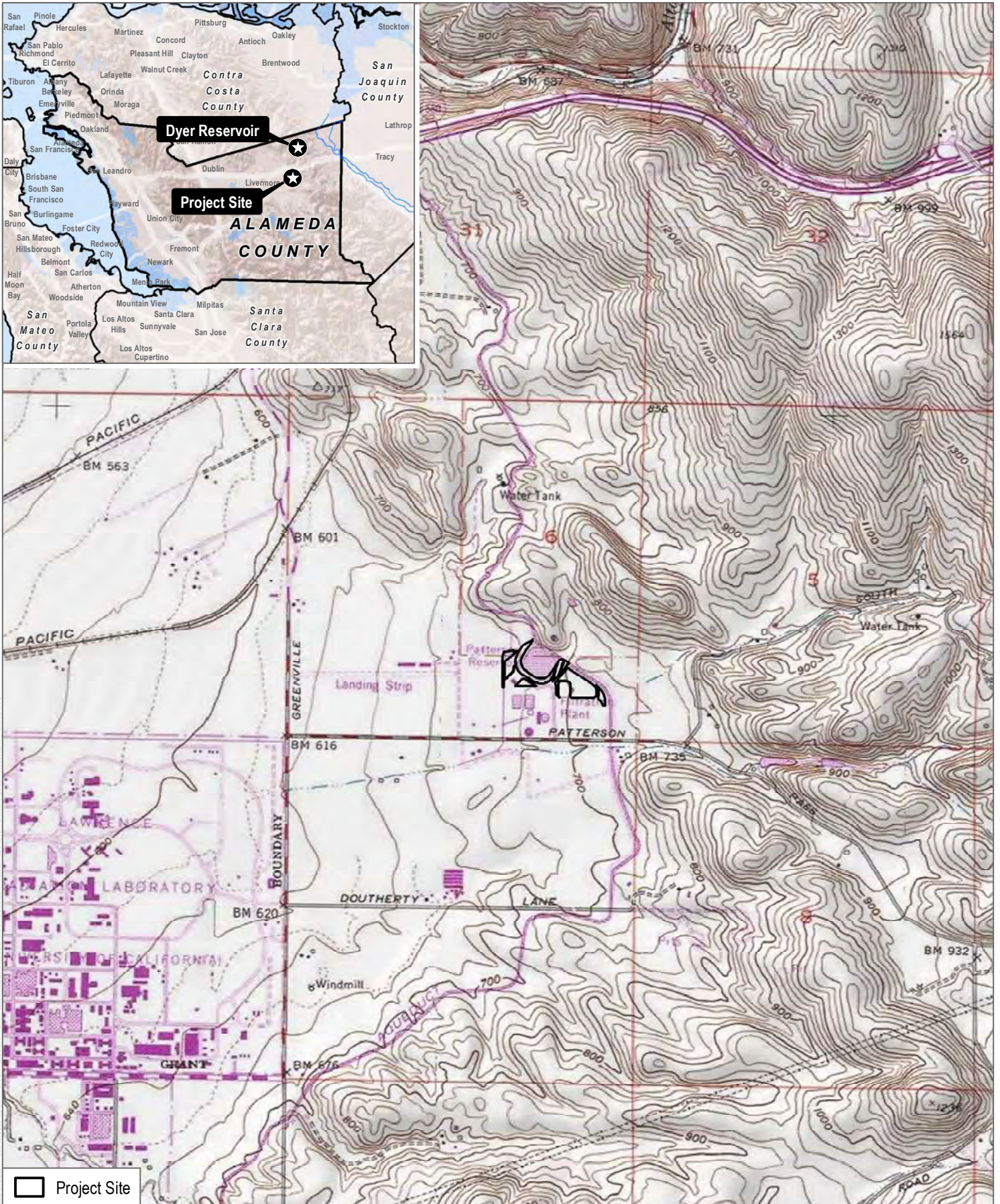
Project Location - Dyer Reservoir

Delta Dams Rodent Burrow Remediation Project



0 1,000 2,000 Feet

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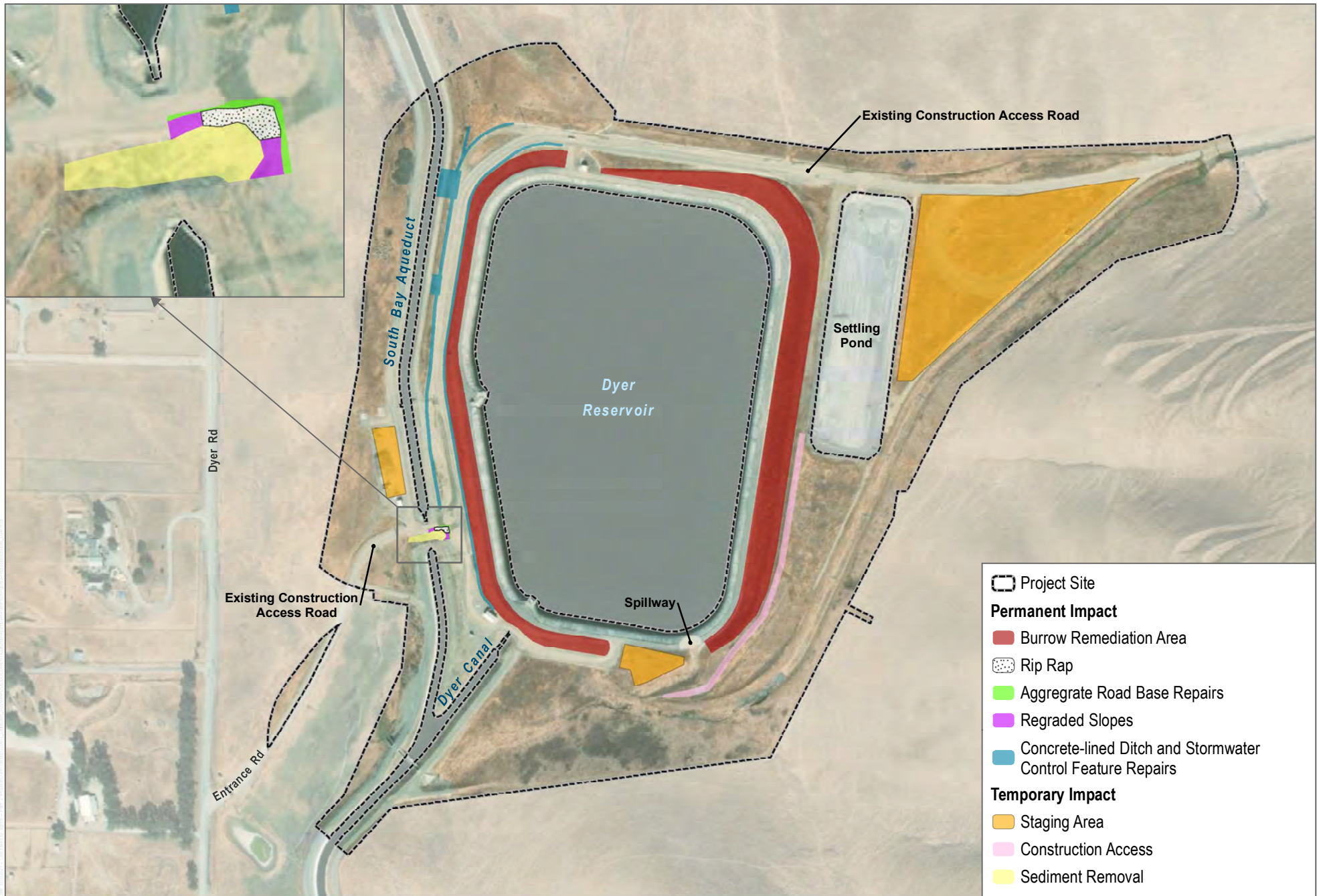
BASEMAP SOURCE: DWR 05/05/2021; USGS 7.5-Minute Series Altamont Quadrangle

FIGURE 2

Project Location - Patterson Reservoir

Delta Dams Rodent Burrow Remediation Project

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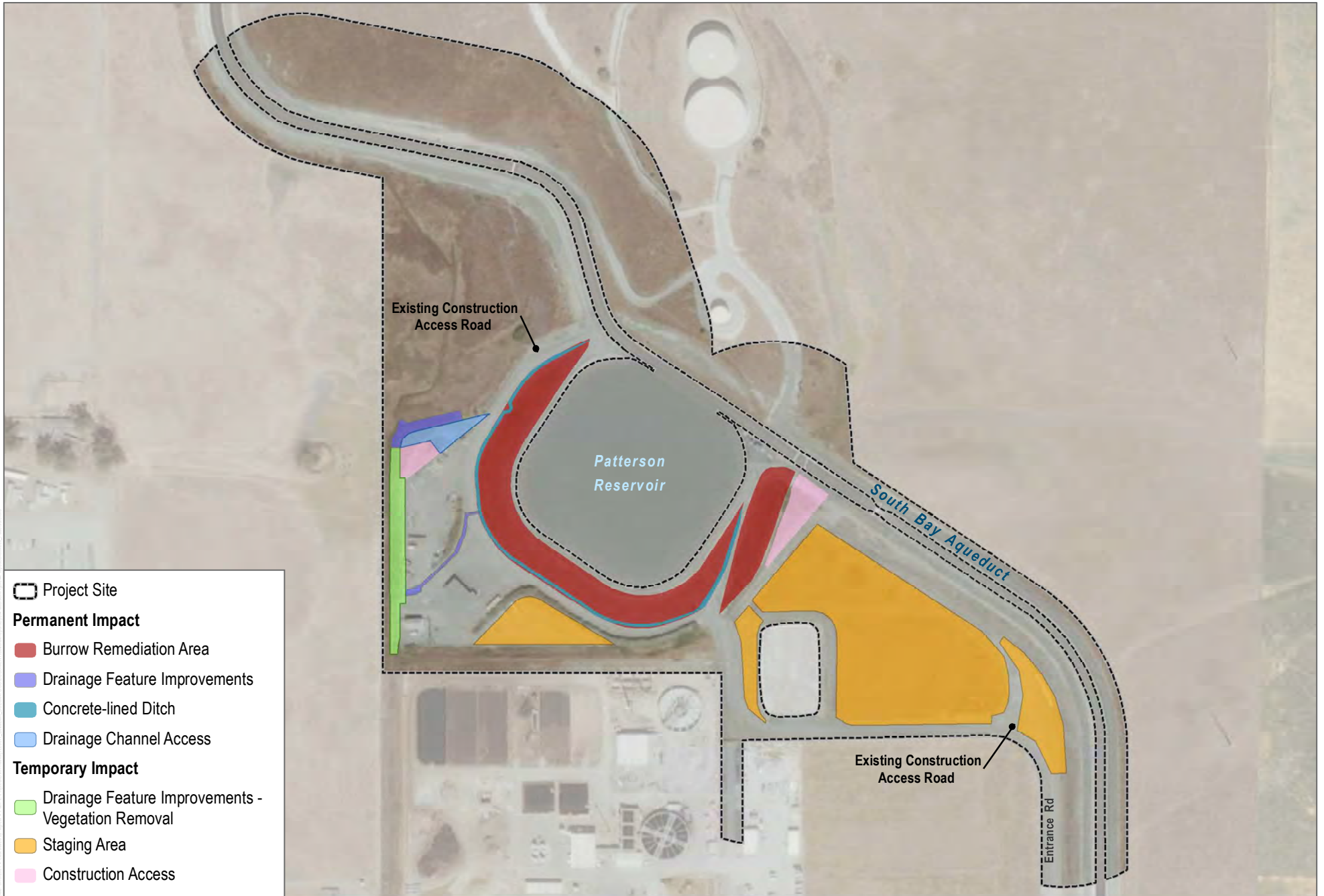
SOURCE: DWR 05/17/2021; ESRI World Imagery

FIGURE 3

Proposed Activities at Dyer Dam

Delta Dams Rodent Burrow Remediation Project

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SOURCE: DWR 05/13/2021; ESRI World Imagery

FIGURE 4
Proposed Activities at Patterson Dam
 Delta Dams Rodent Burrow Remediation Project

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SOURCE: Alameda County 2020; DWR 05/17/2021; USGS 2020; ESRI World Imagery



FIGURE 5
Dyer Reservoir Cultural Resources - Built Environment - Area of Potential Effect

Delta Dams Rodent Burrow Remediation Project

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SOURCE: DWR 05/13/2021; Alameda County 2020; USGS 2020; ESRI World Imagery



FIGURE 6
 Patterson Reservoir Cultural Resources - Built Environment - Area of Potential Effect

Delta Dams Rodent Burrow Remediation Project

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Appendix A

DPR Forms

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-01-011603
HRI #
Trinomial
NRHP Status Code 3S, 3CS

UPDATE FORM

Other Listings
Review Code _____

Reviewer _____

Date _____

Page 1 of 19 *Resource Name or #: (Assigned by recorder) South Bay Aqueduct

P1. Other Identifier: South Bay Aqueduct: Livermore Canal, Dyer Canal

*a. County Alameda and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Byron Hot Springs, Calif. Date 2010 T 02S ; R 03E ; NW ¼ of SW ¼ of Sec 17; MD B.M.
USGS 7.5' Quad Altamont, Calif. Date 2015 T 03S ; R 03E ; NW ¼ of SW ¼ of Sec 06; MD B.M.

c. Address not applicable City not applicable Zip not applicable

d. UTM: (Give more than one for large and/or linear resources)

Dyer segment: start - Zone 10S, 616658.9 mE/ 4180101.5 mN, end - Zone 10S, 616654.6 mE/ 4179415.1 mN

Patterson segment: start - Zone 10S, 615814.0 mE/ 4173337.0 mN, end Zone - 10S, 616410.9 mE/ 4172879.2 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)

The South Bay Aqueduct segment near Dyer Reservoir is located in Altamont Hills in Alameda County, approximately 13 miles west of the City of Tracy and approximately 7 miles northeast of the City of Livermore. The South Bay Aqueduct segment near Patterson Reservoir is located about 4 miles east of Livermore, California, on the east side of Livermore Valley.

Assessor Parcel Numbers (APNs): 99B-5600-7, 99B-6062-6, 99B-6062-5-1

Elevation: 794-786 ft amsl, 713-712 feet amsl

Decimal Degrees: Dyer segment: start: 37.754947° -121.673572°, end: 37.754822° -121.675555°

Patterson Segment: start: 37.698998° -121.681292°, end: 37.698998° -121.681292°

*P3a. Description: (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

(See Continuation Sheet)

*P3b. Resource Attributes: (List attributes and codes) HP20. Canal, Aqueduct

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



*P4. Resources Present:

Building Structure Object Site
 District Element of District Other
(Isolates, etc.)

P5b. Description of Photo: South Bay Aqueduct segment near Dyer Reservoir, view looking north, 4/22/2021 (IMG 4992)

*P6. Date Constructed/Age and Source: Historic Prehistoric Both
1958-1969 (DWR 1974c); segment - 1962

*P7. Owner and Address:

Department of Water Resources
1416 Ninth Street, Room 604
Sacramento, CA 95814

*P8. Recorded by: (Name, affiliation, and address) Kate Kaiser, MSHP,
Architectural Historian, Dudek
38 N. Marengo Avenue
Pasadena, CA 91101

*P9. Date Recorded: 6/29/2021

*P10. Survey Type: (Describe)
intensive level survey

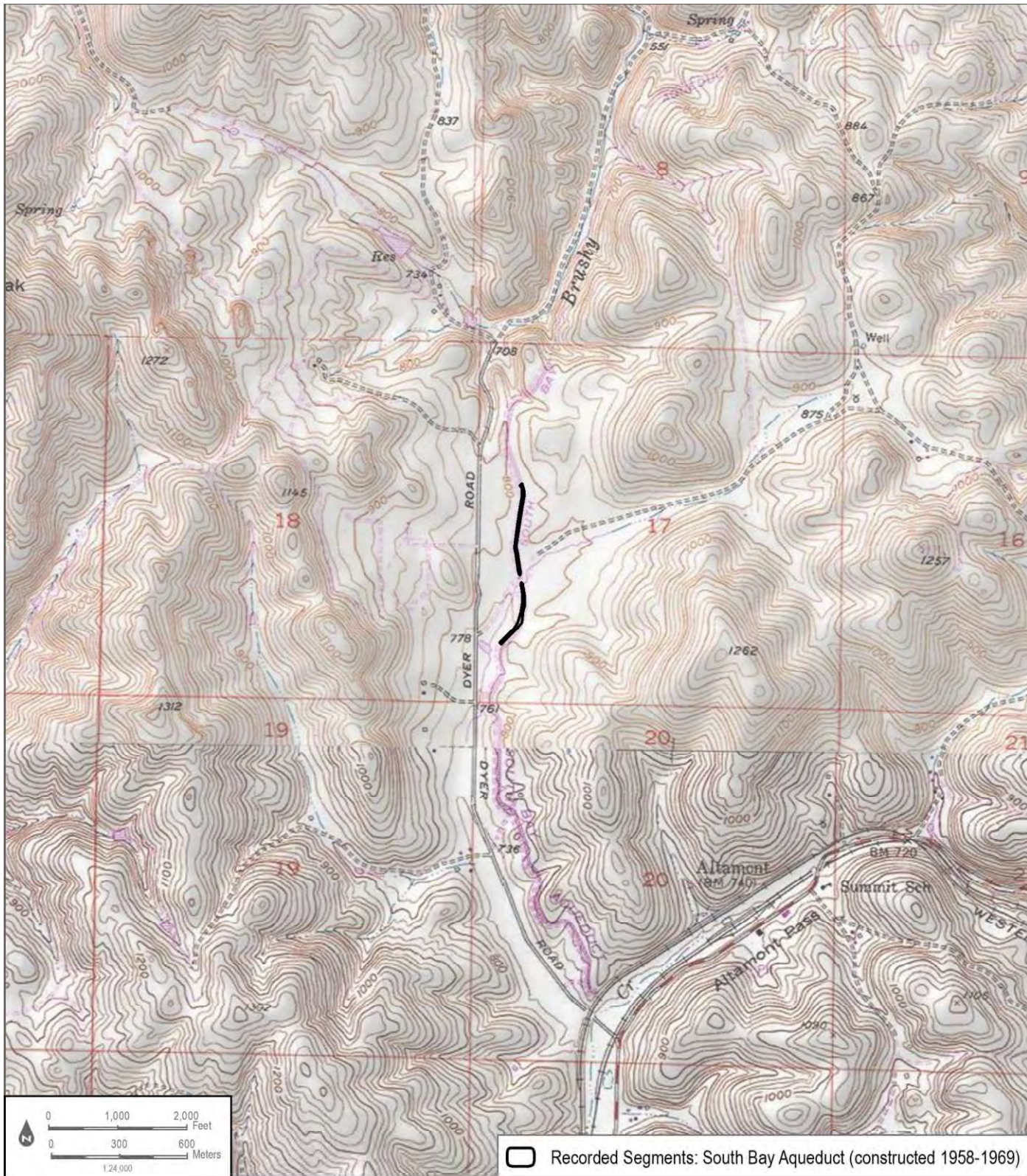
*P11. Report Citation: (Cite survey report and other sources, or enter "none.") Kaiser, K. K. Haley. 2021. Built Environment Inventory and Evaluation Report for the Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Dam and Patterson Reservoir and Dam, Alameda County, California. Prepared by Dudek for DWR, March 2021

*Attachments: NONE Location Map Continuation Sheet Building, Structure, and Object Record
 Archaeological Record District Record Linear Feature Record Milling Station Record Rock Art Record
 Artifact Record Photograph Record Other (List): _____

LOCATION MAP

~~UPDATE FORM~~ **UPDATE FORM**

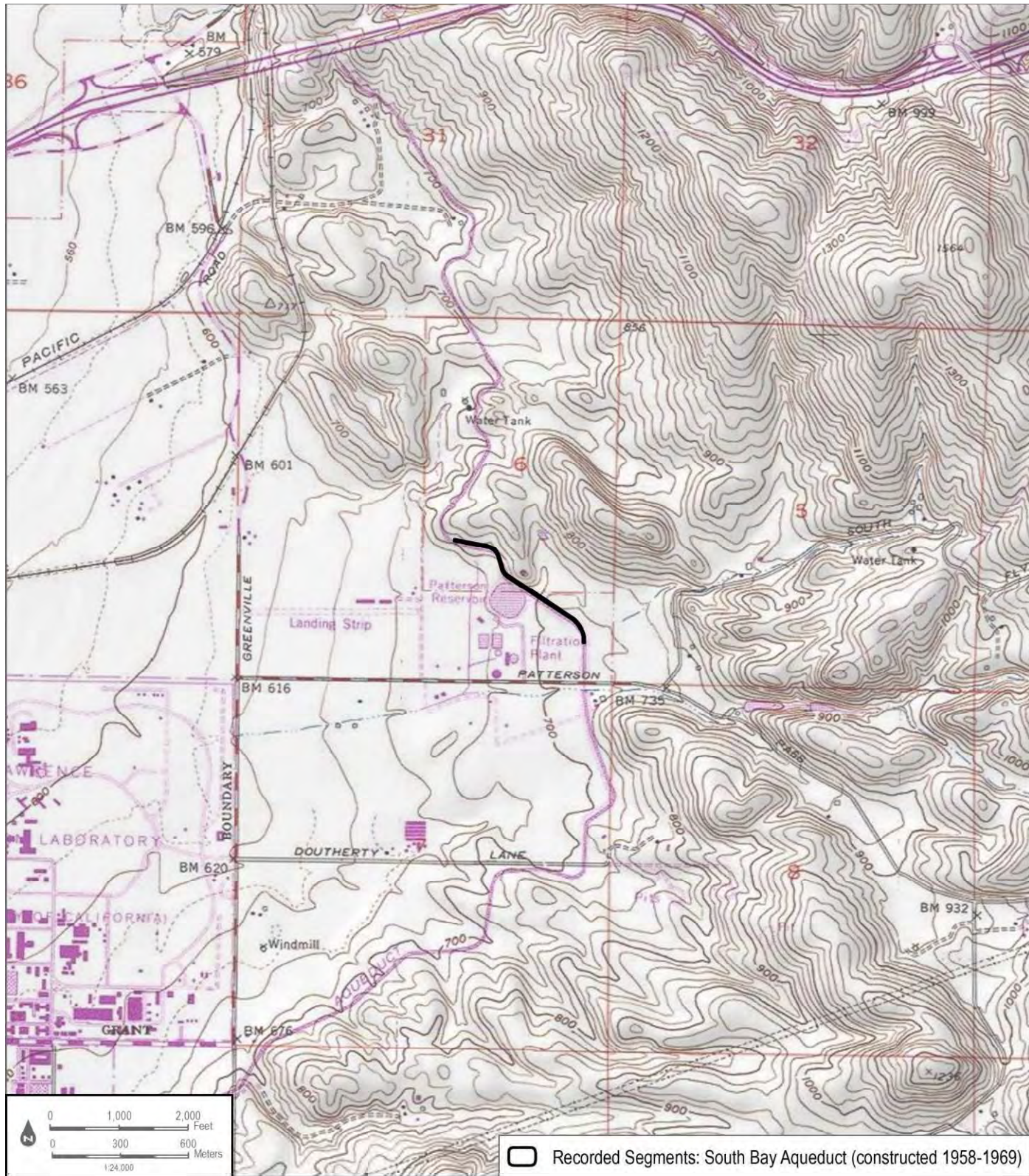
Page 2 of 19 *Resource Name or # (Assigned by recorder) South Bay Aqueduct
*Map Name: (1) Byron Hot Springs, Calif. (2) Altamont, Calif. *Scale: 1:24,000 *Date of map: (1) 2010 (2) 2015



LOCATION MAP

~~UPDATE FORM~~ **UPDATE FORM**

Page 3 of 19 *Resource Name or # (Assigned by recorder) South Bay Aqueduct
*Map Name: (1) Byron Hot Springs, Calif. (2) Altamont, Calif. *Scale: 1:24,000 *Date of map: (1) 2010 (2) 2015



BUILDING, STRUCTURE, AND OBJECT RECORD

UPDATE FORM

*Resource Name or # (Assigned by recorder) South Bay Aqueduct *NRHP Status Code 3S, 3CS

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B1. Historic Name: South Bay Aqueduct

B2. Common Name: South Bay Aqueduct

B3. Original Use: water conveyance B4. Present Use: water conveyance

*B5. Architectural Style: utilitarian

*B6. Construction History: (Construction date, alterations, and date of alterations)

1958 – South Bay Aqueduct designed, exploratory excavations begins, construction begins

1960 – Construction of Patterson Reservoir begins

1962 – South Bay Aqueduct segment from Surge Tank to Patterson Reservoir completed (includes Brushy Creek Pipeline, Dyer Canal, Altamont Pipeline, and Livermore Canal segments)

1963 – Alameda Division Canal segment completed

1964 – La Costa Tunnel and Mission Tunnel segments completed

(See Continuation Sheet)

*B7. Moved? No Yes Unknown Date: _____ Original Location: _____

*B8. Related Features: Patterson Reservoir, Bethany Reservoir, Lake Del Valle, Santa Clara Terminal Facilities

B9a. Architect: California Department of Water Resources b. Builder: Case-Hood

*B10. Significance: Theme Water Development and Supply in California Area Engineering

Period of Significance 1958-1969 Property Type Aqueduct/canal Applicable Criteria A/1, C/3

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

As a result of archival research, the application of NRHP/CRHR Criteria, and guidelines for evaluation water conveyance systems, the South Bay Aqueduct is eligible individually under Criteria A/1 for its association with significant events in SWP's history as the first completed conveyance system and its role in the first successful water delivery in 1962. The South Bay Aqueduct is also eligible under Criteria A/1 as a component of the larger SWP system and the events which led to its implementation, and under Criteria C/3 for its role in the testing and application of conveyance system technology in the SWP. The period of significance for the South Bay Aqueduct is 1958-1969.

(See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References: (See Continuation Sheet)

B13. Remarks:

Segments of the South Bay Aqueduct were previously recorded in 1993 and 1994, however, the resource had not yet reached the 45- and 50-year age thresholds for significance consideration.

*B14. Evaluator: Kate Kaiser, MSHP

*Date of Evaluation: 03/15/2021

(This space reserved for official comments.)



Page 5 of 19 Resource Name or #: (Assigned by recorder) South Bay Aqueduct

L1. **Historic and/or Common Name:** South Bay Aqueduct

L2a. **Portion Described:** Entire Resource Segment Point Observation **Designation:** _____

b. **Location of point or segment:** (Provide UTM coordinates, decimal degrees, legal description, and any other useful locational data. Show the area that has been field inspected on a Location Map.)

Dyer segment: start - Zone 10S, 616658.9 mE/ 4180101.5 mN, end - Zone 10S, 616654.6 mE/ 4179415.1 mN

Patterson segment: start - Zone 10S, 615814.0 mE/ 4173337.0 mN, end Zone - 10S, 616410.9 mE/ 4172879.2 mN

L3. **Description:** (Describe construction details, materials, and artifacts found at this segment/point. Provide plans/sections as appropriate.)

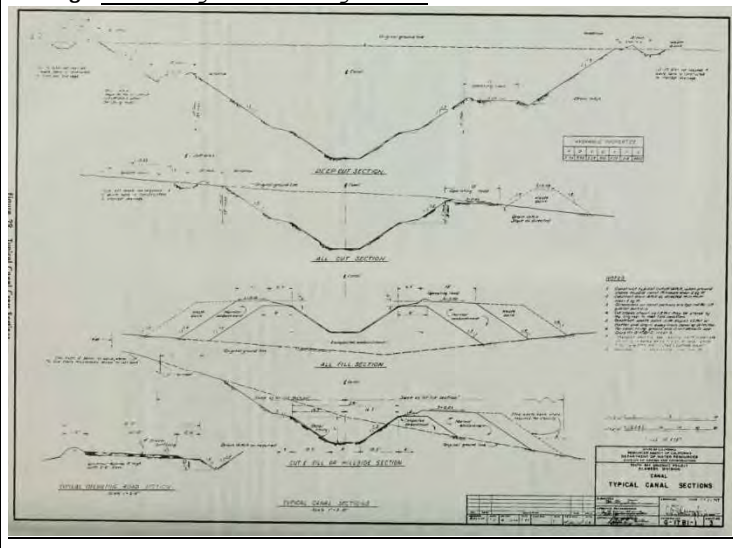
(See Section P3a. Description, Continuation Sheet)

L4. **Dimensions:** (In feet for historic features and meters for prehistoric features)

- a. **Top Width:** average 30-32 feet
- b. **Bottom Width:** 8 feet
- c. **Height or Depth:** average 10 feet deep, 1.5 feet freeboard
- d. **Length of Segment:**
Dyer segment: 300 feet, 215 feet
Patterson segment: 2,613 feet

L4e. **Sketch of Cross-Section**

Facing: throughout length



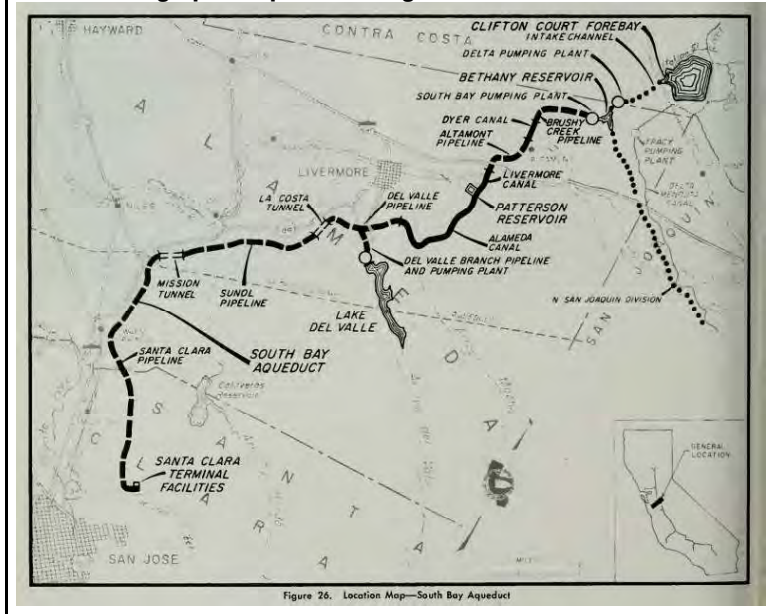
L5. **Associated Resources:**

(See Section B8. Related Features)

L6. **Setting:** (Describe natural features, landscape characteristics, slope, etc., as appropriate.)

Segments of the South Bay Aqueduct are above ground canal portions and are located outside of dense urban areas, among the rolling hills and suburban or agricultural settings it was originally developed in.

L8a. **Photograph, Map or Drawing**



L7. **Integrity Considerations:**

(See Section B10. Significance, Continuation Sheet)

L8b. **Description of Photo, Map, or Drawing** (View, scale, etc.) South Bay Aqueduct Location Map, circa 1974. In "Chapter III. South Bay Aqueduct." Bulletin 200, Volume II: Conveyance Facilities. Prepared by DWR, November 1974

L9. **Remarks:** None

L10. **Form Prepared by:** (Name, affiliation, and address)
Kate Kaiser, MSHP, Architectural Historian,
Dudek, 38 N. Marengo Avenue
Pasadena, CA 91101

L11. March 15, 2021

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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P3a. Description (Continued):

The South Bay Aqueduct was constructed between 1958 and 1969, and the Project APE occurs within the first reach of the South Bay Aqueduct from Surge Tank to Patterson Reservoir, which was complete and operational by 1962. The South Bay Aqueduct is within the Project APE along the Dyer Canal segment, adjacent to Dyer Reservoir, and adjacent to the APE at Patterson Reservoir in the Livermore Canal segment. The South Bay Aqueduct, in its entirety, extends 121 miles from Bethany Reservoir to the Santa Clara Terminal Facilities.

The South Bay Aqueduct segment adjacent to the Dyer Reservoir APE is a trapezoidal shaped, open-air, concrete-lined canal. Because the South Bay Aqueduct segment adjacent to Dyer Reservoir is on flat terrain, it uses an all-cut style, meaning the canal is cut directly into and below the ground surface. The bottom width of the canal is 8 feet and the sides are sloped at a 1.5:1 ratio. The average aqueduct depth is 10 feet with a 1.5-foot freeboard and the average top width of the canal from embankment crest to embankment crest is 30–32 feet. The lining material is unreinforced concrete, 3 inches thick. Within the Dyer Reservoir APE, the Entrance Road ports over the South Bay Aqueduct at a road that is situated atop Check 3, a check structure. Checks share a standardized design along the length of the South Bay Aqueduct. At the check structure inlet, the South Bay Aqueduct walls invert towards the check structure at an angle, narrowing the stream as it passes through the check gates, and flare on the outlet side as well returning to the aqueduct width. Checks in open-canal sections of the South Bay Aqueduct are equipped with two radial gates and stoplog slots. Downstream of Dyer Reservoir, and the Dyer Reservoir outlet canal, also within the APE, there is a box overchute structure spanning the South Bay Aqueduct. Overchute structures also share a standardized design along the length of the South Bay Aqueduct. They are typically 6 feet wide and have 4-foot-tall sidewalls, with no roof or cover, and are supported by two reinforced concrete piers set into the sloping inner aqueduct wall, below the embankment crest.

The South Bay Aqueduct segment adjacent to the Patterson Reservoir APE is a trapezoidal shaped, open-air, concrete-lined canal. Along its length there are four styles of aqueduct canals, depending on where they sit in relation to the terrain: deep-cut, all-cut, all-fill, and cut-and-fill or hillside styles. Because the South Bay Aqueduct segment adjacent to Patterson Reservoir is on a hillside terrain, it uses a cut-and-fill style, meaning the canal is banked into a hillside and the uphill side is cut directly into and below the ground surface and the downhill side is built up with fill, in this case forming and sharing the wall with Patterson Reservoir. The bottom width of the canal is 8 feet and the sides are sloped at a 1.5:1 ratio. The average aqueduct depth is 10 feet with a 1.5-foot freeboard and the average top width of the canal from embankment crest to embankment crest is 30–32 feet. The lining material is unreinforced concrete, 3 inches thick. Within the Patterson Reservoir APE, the South Bay Aqueduct briefly shares its southwest sidewall with Patterson Reservoir, but this does not affect the design, shape, or size of the aqueduct



Figure 5. South Bay Aqueduct: Dyer segment, Dyer Reservoir in background, view looking northeast (IMG_4990)

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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Figure 6. South Bay Aqueduct: Dyer segment near Dyer reservoir, view looking east (IMG_4066)



Figure 7. South Bay Aqueduct, Dyer Segment, looking south to check structure (IMG_4889)

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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Figure 8. South Bay Aqueduct: Dyer segment, view looking south to confluence of Dyer Reservoir outlet canal and South Bay Aqueduct and overchute structure (IMG_5038)



Figure 9. South Bay Aqueduct: Patterson segment, adjacent to Patterson Reservoir, view looking north (IMG_4128)

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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Figure 10. Patterson segment of South Bay Aqueduct, adjacent to Patterson Reservoir, view looking south (IMG_4129)



Figure 11. Patterson segment of South Bay Aqueduct, adjacent to Patterson Reservoir, view looking south (IMG_4163)

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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Figure 12. Patterson segment of South Bay Aqueduct, adjacent to Patterson Reservoir, view looking northwest (IMG_4164)



Figure 13. Patterson segment of South Bay Aqueduct, at modern pipe crossing, view looking northeast (IMG_4172)

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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Figure 14. Patterson segment of South Bay Aqueduct, north of reservoir, view looking northwest (IMG_4178)



Figure 15. Patterson segment of South Bay Aqueduct, north of reservoir, view looking southeast (IMG_4179)

B6. Construction History (Continued) :

1965 – Del Valle Pipeline and Sunol Pipeline segments completed. Niles Pipeline and Santa Clara Division Pipeline completed, Santa Clara Terminal Facilities completed

1966 – Construction of Del Valle Dam begins

1968 – Del Valle Dam completed, Lake Del Valle filled

1967-1969 – Modifications to South Bay Aqueduct

1969 – Del Valle Branch pipeline completed

B10. Significance (Continued) :

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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Historical Context of the South Bay Aqueduct

Planning the South Bay Aqueduct and Related Facilities

San Francisco and the Bay Area cities were some of the first in the state to secure their own municipal water from non-local sources. In 1914, the City of San Francisco began construction on the Hetch Hetchy Aqueduct (1914-1934), which brought water from the Tuolumne River to the Bay. In 1923, Oakland and nine other East Bay cities formed the East Bay Municipal Utility District in 1923 and built The Mokelumne Aqueduct (1924-1928) from the Pardee Reservoir to the Bay. However, the south bay cities and agricultural producers in Alameda and Contra Costa Counties, near the Delta, were unaccounted for (EBMUD 1932: 3-4; JRP and Caltrans 2000, p. 73).

Attempting to make up for the deficiencies in water distribution, State Engineer Edward Hyatt presented the State Water Plan to the California Legislature in 1931. Hyatt's plan called for aqueducts, canals, and conduits to transport water from Northern California to the Sacramento and San Joaquin Valleys, and included provision for the Contra Costa Conduit, which was one of the 1931 State Water Plan units proposed for immediate development and was to serve the industrial and agricultural areas along the south shore of Suisun Bay (Exhibit A). (DPW 1930, p. 44).

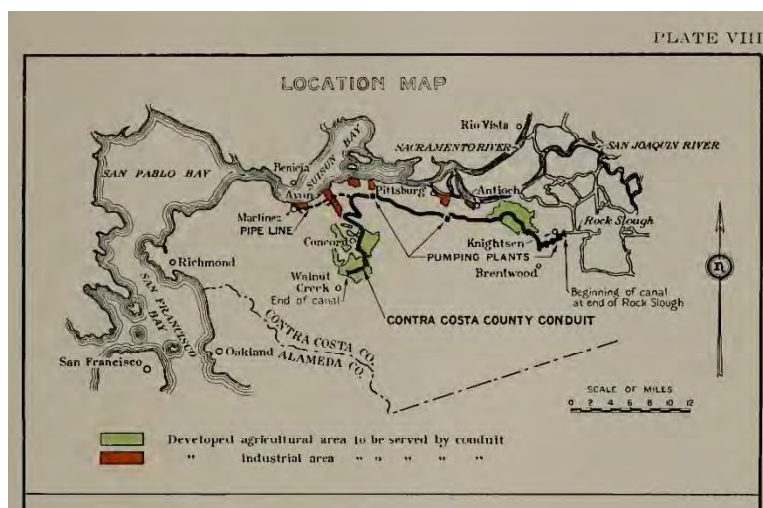


Exhibit A. Major Units of State Plan for development of water resources in California: Contra Costa Conduit (DPW 1930, Plate VII).

Hyatt's Plan was approved but fell through due to the state's inability to issue bonds during the Great Depression, but was revived in the Central Valley Project, one of President F.D. Roosevelt's emergency infrastructure programs. In the Central Valley Plan, the Contra Costa Canal was posed instead. This relatively small component of the Central Valley Project was to deliver water to industrial, agricultural and residential properties in Contra Costa County, and mitigate the effects of pumping water from the Delta. Construction on the 48-mile Contra Costa Canal began in 1937 but completion was delayed until 1948 (Herbert et al. 2004, p. 2-10--2-12; JRP and Caltrans 2000, p. 74).

The South Bay counties, however, continued to fall short of meeting its water needs and saltwater intrusion into the groundwater wells became a growing concern. The "South Bay Aqueduct," conceptually, was proposed as part of A.D. Edmonston's 1951 Feather River Project proposal. As discussed above in Section 4.4.2.3, the Feather River Project proposed a dam for the Feather River near Oroville, two powerplants, a Delta cross-channel, an electric transmission system, an aqueduct between the Delta and Santa Clara and Alameda Counties, and another aqueduct to Central and Southern California. The South Bay Aqueduct was included in the 1955 revisions to the Feather River Project and was authorized for construction in 1957 as part of the Feather River Project (DWR 1974a, p. 7-8, 46; Oakland Tribune 1956, pg. 1).

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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The route of the aqueduct was a point of some debate and was altered several times in the planning process. Nevertheless, design work and land acquisition for the South Bay Aqueduct began in 1958. Exploratory tests for the proposed tunnels began in summer 1958, officially kicking off the construction period for the South Bay Aqueduct. The project was briefly in danger in 1959, when the State Legislature considered abandoning all work on the South Bay Aqueduct, as a cost-saving measure, DWR, the South Bay Cities, and Governor Edmund G. Brown continued to advocate the South Bay Aqueduct, which was needed not only to serve growing South Bay cities, but to combat saltwater intrusion into groundwater wells. The State Legislature eventually funded the South Bay Aqueduct in fall 1959, and construction bids for the first reach of the Aqueduct opened by October. The initial project work would encompass a 2-mile canal segment, a pumping plant and the Bethany Dam and Reservoir. On November 23, a groundbreaking ceremony for the South Bay Aqueduct project was given by Governor Brown and DWR officials (DWR 1974b, p. 41-44; LAT 1958, p. 31; Oakland Tribune 1958a, pg. 11; 1958b, pg. 19; 1959a, pg. 11; 1959b, pg. 1; 1959c, p. 29; 1959d, pg. 19; 1959e, pg. 9).

South Bay Aqueduct was already under construction, but it was also included in the SWP with the passage of the 1959 Burns-Porter Act, which specified it as "a South Bay aqueduct extending to terminal reservoirs in the Counties of Alameda and Santa Clara" (Water Code Sections 12934.d.2). Burns-Porter did not specifically provide for the construction of the Patterson Reservoir, or the pump stations and storage reservoirs along the South Bay Aqueduct which aid in its water delivery contracts and flow regulation. Still, as the South Bay Aqueduct was already underway specifying it in the Burns-Porter Act had no effect on the progress of construction (DWR 1974a, p. 46; Oakland Tribune 1961, pg. 12; Water Code Sections 12934.d.2).

Because the South Bay Aqueduct was designed before the California Aqueduct, South Bay Aqueduct was the location where a variety of water conveyance types were piloted, before the open-air, trapezoidal, concrete-lined canal was adopted for the California Aqueduct.

Construction of the Patterson Reservoir

The South Bay Aqueduct was completed in phases, reach by reach, starting from the Bethany Reservoir. In 1960, DWR took bids for the Patterson Reservoir, the 2.4-mile Brushy Creek First-Stage Pipeline, the 2-mile Dyer Canal, the 2.3-mile Altamont Pipeline, and a 1.8-mile portion of the Livermore Canal, constituting the first reach of the South Bay Aqueduct from the Surge Tank to Patterson Reservoir. Contractor Case-Hood (F.W. Case Corp., Hood Construction Co. Hood Northwest Pipeline Co. and Hood Flexible Pipe Cleaning Co.) from Chico won the contract for this reach as well as for the construction of Patterson Dam and Reservoir. The first reach contract included the construction of Brushy Creek Pipeline, Dyer Canal, and the Livermore Canal, and also included the construction of Patterson Reservoir (Exhibit B) (DWR 1974b, pg. 68; Oakland Tribune 1960a, p. 22; 1961, p. 12).

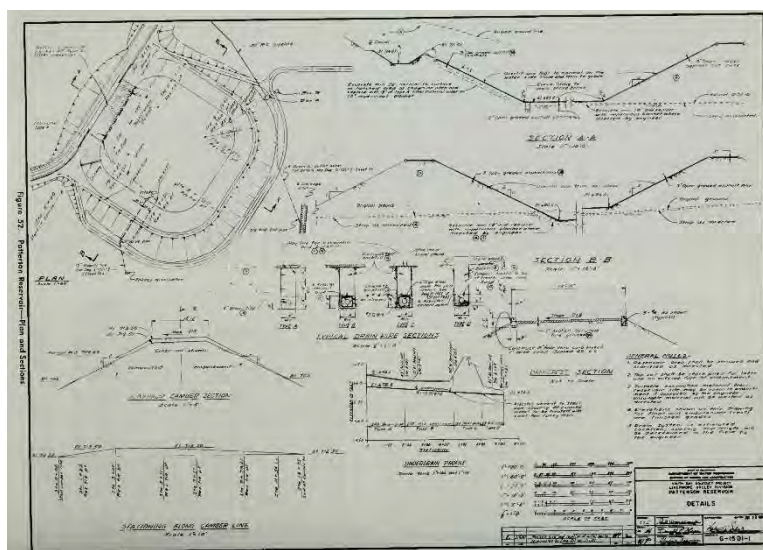


Exhibit B. Patterson Reservoir as-built sheets (DWR 1974b, p. 78).

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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UPDATE FORM



Exhibit C. Dedication ceremony at Patterson Reservoir, South Bay Aqueduct, 1962 (The Bancroft Library, University of California Berkeley).

When Case-Hood finished the work at Patterson Reservoir in 1962, the Surge Tank to Patterson Reservoir reach was complete. On May 10, 1962, Governor Brown again came out to dedicate the South Bay Aqueduct, this time celebrating the first water delivery, which was made from Patterson Reservoir to water contractor Alameda County Flood Control and Water Conservation District (Exhibit C). This was the first water delivery completed for the SWP. Contracts were let immediately after the dedication ceremony for the next segment of the South Bay Aqueduct, from Patterson Reservoir to Lake Del Valle. (DWR 1974, p. 79; Oakland Tribune 1962, p. 1; OMR 1962, p. 7.)

Finishing the South Bay Aqueduct

Success was short-lived though as the Patterson Reservoir, upon being filled, immediately began to leak. The repair work began in 1964 and was completed by the end of the year. During repair construction, temporary earthen dams had to be placed on the South Bay Aqueduct above and below the Patterson Reservoir, and another 24-inch temporary pipeline was placed to make water deliveries in the meantime. Multiple repairs, additions, and secondary facilities, including a Second-Stage Pipeline from South Bay Pumping Plant to the Dyer Canal, were completed by contractors while construction of the South Bay Aqueduct continued (DWR 1974b, p. 79; Oakland Tribune 1964, p. 8).

While repairs to Patterson progressed, the next reach from Patterson Reservoir to Lake Del Valle was built in stages. The 6.9-mile Alameda Canal, which was constructed from August 1962 to August 1963 by contracting firm McGuire and Hester. The Alameda Canal was the last open-air trapezoidal canal in the South Bay Aqueduct. All facilities past the Alameda Canal were pipelines or tunnels. The next section before Lake Del Valle was the Del Valle Pipeline, which was completed along with the Sunol Pipeline in March 1965. These two pipelines, along with the La Costa and Mission Tunnel finished in 1964, form a pressure conveyance system to the Santa Clara Pipeline, the final segment before the Santa Clara Terminal Facilities. The Niles and Santa Clara Division Pipeline was complete by May 1965, concluding the Aqueduct conveyance component construction. Just a month later, the South Bay Aqueduct Terminal Facilities were completed in June 1965 by the Kaiser Steel Corporation. At this point, even without the completion of Lake Del Valle, the South Bay Aqueduct was operational and could make water deliveries to its three water contractors. The South Bay Aqueduct was officially dedicated on July 1, 1965 by Governor Brown, DWR Director William E. Warne, and other state officials (DWR 1974b, p. 68, 79-113; Oakland Tribune 1965, p. 19).

Construction still continued after the dedication. Lake Del Valle, a regulatory storage reservoir that also provided flood control, recreation and fish and wildlife enhancement benefits was still not complete. The final design of the Del Valle Dam was finally approved in 1964, and construction on the dam began in 1966, concluding in 1968. The Del Valle Branch pipeline, which connected the reservoir storage and pumping plants to the larger Aqueduct was complete by spring 1969 (DWR 1974b, p. 68; DWR 1974c, p. 242).

The South Bay Aqueduct required several repairs, corrections, and additions as construction went on, because of economic factors, and increasing water demands as construction went on. As one of the first components of the SWP to be complete enough to make water deliveries, once water districts and municipalities saw the South Bay Aqueduct's success, more groups wanted to secure their water contracts. Design changes to the South Bay Aqueduct include the two-stage construction of the Brushy Creek Pipeline, which added a second pipeline due to the demands once the first South Bay Aqueduct Reach became operational in 1962. Adjustments were also made to the Santa Clara Terminal Facilities, which were originally designed as a terminal dam and large reservoir, but had to be adjusted to a 2.5-million gallon steel tank and water treatment plant after geologic and seismic conditions were deemed too unfavorable for a large reservoir. The Doolan Branch Pipeline and reservoir were also added in 1966 make deliveries to southern Contra Costa County, and a tunnel extension under Highway 50 was complete by 1966 to connect the Doolan Pipeline to the Altamont Pipeline. In addition, additional support structures like pumps and checking structures had to be added at various points to the Aqueduct as needed when repairs or additional construction took place. More modifications were completed after Lake Del Valle

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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went into operation in 1968 and continued through 1969. Overall, the South Bay Aqueduct Project was completed in stages, but officially concluded in 1969 (DWR 1974b, p. 44, 68, 79; Oakland Tribune 1964, p. 8).

South Bay Aqueduct was constructed from 1958 to 1969 and was the first aqueduct delivery system to be completed in the SWP, predating the completion of the California Aqueduct or the Delta Pumping Plant, as well as the first SWP project to make water deliveries to contract-holders, as early as 1962. Though all of the Aqueducts in the SWP generally follow the same design concepts and principles, the South Bay Aqueduct was designed prior to DWR's development of the general aqueduct design, and experiences from designing and constructing the South Bay Aqueduct were later applied to the larger California Aqueduct and the North Bay Aqueduct. Differences include experiments with various canal lining materials, various siphon and check structures, various pipeline materials and designs, and the placement and number of maintenance access roads (DWR 1974b, p. 41, 46-48).

South Bay Aqueduct Post-Construction and Expansion: 1969-2021



Exhibit D. Dyer Reservoir under construction, 2011 (DWR n.d.)

The Patterson Reservoir, as well as segments of the South Bay Aqueduct, have been affected by earthquakes along the Calaveras fault multiple times throughout their lifespan, resulting in repairs, including in 1980, 1997 and 2001. Other improvements were to individual features of the South Bay Aqueduct, including for the South Bay Aqueduct Improvement and Enlargement Project from 2006-2015. This project restored the first 16.38 miles of the South Bay Aqueduct to originally designed flow rate of 300 cubic feet per second (cfs). Part of this enlargement was to add Dyer Reservoir, another regulating reservoir, to the South Bay Aqueduct. Construction of Dyer Reservoir was completed between 2008 and 2012 (Exhibit D). This project also enlarged the South Bay Pumping Plant, which concluded in 2014, and various modifications to Dyer Canal, Livermore Canal, Alameda Canal, and Del Valle Pipeline, such as linear raises and maintenance road repair. Notably, as part of this project, the lining and embankment for Patterson Reservoir was also raised and refurbished in 2015 (DWR 2021; DWR 2019, p. 122; DWR 1974b, p. 79;

NETR 2021; Oakland Tribune 1964, p. 8).

NRHP/CRHR Significance

The South Bay Aqueduct has been partially, previously recorded in 1993 and 1994 as the South Bay Aqueduct (JRP 1993). The initial evaluation, now 26 years out of date, summarizes the significance of the South Bay Aqueduct as “a conduit of considerable importance to the local economies of Alameda and Santa Clara Counties,” and the first completed component of the SWP, which “represents one of the most ambitious public works projects undertaken by the State of California and rivals the CVP in its role in the state water delivery system.” However, because the South Bay Aqueduct was constructed by 1965,¹ it did not meet the 50-year age threshold in 1994 and was recommended ineligible by the recorders. It also did not yet reach a level of significance necessary to meet Criterion Consideration G. Because of the age of this evaluation and because the South Bay Aqueduct has achieved the necessary 45- and 50-year age thresholds, Dudek has re-evaluated the South Bay Aqueduct below.

The following statement of significance evaluates the South Bay Aqueduct in consideration of NRHP and CRHR designation criteria, integrity requirements, and these guidelines.

¹ Dudek has found through extensive archival research and communication with DWR that the actual construction dates for the South Bay Aqueduct are 1958 to 1969. However, the above-ground canal portions of the South Bay Aqueduct, including Dyer Canal, Livermore Canal and Alameda Canal, were complete by 1965.

CONTINUATION SHEET

Property Name: South Bay Aqueduct

Page 16 of 19

UPDATE FORM

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

The South Bay Aqueduct is significant under Criteria A/1 for its association as an integral component of the SWP (1959 to 1974). The SWP is significant as a massive innovative public works program recognized nationally that resulted in substantially altering water distribution throughout in the State of California. The SWP profoundly altered the distribution of water across California, facilitating population increases and agricultural development of the San Joaquin Valley and Southern California. The South Bay Aqueduct, as a component of the larger SPW system, was the first completed facility to make water deliveries, as well as providing acutely needed water infrastructure that was greatly important to the communities it served. The South Bay Aqueduct was initiated in 1958 and completed by 1969. The period of significance for the SWP is 1959 to 1974, the years of construction for the first phase.

As discussed in detail in Section 4.3 Historic Development of the South Bay Aqueduct, the South Bay Aqueduct is representative of two significant "firsts" within the SWP: the construction and implementation of the State Water Project (1959-1974), and its role as the first completed component of the SWP and the first to make water deliveries, providing acutely needed water infrastructure important to the communities it served. As such, the South Bay Aqueduct is individually eligible for its significance under NRHP/CRHR Criterion A/1 as a key component of the SWP system.

Criterion B/2: That are associated with the lives of persons significant in our past.

To be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. While the South Bay Aqueduct is tangentially related to important figures such as Governor Edmund G. Brown and DWR chief William E. Warne, it has no direct association to these figures and should not be considered the place where Brown or Warne produced the work they are known for. Archival research also failed to indicate direct association with any other individuals that are known to be historic figures at the national, state, or local level and the South Bay Aqueduct. As such, the South Bay Aqueduct is not known to have any historical associations with people important to the nation's or state's past. Due to a lack of identified significant associations with important persons in history, the South Bay Aqueduct is not eligible under NRHP/CRHR Criterion B/2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

The South Bay Aqueduct is important for its role within the SWP, one of the most ambitious and extensive engineering projects in the State of California. The SWP features 34 storage facilities, 20 pumping plants, 4 pumping-generating plants, 5 hydroelectric power plants, and over 700 miles of open canals and pipelines. The South Bay Aqueduct comprises 121 miles of SWP's conveyance systems, as well as three of its storage facilities and two pumping plants. The South Bay Aqueduct is also important for its role as the conveyance system where designs were first tested; the results of these tests were later applied to the remainder of the SWP conveyance systems based on their engineering success and economic feasibility. Because construction of the South Bay Aqueduct was designed in 1958, partially complete by 1962, and effectively complete by 1965, design problems were solved on the smaller South Bay Aqueduct before they were applied to the California Aqueduct. The South Bay Aqueduct is where the SWP tested the side wall-slope ratio, thickness of concrete lining, and material types for the fill structure beneath the aqueduct, based on material experiments and material failures (leaks) along the different reaches and canal segments of the aqueduct. The South Bay Aqueduct is also one of the only large-scale conveyance systems in the SWP that uses extensive pipelines and tunnels, which were later abandoned for the open-air, trapezoidal-shaped canals, as that design was more economical than tunnels or pipelines. Though open-air canals were the preferred design for larger SWP structures like the California Aqueduct, the South Bay Aqueduct embodies three types of water conveyance construction in the SWP with various open-air canals, concrete tunnels, and pipelines along its length.

Therefore, the South Bay Aqueduct is eligible as a component of the SWP for its significance under NRHP/CRHR Criterion C/3 for its innovative engineering and design values, as the pilot design for the SWP's water conveyance systems, and for acting as the test laboratory for conveyance system designs, lining materials, and other design components before they were implemented across the entire SWP.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

The South Bay Aqueduct is not significant as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies. Therefore, the South Bay Aqueduct is not eligible under NRHP/CRHR Criterion D/4.

CONTINUATION SHEET

Property Name: South Bay Aqueduct

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UPDATE FORM

Integrity Discussion

The South Bay Aqueduct segments recorded for this project retain sufficient integrity to convey their associative significance under Criteria A/1 and C/3. It retains integrity of location and is in its original alignment, which is one of the critical aspects of integrity required to convey significance. The aqueduct also largely retains its integrity of setting. While some sections of the South Bay Aqueduct are underground as tunnels and pipelines, where visible as an aboveground canal, it was originally located outside of dense urban areas; and located among the rolling hills and suburban or agricultural settings it was originally developed in. Though there have been several repairs and an expansion project for the South Bay Aqueduct, it still retains the basic aspects of its original design. Of the two segments of the Aqueduct examined in this report, the Patterson Reservoir section of the project APE retains the character-defining features of the original South Bay Aqueduct design. Integrity of design and setting are diminished by the presence of the newly constructed Dyer Reservoir and within the Dyer Reservoir APE. However, when understood that the aboveground canal sections are dozens of miles long and largely retain their integrity and that the entire resource is 121 miles long and largely retains its integrity, the impact to the setting and changes to the design of the aqueduct by Dyer Reservoir are contextualized as less impactful. Integrity of materials and workmanship are retained, as the original materials and construction techniques are still visible in this segment of the South Bay Aqueduct and any material replacement or repair has been done with in-kind materials and is indistinguishable from historic-age fabric. The South Bay Aqueduct is able to convey the feeling of a twentieth century public works project completed at a massive scale and can still convey a sense of the time and space in which it was constructed, especially within the Project APE. Finally, the segment retains integrity of association as it retains its association with its role as the location of the first water deliveries to contractors in the SWP, association with the original DWR designers and operators, and historical associations with the SWP as a whole as a component of the first conveyance system in the SWP. The South Bay Aqueduct, therefore, retains the requisite level of integrity to convey significance under Criterion A/1 and C/3.

Character Defining Features

The character defining features of the South Bay Aqueduct are limited to:

- Continued function as a water management and delivery structure within the larger SWP system,
- Original 1958-1969 alignment,
- Variety of conveyance design types: Open-air, trapezoidal, concrete-lined canals; metal pipeline; and reinforced concrete tunnel segments, and
- Originally constructed ancillary features such as overchutes, culverts, and ladder features constructed as part of the unifying design of the SWP project (1959 to 1974).

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METADATA SHEET

P-01-011603

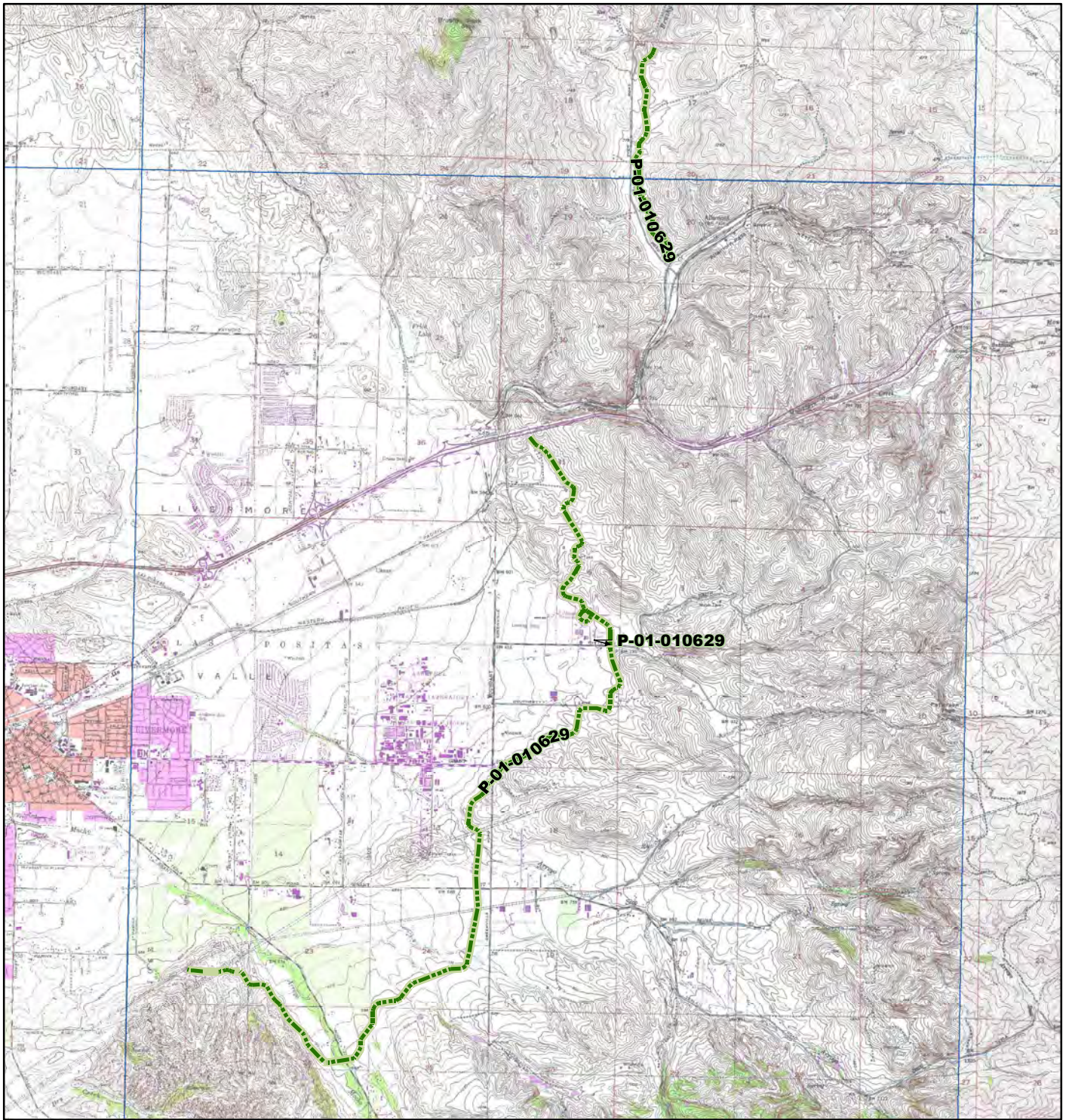
Prior to March and April of 2006, recording events 'c' and 'd' of P-01-010629 (South Bay Aqueduct) were assigned individually to P-01-001770 and P-01-0010772. At this time, these resources were all subsumed under P-01-0010629 (Livermore Valley Canal Bridge).

This is likely due to the depiction of 7 bridges and 3 canals on the location map of recording event 'b' of P-01-010629. The locations of these associated resources are provided in the location map for context and are not meant to be included as part of the Livermore Valley Canal Bridge.

On November 30, 2015 recording events 'c' and 'd' have been removed from P-01-010629 and assigned the designation P-01-011603 as recording events 'a' and 'b' of that Primary record. All unrelated NWIC GIS features have been removed.

Date: November 30, 2015
NWIC Staff: C. Mikulik

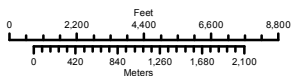
P-01-010629
and
P-01-011603



Northwest Information Center

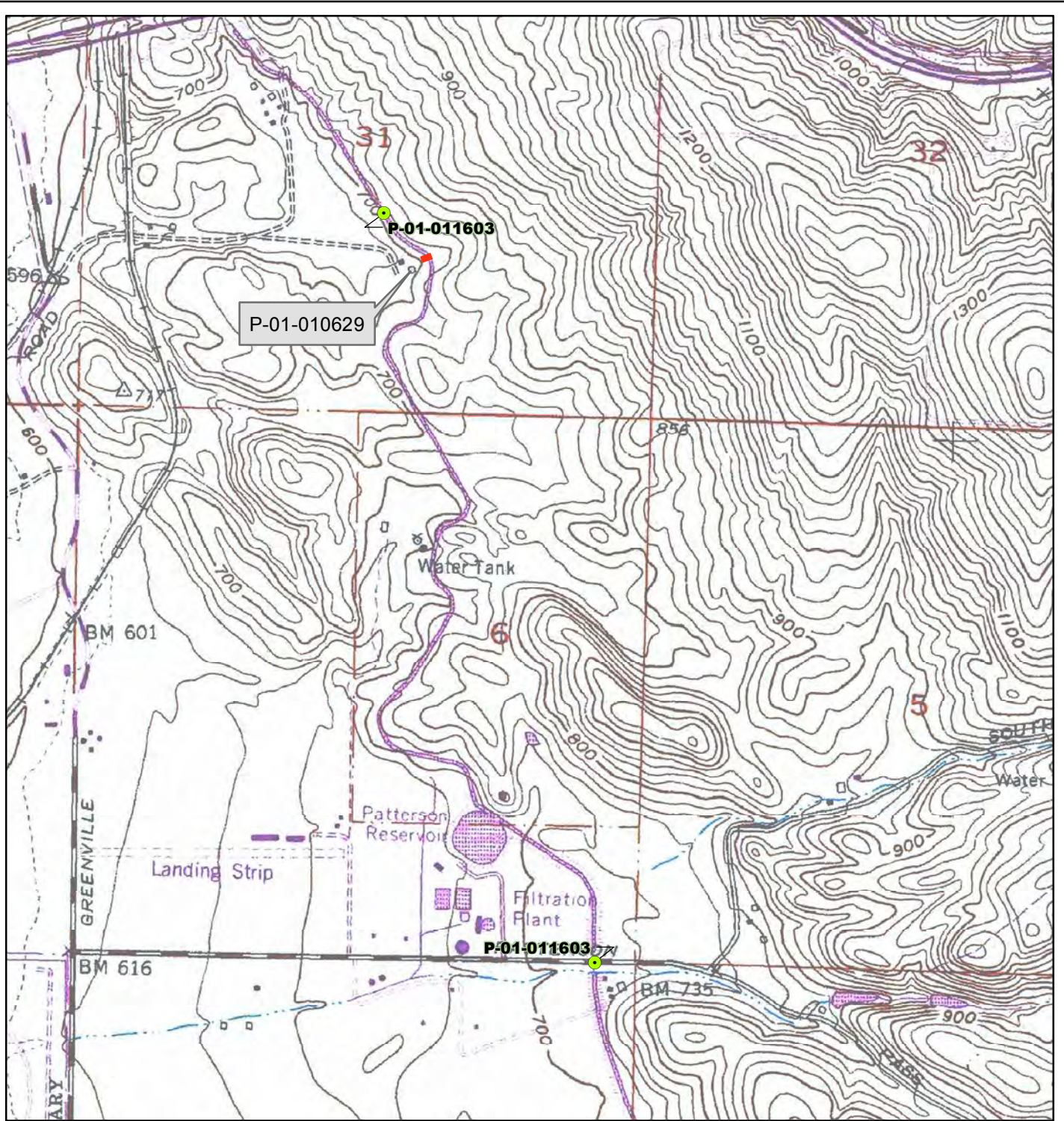
November 30 2015 C. Mikulik

May depict confidential cultural resource locations.
Do not distribute.



Byron Hot Springs
and Altamont
7.5' USGS Quads

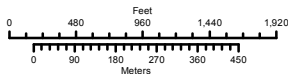
Location of P-01-010629 as depicted in the NWIC database
prior to November 30, 2015.



Northwest Information Center

November 30 2015 C. Mikulik

May depict confidential cultural resource locations.
Do not distribute.



Altamont
7.5' USGS Quads

Locations of P-01-010629 and P-01-011603
as depicted in the NWIC database after
November 30, 2015.

SITE NAME: South Bay Aqueduct, Alameda County

SITE NUMBER: SBA-1

QUAD SHEET: "Altamont Quadrangle," USGS: 1953, photorevised 1981

PIPELINE LOCATION: Milepost 1.7 Altamont Alternative Route

(Altamont quad #4452 1953[81] UTM:Zone10;616520/4172530)

Description of Feature

Site SBA-1 is the point at which the APE for the proposed Mojave Pipeline Northward Expansion Project crosses the South Bay Aqueduct at Patterson Pass Road. The South Bay Aqueduct is a conduit operated by the State of California as part of the State Water Project [SWP] system (for a history of this system see Section 2.2 above). The South Bay Aqueduct runs from Bethany Reservoir, near Tracy, in a generally north - south alignment to the San Jose area. The first portion of the conduit, from the South Bay Pumping Plant at Bethany Reservoir to the south side of State Route 580, is piped underground. The next section, approximately 11 miles, is open canal, as it winds to a point southeast of Livermore where the aqueduct is piped for the rest of its length. Beginning west of Livermore, the aqueduct roughly parallels the south side of Highway 84, and then the east side of State Route 680, to the Warm Springs District. At this point the pipeline turns southeast toward San Jose and ends at the Santa Clara Terminal Facilities on Penitencia Creek (DWR 1969: 23). The total length (43.7 miles) of the South Bay Aqueduct includes 11.5 miles of canal, 30.6 miles of pipeline and 1.6 miles of tunnels (DWR 1965b: 40). Pumps lift water at two places along the aqueduct, one at Bethany Reservoir and the other at Lake Del Valle (DWR 1969: 14).

JRP recorded three points along the South Bay Aqueduct, SBA-1, SW-55 and SW-55(s). The APE for SBA-1 crosses the aqueduct very near the northern end of its only open canal portion. At SW-55 the proposed pipeline alignment crosses the aqueduct near a wooden bridge that spans the canal. The other recordation point [SW-55(s)] is where the aqueduct crosses under Greenville Road. Because of high water flowing in the canal JRP could not record its depth or bottom width, however, the approximate top width of the aqueduct at the recordation points is 30 feet.

History of Feature

The first phase of work on the SWP, including construction of the South Bay Aqueduct, took place from 1961 to 1972. The Department of Water Resources [DWR] built the aqueduct between 1961 and 1965, with the first deliveries of delta water to the Livermore Valley beginning in 1962. When this conduit, the first element of the SWP undertaken by the state, was completed it served the Alameda County Flood Control and Water Conservation District Zone 7, the Alameda County Water District, and the Santa Clara County Flood Control and Water District (DWR 1966: I-3; Cooper 1968: 244). By 1969 these three agencies had a combined annual entitlement of 188,000 acre-feet of water used "principally for municipal and industrial uses, and for some agricultural use" (DWR 1969: 4, 23).

b. d.

Evaluation of Feature

The South Bay Aqueduct does not appear to be eligible for listing in the National Register of Historic Places. Although it is a conduit of considerable importance to the local economies of Alameda and Santa Clara Counties, the South Bay Aqueduct is far less than 50 years old. Applying National Register guidelines to this property, it appears that the aqueduct is simply too young to warrant National Register listing.

As discussed in Section 2.2, the SWP, which includes the colossal California Aqueduct, represents one of the most ambitious public works projects undertaken by the State of California and rivals the CVP in its role in the state's water delivery system. [In raw numbers -- acre-feet stored and delivered, miles of canals, numbers of reservoirs, acres served, and so forth -- the CVP is a much larger system. The SWP serves a somewhat different purpose, supplying municipal industrial users as well as agricultural users.] In the absence of the 50-year exclusion, the South Bay Aqueduct would seem to be an obvious candidate for National Register listing, on the basis of its part in a system using bold engineering solutions and its role in the state's economy and society. In evaluating significance for the South Bay Aqueduct, however, it must be recognized that the canal is not only less than 50 years old, it is not yet 30 years old. With a property so young, the 50-years exclusion becomes a major consideration in assessing eligibility.

In addressing the 50 year exclusion, two considerations must be taken into account. First, National Register guidelines permit listing properties that have achieved significance within the last 50 years, provided these properties are "exceptionally" significant. Second, the same guidelines and regulations make a common sense distinction between properties which are nearly 50 years old and those which are much younger. The guidelines observe:

Correspondingly, the more recently a property has achieved significance, the more justification will be required to demonstrate its value as an exceptionally important historic resource in the field architecture, history, archeology, or culture. A property listed 10 or 15 years after it has achieved significance requires clear, widespread recognition of its importance while a property that has been significant for almost 50 years can more easily be justified as exceptionally significant in a more limited context. (Keeper of the National Register, 1979: 3)

The South Bay Aqueduct was constructed between 1961 and 1965, but the conduit began delivery to some areas as early as 1962. However, it could not be fully operational until Oroville Dam, the key storage facility for the system, was completed in the early 1970s. The system, then, was fully completed some time between 20 and 25 years ago.

In applying the National Register guidelines to this property, one must ultimately balance significance against age, recognizing that an increasingly higher degree of significance must be established that is inversely proportional to the property's age. Unfortunately, National Register guidelines offer no clear formula for striking this balance. The only clear guidance is that quoted earlier, stating the requirement that very young properties must be shown to possess a very high degree of significance.

In the absence of other guidance, one must conclude that the Keeper of the National Register intended to list very few properties that achieved significance in very recent years. Certainly, a few properties from the 1960s and 1970s have been so listed. These properties tend to be

b. d.

National Historic Landmarks, associated with events or trends of national significance. Several sites associated with the Man in Space program have been so listed as have a few of the works of the masters of the International Style of commercial and residential design. The guidelines and practices of the Keeper indicate, however, that very young properties should be listed sparingly.

Recognizing the language of the guidelines and the practices mentioned earlier, it would appear that the South Bay Aqueduct does not meet the eligibility criteria for listing in the National Register. The property should nonetheless be regarded as a sensitive resource, recognizing that there is no obvious point at which it may qualify for National Register listing. The canal would meet the criteria, for example, if it were 50 years old and probably if it were 40 years old. At some point in the not too distant future, the aqueduct will meet the criteria.

CANAL FEATURE INVENTORY FORM

Developed by JRP Historical Consulting Services

P-01-011603

~~P-01-001772~~

~~P-01-010629~~

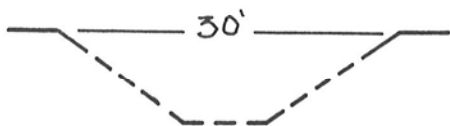
PROJECT: Mojave Natural Gas Pipeline, Northern Extension Project
MILEPOST: 1.7 Altamont Alternative

LOCATION NO: SBA-1
PHOTO DATE: April 17, 1994

1. **Name of Feature:** South Bay Aqueduct
2. **Location of recordation:** This site is where the aqueduct intersects Patterson Pass Road one half mile west of its junction with Flynn Road (**Photograph 1**).
3. **Other locations for recording this feature:** SW-55, SW-55(s)
4. **Structures at or near this location:** The aqueduct is siphoned under Patterson Pass Road.
5. **Setting at this location:** Pastures on rolling hills are located to the east, sloping generally downhill to the Livermore Valley on the west. There is a ranch complex to the southeast, and a water filtration plant to the northwest.
6. **Integrity considerations for this feature:** Site SBA-1 is completely intact and appears to be in its original condition. The aqueduct was built in the 1970s.
7. **Attributes at this location (measurements in feet):**

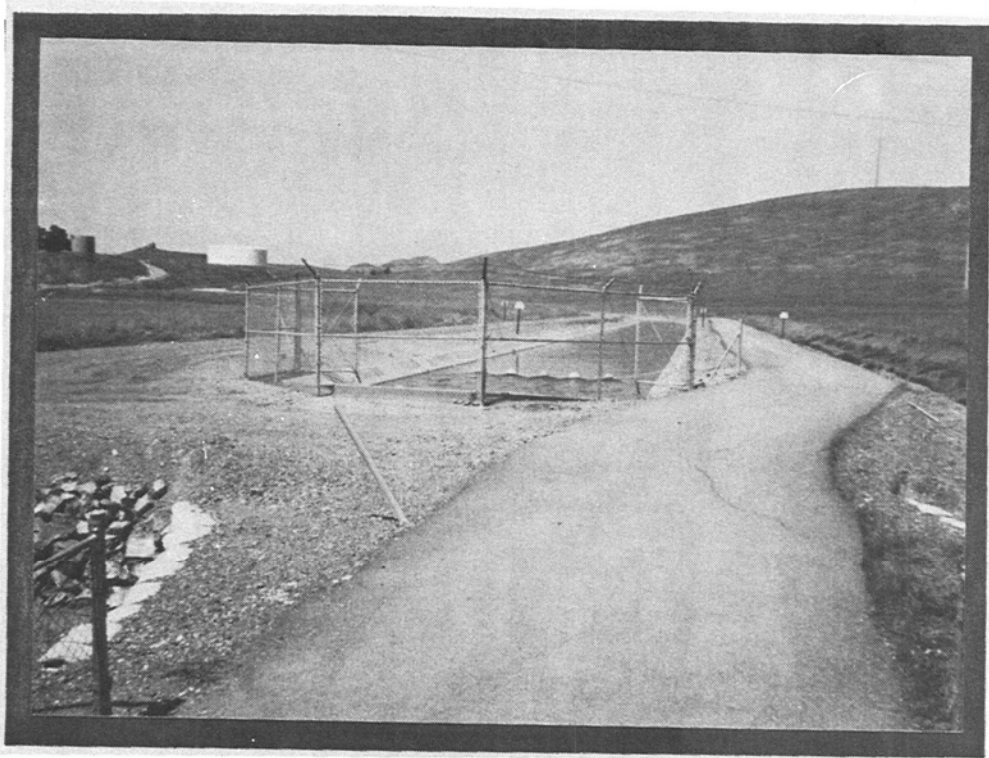
Top width: 30
Bottom width: Unable to measure -- canal full
Height or Depth: Unable to measure -- canal full
Material: Concrete lined

8. **Sketch, in cross section:** Looking north



b.
d.

Photograph Number: 1
Site Number: SBA-1
Common Name: South Bay Aqueduct



1

~~P-01-010620~~

~~P-01-001772~~

P-01-011603

R.
b.



SITE NAME: South Bay Aqueduct, Alameda County
SITE NUMBER: SBA-1
QUAD SHEET: "Altamont Quadrangle," USGS: 1953, photorevised 1981
PIPELINE LOCATION: MP 1.7 Altamont Alternative

b.
4.

P-01-010629

~~P-01-001770~~

Alameda

P-01-011603

SITE NAME: South Bay Aqueduct, San Joaquin County

SITE NUMBER: SW-55

QUAD SHEET: "Altamont Quadrangle," USGS: 1953, photorevised 1981

PIPELINE LOCATION: Milepost 245.9, Mainline

(Altamont quad #4452 1953[81] UTM: Zone 10; 615760/4174840; 615880/4174660)

Description of Feature

Site SW-55 is the point at which the APE for the proposed Mojave Pipeline Northward Expansion Project crosses the South Bay Aqueduct, a conduit operated by the State of California as part of the State Water Project [SWP] system (for a history of this system see Section 2.2 above). The South Bay Aqueduct runs from Bethany Reservoir, near Tracy, in a generally north - south alignment to the San Jose area. The first portion of the conduit, from the South Bay Pumping Plant at Bethany Reservoir to the south side of State Route 580, is piped underground. The next section, approximately 11 miles, is open canal, as it winds to a point southeast of Livermore where the aqueduct is piped for the rest of its length. Beginning west of Livermore, the aqueduct roughly parallels the south side of Highway 84, and then the east side of State Route 680, to the Warm Springs District. At this point the pipeline turns southeast toward San Jose and ends at the Santa Clara Terminal Facilities on Penitencia Creek (DWR 1969: 23). The total length (43.7 miles) of the South Bay Aqueduct includes 11.5 miles of canal, 30.6 miles of pipeline and 1.6 miles of tunnels (DWR 1965b: 40). Pumps lift water at two places along the aqueduct, one at Bethany Reservoir and the other at Lake Del Valle (DWR 1969: 14).

JRP recorded two points along the South Bay Aqueduct, SW-55 and SW-55(s). The APE crosses the aqueduct very near the northern end of its only open canal portion. The conduit is piped underground about 0.5 mile north of the APE, therefore, JRP recorded only a southern comparison point. At SW-55 the proposed pipeline alignment crosses the aqueduct near a wooden bridge that spans the canal; this is the only recordation point within the APE (**Photograph 1**). The other recordation point [SW-55(s)] is about 2.5 miles southwest of the APE where the aqueduct crosses under Greenville Road (**Photograph 2**). Because of high water flowing in the canal JRP could not record its depth or bottom width, however, the approximate top width of the aqueduct for both recordation points is 30 feet.

History of Feature

The first phase of work on the SWP, including construction of the South Bay Aqueduct, took place from 1961 to 1972. The Department of Water Resources [DWR] built the aqueduct between 1961 and 1965, with the first deliveries of delta water to the Livermore Valley beginning in 1962. When this conduit, the first element of the SWP undertaken by the state, was completed it served the Alameda County Flood Control and Water Conservation District Zone 7, the Alameda County Water District, and the Santa Clara County Flood Control and Water District (DWR 1966: I-3; Cooper 1968: 244). By 1969 these three agencies had a combined annual entitlement of 188,000 acre-feet of

U 2 1996

S#17993

water used "principally for municipal and industrial uses, and for some agricultural use" (DWR 1969: 4, 23).

Evaluation of Feature

The South Bay Aqueduct does not appear to be eligible for listing in the National Register of Historic Places. Although it is a conduit of considerable importance to the local economies of Alameda and Santa Clara Counties, the South Bay Aqueduct is far less than 50 years old. Applying National Register guidelines to this property, it appears that the aqueduct is simply too young to warrant National Register listing.

As discussed in Section 2.2, the SWP, which includes the colossal California Aqueduct, represents one of the most ambitious public works projects undertaken by the State of California and rivals the CVP in its role in the state's water delivery system. [In raw numbers -- acre-feet stored and delivered, miles of canals, numbers of reservoirs, acres served, and so forth -- the CVP is a much larger system. The SWP serves a somewhat different purpose, supplying municipal-industrial users as well as agricultural users.] In the absence of the 50-year exclusion, the South Bay Aqueduct would seem to be an obvious candidate for National Register listing, on the basis of its part in a system using bold engineering solutions and its role in the state's economy and society. In evaluating significance for the South Bay Aqueduct, however, it must be recognized that the canal is not only less than 50 years old, it is not yet 30 years old. With a property so young, the 50-years exclusion becomes a major consideration in assessing eligibility.

In addressing the 50 year exclusion, two considerations must be taken into account. First, National Register guidelines permit listing properties that have achieved significance within the last 50 years, provided these properties are "exceptionally" significant. Second, the same guidelines and regulations make a common sense distinction between properties which are nearly 50 years old and those which are much younger. The guidelines observe:

Correspondingly, the more recently a property has achieved significance, the more justification will be required to demonstrate its value as an exceptionally important historic resource in the field architecture, history, archeology, or culture. A property listed 10 or 15 years after it has achieved significance requires clear, widespread recognition of its importance while a property that has been significant for almost 50 years can more easily be justified as exceptionally significant in a more limited context. (Keeper of the National Register, 1979: 3)

The South Bay Aqueduct was constructed between 1961 and 1965, but the conduit began delivery to some areas as early as 1962. However, it could not be fully operational until Oroville Dam, the key storage facility for the system, was completed in the early 1970s. The system, then, was fully completed some time between 20 and 25 years ago.

In applying the National Register guidelines to this property, one must ultimately balance significance against age, recognizing that an increasingly higher degree of significance

e. a.

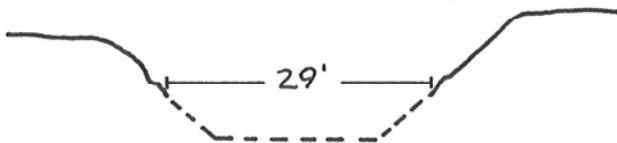
must be established that is inversely proportional to the property's age. Unfortunately, National Register guidelines offer no clear formula for striking this balance. The only clear guidance is that quoted earlier, stating the requirement that very young properties must be shown to possess a very high degree of significance.

In the absence of other guidance, one must conclude that the Keeper of the National Register intended to list very few properties that achieved significance in very recent years. Certainly, a few properties from the 1960s and 1970s have been so listed. These properties tend to be National Historic Landmarks, associated with events or trends of national significance. Several sites associated with the Man in Space program have been so listed as have a few of the works of the masters of the International Style of commercial and residential design. The guidelines and practices of the Keeper indicate, however, that very young properties should be listed sparingly.

Recognizing the language of the guidelines and the practices mentioned earlier, it would appear that the South Bay Aqueduct does not meet the eligibility criteria for listing in the National Register. The property should nonetheless be regarded as a sensitive resource, recognizing that there is no obvious point at which it may qualify for National Register listing. The canal would meet the criteria, for example, if it were 50 years old and probably if it were 40 years old. At some point in the not too distant future, the aqueduct will meet the criteria.

CANAL FEATURE INVENTORY FORM

Developed by JRP Historical Consulting Services

~~P-01-010629~~**PROJECT:** Mojave Natural Gas Pipeline, Northern Extension Project**MILEPOST:** 245.9, Mainline**LOCATION NO:** SW-55**PHOTO DATE:** August 10, 1993**1. Name of Feature:** South Bay Aqueduct**2. Location of recordation:** Where the proposed gas pipeline intersects with the South Bay Aqueduct, approximately 0.7 mile east of Greenville Road and 0.5 mile south of State Route 580, on the Christensen A-C Ranch.**3. Other locations for recording this feature:** SW-55(s)**4. Structures at or near this location:** The proposed gas pipeline alignment crosses the aqueduct diagonally, just south of the northwest corner of a wooden bridge which spans the aqueduct at this point. A road from the Christensen ranch leads to the bridge, which sits on wooden pilings, and provides access to range land east of the canal. About 60 feet south of the bridge, a water pipe spans the aqueduct. A gravel road parallels the west side of the aqueduct, while a small dirt road runs along the aqueduct's east side.**5. Setting at this location:** The range lands of the Christensen A-C Ranch surround the site, the ranch and outbuildings are approximately 0.3 miles to the northwest.**6. Integrity considerations for this feature:** The aqueduct was constructed as part of the State Water Plan and was completed to terminus in 1965.**7. Attributes at this location (measurements in feet):****Top width:** 29**Bottom width:** Unable to observe due to high flows**Height or Depth:** Unable to observe due to high flows**Material:** Concrete**8. Sketch, in cross section:** Looking northa.
e.

P-01-011003

~~P-01-001770~~

CANAL FEATURE INVENTORY FORM 1-011003

Developed by JRP Historical Consulting Services

~~P-01-010629~~

PROJECT: Mojave Natural Gas Pipeline, Northern Extension Project
MILEPOST: N/A

LOCATION NO: SW-55(s)
PHOTO DATE: August 10, 1993

1. **Name of Feature:** South Bay Aqueduct
2. **Location of recordation:** Where the aqueduct crosses under Greenville Road, 0.1 mile south of East Avenue, and 2.5 miles southwest of the APE.
3. **Other locations for recording this feature:** SW-55
4. **Structures at or near this location:** A concrete bridge carries Greenville Road traffic over the fenced-off aqueduct. There is a gravel access road that parallels the aqueduct's north side.
5. **Setting at this location:** To the northwest is open land, with the Lawrence Livermore Nuclear Laboratory beyond. East of Greenville Road, on either side of the aqueduct, is pasture land.
6. **Integrity considerations for this feature:** The aqueduct was constructed as part of the State Water Plan and was completed to terminus in 1965.
7. **Attributes at this location (measurements in feet):**

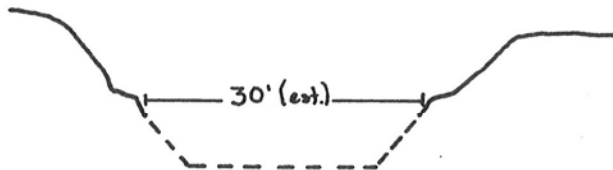
Top width: 30 (estimated measurement taken from the bridge -- canal fenced off)

Bottom width: Unable to observe due to high flows

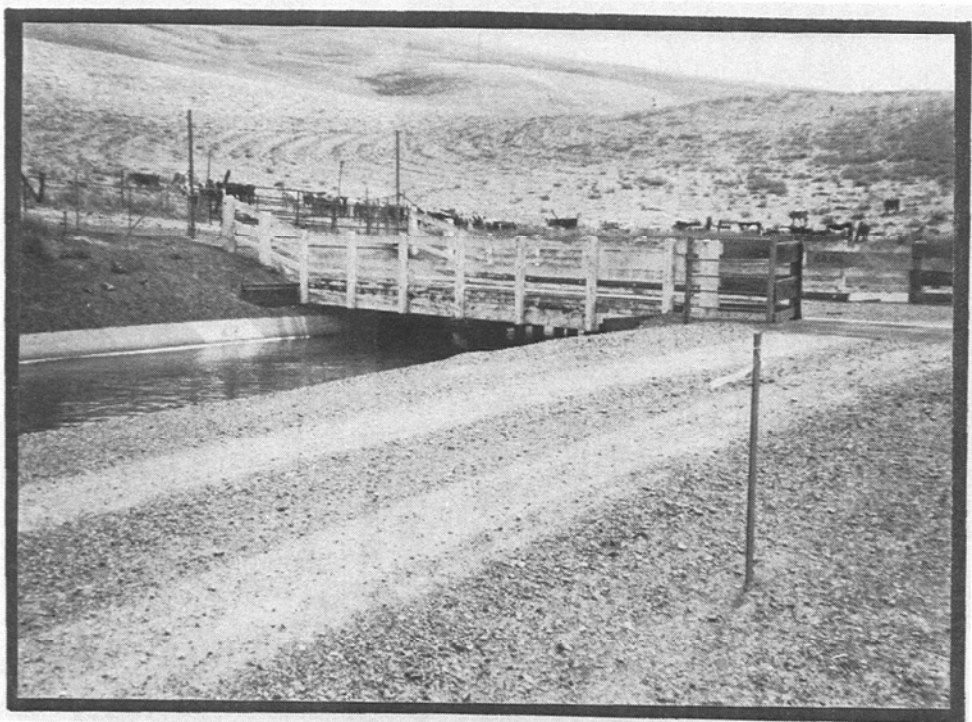
Height or Depth: Unable to observe due to high flows

Material: Concrete

8. **Sketch, in cross section:** Looking west

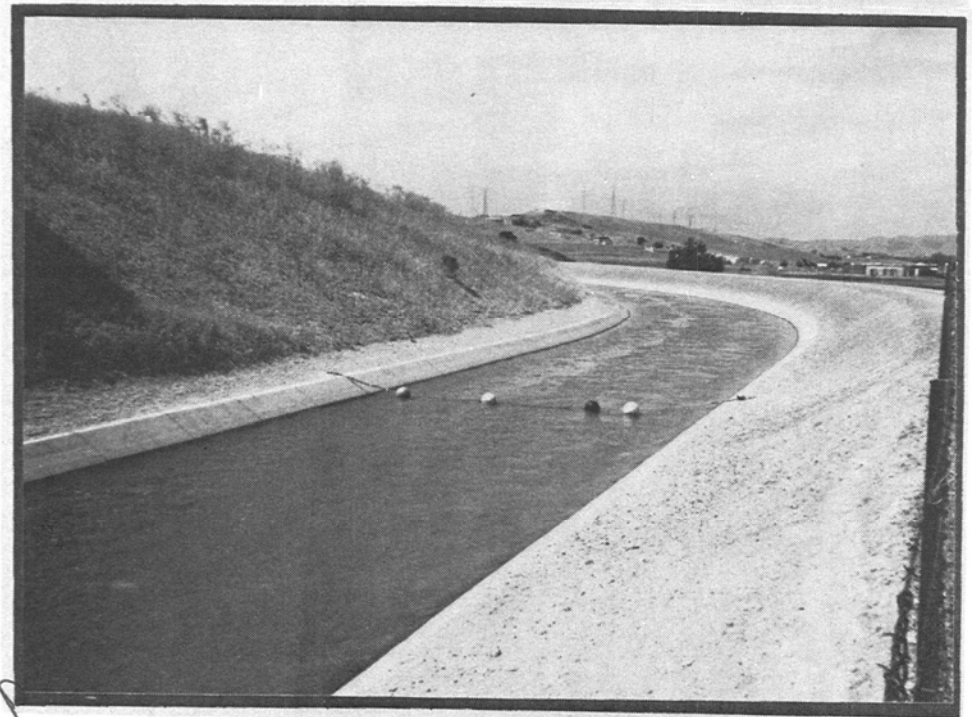


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1

Photograph Number: 1
Site Number: SW-55
Common Name: South Bay Aqueduct
Camera Facing: East



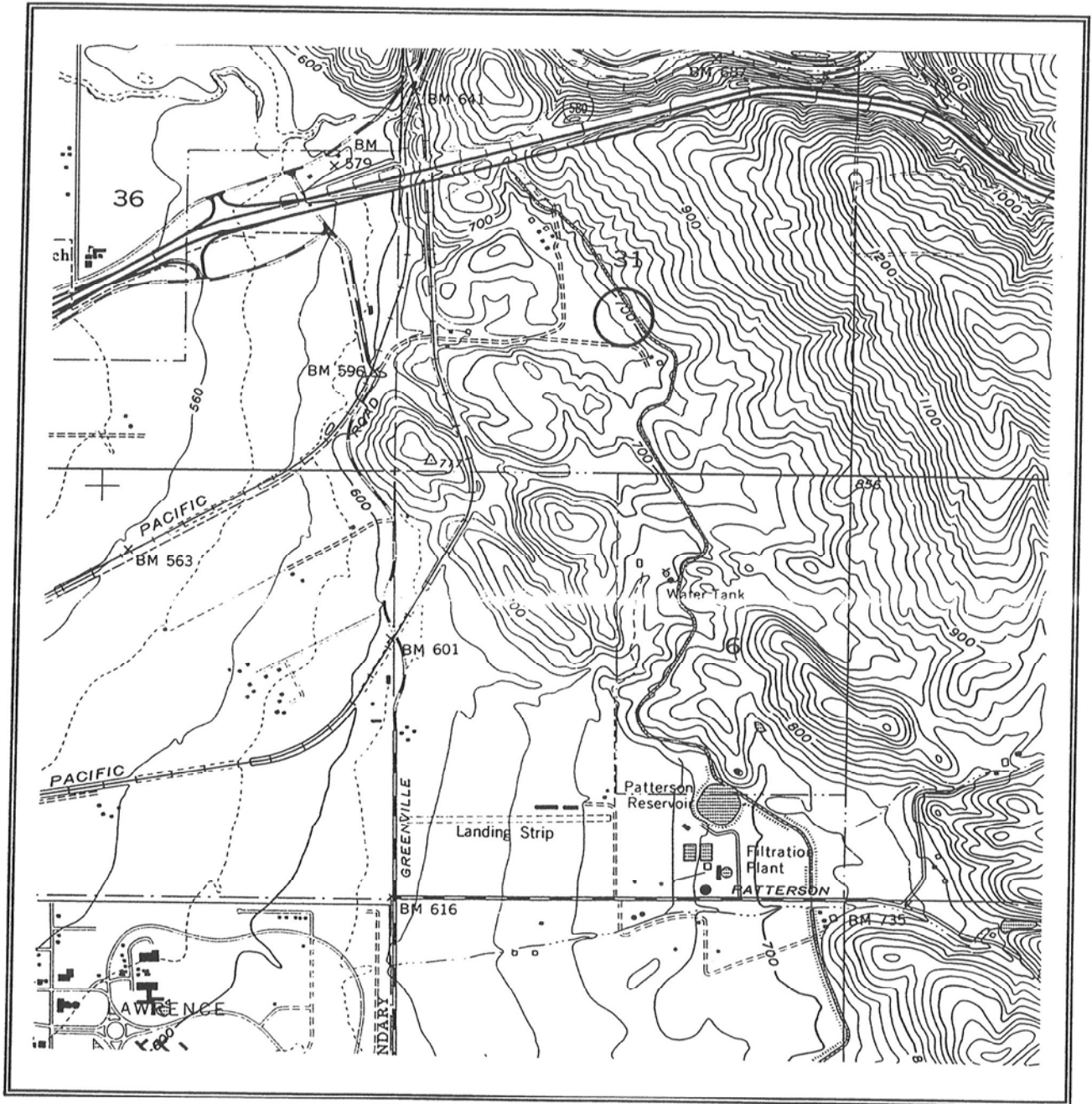
2

Photograph Number: 2
Site Number: SW-55
Common Name: South Bay Aqueduct
Camera Facing: West

~~P-01-010629~~

P-01-011603

~~P-01-001770~~



SITE NAME: South Bay Aqueduct, San Joaquin County

SITE NUMBER: SW-55

QUAD SHEET: "Altamont Quadrangle," USGS: 1953, photorevised 1981

PIPELINE LOCATION: Milepost 245.9, Mainline

g.
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P-01-011003

~~P-01-001770~~

~~P-01-010629~~

**FEATURE SW-55, REROUTE A-32
ADDENDUM TO HISTORIC FEATURE EVALUATION FORM**

ALT #	A-32
ORIGINAL SITE #	SW-55
SEGMENT	Mainline
MILEPOSTS	245.9
QUAD NO., NAME	41, Altamont (1953/1981)

COMMENTS:

The original alignment at SW-55, the South Bay Aqueduct, passed to the north approximately 1.2 miles from where the Alternate Route crosses the aqueduct at the junction of Patterson Pass Road with the canal. JRP field crews recorded this new location on April 16, 1994. This site form, with evaluation, can be found as an attachment to the main report, as Site SBA-1. (see Site Form SW-51 in main body of Class III Report)

a.

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State of California & The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 3S, 3CS

Other Listings
Review Code

Reviewer

Date

Page 1 of 13 *Resource Name or #: (Assigned by recorder) Patterson Reservoir

P1. Other Identifier: _____

*P2. Location: Not for Publication Unrestricted

*a. County Alameda and (P2c, P2e, and P2b or P2d. Attach a Location Map as necessary.)

*b. USGS 7.5' Quad Altamont, Calif. Date 2015 T 03S ; R 03E ; NW ¼ of SW ¼ of Sec 06; MD B.M.

c. Address 8750 Patterson Pass Road City Livermore Zip 94550

d. UTM: (Give more than one for large and/or linear resources) Zone 10S, 616069.9 mE/ 4173077.1 mN

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, decimal degrees, etc., as appropriate)

Patterson Reservoir is located about 4 miles east of Livermore, California, on the east side of Livermore Valley. Patterson Reservoir is a 104-acre-foot off-stream storage facility along the South Bay Aqueduct at the terminus of the Livermore Valley Canal. This reservoir, which was constructed between 1960 and 1962, provides off-line storage for the Zone 7 Water Agency (Zone 7) Patterson Pass Water Treatment Plant. Water enters the reservoir by flowing over a 175-foot-long reinforced concrete ogee-crest weir from the adjoining South Bay Aqueduct. Assessor Parcel Number (APN) 99B-5600-7; Elevation: 713 amsl; Decimal Degrees: 37.6975449°, -121.68331498829583°

*P3a. Description: (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)

(See Continuation Sheet)

*P3b. Resource Attributes: (List attributes and codes) HP22 – Lake, River, Reservoir

*P4. Resources Present: Building Structure Object Site District Element of District Other (Isolates, etc.)

P5a. Photograph or Drawing (Photograph required for buildings, structures, and objects.)



P5b. Description of Photo: (view, date, accession #) View of Patterson Reservoir shoreline, looking south (IMG 4160)

*P6. Date Constructed/Age and Source: Historic Prehistoric
 Both 1962 (DWR 1974c)

*P7. Owner and Address:
Department of Water Resources
1416 Ninth Street, Room 604
Sacramento, CA 95814

*P8. Recorded by: (Name, affiliation, and address) Kate Kaiser,
MSHP, Architectural Historian,
Dudek, 38 N. Marengo Avenue
Pasadena, CA 91101

*P9. Date Recorded: 3/15/2021

*P10. Survey Type: (Describe)
intensive level survey

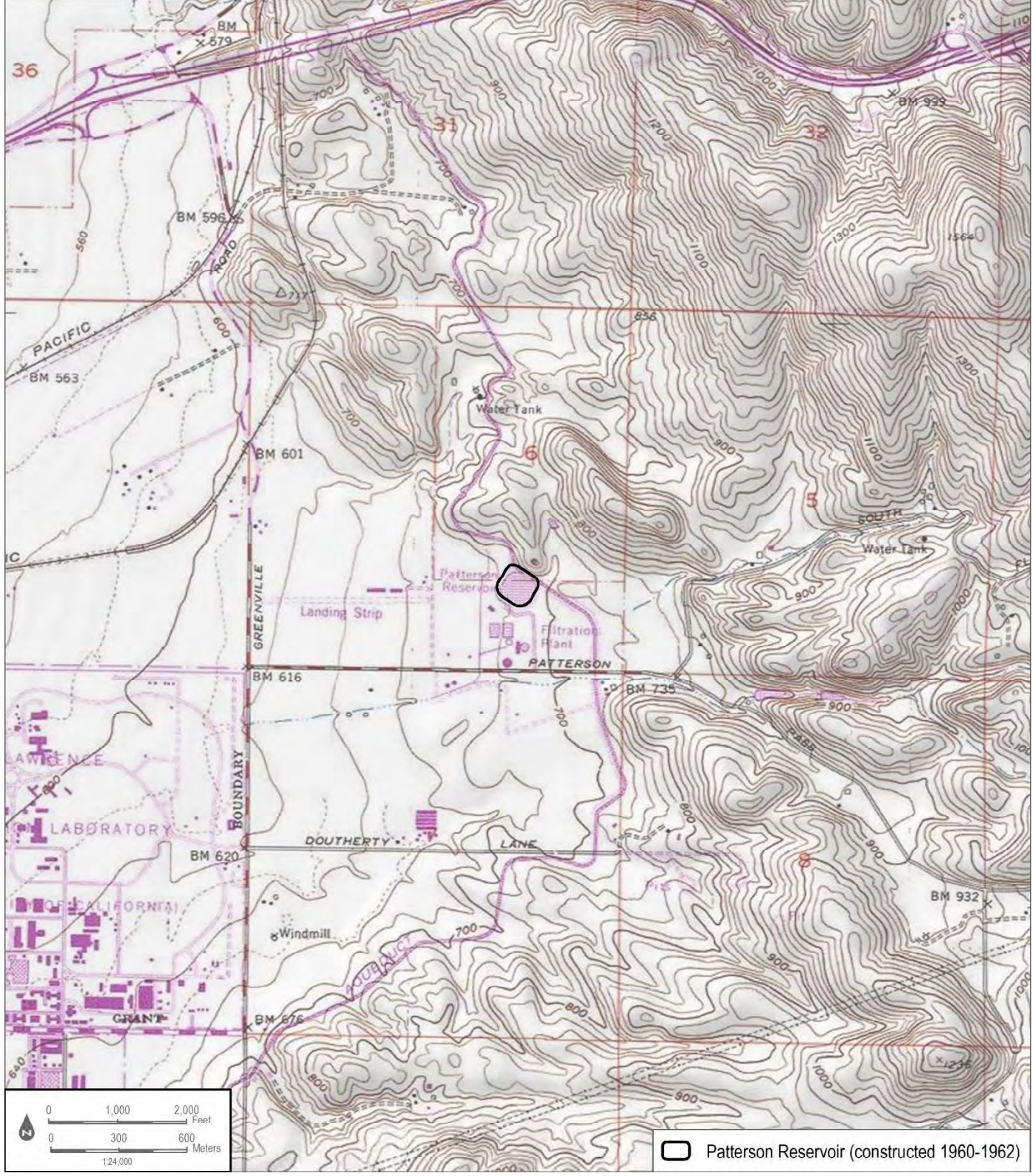
*P11. Report Citation: (Cite survey report and other sources, or enter "none.")
Kaiser, K. K. Haley. 2021. Built Environment Inventory and Evaluation Report for the Delta Dams Rodent

Burrow Remediation Project at Dyer Reservoir and Dam and Patterson Reservoir and Dam, Alameda County, California, Prepared by Dudek for DWR, April 2021

*Attachments: NONE Location Map Continuation Sheet Building, Structure, and Object Record
 Archaeological Record District Record Linear Feature Record Milling Station Record Rock Art Record
 Artifact Record Photograph Record Other (List): _____



Page 2 of 13 *Resource Name or # (Assigned by recorder) Patterson Reservoir
*Map Name: Altamont, Calif. *Scale: 1:24,000 *Date of map: 2015



BUILDING, STRUCTURE, AND OBJECT RECORD

*Resource Name or # (Assigned by recorder) Patterson Reservoir *NRHP Status Code 3S, 3CS
Page 3 of 13

B1. Historic Name: Patterson Reservoir
B2. Common Name: Patterson Reservoir
B3. Original Use: regulatory storage for the South Bay Aqueduct ; and water delivery point for Alameda County Flood Control and Water Conservation District
B4. Present Use: regulatory storage and water delivery point

*B5. Architectural Style: utilitarian

*B6. Construction History: (Construction date, alterations, and date of alterations)

1958 – South Bay Aqueduct designed, exploratory excavations begins, construction begins
1960 – Construction of Patterson Reservoir begins
1962 – South Bay Aqueduct segment from Surge Tank to Patterson Reservoir completed (includes Brushy Creek Pipeline, Dyer Canal, Altamont Pipeline, and Livermore Canal segments)
1964 – repairs made to Patterson Reservoir liner
1965 – remainder of South Bay Aqueduct completed
1980 – repair to Patterson Reservoir after earthquake
2009-2015 – Patterson Reservoir refurbished and liner raised

*B7. Moved? No Yes Unknown Date: _____ Original Location: _____

*B8. Related Features: P-01-011603 South Bay Aqueduct

B9a. Architect: California Department of Water Resources b. Builder: Case-Hood

*B10. Significance: Theme Water Development and Supply in California Area Engineering
Period of Significance 1958-1969 Property Type Reservoir Applicable Criteria A/1
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

Patterson Reservoir is eligible under Criteria A/1 as a component of the South Bay Aqueduct, however it does not rise to the level of individual significance and should instead be considered within the context of the overarching South Bay Aqueduct system. The Patterson Reservoir is an operational and regulatory component of the South Bay Aqueduct and shares the same historical and design contexts. Patterson Reservoir, constructed 1960-1962, falls within the period of significance for the South Bay Aqueduct, 1958-1969.

Historical Context of Patterson Reservoir

Planning the South Bay Aqueduct and Related Facilities

San Francisco and the Bay Area cities were some of the first in the state to secure their own municipal water from non-local sources. In 1914, the City of San Francisco began construction on the Hetch Hetchy Aqueduct (1914-1934), which brought water from the Tuolumne River to the Bay. (See Continuation Sheet)

B11. Additional Resource Attributes: (List attributes and codes) _____

*B12. References: (See Continuation Sheet)

B13. Remarks:

*B14. Evaluator: Kate Kaiser, MSHP

*Date of Evaluation: 03/15/2020

(This space reserved for official comments.)



CONTINUATION SHEET

Property Name: Patterson Reservoir

Page 4 of 13

P3a. Description (Continued) :

Patterson Reservoir was constructed between 1960 and 1962 as part of the first reach (Surge Tank to Patterson Reservoir) of the South Bay Aqueduct (Figures 3-7). Patterson Reservoir was designed by engineers at DWR and built by Case-Hood Company contractors. The reservoir is relatively small compared with others in the SWP system, only 100 acre-feet capacity, and serves as emergency storage, regulatory storage, and a water delivery point to SWP water contractor Alameda County Flood Control and Water Conservation District.

The reservoir embankment perimeter height is 712.50 feet amsl and the canal-side embankment is 708.72 feet amsl. The Inboard side slopes are at a 2:1 ration and the embankment crest is 15 feet wide, around the entire perimeter. The reservoir basin is sloped from north to south to promote drainage through a 12-inch concrete drain line which is controlled with a 12-inch plug valve. Aqueduct water enters the reservoir on the north side through a 175-foot long concrete-lined weir. The entire reservoir from embankment crest to embankment crest measures 500 feet NW-SE and 475 feet SW-NE. The average depth of the of the reservoir is 29 feet.



Figure 3. Patterson Reservoir, view looking southeast (IMG_4158)

CONTINUATION SHEET

Property Name: Patterson Reservoir

Page 5 of 13



Figure 4. Patterson Reservoir, view looking south (IMG_4159)



Figure 5. Dyer segment near Dyer Reservoir, view looking northeast (IMG_4119)

CONTINUATION SHEET

Property Name: Patterson Reservoir

Page 6 of 13



Figure 6. Patterson Reservoir, view looking southeast (IMG_4146)



Figure 7. Patterson Reservoir, view looking east (IMG_4152)

B10. Significance (Continued):

CONTINUATION SHEET

Property Name: Patterson Reservoir

Page 7 of 13

In 1923, Oakland and nine other East Bay cities formed the East Bay Municipal Utility District in 1923 and built The Mokelumne Aqueduct (1924-1928) from the Pardee Reservoir to the Bay. However, the south bay cities and agricultural producers in Alameda and Contra Costa Counties, near the Delta, were unaccounted for (EBMUD 1932: 3-4; JRP and Caltrans 2000, p. 73).

Attempting to make up for the deficiencies in water distribution, State Engineer Edward Hyatt presented the State Water Plan to the California Legislature in 1931. Hyatt's plan called for aqueducts, canals, and conduits to transport water from Northern California to the Sacramento and San Joaquin Valleys, and included provision for the Contra Costa Conduit, which was one of the 1931 State Water Plan units proposed for immediate development and was to serve the industrial and agricultural areas along the south shore of Suisun Bay (Exhibit A). (DPW 1930, p. 44).

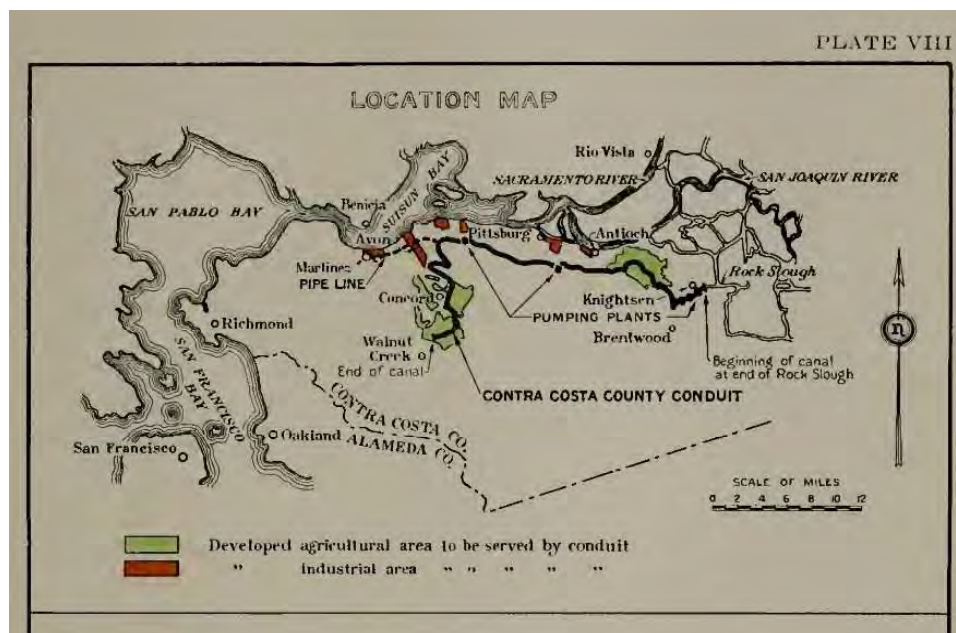


Exhibit A. Major Units of State Plan for development of water resources in California: Contra Costa Conduit (DPW 1930, Plate VII).

Hyatt's Plan was approved but fell through due to the state's inability to issue bonds during the Great Depression, but was revived in the Central Valley Project, one of President F.D. Roosevelt's emergency infrastructure programs. In the Central Valley Plan, the Contra Costa Canal was posed instead. This relatively small component of the Central Valley Project was to deliver water to industrial, agricultural and residential properties in Contra Costa County, and mitigate the effects of pumping water from the Delta. Construction on the 48-mile Contra Costa Canal began in 1937 but completion was delayed until 1948 (Herbert et al. 2004, p. 2-10--2-12; JRP and Caltrans 2000, p. 74).

The South Bay counties, however, continued to fall short of meeting its water needs and saltwater intrusion into the groundwater wells became a growing concern. The "South Bay Aqueduct," conceptually, was proposed as part of A.D. Edmonston's 1951 Feather River Project proposal. As discussed above in Section 4.4.2.3, the Feather River Project proposed a dam for the Feather River near Oroville, two powerplants, a Delta cross-channel, an electric transmission system, an aqueduct between the Delta and Santa Clara and Alameda Counties, and another aqueduct to Central and Southern California. The South Bay Aqueduct was included in the 1955 revisions to the Feather River Project and was authorized for construction in 1957 as part of the Feather River Project (DWR 1974a, p. 7-8, 46; Oakland Tribune 1956, pg. 1).

The route of the aqueduct was a point of some debate and was altered several times in the planning process. Nevertheless, design work and land acquisition for the South Bay Aqueduct began in 1958. Exploratory tests for the proposed tunnels began in summer 1958, officially kicking off the construction period for the South Bay Aqueduct. The project was briefly in danger in 1959, when the State Legislature considered abandoning all work on the South Bay Aqueduct, as a cost-saving measure, DWR, the South Bay Cities, and Governor Edmund G. Brown continued to advocate the South Bay Aqueduct, which was needed not only to serve growing South Bay cities, but to combat saltwater intrusion into groundwater wells. The State Legislature eventually funded the South Bay

CONTINUATION SHEET

Property Name: Patterson Reservoir

Page 8 of 13

Aqueduct in fall 1959, and construction bids for the first reach of the Aqueduct opened by October. The initial project work would encompass a 2-mile canal segment, a pumping plant and the Bethany Dam and Reservoir. On November 23, a groundbreaking ceremony for the South Bay Aqueduct project was given by Governor Brown and DWR officials (DWR 1974b, p. 41-44; LAT 1958, p. 31; Oakland Tribune 1958a, pg. 11; 1958b, pg. 19; 1959a, pg. 11; 1959b, pg. 1; 1959c, p. 29; 1959d, pg. 19; 1959e, pg. 9).

South Bay Aqueduct was already under construction, but it was also included in the SWP with the passage of the 1959 Burns-Porter Act, which specified it as "a South Bay aqueduct extending to terminal reservoirs in the Counties of Alameda and Santa Clara" (Water Code Sections 12934.d.2). Burns-Porter did not specifically provide for the construction of the Patterson Reservoir, or the pump stations and storage reservoirs along the South Bay Aqueduct which aid in its water delivery contracts and flow regulation. Still, as the South Bay Aqueduct was already underway specifying it in the Burns-Porter Act had no effect on the progress of construction (DWR 1974a, p. 46; Oakland Tribune 1961, pg. 12; Water Code Sections 12934.d.2).

Because the South Bay Aqueduct was designed before the California Aqueduct, South Bay Aqueduct was the location where a variety of water conveyance types were piloted, before the open-air, trapezoidal, concrete-lined canal was adopted for the California Aqueduct.

Construction of the Patterson Reservoir (1960-1962)

The South Bay Aqueduct was completed in phases, reach by reach, starting from the Bethany Reservoir. In 1960, DWR took bids for the Patterson Reservoir, the 2.4-mile Brushy Creek First-Stage Pipeline, the 2-mile Dyer Canal, the 2.3-mile Altamont Pipeline, and a

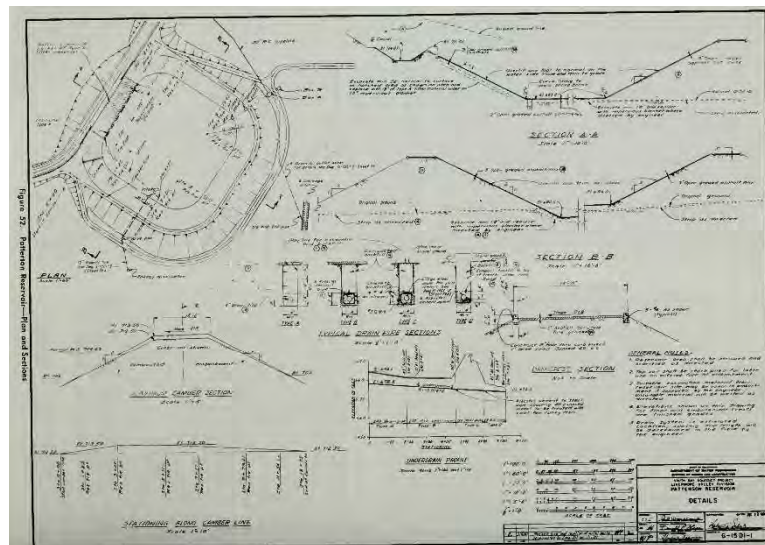


Exhibit B. Patterson Reservoir as-built sheets (DWR 1974b, p. 78).

1.8-mile portion of the Livermore Canal, constituting the first reach of the South Bay Aqueduct from the Surge Tank to Patterson Reservoir. Contractor Case-Hood (F.W. Case Corp., Hood Construction Co. Hood Northwest Pipeline Co. and Hood Flexible Pipe Cleaning Co.) from Chico won the contract for this reach as well as for the construction of Patterson Dam and Reservoir. The first reach contract included the construction of Brushy Creek Pipeline, Dyer Canal, and the Livermore Canal, and also included the construction of Patterson Reservoir (Exhibit B) (DWR 1974b, pg. 68; Oakland Tribune 1960a, p. 22; 1961, p. 12).

CONTINUATION SHEET

Property Name: Patterson Reservoir

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Exhibit C. Dedication ceremony at Patterson Reservoir, South Bay Aqueduct, 1962 (The Bancroft Library, University of California Berkeley).

When Case-Hood finished the work at Patterson Reservoir in 1962, the Surge Tank to Patterson Reservoir reach was complete. On May 10, 1962, Governor Brown again came out to dedicate the South Bay Aqueduct, this time celebrating the first water delivery, which was made from Patterson Reservoir to water contractor Alameda County Flood Control and Water Conservation District (Exhibit C). This was the first water delivery completed for the SWP. Contracts were let immediately after the dedication ceremony for the next segment of the South Bay Aqueduct, from Patterson Reservoir to Lake Del Valle. (DWR 1974, p. 79; Oakland Tribune 1962, p. 1; OMR 1962, p. 7.)

Finishing the South Bay Aqueduct (1962-1969)

Success was short-lived though as the Patterson Reservoir, upon being filled, immediately began to leak. The repair work began in 1964 and was completed by the end of the year. During repair construction, temporary earthen dams had to be placed on the South Bay Aqueduct above and below the Patterson Reservoir, and another 24-inch temporary pipeline was placed to make water deliveries in the meantime. Multiple repairs, additions, and secondary facilities, including a Second-Stage Pipeline from South Bay Pumping Plant to the Dyer Canal, were completed by contractors while construction of the South Bay Aqueduct continued (DWR 1974b, p. 79; Oakland Tribune 1964, p. 8).

While repairs to Patterson progressed, the next reach from Patterson Reservoir to Lake Del Valle was built in stages. The 6.9-mile Alameda Canal, which was constructed from August 1962 to August 1963 by contracting firm McGuire and Hester. The Alameda Canal was the last open-air trapezoidal canal in the South Bay Aqueduct. All facilities past the Alameda Canal were pipelines or tunnels. The next section before Lake Del Valle was the Del Valle Pipeline, which was completed along with the Sunol Pipeline in March 1965. These two pipelines, along with the La Costa and Mission Tunnel finished in 1964, form a pressure conveyance system to the Santa Clara Pipeline, the final segment before the Santa Clara Terminal Facilities. The Niles and Santa Clara Division Pipeline was complete by May 1965, concluding the Aqueduct conveyance component construction. Just a month later, the South Bay Aqueduct Terminal Facilities were completed in June 1965 by the Kaiser Steel Corporation. At this point, even without the completion of Lake Del Valle, the South Bay Aqueduct was operational and could make water deliveries to its three water contractors. The South Bay Aqueduct was officially dedicated on July 1, 1965 by Governor Brown, DWR Director William E. Warne, and other state officials (DWR 1974b, p. 68, 79-113; Oakland Tribune 1965, p. 19).

Construction still continued after the dedication. Lake Del Valle, a regulatory storage reservoir that also provided flood control, recreation and fish and wildlife enhancement benefits was still not complete. The final design of the Del Valle Dam was finally approved in 1964, and construction on the dam began in 1966, concluding in 1968. The Del Valle Branch pipeline, which connected the reservoir storage and pumping plants to the larger Aqueduct was complete by spring 1969 (DWR 1974b, p. 68; DWR 1974c, p. 242).

The South Bay Aqueduct required several repairs, corrections, and additions as construction went on, because of economic factors, and increasing water demands as construction went on. As one of the first components of the SWP to be complete enough to make water deliveries, once water districts and municipalities saw the South Bay Aqueduct's success, more groups wanted to secure their water contracts. Design changes to the South Bay Aqueduct include the two-stage construction of the Brushy Creek Pipeline, which added a second pipeline due to the demands once the first South Bay Aqueduct Reach became operational in 1962. Adjustments were also made to the Santa Clara Terminal Facilities, which were originally designed as a terminal dam and large reservoir, but had to be adjusted to a 2.5-million gallon steel tank and water treatment plant after geologic and seismic conditions were deemed too unfavorable for a large reservoir. The Doolan Branch Pipeline and reservoir were also added in 1966 make deliveries to southern Contra Costa County, and a tunnel extension under Highway 50 was complete by 1966 to connect the Doolan Pipeline to the Altamont Pipeline. In addition, additional support structures like pumps and checking structures had to be added at various points to the Aqueduct as needed when repairs or additional construction took place. More modifications were completed after Lake Del Valle went into operation in 1968 and continued through 1969. Overall, the South Bay Aqueduct Project was completed in stages, but officially concluded in 1969 (DWR 1974b, p. 44, 68, 79; Oakland Tribune 1964, p. 8).

CONTINUATION SHEET

Property Name: Patterson Reservoir

Page 10 of 13

South Bay Aqueduct was constructed from 1958 to 1969 and was the first aqueduct delivery system to be completed in the SWP, predating the completion of the California Aqueduct or the Delta Pumping Plant, as well as the first SWP project to make water deliveries to contract-holders, as early as 1962. Though all of the Aqueducts in the SWP generally follow the same design concepts and principles, the South Bay Aqueduct was designed prior to DWR's development of the general aqueduct design, and experiences from designing and constructing the South Bay Aqueduct were later applied to the larger California Aqueduct and the North Bay Aqueduct. Differences include experiments with various canal lining materials, various siphon and check structures, various pipeline materials and designs, and the placement and number of maintenance access roads (DWR 1974b, p. 41, 46-48).

South Bay Aqueduct Post-Construction and Expansion: 1969-2021



Exhibit D. Dyer Reservoir under construction, 2011 (DWR, N.D.)

The Patterson Reservoir, as well as segments of the South Bay Aqueduct, have been affected by earthquakes along the Calaveras fault multiple times throughout their lifespan, resulting in repairs, including in 1980, 1997 and 2001. Other improvements were to individual features of the South Bay Aqueduct, including for the South Bay Aqueduct Improvement and Enlargement Project from 2006-2015. This project restored the first 16.38 miles of the South Bay Aqueduct to originally designed flow rate of 300 cubic feet per second (cfs). Part of this enlargement was to add Dyer Reservoir, another regulating reservoir, to the South Bay Aqueduct. Construction of Dyer Reservoir was completed between 2008 and 2012 (Exhibit D). This project also enlarged the South Bay Pumping Plant, which concluded in 2014, and various modifications to Dyer Canal, Livermore Canal, Alameda Canal, and Del Valle Pipeline, such as linear raises and maintenance road repair. Notably, as part of this project, the lining and embankment for Patterson

Reservoir was also raised and refurbished in 2015 (DWR 2021; DWR 2019, p. 122; DWR 1974b, p. 79; NETR 2021; Oakland Tribune 1964, p. 8).

NRHP/CRHR Significance

The Patterson Reservoir is an operational and regulatory component of the South Bay Aqueduct and shares the same historical and design contexts. As a component of the South Bay Aqueduct, Patterson Reservoir cannot operate independently and should not be considered individually eligible or separate from the South Bay Aqueduct. Despite its age, Patterson Reservoir has never been evaluated. AS with the South Bay Aqueduct, Dudek followed the evaluation guidelines established in Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures, developed by JRP and Caltrans and published in December 2000 (JRP and Caltrans 2000, p. 92-97). Dudek also researched other components of the SWP that have already been evaluated (Oroville Facilities, in Herbert et al 2004) or determined significant (the California Aqueduct, in Donaldson 2012 and Ambacher 2011), to help craft the statement of significance. The following statement of significance evaluates the Patterson Reservoir in consideration of NRHP and CRHR designation criteria, integrity requirements, and these guidelines.

Criterion A/1: That are associated with events that have made a significant contribution to the broad patterns of our history.

As discussed in Section 4.3, Patterson Reservoir is a component of the South Bay Aqueduct (1958–1969), and as a component of the aqueduct, is associated with important, state-level events that have made a significant contribution to the broad patterns of our history—the construction and implementation of the SWP (1959–1974). For a water conveyance system “to be eligible under Criterion A, it must be found to be associated with specific important events (e.g., first long-distance transmission of hydroelectric power) or important patterns of events (e.g., development of irrigated farming)” (JRP and Caltrans 2000, p. 93). The construction of Patterson Reservoir, in its capacity as a component of the South Bay Aqueduct, is a significant first event in SWP’s history: the first water delivery to a contractor. Because the SWP was meant to be self-sufficiently funded by its own water and power sales, the 1962 water deliveries made from Patterson Reservoir also represent a significant event within the larger SWP context. The SWP is eligible under Criterion A/1 within its own right, because it profoundly altered the distribution of water across California, facilitating population increases and agricultural development in the San Joaquin Valley and Southern California. Patterson Reservoir was notably

CONTINUATION SHEET

Property Name: Patterson Reservoir

Page 11 of 13

refurbished and raised during the South Bay Aqueduct Improvement and Enlargement Project from 2006–2015, but the reservoir retains enough integrity to convey significance under Criterion A/1.

Because of the scale of Patterson Reservoir and its role in the South Bay Aqueduct as a water regulatory body, emergency storage, and water customer delivery point, its role in the greater system does not rise to the level of individual significance. Therefore, Patterson Reservoir is eligible under NRHP/CRHR Criterion A/1 as a component of the South Bay Aqueduct. The period of significance for the South Bay Aqueduct for NRHP/CRHR Criteria A/1 is its construction period: 1958–1969.

Criterion B/2: That are associated with the lives of persons significant in our past.

To be found eligible under B/2 the property has to be directly tied to an important person and the place where that individual conducted or produced the work for which he or she is known. Archival research failed to indicate direct association with any individuals that are known to be historic figures at the national, state, or local level and Patterson Reservoir. As such, Patterson Reservoir is not known to have any historical associations with people important to the nation's or state's past. Due to a lack of identified significant associations with important persons in history, the Patterson Reservoir is not eligible under NRHP/CRHR Criterion B/2.

Criterion C/3: That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

Though the South Bay Aqueduct is important for its role within the SWP and is significant as one of the most ambitious and extensive engineering projects in the State of California, Patterson Reservoir's design and role along the South Bay Aqueduct is unremarkable and does not rise to the same level of significance. Unlike the remainder of the South Bay Aqueduct, no new technologies were tested at Patterson Reservoir and it does not add to the overall body of engineering in the South Bay Aqueduct or the larger SWP.

Patterson Reservoir was also refurbished, and its lining was raised for the South Bay Aqueduct Improvement and Enlargement Project (2006–2015). These alterations to design, materials, and workmanship go beyond an acceptable threshold of alteration for a working structure and diminish the ability of Patterson Reservoir to convey significance under NRHP/CRHR Criterion C/3. Therefore, Patterson Reservoir is not eligible either at the individual level or as a component of the South Bay Aqueduct under NRHP/CRHR Criterion C/3.

Criterion D/4: That have yielded, or may be likely to yield, information important in prehistory or history.

Patterson Reservoir is not significant as a source, or likely source, of important historical information nor does it appear likely to yield important information about historic construction methods, materials or technologies. Therefore, Patterson Reservoir is not eligible under NRHP/CRHR Criterion D/4.

Integrity Discussion

Patterson Reservoir retains sufficient integrity to convey significance under Criteria A/1 but lacks sufficient integrity to be considered under C/3 due to material replacements and minor design alterations. The Patterson Reservoir retains its original location and position along the South Bay Aqueduct's original alignment. It retains integrity of setting, retaining its rural setting among rolling hills east of the City of Livermore but safely outside of the boundary and setting of the urban area. There have been repairs to Patterson Reservoir since its construction, especially owing to an early grouting and leak issue that was resolved by 1964; however, major changes to the reservoir resulted from the South Bay Aqueduct Improvement and Enlargement Project (2006–2015), which impacted the integrity of design, materials, and workmanship by raising and refurbishing the reservoir. Because Patterson Reservoir is so small, these changes cannot be contextualized or reduced in importance. Despite these alterations, Patterson Reservoir is still able to convey the feeling of a twentieth century public works project and of its role within the larger South Bay Aqueduct system, and can still convey a sense of the time and space in which it was constructed. Finally, Patterson Reservoir retains integrity of association as it retains its association with the original DWR designers and operators, association with its original water supply contractors, and historical associations with the South Bay Aqueduct as the first water delivery location. Therefore, Patterson Reservoir retains the requisite level of integrity to convey significance under Criterion A/1 as a component of the South Bay Aqueduct but lacks sufficient integrity to be considered under C/3.

Character Defining Features

The character-defining features of Patterson Reservoir are limited to the following:

- Continued function as a water management and delivery structure within the larger SWP system

CONTINUATION SHEET

Property Name: Patterson Reservoir

Page 12 of 13

- The original 1960–1962 location and relationship to South Bay Aqueduct alignment

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Property Name: Patterson Reservoir

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Appendix B

Interested Party Correspondence

Kate G. Kaiser

From: Kate G. Kaiser
Sent: Wednesday, May 12, 2021 1:35 PM
To: aaps@alameda-preservation.org
Cc: Katie Haley
Subject: Outreach Request: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, Dyer Reservoir, and Patterson Reservoir
Attachments: IPL_AAPS_05122021_CCF.pdf; IPL_AAPS_05122021_DyPat.pdf

Dear Alameda Architectural Preservation Society,

I am reaching out today on behalf of Dudek and the California Department of Water Resources (DWR) to provide you with some information about the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, in Contra Costa County and Alameda County and the Dyer and Patterson Reservoirs in Alameda County. As part of the cultural resources study for the proposed project, Dudek is consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be within the proposed project areas. Please see the attached letters and maps for more information about the nature and location of the project, and please feel free to contact me should you have questions or information regarding cultural or historical resources in this area.

Kate G. Kaiser, MSHP

Architectural Historian

DUDEK

O: 626.204.9815 C: 760.814.4664

www.dudek.com

May 12, 2021

Alameda Architectural Preservation Society
P.O. Box 1677
Alameda, CA 94501
aaps@alameda-preservation.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay*

To the Alameda Architectural Preservation Society:

Dudek has been retained by the Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay (Proposed Project). Clifton Court Forebay is located at the southwestern edge of the Sacramento–San Joaquin River Delta, approximately 10 miles northwest of the City of Tracy and adjacent to Byron Road. The Proposed Project is located along the 8-mile dam embankment (see Figure 1, enclosed).

Clifton Court Forebay has been subject to ongoing rodent burrowing throughout its service life. Rodent burrows are a recognized hazard to dams and levees as they can be associated with potential failure modes for dams by promoting piping and internal erosion that can ultimately lead to dam failure. The Project proposes rodent burrow repairs and restoration measures, as well as permanent measures to prevent future burrowing. DWR also proposes to repair shallow ruts and near-surface deformations by filling these areas with native soil and compacting it.

As part of our study, we are consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be affected by the Proposed Project. Your efforts in this process will provide invaluable information for the proper identification and treatment of such resources.

If you have any questions or comments regarding cultural resources in the proposed project area, please direct your response to:

Dudek
Attn: Kate Kaiser
Phone: 626-204-9815
Email: kkaiser@dudek.com

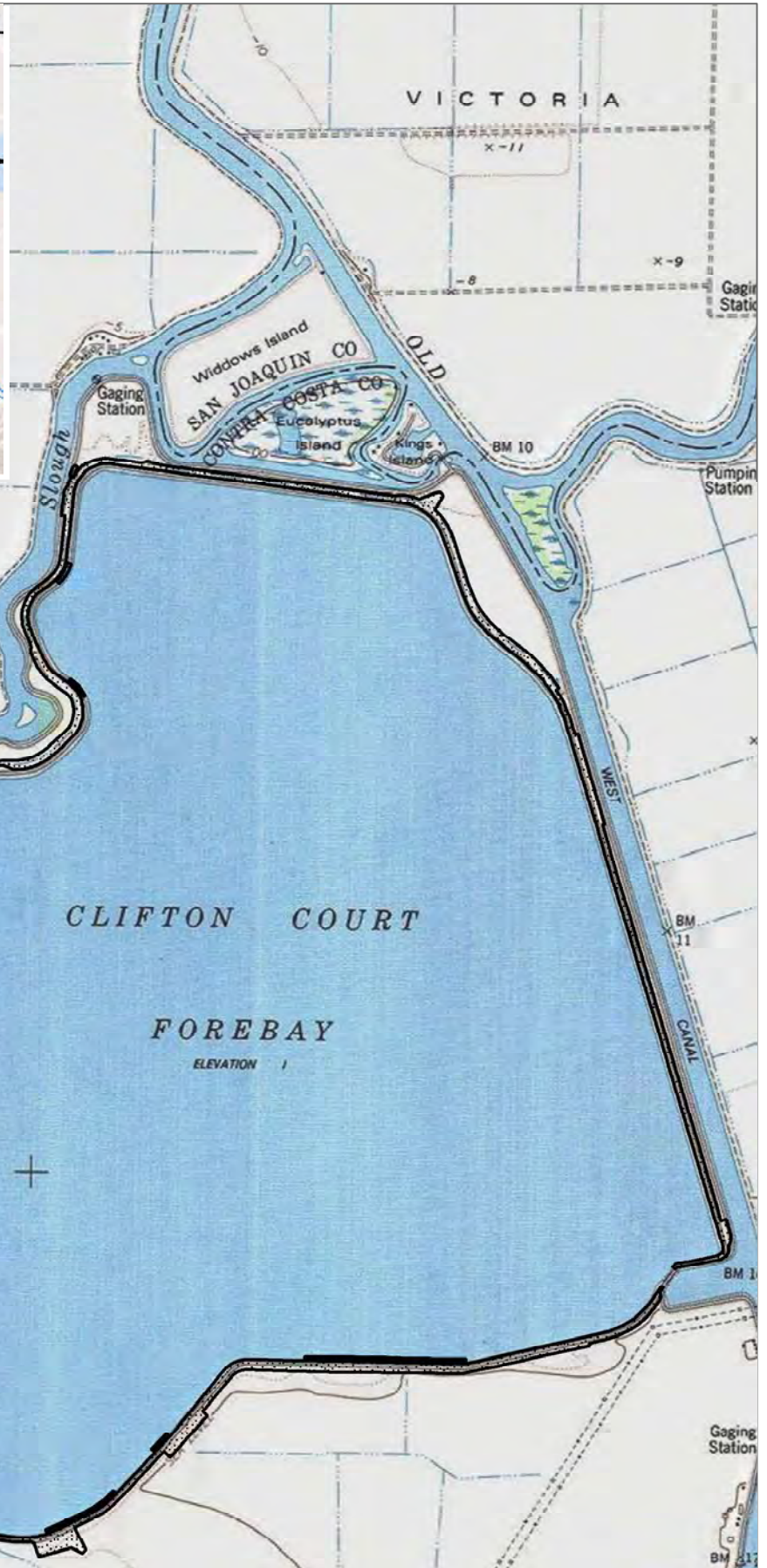
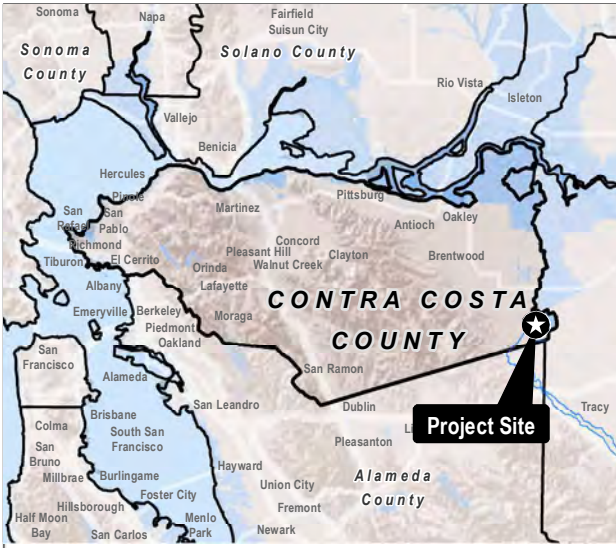
All comments, emails, or letters received will be included in the reports generated by this study. Thank you very much for your time regarding our request.

Sincerely,



Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Clifton Court Forebay Project Location



BASEMAP SOURCE: DWR 2020; USGS 7.5-Minute Series Clifton Court Forebay Quadrangle



FIGURE 1
 Project Location - Clifton Court Forebay
 Delta Dams Rodent Burrow Remediation Project

May 12, 2021

Alameda Architectural Preservation Society
P.O. Box 1677
Alameda, CA 94501
aaps@alameda-preservation.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Dam and Patterson Reservoir and Dam*

To the Alameda Architectural Preservation Society:

Dudek has been retained by the Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Patterson Reservoir (Proposed Project). Dyer Reservoir is located in the Altamont Hills, approximately 7 miles northeast of the City of Livermore in Alameda County; and Patterson Reservoir is approximately 1 mile east of the City of Livermore (see Map Figures 1 and 2, enclosed).

Both the Dyer Dam (2012) and Patterson Dam (1962) embankments have been subject to ongoing rodent burrowing throughout their service life. Rodent burrows are a recognized hazard to dams and levees as they can be associated with potential failure modes for dams by promoting piping and internal erosion that can ultimately lead to dam failure. The Project proposes rodent burrow repairs and restoration measures, as well as permanent measures to prevent future burrowing. DWR also proposes to repair shallow ruts and near-surface deformations by filling these areas with native soil and compacting it.

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Email: kkaiser@dudek.com

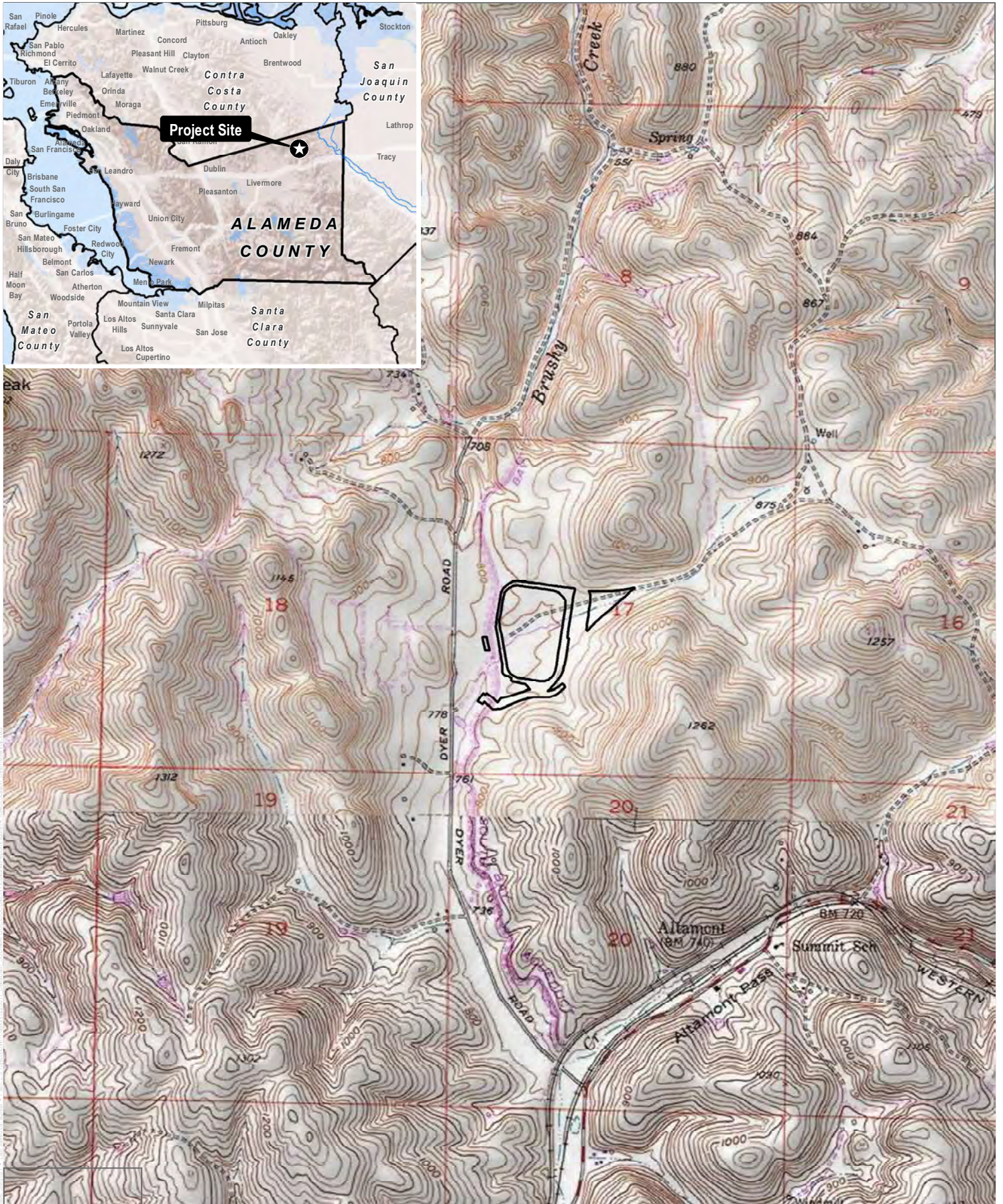
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Kate Kaiser, MSHP
Architectural Historian

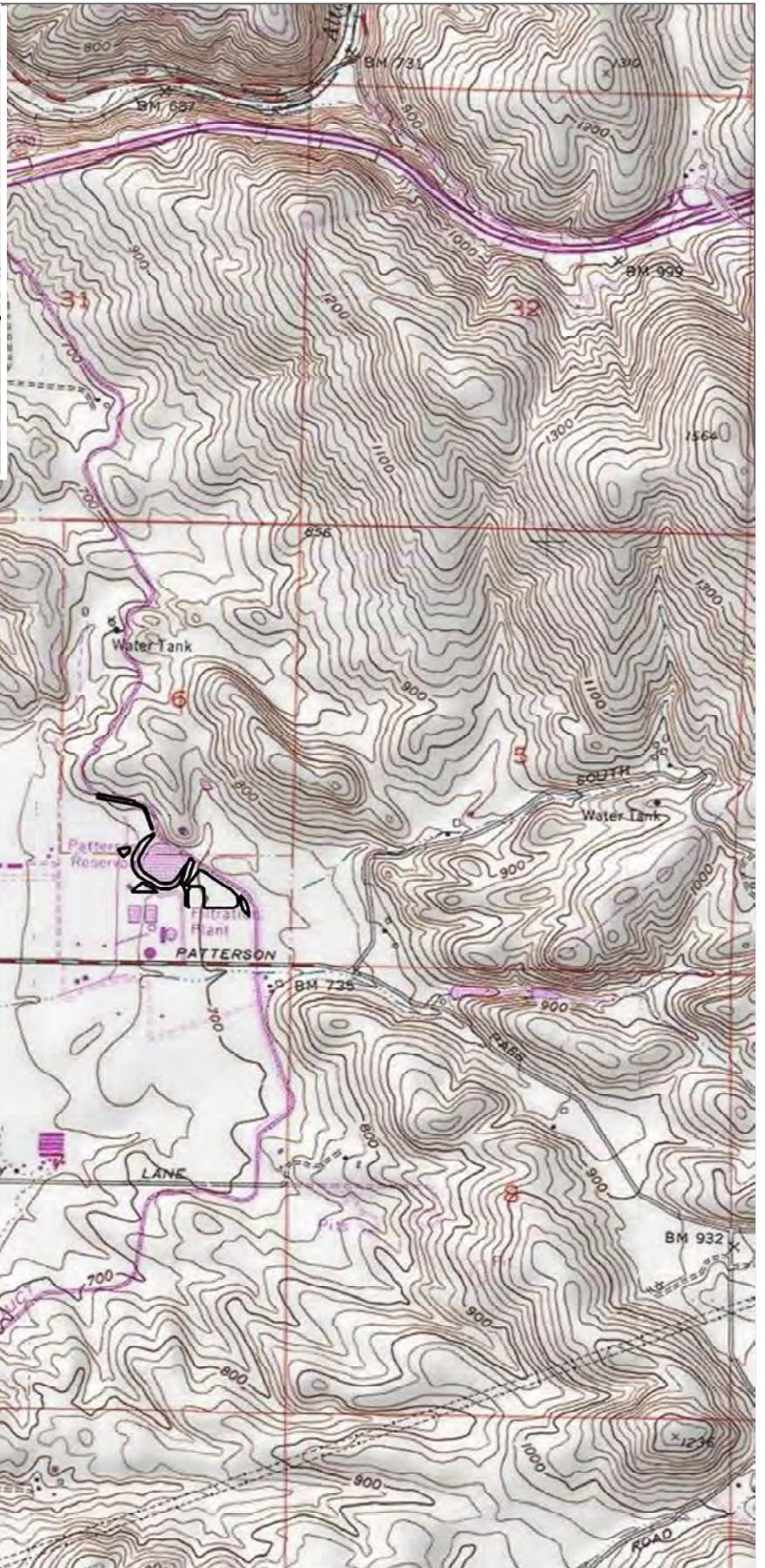
Enclosures: Figure 1. Dyer Dam Project Location and Figure 2. Patterson Dam Project Location



BASEMAP SOURCE: DWR 12/28/2020; USGS 7.5-Minute Series Byron Hot Springs Quadrangle

FIGURE 1

Project Location - Dyer Reservoir
Delta Dams Rodent Burrow Remediation Project



BASEMAP SOURCE: DWR 12/11/2020; USGS 7.5-Minute Series Altamont Quadrangle

FIGURE 2

Project Location - Patterson Reservoir

Delta Dams Rodent Burrow Remediation Project



Kate G. Kaiser

From: Kate G. Kaiser
Sent: Wednesday, May 12, 2021 1:35 PM
To: info@AlamedaCountyHistory.org
Cc: Katie Haley
Subject: Outreach Request: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, Dyer Reservoir, and Patterson Reservoir
Attachments: IPL_ACHS_05122021_CCF.pdf; IPL_ACHS_05122021_DyPat.pdf

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Kate G. Kaiser, MSHP

Architectural Historian

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O: 626.204.9815 C: 760.814.4664

www.dudek.com

May 12, 2021

Alameda County Historical Society
P.O. Box 13145
Oakland, CA 94661
info@AlamedaCountyHistory.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay*

To the Alameda County Historical Society:

Dudek has been retained by the Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay (Proposed Project). Clifton Court Forebay is located at the southwestern edge of the Sacramento–San Joaquin River Delta, approximately 10 miles northwest of the City of Tracy and adjacent to Byron Road. The Proposed Project is located along the 8-mile dam embankment (see Figure 1, enclosed).

Clifton Court Forebay has been subject to ongoing rodent burrowing throughout its service life. Rodent burrows are a recognized hazard to dams and levees as they can be associated with potential failure modes for dams by promoting piping and internal erosion that can ultimately lead to dam failure. The Project proposes rodent burrow repairs and restoration measures, as well as permanent measures to prevent future burrowing. DWR also proposes to repair shallow ruts and near-surface deformations by filling these areas with native soil and compacting it.

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Email: kkaiser@dudek.com

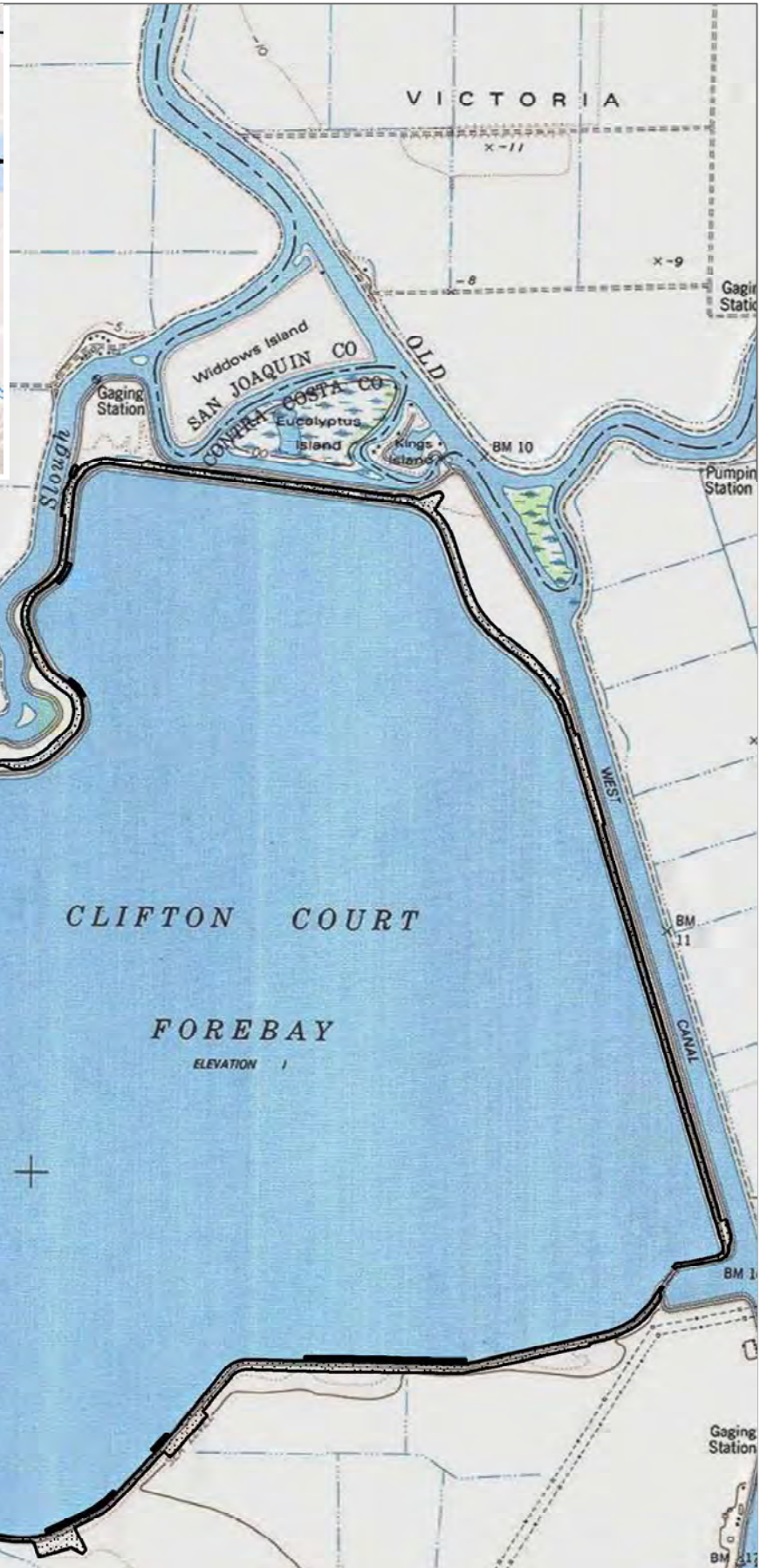
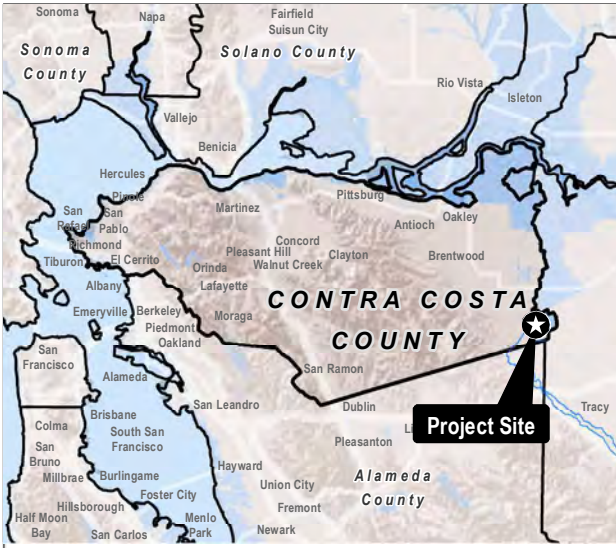
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Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Clifton Court Forebay Project Location



BASEMAP SOURCE: DWR 2020; USGS 7.5-Minute Series Clifton Court Forebay Quadrangle

FIGURE 1

Project Location - Clifton Court Forebay

Delta Dams Rodent Burrow Remediation Project

May 12, 2021

Alameda County Historical Society
P.O. Box 13145
Oakland, CA 94661
info@AlamedaCountyHistory.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Dam and Patterson Reservoir and Dam*

To the Alameda County Historical Society:

Dudek has been retained by the Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Patterson Reservoir (Proposed Project). Dyer Reservoir is located in the Altamont Hills, approximately 7 miles northeast of the City of Livermore in Alameda County; and Patterson Reservoir is approximately 1 mile east of the City of Livermore (see Map Figures 1 and 2, enclosed).

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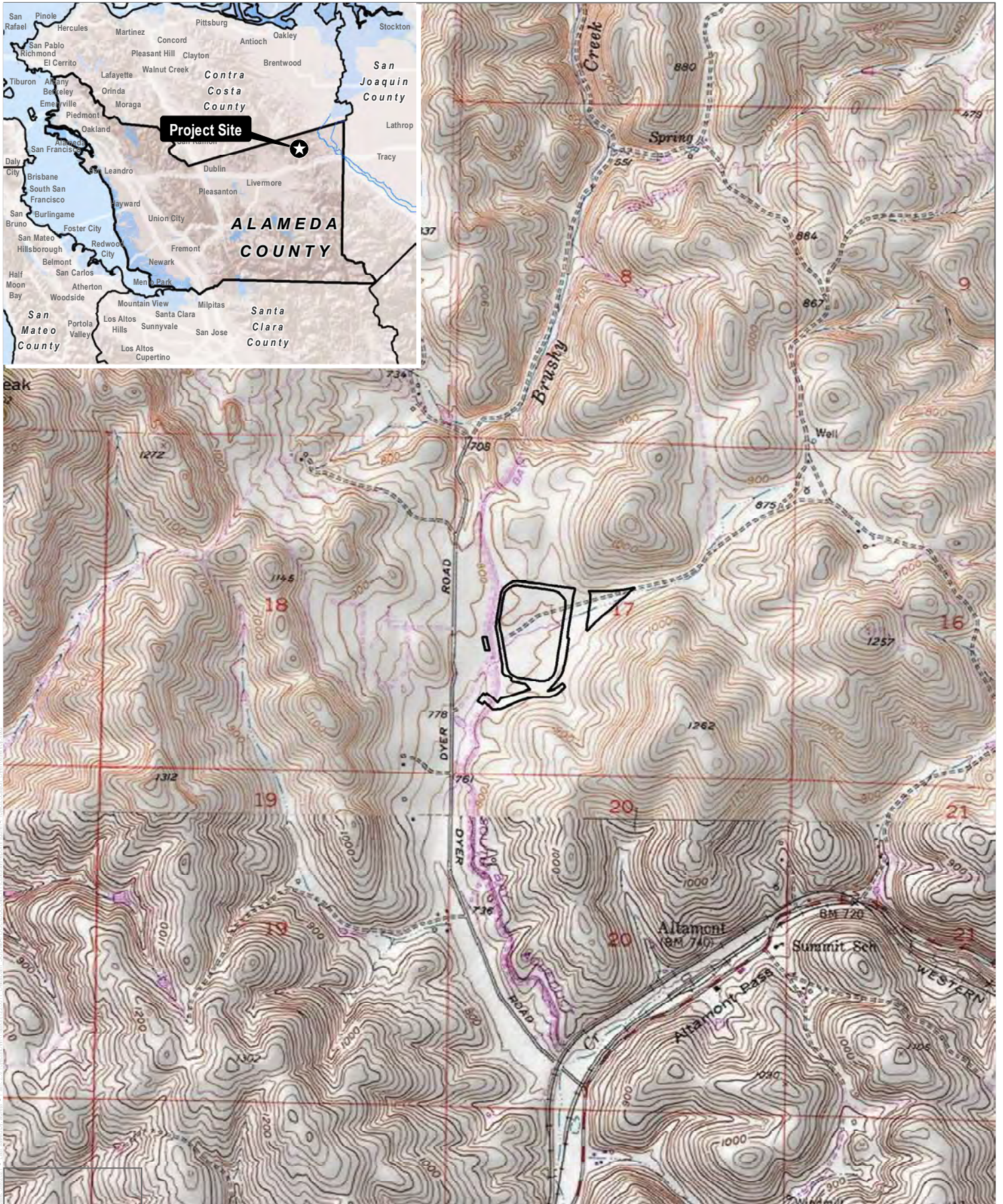
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Sincerely,



Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Dyer Dam Project Location and Figure 2. Patterson Dam Project Location

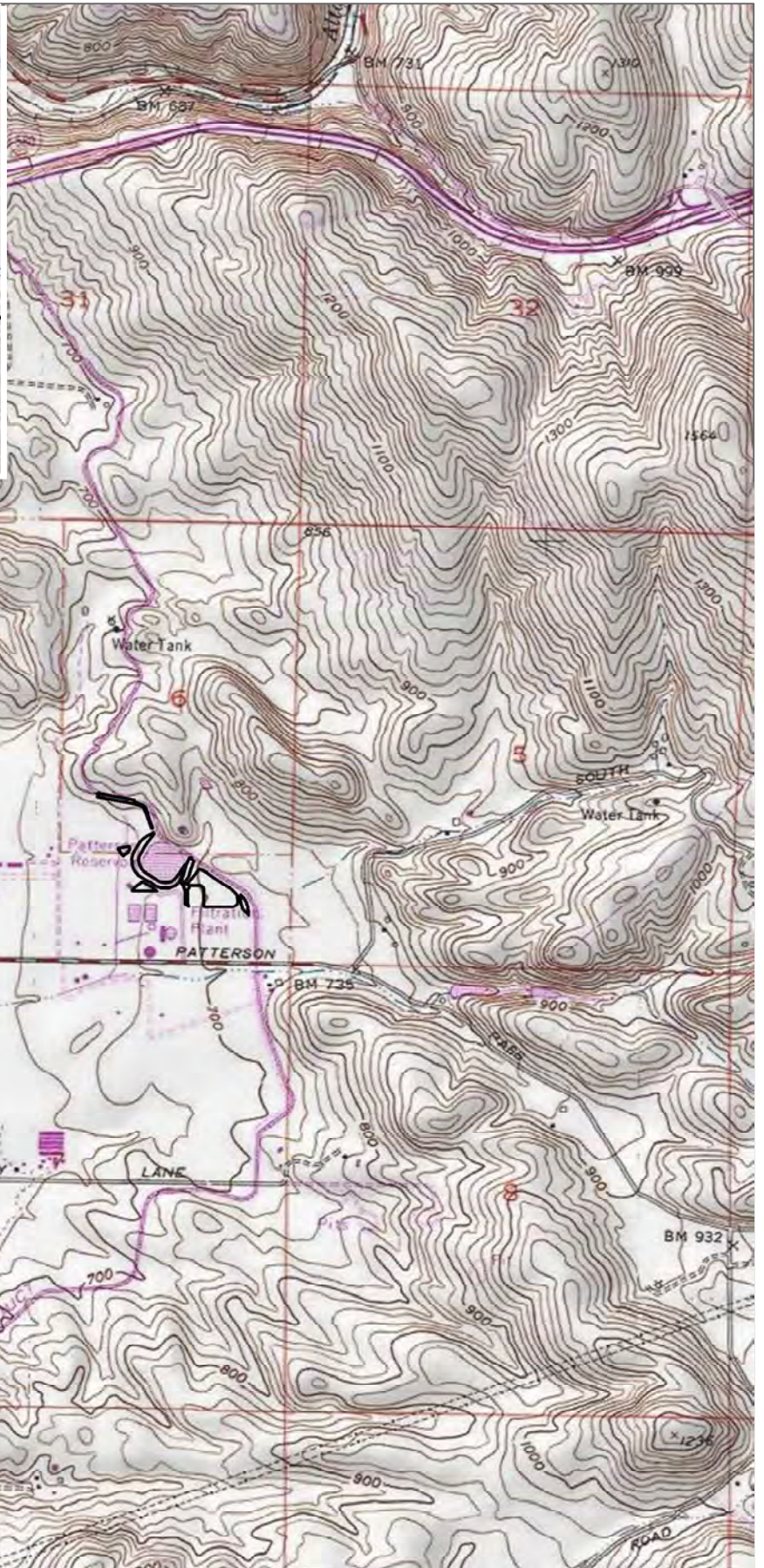


BASEMAP SOURCE: DWR 12/28/2020; USGS 7.5-Minute Series Byron Hot Springs Quadrangle

FIGURE 1

Project Location - Dyer Reservoir

Delta Dams Rodent Burrow Remediation Project



BASEMAP SOURCE: DWR 12/11/2020; USGS 7.5-Minute Series Altamont Quadrangle

FIGURE 2

Project Location - Patterson Reservoir

Delta Dams Rodent Burrow Remediation Project

Kate G. Kaiser

From: Kate G. Kaiser
Sent: Wednesday, May 12, 2021 1:35 PM
To: curator@museumonmain.org
Cc: Katie Haley
Subject: Outreach Request: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay, Dyer Reservoir, and Patterson Reservoir
Attachments: IPL_MOM_05122021_DyPat.pdf; IPL_MOM_05122021_CCF.pdf

Dear Mr. MacLennan,

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Kate G. Kaiser, MSHP

Architectural Historian

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www.dudek.com

May 12, 2021

Mr. Ken MacLennan
Museum on Main
603 Main Street
Pleasanton, CA 94566
curator@museumonmain.org

Subject: Delta Dams Rodent Burrow Remediation Project at Clifton Court Forebay

To Mr. MacLennan:

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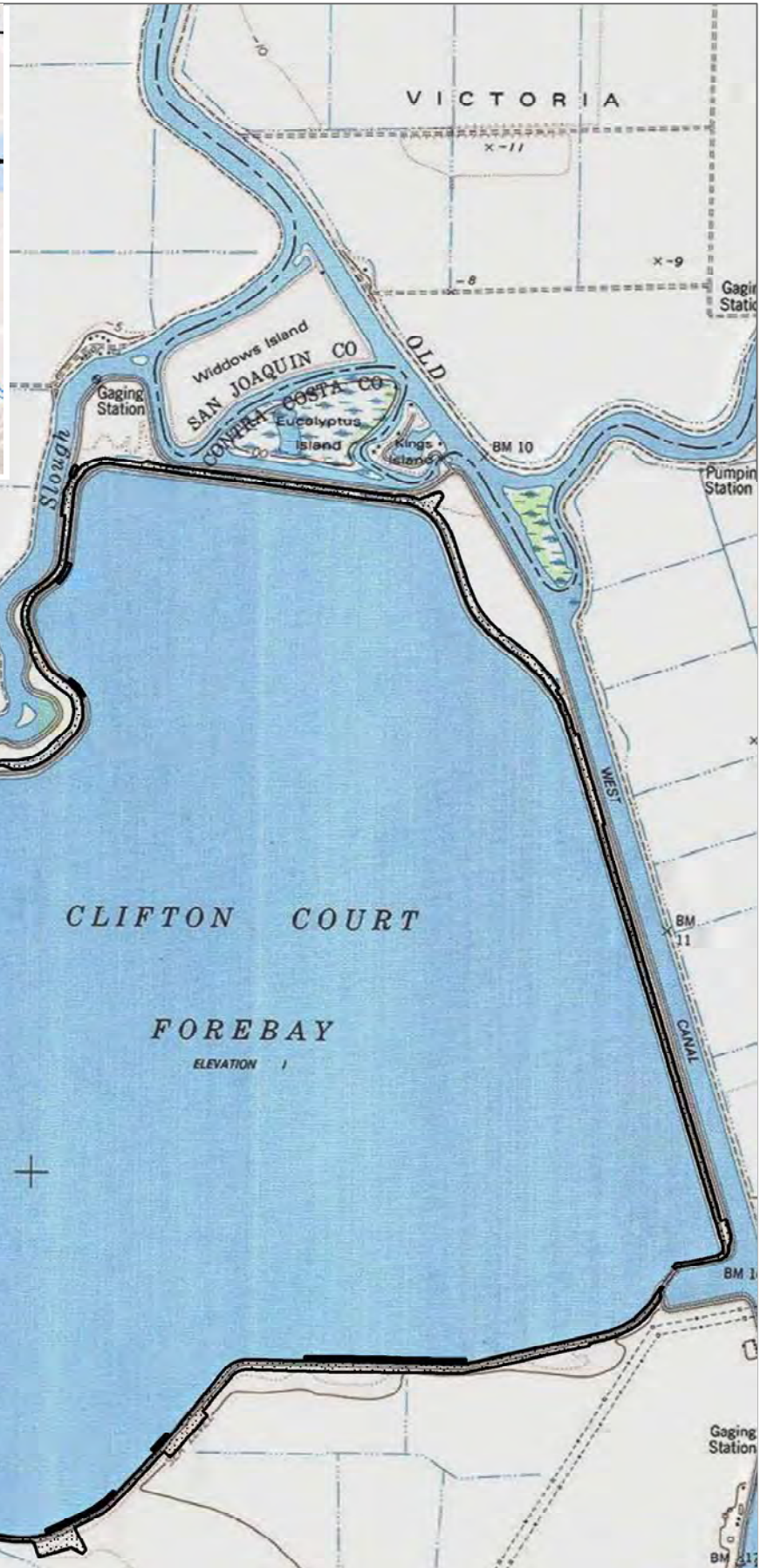
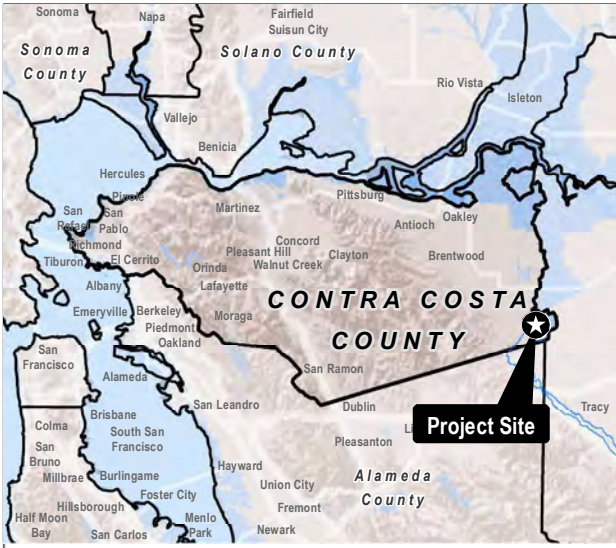
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Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Clifton Court Forebay Project Location



BASEMAP SOURCE: DWR 2020; USGS 7.5-Minute Series Clifton Court Forebay Quadrangle

FIGURE 1

Project Location - Clifton Court Forebay

Delta Dams Rodent Burrow Remediation Project

May 12, 2021

Mr. Ken MacLennan
Museum on Main
603 Main Street
Pleasanton, CA 94566
curator@museumonmain.org

Subject: *Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Dam and Patterson Reservoir and Dam*

To Mr. MacLennan:

Dudek has been retained by the Department of Water Resources (DWR) to complete a cultural resources inventory evaluation and finding of effect report for the Delta Dams Rodent Burrow Remediation Project at Dyer Reservoir and Patterson Reservoir (Proposed Project). Dyer Reservoir is located in the Altamont Hills, approximately 7 miles northeast of the City of Livermore in Alameda County; and Patterson Reservoir is approximately 1 mile east of the City of Livermore (see Map Figures 1 and 2, enclosed).

Both the Dyer Dam (2012) and Patterson Dam (1962) embankments have been subject to ongoing rodent burrowing throughout their service life. Rodent burrows are a recognized hazard to dams and levees as they can be associated with potential failure modes for dams by promoting piping and internal erosion that can ultimately lead to dam failure. The Project proposes rodent burrow repairs and restoration measures, as well as permanent measures to prevent future burrowing. DWR also proposes to repair shallow ruts and near-surface deformations by filling these areas with native soil and compacting it.

As part of our study, we are consulting all regional historical organizations to determine if there are any known historic or cultural resources that may be affected by the Proposed Project. Your efforts in this process will provide invaluable information for the proper identification and treatment of such resources.

If you have any questions or comments regarding cultural resources in the proposed project area, please direct your response to:

Dudek
Attn: Kate Kaiser
Phone: 626-204-9815
Email: kkaiser@dudek.com

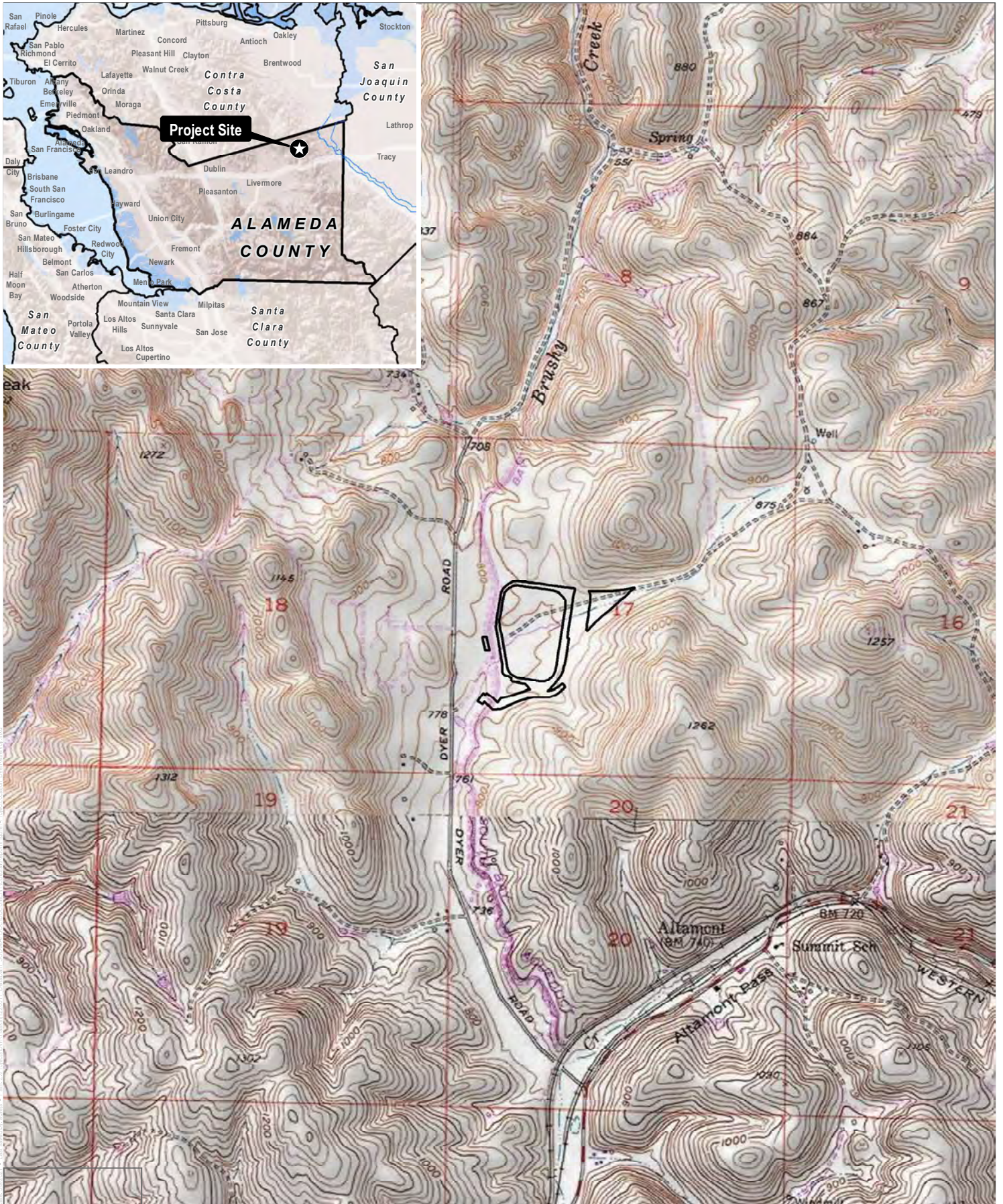
All comments, emails, or letters received will be included in the reports generated by this study. Thank you very much for your time regarding our request.

Sincerely,



Kate Kaiser, MSHP
Architectural Historian

Enclosures: Figure 1. Dyer Dam Project Location and Figure 2. Patterson Dam Project Location



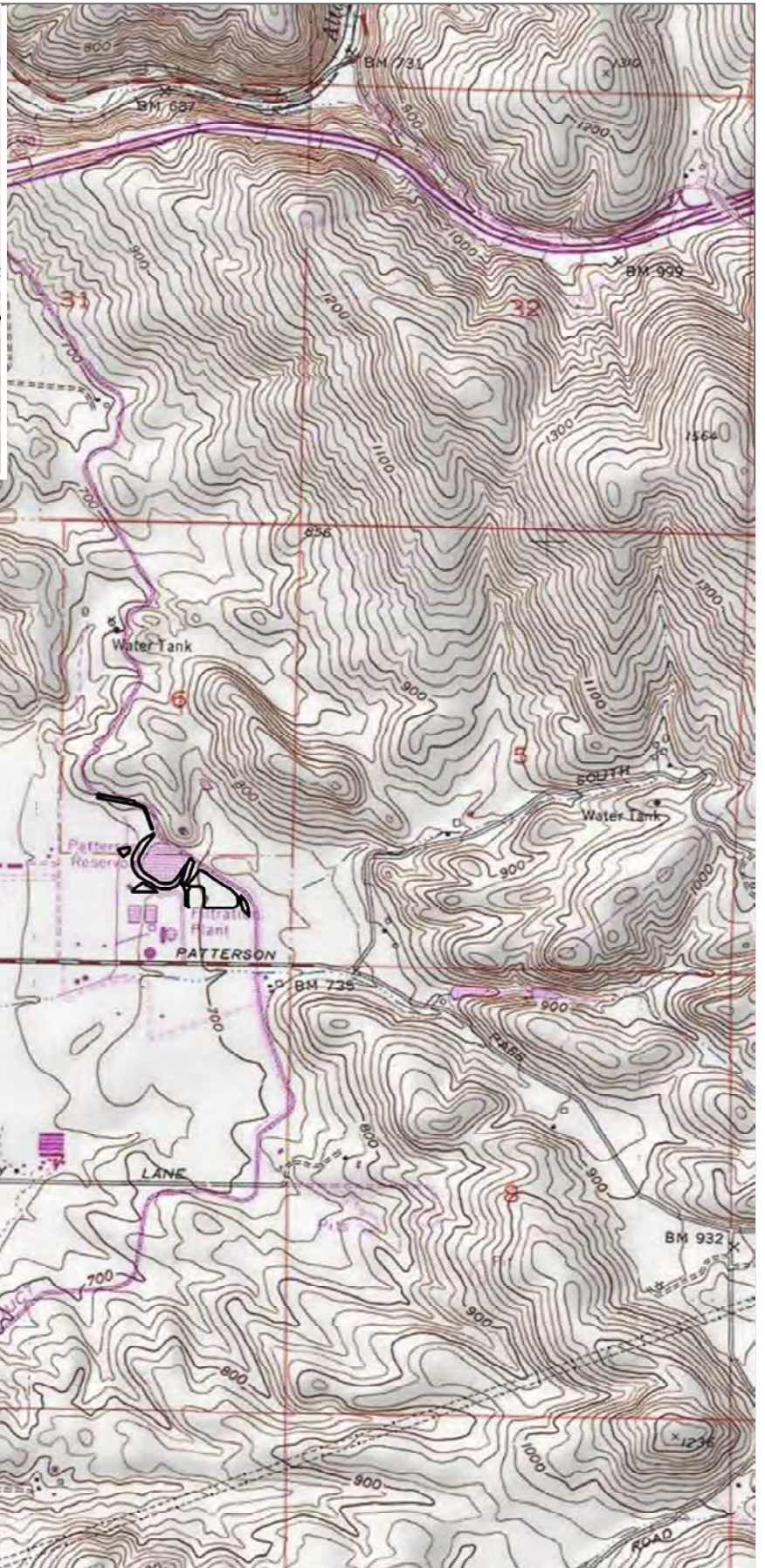
BASEMAP SOURCE: DWR 12/28/2020; USGS 7.5-Minute Series Byron Hot Springs Quadrangle

FIGURE 1

Project Location - Dyer Reservoir

Delta Dams Rodent Burrow Remediation Project





BASEMAP SOURCE: DWR 12/11/2020; USGS 7.5-Minute Series Altamont Quadrangle

FIGURE 2

Project Location - Patterson Reservoir

Delta Dams Rodent Burrow Remediation Project

