APPENDIX A

CALEEMOD RESULTS

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Heather Farm Park Project Custom Report

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1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Heather Farm Park Project
Construction Start Date	8/4/2025
Operational Year	2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	3.60
Precipitation (days)	34.0
Location	Heather Farm Park, 301 N San Carlos Dr, Walnut Creek, CA 94598, USA
County	Contra Costa
City	Walnut Creek
Air District	Bay Area AQMD
Air Basin	San Francisco Bay Area
TAZ	1381
EDFZ	1
Electric Utility	Pacific Gas & Electric Company
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.22

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description

Health Club	27.0	1000sqft	0.62	27,000	58,480	—	—	—
Parking Lot	9.00	Space	2.21	0.00	0.00	—	—	—
Other Non-Asphalt Surfaces	1.89	Acre	1.89	82,328	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

Sector	#	Measure Title
Construction	C-5	Use Advanced Engine Tiers
Construction	C-6	Use Diesel Particulate Filters

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.65	39.9	29.0	0.05	1.12	7.81	8.93	1.02	3.97	4.99	—	6,191	6,191	0.35	0.45	6,339
Mit.	1.46	24.1	29.0	0.05	0.17	7.81	7.95	0.14	3.97	4.10	—	6,191	6,191	0.35	0.45	6,339
% Reduced	11%	40%	—	—	85%	—	11%	86%	—	18%	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.64	39.9	28.9	0.06	1.12	7.81	8.93	1.02	3.97	4.99	—	8,770	8,770	0.56	0.93	9,061
Mit.	1.46	24.1	28.9	0.06	0.20	7.81	7.95	0.15	3.97	4.10	—	8,770	8,770	0.56	0.93	9,061
% Reduced	11%	40%	—	—	83%	—	11%	85%	—	18%	—	—	—	—	—	—

Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.59	14.1	11.5	0.02	0.50	1.25	1.51	0.47	0.53	0.77	—	2,324	2,324	0.10	0.12	2,350
Mit.	0.52	9.03	11.5	0.02	0.06	1.25	1.29	0.05	0.53	0.57	—	2,324	2,324	0.10	0.12	2,350
% Reduced	13%	36%	—	—	88%	—	14%	88%	—	26%	—	—	—	—	—	—
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.11	2.57	2.11	< 0.005	0.09	0.23	0.28	0.09	0.10	0.14	—	385	385	0.02	0.02	389
Mit.	0.09	1.65	2.11	< 0.005	0.01	0.23	0.24	0.01	0.10	0.10	—	385	385	0.02	0.02	389
% Reduced	13%	36%	—	—	88%	—	14%	88%	—	26%	—	—	—	—	—	—

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	1.13	39.9	29.0	0.05	1.12	7.81	8.93	1.02	3.97	4.99	—	6,191	6,191	0.35	0.45	6,339
2026	0.79	19.6	16.4	0.03	0.69	0.51	1.20	0.65	0.12	0.77	—	3,269	3,269	0.13	0.10	3,306
2027	1.65	20.7	17.6	0.03	0.76	0.58	1.34	0.71	0.14	0.85	—	3,463	3,463	0.14	0.11	3,502
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	1.13	39.9	28.9	0.06	1.12	7.81	8.93	1.02	3.97	4.99	—	8,770	8,770	0.56	0.93	9,061
2026	1.64	20.8	17.4	0.03	0.76	0.58	1.34	0.71	0.14	0.85	—	3,442	3,442	0.14	0.11	3,478
2027	1.64	20.7	17.3	0.03	0.76	0.58	1.34	0.71	0.14	0.85	—	3,424	3,424	0.14	0.11	3,460
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2025	0.27	8.97	6.56	0.01	0.26	1.25	1.51	0.24	0.53	0.77	—	1,824	1,824	0.10	0.12	1,864
2026	0.59	14.1	11.5	0.02	0.50	0.36	0.86	0.47	0.09	0.55	—	2,324	2,324	0.09	0.08	2,350
2027	0.56	4.92	4.18	0.01	0.19	0.13	0.33	0.18	0.03	0.21	—	792	792	0.03	0.02	799
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	0.05	1.64	1.20	< 0.005	0.05	0.23	0.28	0.04	0.10	0.14	—	302	302	0.02	0.02	309
2026	0.11	2.57	2.11	< 0.005	0.09	0.07	0.16	0.09	0.02	0.10	—	385	385	0.02	0.01	389
2027	0.10	0.90	0.76	< 0.005	0.04	0.02	0.06	0.03	0.01	0.04	—	131	131	0.01	< 0.005	132

2.3. Construction Emissions by Year, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	0.96	24.1	29.0	0.05	0.17	7.81	7.95	0.14	3.97	4.10	—	6,191	6,191	0.35	0.45	6,339
2026	0.61	12.5	16.4	0.03	0.08	0.51	0.59	0.08	0.12	0.20	—	3,269	3,269	0.13	0.10	3,306
2027	1.46	13.6	17.6	0.03	0.09	0.58	0.67	0.08	0.14	0.23	—	3,463	3,463	0.14	0.11	3,502
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	0.96	24.1	28.9	0.06	0.20	7.81	7.95	0.15	3.97	4.10	—	8,770	8,770	0.56	0.93	9,061
2026	1.46	13.7	17.4	0.03	0.09	0.58	0.67	0.08	0.14	0.23	—	3,442	3,442	0.14	0.11	3,478
2027	1.45	13.7	17.3	0.03	0.09	0.58	0.67	0.08	0.14	0.23	—	3,424	3,424	0.14	0.11	3,460
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	0.23	5.96	6.56	0.01	0.04	1.25	1.29	0.04	0.53	0.57	—	1,824	1,824	0.10	0.12	1,864
2026	0.46	9.03	11.5	0.02	0.06	0.36	0.42	0.05	0.09	0.14	—	2,324	2,324	0.09	0.08	2,350
2027	0.52	3.32	4.18	0.01	0.02	0.13	0.16	0.02	0.03	0.05	—	792	792	0.03	0.02	799
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2025	0.04	1.09	1.20	< 0.005	0.01	0.23	0.24	0.01	0.10	0.10	—	302	302	0.02	0.02	309
2026	0.08	1.65	2.11	< 0.005	0.01	0.07	0.08	0.01	0.02	0.03	—	385	385	0.02	0.01	389
2027	0.09	0.61	0.76	< 0.005	< 0.005	0.02	0.03	< 0.005	0.01	0.01	—	131	131	0.01	< 0.005	132

2.4. Operations Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.76	0.57	7.30	0.01	0.04	0.49	0.53	0.03	0.13	0.16	86.0	1,166	1,252	8.70	0.03	1,481
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.96	0.56	2.42	0.01	0.03	0.49	0.52	0.03	0.13	0.15	86.0	1,109	1,195	8.70	0.04	1,424
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.34	0.57	4.67	0.01	0.03	0.48	0.51	0.03	0.12	0.15	86.0	1,123	1,209	8.70	0.04	1,438
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.25	0.10	0.85	< 0.005	0.01	0.09	0.09	0.01	0.02	0.03	14.2	186	200	1.44	0.01	238

2.5. Operations Emissions by Sector, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.31	0.21	2.28	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	548	548	0.02	0.02	557

Area	1.43	0.04	4.75	< 0.005	0.01	—	0.01	0.01	—	0.01	—	19.6	19.6	< 0.005	< 0.005	19.6
Energy	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	591	591	0.07	< 0.005	594
Water	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Waste	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	1.76	0.57	7.30	0.01	0.04	0.49	0.53	0.03	0.13	0.16	86.0	1,166	1,252	8.70	0.03	1,481
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.30	0.25	2.15	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	511	511	0.03	0.02	519
Area	0.65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	591	591	0.07	< 0.005	594
Water	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Waste	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	0.96	0.56	2.42	0.01	0.03	0.49	0.52	0.03	0.13	0.15	86.0	1,109	1,195	8.70	0.04	1,424
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.29	0.23	2.06	0.01	< 0.005	0.48	0.49	< 0.005	0.12	0.13	—	515	515	0.03	0.02	523
Area	1.03	0.02	2.34	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	9.64	9.64	< 0.005	< 0.005	9.68
Energy	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	591	591	0.07	< 0.005	594
Water	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Waste	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	1.34	0.57	4.67	0.01	0.03	0.48	0.51	0.03	0.12	0.15	86.0	1,123	1,209	8.70	0.04	1,438
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.05	0.04	0.38	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.02	—	85.3	85.3	< 0.005	< 0.005	86.6
Area	0.19	< 0.005	0.43	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.60	1.60	< 0.005	< 0.005	1.60
Energy	< 0.005	0.06	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	97.8	97.8	0.01	< 0.005	98.3

Water	—	—	—	—	—	—	—	—	—	—	0.51	1.28	1.78	0.05	< 0.005	3.46
Waste	—	—	—	—	—	—	—	—	—	—	13.7	0.00	13.7	1.37	0.00	48.0
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Total	0.25	0.10	0.85	< 0.005	0.01	0.09	0.09	0.01	0.02	0.03	14.2	186	200	1.44	0.01	238

2.6. Operations Emissions by Sector, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.31	0.21	2.28	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	548	548	0.02	0.02	557
Area	1.43	0.04	4.75	< 0.005	0.01	—	0.01	0.01	—	0.01	—	19.6	19.6	< 0.005	< 0.005	19.6
Energy	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	591	591	0.07	< 0.005	594
Water	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Waste	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	1.76	0.57	7.30	0.01	0.04	0.49	0.53	0.03	0.13	0.16	86.0	1,166	1,252	8.70	0.03	1,481
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.30	0.25	2.15	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	511	511	0.03	0.02	519
Area	0.65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	591	591	0.07	< 0.005	594
Water	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Waste	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	0.96	0.56	2.42	0.01	0.03	0.49	0.52	0.03	0.13	0.15	86.0	1,109	1,195	8.70	0.04	1,424

Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.29	0.23	2.06	0.01	< 0.005	0.48	0.49	< 0.005	0.12	0.13	—	515	515	0.03	0.02	523
Area	1.03	0.02	2.34	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	9.64	9.64	< 0.005	< 0.005	9.68
Energy	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	591	591	0.07	< 0.005	594
Water	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Waste	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	1.34	0.57	4.67	0.01	0.03	0.48	0.51	0.03	0.12	0.15	86.0	1,123	1,209	8.70	0.04	1,438
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.05	0.04	0.38	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.02	—	85.3	85.3	< 0.005	< 0.005	86.6
Area	0.19	< 0.005	0.43	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.60	1.60	< 0.005	< 0.005	1.60
Energy	< 0.005	0.06	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	97.8	97.8	0.01	< 0.005	98.3
Water	—	—	—	—	—	—	—	—	—	—	0.51	1.28	1.78	0.05	< 0.005	3.46
Waste	—	—	—	—	—	—	—	—	—	—	13.7	0.00	13.7	1.37	0.00	48.0
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Total	0.25	0.10	0.85	< 0.005	0.01	0.09	0.09	0.01	0.02	0.03	14.2	186	200	1.44	0.01	238

3. Construction Emissions Details

3.1. Demolition (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.72	24.9	18.2	0.03	0.79	—	0.79	0.71	—	0.71	—	3,425	3,425	0.14	0.03	3,437

Demolition	—	—	—	—	—	2.11	2.11	—	0.32	0.32	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	1.37	1.00	< 0.005	0.04	—	0.04	0.04	—	0.04	—	188	188	0.01	< 0.005	188
Demolition	—	—	—	—	—	0.12	0.12	—	0.02	0.02	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.25	0.18	< 0.005	0.01	—	0.01	0.01	—	0.01	—	31.1	31.1	< 0.005	< 0.005	31.2
Demolition	—	—	—	—	—	0.02	0.02	—	< 0.005	< 0.005	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.04	0.63	0.00	0.00	0.12	0.12	0.00	0.03	0.03	—	132	132	< 0.005	< 0.005	134
Vendor	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
Hauling	0.06	3.34	1.61	0.02	0.05	0.68	0.73	0.03	0.19	0.22	—	2,633	2,633	0.20	0.42	2,768
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	6.70	6.70	< 0.005	< 0.005	6.80

Vendor	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
Hauling	< 0.005	0.19	0.09	< 0.005	< 0.005	0.04	0.04	< 0.005	0.01	0.01	—	144	144	0.01	0.02	152
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.11	1.11	< 0.005	< 0.005	1.13
Vendor	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
Hauling	< 0.005	0.03	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	23.9	23.9	< 0.005	< 0.005	25.1

3.2. Demolition (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.72	17.3	18.2	0.03	0.12	—	0.12	0.11	—	0.11	—	3,425	3,425	0.14	0.03	3,437
Demolition	—	—	—	—	—	2.11	2.11	—	0.32	0.32	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	0.95	1.00	< 0.005	0.01	—	0.01	0.01	—	0.01	—	188	188	0.01	< 0.005	188
Demolition	—	—	—	—	—	0.12	0.12	—	0.02	0.02	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.01	0.17	0.18	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	31.1	31.1	< 0.005	< 0.005	31.2
Demolition	—	—	—	—	—	0.02	0.02	—	< 0.005	< 0.005	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.04	0.63	0.00	0.00	0.12	0.12	0.00	0.03	0.03	—	132	132	< 0.005	< 0.005	134
Vendor	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
Hauling	0.06	3.34	1.61	0.02	0.05	0.68	0.73	0.03	0.19	0.22	—	2,633	2,633	0.20	0.42	2,768
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	6.70	6.70	< 0.005	< 0.005	6.80
Vendor	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
Hauling	< 0.005	0.19	0.09	< 0.005	< 0.005	0.04	0.04	< 0.005	0.01	0.01	—	144	144	0.01	0.02	152
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.11	1.11	< 0.005	< 0.005	1.13
Vendor	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
Hauling	< 0.005	0.03	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	23.9	23.9	< 0.005	< 0.005	25.1

3.3. Site Preparation (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.07	39.9	28.3	0.05	1.12	—	1.12	1.02	—	1.02	—	5,295	5,295	0.21	0.04	5,314
Dust From Material Movement	—	—	—	—	—	7.67	7.67	—	3.94	3.94	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.07	39.9	28.3	0.05	1.12	—	1.12	1.02	—	1.02	—	5,295	5,295	0.21	0.04	5,314
Dust From Material Movement	—	—	—	—	—	7.67	7.67	—	3.94	3.94	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	3.28	2.33	< 0.005	0.09	—	0.09	0.08	—	0.08	—	435	435	0.02	< 0.005	437
Dust From Material Movement	—	—	—	—	—	0.63	0.63	—	0.32	0.32	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.60	0.42	< 0.005	0.02	—	0.02	0.02	—	0.02	—	72.1	72.1	< 0.005	< 0.005	72.3
Dust From Material Movement	—	—	—	—	—	0.11	0.11	—	0.06	0.06	—	—	—	—	—	—

Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.04	0.73	0.00	0.00	0.14	0.14	0.00	0.03	0.03	—	154	154	< 0.005	0.01	157
Vendor	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
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.62	0.00	0.00	0.14	0.14	0.00	0.03	0.03	—	141	141	< 0.005	0.01	143
Vendor	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
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	11.7	11.7	< 0.005	< 0.005	11.9
Vendor	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
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.94	1.94	< 0.005	< 0.005	1.97
Vendor	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
Hauling	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

3.4. Site Preparation (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.90	24.0	28.3	0.05	0.14	—	0.14	0.13	—	0.13	—	5,295	5,295	0.21	0.04	5,314
Dust From Material Movement	—	—	—	—	—	7.67	7.67	—	3.94	3.94	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.90	24.0	28.3	0.05	0.14	—	0.14	0.13	—	0.13	—	5,295	5,295	0.21	0.04	5,314
Dust From Material Movement	—	—	—	—	—	7.67	7.67	—	3.94	3.94	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	1.97	2.33	< 0.005	0.01	—	0.01	0.01	—	0.01	—	435	435	0.02	< 0.005	437
Dust From Material Movement	—	—	—	—	—	0.63	0.63	—	0.32	0.32	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.36	0.42	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	72.1	72.1	< 0.005	< 0.005	72.3
Dust From Material Movement	—	—	—	—	—	0.11	0.11	—	0.06	0.06	—	—	—	—	—	—

Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.04	0.73	0.00	0.00	0.14	0.14	0.00	0.03	0.03	—	154	154	< 0.005	0.01	157
Vendor	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
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.62	0.00	0.00	0.14	0.14	0.00	0.03	0.03	—	141	141	< 0.005	0.01	143
Vendor	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
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	11.7	11.7	< 0.005	< 0.005	11.9
Vendor	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
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.94	1.94	< 0.005	< 0.005	1.97
Vendor	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
Hauling	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

3.5. Grading (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.73	23.2	17.8	0.03	0.75	—	0.75	0.69	—	0.69	—	2,959	2,959	0.12	0.02	2,970
Dust From Material Movement	—	—	—	—	—	2.78	2.78	—	1.34	1.34	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	2.22	1.70	< 0.005	0.07	—	0.07	0.07	—	0.07	—	284	284	0.01	< 0.005	285
Dust From Material Movement	—	—	—	—	—	0.27	0.27	—	0.13	0.13	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.41	0.31	< 0.005	0.01	—	0.01	0.01	—	0.01	—	47.0	47.0	< 0.005	< 0.005	47.1
Dust From Material Movement	—	—	—	—	—	0.05	0.05	—	0.02	0.02	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.53	0.00	0.00	0.12	0.12	0.00	0.03	0.03	—	121	121	< 0.005	0.01	123
Vendor	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
Hauling	0.12	7.59	3.50	0.04	0.11	1.47	1.58	0.07	0.40	0.47	—	5,690	5,690	0.44	0.90	5,969
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	11.7	11.7	< 0.005	< 0.005	11.9
Vendor	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
Hauling	0.01	0.71	0.33	< 0.005	0.01	0.14	0.15	0.01	0.04	0.04	—	546	546	0.04	0.09	573
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.94	1.94	< 0.005	< 0.005	1.97
Vendor	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
Hauling	< 0.005	0.13	0.06	< 0.005	< 0.005	0.03	0.03	< 0.005	0.01	0.01	—	90.3	90.3	0.01	0.01	94.8

3.6. Grading (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.53	14.1	17.8	0.03	0.09	—	0.09	0.08	—	0.08	—	2,959	2,959	0.12	0.02	2,970
Dust From Material Movement	—	—	—	—	—	2.78	2.78	—	1.34	1.34	—	—	—	—	—	—

Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	1.35	1.70	< 0.005	0.01	—	0.01	0.01	—	0.01	—	284	284	0.01	< 0.005	285
Dust From Material Movement	—	—	—	—	—	0.27	0.27	—	0.13	0.13	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.25	0.31	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	47.0	47.0	< 0.005	< 0.005	47.1
Dust From Material Movement	—	—	—	—	—	0.05	0.05	—	0.02	0.02	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.53	0.00	0.00	0.12	0.12	0.00	0.03	0.03	—	121	121	< 0.005	0.01	123
Vendor	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
Hauling	0.12	7.59	3.50	0.04	0.11	1.47	1.58	0.07	0.40	0.47	—	5,690	5,690	0.44	0.90	5,969
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	11.7	11.7	< 0.005	< 0.005	11.9
Vendor	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

Hauling	0.01	0.71	0.33	< 0.005	0.01	0.14	0.15	0.01	0.04	0.04	—	546	546	0.04	0.09	573
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.94	1.94	< 0.005	< 0.005	1.97
Vendor	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
Hauling	< 0.005	0.13	0.06	< 0.005	< 0.005	0.03	0.03	< 0.005	0.01	0.01	—	90.3	90.3	0.01	0.01	94.8

3.7. Building Construction (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.62	18.9	14.3	0.02	0.69	—	0.69	0.64	—	0.64	—	2,398	2,398	0.10	0.02	2,406
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	1.14	0.87	< 0.005	0.04	—	0.04	0.04	—	0.04	—	145	145	0.01	< 0.005	146
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.21	0.16	< 0.005	0.01	—	0.01	0.01	—	0.01	—	24.1	24.1	< 0.005	< 0.005	24.2
Onsite truck	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

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.16	0.14	1.63	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	370	370	0.01	0.02	375
Vendor	0.02	0.68	0.32	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	484	484	0.03	0.07	505
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.10	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	22.7	22.7	< 0.005	< 0.005	23.0
Vendor	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	29.3	29.3	< 0.005	< 0.005	30.7
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.02	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.76	3.76	< 0.005	< 0.005	3.82
Vendor	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	4.86	4.86	< 0.005	< 0.005	5.08
Hauling	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

3.8. Building Construction (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.44	11.8	14.3	0.02	0.08	—	0.08	0.07	—	0.07	—	2,398	2,398	0.10	0.02	2,406
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.72	0.87	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	145	145	0.01	< 0.005	146
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	0.13	0.16	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	24.1	24.1	< 0.005	< 0.005	24.2
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.16	0.14	1.63	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	370	370	0.01	0.02	375
Vendor	0.02	0.68	0.32	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	484	484	0.03	0.07	505
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.10	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	22.7	22.7	< 0.005	< 0.005	23.0
Vendor	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	29.3	29.3	< 0.005	< 0.005	30.7
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.02	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.76	3.76	< 0.005	< 0.005	3.82

Vendor	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	4.86	4.86	< 0.005	< 0.005	5.08
Hauling	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

3.9. Building Construction (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.62	18.9	14.3	0.02	0.69	—	0.69	0.64	—	0.64	—	2,397	2,397	0.10	0.02	2,405
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.62	18.9	14.3	0.02	0.69	—	0.69	0.64	—	0.64	—	2,397	2,397	0.10	0.02	2,405
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.44	13.5	10.2	0.02	0.49	—	0.49	0.46	—	0.46	—	1,712	1,712	0.07	0.01	1,718
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.08	2.46	1.86	< 0.005	0.09	—	0.09	0.08	—	0.08	—	283	283	0.01	< 0.005	284
Onsite truck	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

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.16	0.10	1.80	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	397	397	0.01	0.01	403
Vendor	0.01	0.61	0.30	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	475	475	0.03	0.07	498
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.14	0.13	1.52	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	363	363	0.01	0.02	368
Vendor	0.01	0.64	0.30	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	475	475	0.03	0.07	497
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.10	0.08	1.06	0.00	0.00	0.27	0.27	0.00	0.06	0.06	—	262	262	0.01	0.01	266
Vendor	0.01	0.45	0.21	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	339	339	0.02	0.05	355
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.19	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	43.4	43.4	< 0.005	< 0.005	44.1
Vendor	< 0.005	0.08	0.04	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	56.2	56.2	< 0.005	0.01	58.8
Hauling	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

3.10. Building Construction (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.44	11.8	14.3	0.02	0.08	—	0.08	0.07	—	0.07	—	2,397	2,397	0.10	0.02	2,405
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.44	11.8	14.3	0.02	0.08	—	0.08	0.07	—	0.07	—	2,397	2,397	0.10	0.02	2,405
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.31	8.44	10.2	0.02	0.05	—	0.05	0.05	—	0.05	—	1,712	1,712	0.07	0.01	1,718
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	1.54	1.86	< 0.005	0.01	—	0.01	0.01	—	0.01	—	283	283	0.01	< 0.005	284
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.16	0.10	1.80	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	397	397	0.01	0.01	403
Vendor	0.01	0.61	0.30	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	475	475	0.03	0.07	498
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.14	0.13	1.52	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	363	363	0.01	0.02	368

Vendor	0.01	0.64	0.30	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	475	475	0.03	0.07	497
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.10	0.08	1.06	0.00	0.00	0.27	0.27	0.00	0.06	0.06	—	262	262	0.01	0.01	266
Vendor	0.01	0.45	0.21	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	339	339	0.02	0.05	355
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.19	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	43.4	43.4	< 0.005	< 0.005	44.1
Vendor	< 0.005	0.08	0.04	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	56.2	56.2	< 0.005	0.01	58.8
Hauling	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

3.11. Building Construction (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.62	18.9	14.3	0.02	0.69	—	0.69	0.64	—	0.64	—	2,397	2,397	0.10	0.02	2,405
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.62	18.9	14.3	0.02	0.69	—	0.69	0.64	—	0.64	—	2,397	2,397	0.10	0.02	2,405
Onsite truck	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

Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.11	3.40	2.57	< 0.005	0.12	—	0.12	0.12	—	0.12	—	432	432	0.02	< 0.005	433
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.62	0.47	< 0.005	0.02	—	0.02	0.02	—	0.02	—	71.5	71.5	< 0.005	< 0.005	71.7
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.14	0.10	1.69	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	389	389	0.01	0.01	395
Vendor	0.01	0.58	0.28	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	465	465	0.03	0.07	488
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.13	0.12	1.43	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	356	356	0.01	0.02	361
Vendor	0.01	0.61	0.29	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	466	466	0.03	0.07	487
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.25	0.00	0.00	0.07	0.07	0.00	0.02	0.02	—	64.9	64.9	< 0.005	< 0.005	65.8
Vendor	< 0.005	0.11	0.05	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	83.8	83.8	< 0.005	0.01	87.8
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.7	10.7	< 0.005	< 0.005	10.9

Vendor	< 0.005	0.02	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	13.9	13.9	< 0.005	< 0.005	14.5
Hauling	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

3.12. Building Construction (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.44	11.8	14.3	0.02	0.08	—	0.08	0.07	—	0.07	—	2,397	2,397	0.10	0.02	2,405
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.44	11.8	14.3	0.02	0.08	—	0.08	0.07	—	0.07	—	2,397	2,397	0.10	0.02	2,405
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.08	2.13	2.57	< 0.005	0.01	—	0.01	0.01	—	0.01	—	432	432	0.02	< 0.005	433
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.39	0.47	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	71.5	71.5	< 0.005	< 0.005	71.7
Onsite truck	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

Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.14	0.10	1.69	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	389	389	0.01	0.01	395
Vendor	0.01	0.58	0.28	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	465	465	0.03	0.07	488
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.13	0.12	1.43	0.00	0.00	0.38	0.38	0.00	0.09	0.09	—	356	356	0.01	0.02	361
Vendor	0.01	0.61	0.29	< 0.005	0.01	0.13	0.13	0.01	0.03	0.04	—	466	466	0.03	0.07	487
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.25	0.00	0.00	0.07	0.07	0.00	0.02	0.02	—	64.9	64.9	< 0.005	< 0.005	65.8
Vendor	< 0.005	0.11	0.05	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	83.8	83.8	< 0.005	0.01	87.8
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.7	10.7	< 0.005	< 0.005	10.9
Vendor	< 0.005	0.02	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	13.9	13.9	< 0.005	< 0.005	14.5
Hauling	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

3.13. Paving (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.42	11.2	8.87	0.01	0.48	—	0.48	0.45	—	0.45	—	1,350	1,350	0.05	0.01	1,355
Paving	0.19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.92	0.73	< 0.005	0.04	—	0.04	0.04	—	0.04	—	111	111	< 0.005	< 0.005	111
Paving	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.17	0.13	< 0.005	0.01	—	0.01	0.01	—	0.01	—	18.4	18.4	< 0.005	< 0.005	18.4
Paving	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.04	0.73	0.00	0.00	0.17	0.17	0.00	0.04	0.04	—	170	170	< 0.005	0.01	172
Vendor	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
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	12.9	12.9	< 0.005	< 0.005	13.1
Vendor	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
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.13	2.13	< 0.005	< 0.005	2.17
Vendor	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
Hauling	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

3.14. Paving (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.26	7.14	8.87	0.01	0.05	—	0.05	0.04	—	0.04	—	1,350	1,350	0.05	0.01	1,355
Paving	0.19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.59	0.73	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	111	111	< 0.005	< 0.005	111
Paving	0.02	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	0.11	0.13	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	18.4	18.4	< 0.005	< 0.005	18.4
Paving	< 0.005	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.04	0.73	0.00	0.00	0.17	0.17	0.00	0.04	0.04	—	170	170	< 0.005	0.01	172
Vendor	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
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	12.9	12.9	< 0.005	< 0.005	13.1
Vendor	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
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.13	2.13	< 0.005	< 0.005	2.17
Vendor	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
Hauling	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

3.15. Architectural Coating (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	1.09	0.96	< 0.005	0.07	—	0.07	0.06	—	0.06	—	134	134	0.01	< 0.005	134
Architectural Coatings	0.79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	0.05	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	6.53	6.53	< 0.005	< 0.005	6.55
Architectural Coatings	0.04	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	0.01	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.08	1.08	< 0.005	< 0.005	1.09
Architectural Coatings	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.30	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	72.6	72.6	< 0.005	< 0.005	73.6
Vendor	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
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.59	3.59	< 0.005	< 0.005	3.65
Vendor	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
Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	0.59	0.59	< 0.005	< 0.005	0.60
Vendor	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
Hauling	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

3.16. Architectural Coating (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	1.09	0.96	< 0.005	0.01	—	0.01	0.01	—	0.01	—	134	134	0.01	< 0.005	134
Architectural Coatings	0.79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	0.05	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	6.53	6.53	< 0.005	< 0.005	6.55
Architectural Coatings	0.04	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	0.01	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.08	1.08	< 0.005	< 0.005	1.09
Architectural Coatings	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.30	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	72.6	72.6	< 0.005	< 0.005	73.6
Vendor	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
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.59	3.59	< 0.005	< 0.005	3.65
Vendor	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

Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	0.59	0.59	< 0.005	< 0.005	0.60
Vendor	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
Hauling	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

3.17. Architectural Coating (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	1.09	0.96	< 0.005	0.07	—	0.07	0.06	—	0.06	—	134	134	0.01	< 0.005	134
Architectural Coatings	0.79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	1.09	0.96	< 0.005	0.07	—	0.07	0.06	—	0.06	—	134	134	0.01	< 0.005	134
Architectural Coatings	0.79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.02	0.46	0.41	< 0.005	0.03	—	0.03	0.03	—	0.03	—	57.0	57.0	< 0.005	< 0.005	57.2
Architectural Coatings	0.34	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	0.08	0.07	< 0.005	0.01	—	0.01	< 0.005	—	< 0.005	—	9.43	9.43	< 0.005	< 0.005	9.46
Architectural Coatings	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.02	0.34	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.9	77.9	< 0.005	< 0.005	79.1
Vendor	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
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.02	0.29	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	71.3	71.3	< 0.005	< 0.005	72.3
Vendor	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
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.12	0.00	0.00	0.03	0.03	0.00	0.01	0.01	—	30.7	30.7	< 0.005	< 0.005	31.2
Vendor	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

Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.02	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	5.09	5.09	< 0.005	< 0.005	5.16
Vendor	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
Hauling	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

3.18. Architectural Coating (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	1.09	0.96	< 0.005	0.01	—	0.01	0.01	—	0.01	—	134	134	0.01	< 0.005	134
Architectural Coatings	0.79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	1.09	0.96	< 0.005	0.01	—	0.01	0.01	—	0.01	—	134	134	0.01	< 0.005	134
Architectural Coatings	0.79	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.02	0.46	0.41	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	57.0	57.0	< 0.005	< 0.005	57.2
Architectural Coatings	0.34	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	0.08	0.07	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	9.43	9.43	< 0.005	< 0.005	9.46
Architectural Coatings	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	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
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.02	0.34	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.9	77.9	< 0.005	< 0.005	79.1
Vendor	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
Hauling	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.02	0.29	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	71.3	71.3	< 0.005	< 0.005	72.3
Vendor	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
Hauling	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.12	0.00	0.00	0.03	0.03	0.00	0.01	0.01	—	30.7	30.7	< 0.005	< 0.005	31.2
Vendor	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

Hauling	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.02	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	5.09	5.09	< 0.005	< 0.005	5.16
Vendor	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
Hauling	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

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.31	0.21	2.28	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	548	548	0.02	0.02	557
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.31	0.21	2.28	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	548	548	0.02	0.02	557
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.30	0.25	2.15	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	511	511	0.03	0.02	519
Parking Lot	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

Other Non-Asphalt Surfaces	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
Total	0.30	0.25	2.15	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	511	511	0.03	0.02	519
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.05	0.04	0.38	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.02	—	85.3	85.3	< 0.005	< 0.005	86.6
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.05	0.04	0.38	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.02	—	85.3	85.3	< 0.005	< 0.005	86.6

4.1.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.31	0.21	2.28	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	548	548	0.02	0.02	557
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.31	0.21	2.28	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	548	548	0.02	0.02	557
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.30	0.25	2.15	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	511	511	0.03	0.02	519

Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.30	0.25	2.15	0.01	< 0.005	0.49	0.50	< 0.005	0.13	0.13	—	511	511	0.03	0.02	519
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.05	0.04	0.38	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.02	—	85.3	85.3	< 0.005	< 0.005	86.6
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.05	0.04	0.38	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.02	—	85.3	85.3	< 0.005	< 0.005	86.6

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	165	165	0.03	< 0.005	166
Parking Lot	—	—	—	—	—	—	—	—	—	—	—	47.1	47.1	0.01	< 0.005	47.6
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	212	212	0.03	< 0.005	214

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	165	165	0.03	< 0.005	166
Parking Lot	—	—	—	—	—	—	—	—	—	—	—	47.1	47.1	0.01	< 0.005	47.6
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	212	212	0.03	< 0.005	214
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	27.3	27.3	< 0.005	< 0.005	27.5
Parking Lot	—	—	—	—	—	—	—	—	—	—	—	7.80	7.80	< 0.005	< 0.005	7.88
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	35.1	35.1	0.01	< 0.005	35.4

4.2.2. Electricity Emissions By Land Use - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	165	165	0.03	< 0.005	166
Parking Lot	—	—	—	—	—	—	—	—	—	—	—	47.1	47.1	0.01	< 0.005	47.6

Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	212	212	0.03	< 0.005	214
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	165	165	0.03	< 0.005	166
Parking Lot	—	—	—	—	—	—	—	—	—	—	—	47.1	47.1	0.01	< 0.005	47.6
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	212	212	0.03	< 0.005	214
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	27.3	27.3	< 0.005	< 0.005	27.5
Parking Lot	—	—	—	—	—	—	—	—	—	—	—	7.80	7.80	< 0.005	< 0.005	7.88
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	35.1	35.1	0.01	< 0.005	35.4

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	379	379	0.03	< 0.005	380

Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	379	379	0.03	< 0.005	380
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	379	379	0.03	< 0.005	380
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	379	379	0.03	< 0.005	380
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	< 0.005	0.06	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	62.7	62.7	0.01	< 0.005	62.9
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	< 0.005	0.06	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	62.7	62.7	0.01	< 0.005	62.9

4.2.4. Natural Gas Emissions By Land Use - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Health Club	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	379	379	0.03	< 0.005	380
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	379	379	0.03	< 0.005	380
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	379	379	0.03	< 0.005	380
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	0.02	0.32	0.27	< 0.005	0.02	—	0.02	0.02	—	0.02	—	379	379	0.03	< 0.005	380
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	< 0.005	0.06	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	62.7	62.7	0.01	< 0.005	62.9
Parking Lot	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
Other Non-Asphalt Surfaces	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
Total	< 0.005	0.06	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	62.7	62.7	0.01	< 0.005	62.9

4.3. Area Emissions by Source

4.3.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.59	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.78	0.04	4.75	< 0.005	0.01	—	0.01	0.01	—	0.01	—	19.6	19.6	< 0.005	< 0.005	19.6
Total	1.43	0.04	4.75	< 0.005	0.01	—	0.01	0.01	—	0.01	—	19.6	19.6	< 0.005	< 0.005	19.6
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.59	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	0.65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.07	< 0.005	0.43	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.60	1.60	< 0.005	< 0.005	1.60
Total	0.19	< 0.005	0.43	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.60	1.60	< 0.005	< 0.005	1.60

4.3.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.59	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.78	0.04	4.75	< 0.005	0.01	—	0.01	0.01	—	0.01	—	19.6	19.6	< 0.005	< 0.005	19.6
Total	1.43	0.04	4.75	< 0.005	0.01	—	0.01	0.01	—	0.01	—	19.6	19.6	< 0.005	< 0.005	19.6
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.59	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.06	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	0.65	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.01	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Landscape Equipment	0.07	< 0.005	0.43	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.60	1.60	< 0.005	< 0.005	1.60
Total	0.19	< 0.005	0.43	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.60	1.60	< 0.005	< 0.005	1.60

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	0.51	1.28	1.78	0.05	< 0.005	3.46
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	0.51	1.28	1.78	0.05	< 0.005	3.46

4.4.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00

Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	3.06	7.70	10.8	0.32	0.01	20.9
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	0.51	1.28	1.78	0.05	< 0.005	3.46
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	0.51	1.28	1.78	0.05	< 0.005	3.46

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Health Club	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	13.7	0.00	13.7	1.37	0.00	48.0
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	13.7	0.00	13.7	1.37	0.00	48.0

4.5.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	82.9	0.00	82.9	8.29	0.00	290
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	13.7	0.00	13.7	1.37	0.00	48.0
Parking Lot	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	—	—	—	—	—	—	—	—	—	—	13.7	0.00	13.7	1.37	0.00	48.0

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02

4.6.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Health Club	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.7.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.8.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.9.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.4. Soil Carbon Accumulation By Vegetation Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.5. Above and Belowground Carbon Accumulation by Land Use Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.6. Avoided and Sequestered Emissions by Species - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Demolition	Demolition	8/4/2025	8/29/2025	5.00	20.0	—
Site Preparation	Site Preparation	9/1/2025	10/10/2025	5.00	30.0	—
Grading	Grading	10/13/2025	11/28/2025	5.00	35.0	—

Building Construction	Building Construction	12/1/2025	4/2/2027	5.00	350	—
Paving	Paving	4/5/2027	5/14/2027	5.00	30.0	—
Architectural Coating	Architectural Coating	12/7/2026	8/6/2027	5.00	175	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Demolition	Rubber Tired Dozers	Diesel	Tier 2	2.00	8.00	367	0.40
Demolition	Concrete/Industrial Saws	Diesel	Tier 2	1.00	8.00	33.0	0.73
Demolition	Excavators	Diesel	Tier 2	3.00	8.00	36.0	0.38
Site Preparation	Rubber Tired Dozers	Diesel	Tier 2	3.00	8.00	367	0.40
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Tier 2	4.00	8.00	84.0	0.37
Grading	Graders	Diesel	Tier 2	1.00	8.00	148	0.41
Grading	Excavators	Diesel	Tier 2	1.00	8.00	36.0	0.38
Grading	Tractors/Loaders/Backhoes	Diesel	Tier 2	3.00	8.00	84.0	0.37
Grading	Rubber Tired Dozers	Diesel	Tier 2	1.00	8.00	367	0.40
Building Construction	Cranes	Diesel	Tier 2	1.00	7.00	367	0.29
Building Construction	Forklifts	Diesel	Tier 2	3.00	8.00	82.0	0.20
Building Construction	Generator Sets	Diesel	Tier 2	1.00	8.00	14.0	0.74
Building Construction	Welders	Diesel	Tier 2	1.00	8.00	46.0	0.45
Building Construction	Tractors/Loaders/Backhoes	Diesel	Tier 2	3.00	7.00	84.0	0.37
Paving	Tractors/Loaders/Backhoes	Diesel	Tier 2	1.00	8.00	84.0	0.37
Paving	Cement and Mortar Mixers	Diesel	Tier 2	2.00	6.00	10.0	0.56

Paving	Pavers	Diesel	Tier 2	1.00	8.00	81.0	0.42
Paving	Paving Equipment	Diesel	Tier 2	2.00	6.00	89.0	0.36
Paving	Rollers	Diesel	Tier 2	2.00	6.00	36.0	0.38
Architectural Coating	Air Compressors	Diesel	Tier 2	1.00	6.00	37.0	0.48

5.2.2. Mitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Demolition	Rubber Tired Dozers	Diesel	Tier 3	2.00	8.00	367	0.40
Demolition	Concrete/Industrial Saws	Diesel	Tier 3	1.00	8.00	33.0	0.73
Demolition	Excavators	Diesel	Tier 3	3.00	8.00	36.0	0.38
Site Preparation	Rubber Tired Dozers	Diesel	Tier 3	3.00	8.00	367	0.40
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Tier 3	4.00	8.00	84.0	0.37
Grading	Graders	Diesel	Tier 3	1.00	8.00	148	0.41
Grading	Excavators	Diesel	Tier 3	1.00	8.00	36.0	0.38
Grading	Tractors/Loaders/Backhoes	Diesel	Tier 3	3.00	8.00	84.0	0.37
Grading	Rubber Tired Dozers	Diesel	Tier 3	1.00	8.00	367	0.40
Building Construction	Cranes	Diesel	Tier 3	1.00	7.00	367	0.29
Building Construction	Forklifts	Diesel	Tier 3	3.00	8.00	82.0	0.20
Building Construction	Generator Sets	Diesel	Tier 2	1.00	8.00	14.0	0.74
Building Construction	Welders	Diesel	Tier 3	1.00	8.00	46.0	0.45
Building Construction	Tractors/Loaders/Backhoes	Diesel	Tier 3	3.00	7.00	84.0	0.37
Paving	Tractors/Loaders/Backhoes	Diesel	Tier 3	1.00	8.00	84.0	0.37
Paving	Cement and Mortar Mixers	Diesel	Tier 2	2.00	6.00	10.0	0.56

Paving	Pavers	Diesel	Tier 3	1.00	8.00	81.0	0.42
Paving	Paving Equipment	Diesel	Tier 3	2.00	6.00	89.0	0.36
Paving	Rollers	Diesel	Tier 3	2.00	6.00	36.0	0.38
Architectural Coating	Air Compressors	Diesel	Tier 3	1.00	6.00	37.0	0.48

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demolition	—	—	—	—
Demolition	Worker	15.0	11.7	LDA,LDT1,LDT2
Demolition	Vendor	—	8.40	HHDT,MHDT
Demolition	Hauling	36.8	20.0	HHDT
Demolition	Onsite truck	—	—	HHDT
Site Preparation	—	—	—	—
Site Preparation	Worker	17.5	11.7	LDA,LDT1,LDT2
Site Preparation	Vendor	—	8.40	HHDT,MHDT
Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	15.0	11.7	LDA,LDT1,LDT2
Grading	Vendor	—	8.40	HHDT,MHDT
Grading	Hauling	79.5	20.0	HHDT
Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	45.9	11.7	LDA,LDT1,LDT2
Building Construction	Vendor	17.9	8.40	HHDT,MHDT

Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	20.0	11.7	LDA,LDT1,LDT2
Paving	Vendor	—	8.40	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT
Architectural Coating	—	—	—	—
Architectural Coating	Worker	9.18	11.7	LDA,LDT1,LDT2
Architectural Coating	Vendor	—	8.40	HHDT,MHDT
Architectural Coating	Hauling	0.00	20.0	HHDT
Architectural Coating	Onsite truck	—	—	HHDT

5.3.2. Mitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Demolition	—	—	—	—
Demolition	Worker	15.0	11.7	LDA,LDT1,LDT2
Demolition	Vendor	—	8.40	HHDT,MHDT
Demolition	Hauling	36.8	20.0	HHDT
Demolition	Onsite truck	—	—	HHDT
Site Preparation	—	—	—	—
Site Preparation	Worker	17.5	11.7	LDA,LDT1,LDT2
Site Preparation	Vendor	—	8.40	HHDT,MHDT
Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	15.0	11.7	LDA,LDT1,LDT2

Grading	Vendor	—	8.40	HHDT,MHDT
Grading	Hauling	79.5	20.0	HHDT
Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	45.9	11.7	LDA,LDT1,LDT2
Building Construction	Vendor	17.9	8.40	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	20.0	11.7	LDA,LDT1,LDT2
Paving	Vendor	—	8.40	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT
Architectural Coating	—	—	—	—
Architectural Coating	Worker	9.18	11.7	LDA,LDT1,LDT2
Architectural Coating	Vendor	—	8.40	HHDT,MHDT
Architectural Coating	Hauling	0.00	20.0	HHDT
Architectural Coating	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Control Strategies Applied	PM10 Reduction	PM2.5 Reduction
Water unpaved roads twice daily	55%	55%
Limit vehicle speeds on unpaved roads to 25 mph	44%	44%
Sweep paved roads once per month	9%	9%

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
Architectural Coating	0.00	0.00	40,500	13,500	5,776

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Building Square Footage)	Acres Paved (acres)
Demolition	0.00	0.00	0.00	64,000	—
Site Preparation	0.00	0.00	45.0	0.00	—
Grading	250	22,000	35.0	0.00	—
Paving	0.00	0.00	0.00	0.00	4.10

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Health Club	0.00	0%
Parking Lot	2.21	100%
Other Non-Asphalt Surfaces	1.89	0%
—	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2025	0.00	204	0.03	< 0.005
2026	0.00	204	0.03	< 0.005
2027	0.00	204	0.03	< 0.005

5.9. Operational Mobile Sources

5.9.1. Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Health Club	89.9	89.9	89.9	32,817	699	699	699	255,029
Parking Lot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

5.9.2. Mitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Health Club	89.9	89.9	89.9	32,817	699	699	699	255,029
Parking Lot	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Non-Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.1.2. Mitigated

5.10.2. Architectural Coatings

Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
0	0.00	60,000	20,000	10,716

5.10.3. Landscape Equipment

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	180

5.10.4. Landscape Equipment - Mitigated

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	180

5.11. Operational Energy Consumption

5.11.1. Unmitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
Health Club	294,574	204	0.0330	0.0040	1,182,306
Parking Lot	84,330	204	0.0330	0.0040	0.00
Other Non-Asphalt Surfaces	0.00	204	0.0330	0.0040	0.00

5.11.2. Mitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
Health Club	294,574	204	0.0330	0.0040	1,182,306
Parking Lot	84,330	204	0.0330	0.0040	0.00
Other Non-Asphalt Surfaces	0.00	204	0.0330	0.0040	0.00

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
Health Club	1,596,865	697,967
Parking Lot	0.00	0.00
Other Non-Asphalt Surfaces	0.00	0.00

5.12.2. Mitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
Health Club	1,596,865	697,967
Parking Lot	0.00	0.00
Other Non-Asphalt Surfaces	0.00	0.00

5.13. Operational Waste Generation

5.13.1. Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
Health Club	154	—

Parking Lot	0.00	—
Other Non-Asphalt Surfaces	0.00	—

5.13.2. Mitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
Health Club	154	—
Parking Lot	0.00	—
Other Non-Asphalt Surfaces	0.00	—

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced
Health Club	Other commercial A/C and heat pumps	R-410A	2,088	< 0.005	4.00	4.00	18.0
Health Club	Stand-alone retail refrigerators and freezers	R-134a	1,430	0.04	1.00	0.00	1.00

5.14.2. Mitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced
Health Club	Other commercial A/C and heat pumps	R-410A	2,088	< 0.005	4.00	4.00	18.0
Health Club	Stand-alone retail refrigerators and freezers	R-134a	1,430	0.04	1.00	0.00	1.00

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

5.15.2. Mitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

Equipment Type	Fuel Type	Number per Day	Hours per Day	Hours per Year	Horsepower	Load Factor

5.16.2. Process Boilers

Equipment Type	Fuel Type	Number	Boiler Rating (MMBtu/hr)	Daily Heat Input (MMBtu/day)	Annual Heat Input (MMBtu/yr)

5.17. User Defined

Equipment Type	Fuel Type

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

5.18.2.2. Mitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

8. User Changes to Default Data

Screen	Justification
Land Use	Total project site is approximately 4.7 acres. Project would consists of a 27,000 sf aquatic/community center with a 1.89 acre concrete pond and 9 new parking spaces. Landscape area is based on the proposed pervious surfaces for the project site.
Construction: Construction Phases	Construction is expected to start in August 2025 and occur for 24 months. Phases were extended to account for a 24-month construction period. Assuming overlap between building construction and architectural coating.
Construction: Off-Road Equipment	default construction equipment with Tier 2 engines

Construction: Architectural Coatings	Project would comply with BAAQMD regulation 8, rule 3 for architectural coating
Operations: Vehicle Data	proposed project would result in 90 net average daily trips, traip rate was adjusted as follows: Trip rate = 90 trips/ 27 tsf = 3.33
Operations: Architectural Coatings	Project would comply with BAAQMD regulation 8, rule 3 for architectural coating

APPENDIX B

HRA MODEL SNAPSHOTS

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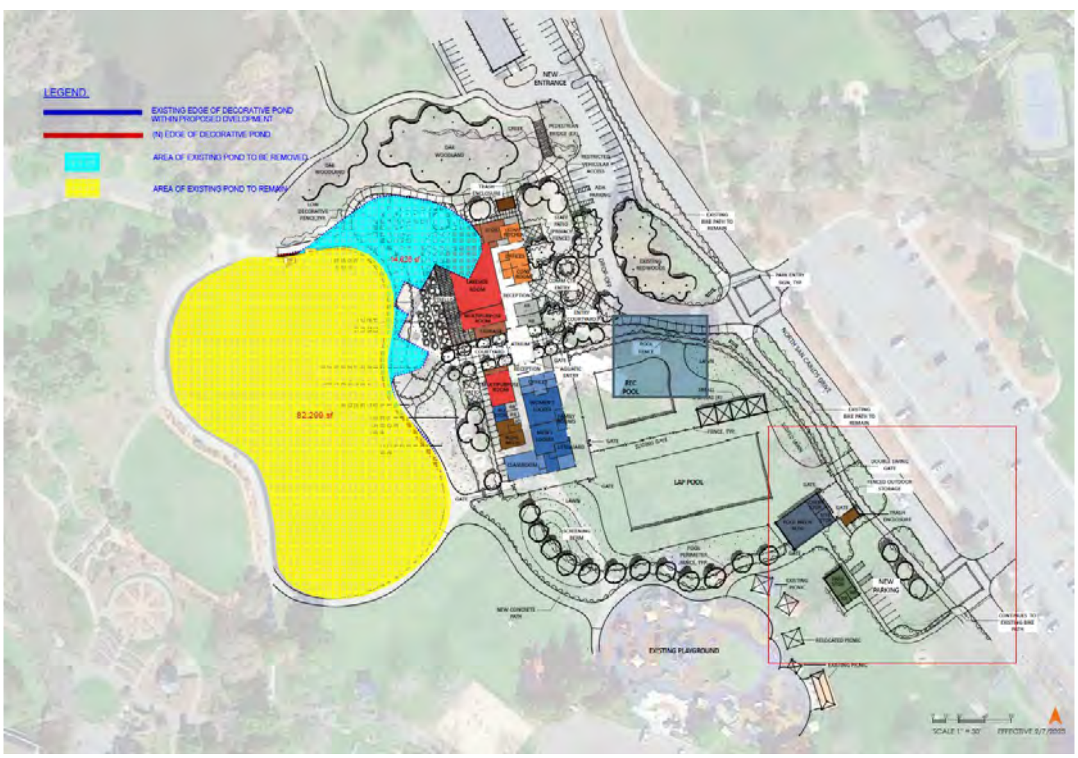
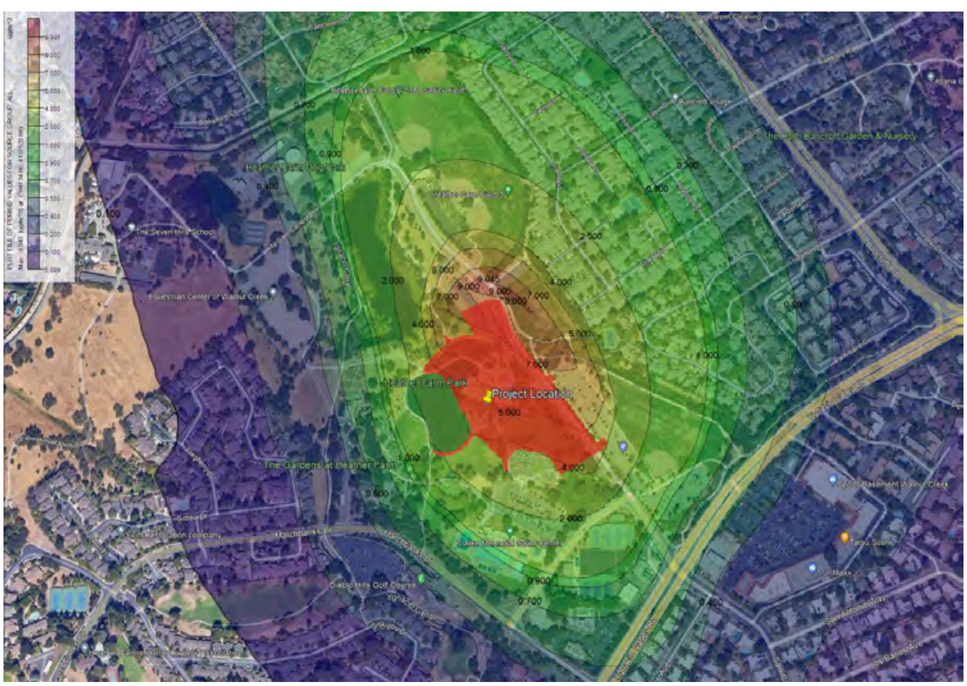
Project Location

Site Plan



Receptor Grid

Construction Cancer Risk – Sensitive Receptor (Mitigated Scenario)



General AERMOD Input Parameters		
Project Boundary		
Based on site plan		
Project Elevation Data		
Source	**Lakes Environmental**	
Link	http://www.webgis.com/terraindata.html	
Data Descr.	**7.5 min DEM not available**	
Project Receptor Grid		
Fenceline Boundary Grid	Spacing (m)	Distance (m)
Grid 1	**20**	**100**
Grid 2	**50**	**200**
Grid 3	**100**	**400**
Grid 4	**200**	**800**
Comments	**Receptors on roads or parking lot areas have been removed.**	
Meteorological Dataset		
Location	**KCCR**	
Provided By	**BAAQMD**	
Years	**2013-2017**	
Elevation (m)	**23.6**	
Link	https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/ceqa-tools/ceqa-modeling-data	
Construction Modeling Specific Inputs		
AERMOD Input Options		
Regulatory Options	**Default**	
Pollutant Type	**Other**	
Averaging Period	**Annual & Hourly**	
Dispersion Coefficient	**Urban**	
County	**Contra Costa**	
Urban Grouping / Pop	**Y**	**68,969**
# of Sensitive Receptors	**2,962**	
Construction Area Parameters		
Source Type	**Polygon Area**	
Project Area (m^2)	**342715.6**	
Ht. of Source (m)	**3.048**	

General HARP Input Parameters	
Construction	
Sensitive Receptors	
Sensitive Scenario Parameters	
Starting Age	**3rd Trimester**
Age Range	**3rd Trimester - 3 Year**
Receptor Type	**Individual Resident**
Assessment Type	**Cancer / Chronic / Acute**
Exposure Duration	**3**

	Intake Rate	**RMP using the Derived Method**
Sensitive Pathway Parameters		
	Pathways	**BAAQMD Mandatory minimum Pathways**
	Deposition Rate	**0.02**
	TAH < 16 yrs	**N**
	TAH ≥ 16 yrs	**N**

Construction MEI (Sensitive) - Cancer Risk (in a Million) HARP Rec #: 110 X: 584205.95 Y: 4197493.87	
Unmitigated (in one million)	Mitigated (in one million)
76.40	9.07
MEI (Sensitive) - Chronic Hazard Index HARP Rec #: 110 X: 584205.95 Y: 4197493.87	
Unmitigated	Mitigated
4.01E-02	5.22E-03
MEI (Sensitive) - Acute Hazard Index HARP Rec #: NA X: NA Y: NA	
Unmitigated	Mitigated
0.00E+00	0.00E+00
MEI (Sensitive) - PM 2.5 HARP Rec #: 110 X: 584205.95 Y: 4197493.87	
Unmitigated	Mitigated
2.006E-01	2.381E-02

Control Pathway

Dispersion Options

Titles

C:\Users\Jessica.Coria\OneDrive - LSA Associates\Desktop\Heather Far

Dispersion Options

- [x] Regulatory Default
- [ ] Non-Default Options

Dispersion Coefficient

Urban

Population:
Name (Optional):
Roughness Length:

Output Type

- [x] Concentration
- [ ] Total Deposition (Dry & Wet)
- [ ] Dry Deposition
- [ ] Wet Deposition

Plume Depletion

- [ ] Dry Removal
- [ ] Wet Removal

Output Warnings

- [ ] No Output Warnings
- [ ] Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

PM2.5

Averaging Time Options

Hours

1	2	3	4	6	8	12	24
[x]	[ ]	[ ]	[ ]	[ ]	[x]	[ ]	[ ]

- [ ] Month
- [ ] Period
- [x] Annual

Exponential Decay

Option not available
Half Life of 4 hrs will be used

Terrain Height Options

- [ ] Flat
- [x] Elevated

SO: Meters
RE: Meters
TG: Meters

Flagpole Receptors

- [ ] Yes
- [x] No

Default Height = 0.00 m

Control Pathway

Optional Files

- [ ] Re-Start File
- [ ] Init File
- [ ] Multi-Year Analyses
- [ ] Event Input File
- [x] Error Listing File

Detailed Error Listing File

Filename: HeatherFarmHRA.err

Meteorology Pathway

AERMOD

Met Input Data

Surface Met Data

Filename: KCCR_2013-17.SFC

Format Type: Default AERMET format

Profile Met Data

Filename: KCCR_2013-17.PFL

Format Type: Default AERMET format

Wind Speed

☐ Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 5.50 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2013			Concord-Buchanan Field KCCR
Upper Air		2013			OAKLAND/WSO AP

Data Period

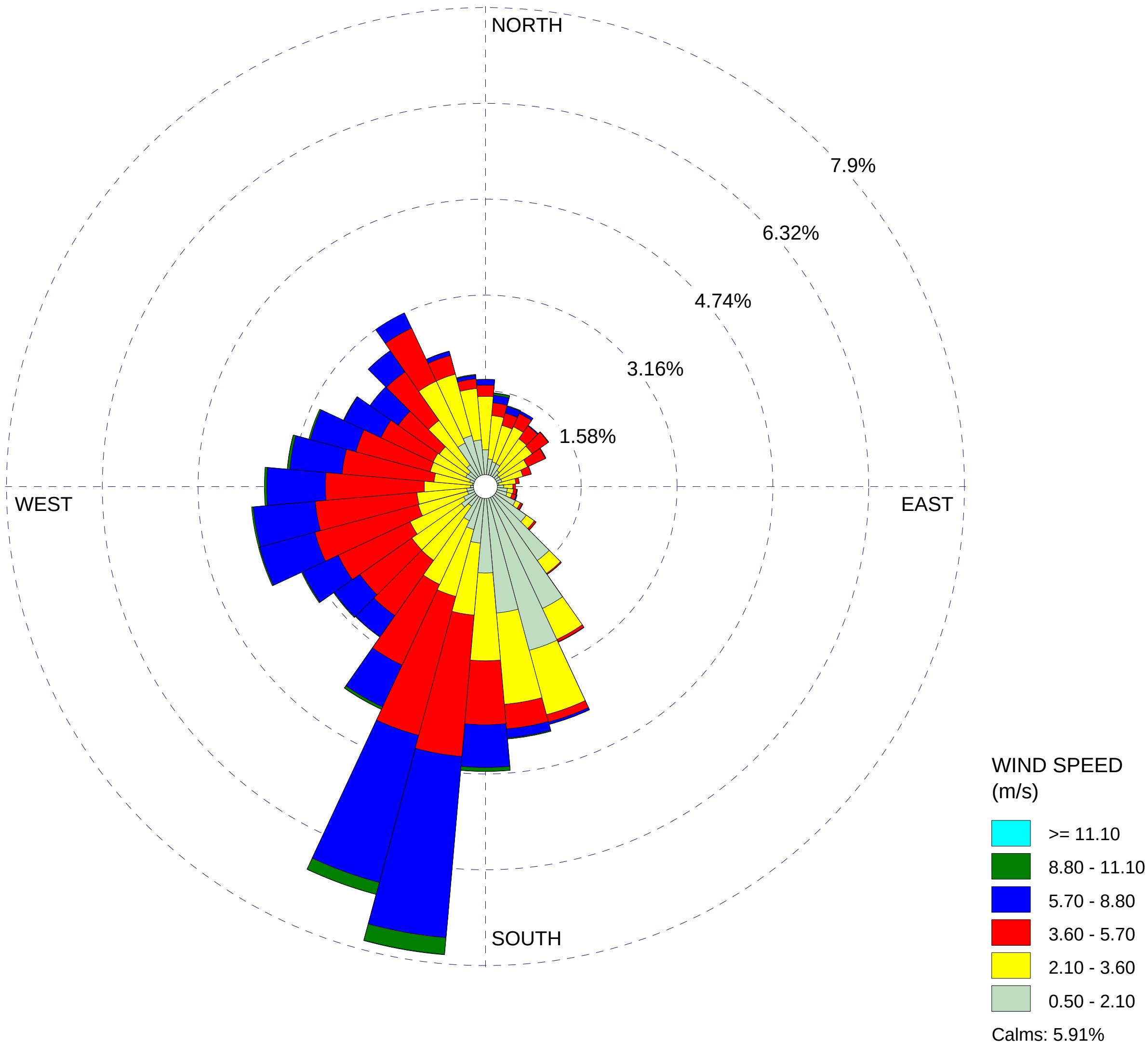
Data Period to Process

Start Date: 1/1/2013 Start Hour: 1 End Date: 12/31/2017 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

WIND ROSE PLOT:	DISPLAY:
Station #23254	**Wind Speed** **Direction (blowing from)**



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	Start Date: 1/1/2013 - 00:00 **End Date: 12/31/2017 - 23:59**		
		MODELER:	
	CALM WINDS: **5.91%**	TOTAL COUNT: **43148 hrs.**	
	AVG. WIND SPEED: **3.47 m/s**	DATE: **4/4/2024**	PROJECT NO.: **201.70 Via Oro Wareh**

WRPLOT View - Lakes Environmental Software

APPENDIX C

BIOLOGICAL RESOURCES TECHNICAL MEMORANDUM

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LSA

CARLSBAD
CLOVIS
IRVINE
LOS ANGELES
PALM SPRINGS
POINT RICHMOND
RIVERSIDE
ROSEVILLE
SAN LUIS OBISPO

MEMORANDUM

DATE: December 14, 2023

TO: Steve Waymire, City Engineer, City of Walnut Creek

FROM: John Kunna, Senior Biologist, LSA

SUBJECT: Biological Resources Technical Memorandum for Heather Farm Park, North San Carlos Drive, Walnut Creek

INTRODUCTION AND PURPOSE

This memo presents the results of LSA's biological survey of Heather Farm Park. This study was conducted to assess the potential presence of special-status species and other protected biological resources. This study could form the basis for the California Environmental Quality Act (CEQA) analysis on biological resources for projects, such as replacing turfgrass with synthetic turf and filling part of the concrete pond. This memorandum includes:

- A description of the methods
- A discussion of the general regulatory background
- A discussion of the soils, plant communities, and other land cover types
- Identification and discussion of areas that may potentially be considered jurisdictional wetlands, waters of the United States (WOTUS), waters of the State, or streambeds, as defined by the United States Army Corps of Engineers (USACE), the California State Water Resources Control Board, and the California Department of Fish and Wildlife (CDFW)
- A description of observed or otherwise detected special-status species
- An assessment of potential habitat value for special-status species
- Recommendations for protection of biological resources

METHODS

Literature Review

LSA conducted a biological resource records search of the most current versions of the CDFW California Natural Diversity Database (CNDDB), the California Native Plant Society (CNPS) Electronic

Inventory of Rare and Endangered Vascular Plants of California, and the United States Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) database (Appendix A). For the CNDDB query, LSA used a 5-mile radius of the site. For the CNPS query, LSA searched for all records of special-status species on the *Walnut Creek*, California United States Geological Survey (USGS) quadrangle.

LSA accessed the National Wetlands Inventory (NWI) Wetlands Mapper[1] to determine if there were any known drainages or wetlands on or near the site. LSA used the United States Department of Agriculture Web Soil Survey to map the soils on the site (USDA n.d.).

LSA also reviewed historic aerial imagery of the site and the following documents:

- 2003 Draft Initial Study/Mitigated Negative Declaration (IS/MND) for the Heather Farm Park Master Plan Update (Wagstaff and Associates et al. 2003)
- 2010 memo from ICF to the City of Walnut Creek (City) (Walter 2010)
- 2022 Annual Report Summary for Aquatic Pesticide Monitoring at Heather Farm Park Agency Submittal, Heather Farm Park Waters, City of Walnut Creek, California (Joyce 2022)
- 2023 memo from Balance Hydrologics, Inc. to Nomad Ecology regarding stream and pond enhancement opportunities (Balance Hydrologics, Inc. 2023)

Site Visit

LSA Senior Biologist John Kunna conducted a site visit on July 28, 2023. Mr. Kunna has conducted wildlife studies in Contra Costa County and the greater Bay Area since 2005. He holds an Endangered Species Act Section 10(a)(1)(A) recovery permit from the USFWS that allows him to work independently with the California tiger salamander (*Ambystoma californiense*), Alameda striped racer (*Coluber lateralis euryxanthus*), and California red-legged frog (*Rana draytonii*). He also has expertise with all other special-status wildlife species that occur in Contra Costa County.

Weather conditions were conducive to observing bird nests and other wildlife activity and sign, with warm temperatures and minimal winds. The biologist used binoculars to observe bird behavior and look for nests. The biologist traversed the entire site on foot, plus a 100-foot buffer around the park boundary where accessible and appropriate. Plant and wildlife species observed during the survey were recorded in field notes and representative photographs were taken.

Although the site visit was not intended to be a protocol-level botanical or rare plant survey, the biologist conducted a focused search for Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*) to the north and west of Concrete Pond and Nature Lake.

1 https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/.

As part of the fieldwork, potential jurisdictional WOTUS and streambeds, riparian vegetation, wetlands subject to State jurisdiction, and/or features considered sensitive by local jurisdictions were also assessed.

All accessible areas of Heather Farm Park were visited. The irrigation reservoir northwest of the park was not surveyed.

REGULATORY BACKGROUND

Federal Endangered Species Act

The USFWS has jurisdiction over federally listed threatened and endangered plant and animal species. The Federal Endangered Species Act (FESA) protects listed species from harm or “take,” which is broadly defined as to “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.” Any such activity can be defined as a “take,” even if it is unintentional or accidental. Listed plant species are typically provided less protection than listed animals.

An endangered species is one that is considered in danger of becoming extinct throughout all or a significant portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Federal agencies involved in permitting projects that may result in take of federally listed species (e.g., USACE) are required under Section 7 of FESA to consult with the USFWS prior to issuing such permits. Any activity that could result in the take of a federally listed species and is not authorized as part of a Section 7 consultation requires an FESA Section 10 take permit from the USFWS.

Clean Water Act Section 404 (33 U.S.C. Sections 1251 to 1376)

The USACE is responsible under Section 404 of the Clean Water Act (CWA) to regulate the discharge of fill material into WOTUS. The CWA provides the primary means for the protection of “waters of the United States,” including wetlands. Under Section 404 of the CWA, the USACE, under the United States Environmental Protection Agency (USEPA), regulates the discharge of dredged and fill material into WOTUS, including wetlands.

The CWA addresses “navigable waters,” defined in the statute as WOTUS. The USACE has further refined the definition through various Clean Water Rules, including wetlands as a subset of WOTUS. Wetlands are those areas that are inundated or saturated by surface water 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 include swamps, marshes, bogs, and similar areas (33 Code of Federal Regulations [CFR] 328.3[b]; 40 CFR 230.3[t]). Wetlands contain three distinct parameters: hydrophytic vegetation, hydric soils, and wetland hydrology.

WOTUS generally not considered to be USACE-jurisdictional include nontidal drainage and irrigation ditches excavated on dry land, artificially irrigated areas, artificial lakes or ponds excavated on dry land used for irrigation or stock watering, small artificial water bodies such as swimming pools, and water-filled depressions (51 *Federal Register* 41, 217 1986). In addition, a Supreme Court ruling (*South Waste Agency of North Cook County [SWANCC] vs. USACE*, January 9, 2001) determined that the USACE exceeded its statutory authority by asserting CWA jurisdiction over “an abandoned sand and gravel pit in northern Illinois, which provides habitat for migratory birds.” Based solely on the use of such waters by migratory birds, the Supreme Court’s holding was strictly limited to waters that are “non-navigable, isolated, and intrastate.”

The Supreme Court further addressed the extent of the USACE’s jurisdiction in the consolidated cases *Rapanos v. United States* (No. 04-1034) and *Carabell v. United States* (No. 04-1384 [USACE and USEPA 2007], referred to as “*Rapanos*.” In *Rapanos*, a sharply divided Court issued multiple opinions, none of which garnered the support of a majority of the Justices. This created substantial uncertainty as to which jurisdictional test should be used in routine jurisdictional determinations. The Ninth Circuit Court of Appeal, which encompasses California, answered this in *Northern California River Watch v. City of Healdsburg* (August 11, 2006). In this case, the Court held that Justice Kennedy’s opinion in *Rapanos* provided the controlling rule of law. Under that rule, wetlands or other waters that are not navigable are subject to USACE jurisdiction if they have “a significant nexus to waters that are navigable in fact.” As Justice Kennedy explained, whether a “significant nexus” exists in any given situation will need to be decided on a case-by-case basis, depending on site-specific circumstances. The USEPA and USACE subsequently developed an instructional guidebook on how to apply these rulings for all future jurisdictional determinations (USACE and USEPA 2007), as well as a memorandum providing guidance to implement the U.S. Supreme Court’s decision in *Rapanos* (Grumbles and Woodley 2007).

On January 18, 2023, the USACE published in the Federal Register the final *Revised Definition of “Waters of the United States* (88 Federal Register 2004). On March 25, 2023, the United States Supreme Court modified the January 2023 definition of WOTUS in *Sackett v. Environmental Protection Agency* (No. 21-454), herein referred to as “*Sackett*.” Specifically, the Court considered the “significant nexus” standard established under *Rapanos* to be inconsistent with the CWA while upholding the plurality standard that the USACE jurisdiction is limited to WOTUS that are “relatively permanent, standing or continuously flowing bodies of water” that can be described in ordinary parlance as “streams, oceans, rivers, and lakes.” The Supreme Court further affirmed that wetlands can be considered WOTUS when a continuous surface connection to bodies that are WOTUS are present and that no clear boundary exists between WOTUS and wetlands. *Sackett* further revised the CWA by removing interstate wetlands from consideration as WOTUS.

On September 8, 2023, the USACE published a final rule conforming the January 2023 rule with the *Sackett* decision, removing the “significant nexus” standard. The amended rule is operative in California.

Features currently **included** in the definition of WOTUS per 33 CFR 328.3(b) include:

(1) Waters which are:

(i) Currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;

(ii) The territorial seas; or

(iii) Interstate waters;

(2) Impoundments of waters otherwise defined as waters of the United States under this definition, other than impoundments of waters identified under paragraph (a)(5) of this section;

(3) Tributaries of waters identified in paragraph (a)(1) or (2) of this section that are relatively permanent, standing or continuously flowing bodies of water

(4) Wetlands adjacent to the following waters

(i) Waters identified in paragraph (a)(1) of this section, or

(ii) Relatively permanent, standing or continuously flowing bodies of water identified in paragraph (a)(2) or (a)(3) of this section and with a continuous surface connection to those waters

(5) Intrastate lakes and ponds, streams, or wetlands not identified in paragraphs (a)(1) through (4) of this section that are relatively permanent, standing or continuously flowing bodies of water with a continuous surface connection to the waters identified in paragraph (a)(1) or (a)(3) of this section

Features currently **excluded** from identification as WOTUS per 33 CFR 328.3(b) include:

- Intrastate streams and wetlands.
- Waste treatment systems, including treatment ponds or lagoons, designed to meet the requirements of the CWA.
- Prior converted cropland designated by the Secretary of Agriculture. The exclusion would cease upon a change of use, which means that the area is no longer available for the production of agricultural commodities. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency, for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with the USEPA.
- Ditches (including roadside ditches) excavated wholly in and draining only dry land and that do not carry a relatively permanent flow of water.
- Artificially irrigated areas that would revert to dry land if the irrigation ceased.

- Artificial lakes or ponds created by excavating or diking dry land to collect and retain water and used exclusively for such purposes as stock watering, irrigation, settling basins, or rice growing.
- Artificial reflecting or swimming pools or other small ornamental bodies of water created by excavating or diking dry land to retain water for primarily aesthetic reasons.
- Water-filled depressions created in dry land incidental to construction activity and pits excavated in dry land for the purpose of obtaining fill, sand, or gravel, unless and until the construction or excavation operation is abandoned and the resulting body of water meets the definition of WOTUS.
- Swales and erosional features (e.g., gullies, small washes) characterized by low-volume, infrequent, or short-duration flow.

In general, a USACE permit must be obtained before placing fill or grading in jurisdictional wetlands or other WOTUS. The USACE will be required to consult with the USFWS and/or National Marine Fisheries Services (NMFS) under Section 7 of FESA if the action subject to CWA permitting could result in take of federally listed species.

Migratory Bird Treaty Act

The federal Migratory Bird Treaty Act (MBTA) prohibits the taking, hunting, killing, selling, purchasing, etc., of migratory birds, parts of migratory birds, and their eggs and nests. As used in the MBTA, the term “take” is defined as “to pursue, hunt, shoot, capture, collect, kill, or attempt to pursue, hunt, shoot, capture, collect, or kill, unless the context otherwise requires.” This act covers most bird species native to the United States.

California Endangered Species Act

CDFW has jurisdiction over State-listed endangered, threatened, and rare plant and animal species under the California Endangered Species Act (CESA). In addition, species designated as “candidates” for listing under CESA are protected by its provisions. CDFW also maintains a list of Species of Special Concern, defined as species that appear to be vulnerable to extinction because of declining populations, limited ranges, and/or continuing threats. Species of Special Concern are not afforded legal protection under CESA.

California Fish and Game Code Section 86 defines “take” as to “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.”

California Fish and Game Code

CDFW is also responsible for enforcing the California Fish and Game Code, which contains several provisions potentially relevant to construction projects. For example, Section 1602 of the California Fish and Game Code governs the CDFW’s issuance of Lake and Streambed Alteration Agreements. Lake and Streambed Alteration Agreements are required whenever proposed project activities would substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated as such by CDFW.

The California Fish and Game Code also designates some animal species as fully protected, which may not be taken or possessed without a permit from the California Fish and Game Commission and/or the CDFW. These take permits do not allow “incidental take” (except in limited circumstances) and are more restrictive than the take allowed under Section 2081 of CESA. Fully protected species are listed in Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the California Fish and Game Code.

Section 3503 of the California Fish and Game Code prohibits the take, possession, or needless destruction of the nest or eggs of any bird. Subsection 3503.5 specifically prohibits the take, possession, or destruction of any birds in the order of Falconiformes (hawks and eagles) or Strigiformes (owls) and their nests. These provisions, along with the federal MBTA, essentially serve to protect nesting native birds. Non-native species are not afforded any protection under the MBTA or the California Fish and Game Code (except that hunting regulations apply to some non-native species listed as game birds).

California Environmental Quality Act

CEQA applies to “projects” proposed to be undertaken or requiring approval by State or local government agencies. Projects are defined as having the potential to have physical impact on the environment.

RESULTS

Existing Conditions

The site is entirely developed with parking lots, sidewalks, sports fields, playground, swim center, buildings, and associated infrastructure, such as lighting and fences. At the time of the site visit**,** there were many visitors using the sports fields and other recreation areas. Several people were walking dogs. Dogs are permitted to be off-leash in the dog park at the north end of the park.

Soils

The soils on and near the site are mapped as Clear Lake Clay, Tierra Loam, and Zamora Silty Clay Loam. The entire survey area has been altered by grading and development. Clear Lake Clay is classified as nonsaline to very slightly saline. There are no serpentine soils on the site.

Vegetation Communities

The vegetation communities are almost entirely planted or ornamental. There are some native trees, but nothing that could be considered an intact woodland community. Small portions of the park that have not been actively maintained would best be described as ruderal.

Special-Status Plant Species

Special-status plants species are rare due to a combination of factors, including restriction to rare soil types, vegetation communities or vernal pools, inability to persist in developed or grazed areas, and inability to compete with non-native invasive species. The IPaC list (provided in Attachment B) contained one federally protected plant species, Contra Costa goldfields (*Lasthenia conjugens*). The

CNDDB query returned 22 special-status plant species with occurrences within 5 miles of the site. The CNPS query returned 11 special-status plant species, 8 of which were also in the CNDDB. The resulting combined list of 25 species is shown in Table A (provided in Attachment C).

Of these 25 species, 24 were determined to have no potential to occur due to a total lack of suitable habitat within the project site (e.g., serpentine and alkaline soils, vernal pools, coastal habitats) and/or because they have not been found within the past 50 years and are therefore likely considered no longer present in the region. No special-status plant species were observed during the reconnaissance-level site visit.

One of the 24 species with no potential to occur—Congdon's tarplant (*Centromadia parryi* ssp*. Congdonii*)—was identified in the ICF memo as the only special-status plant species with potential to occur. There are two CNDDB occurrences for Congdon's tarplant within 5 miles of the site, but both are listed as extirpated. The ICF memo states that one individual Congdon's tarplant had been observed northwest of the site but does not provide a citation for that observation. If there was a population of Congdon's tarplant prior to 2010, it was likely extirpated in subsequent years. The survey was conducted during the flowering period for Congdon's tarplant, when it would have been identifiable if it were present. Therefore, LSA has determined that Congdon's tarplant has no potential to occur.

One special-status plant species—slender-leaved pondweed (*Stuckenia filiformis* subsp. *Alpina*)—was determined to have a moderate potential to occur and is discussed in further detail below.

Slender-Leaved Pondweed. This taxon was added to the CNPS Inventory of Rare and Endangered Plants of California in 1994, under its old name, *Potamogeton filiformis*. The slender-leaved pondweed has a California Rare Plant Rank of 2B.2, meaning that the subspecies is rare, fairly threatened**,** or endangered in California but more common elsewhere. This plant is an aquatic, perennial, rhizomatous herb that generally occurs in shallow freshwater environments. In California, this plant occurs from **t**he Klamath Ranges to the San Joaquin Valley, in the San Francisco Bay area, along the Central Coast, on the Modoc Plateau, and **e**ast of the Sierra Nevada. Pondweeds are an important food source for ducks and can support complex communities of unicellular organisms on their leaf surfaces. Pondweeds also provide important habitat for aquatic invertebrates and fish. There is one CNDDB occurrence within 5 miles of Heather Farms Park, although the subspecies may be more common than observed due to aquatic habitats generally being less surveyed by botanists than terrestrial habitats. The subspecies can grow in fresh, calcareous, brackish**,** or saline waters, as well as in developed areas. A specimen was collected from the city pond at the city hall in Fairfield, California, in 1981 (Wiebush 2021)**.**

There is suitable habitat for the slender-leaved pondweed in Nature Lake and some potential that it may occur there. The plant is not expected to occur in the Concrete Pond due to the ongoing vegetation management activities.

Wildlife

A few California ground squirrels (*Otospermophilus beecheyi*) and their burrows were seen. At least five non-native red-eared sliders (*Trachemys scripta elegans*) were observed in Nature Lake. One turtle that could not be identified to species was also observed. American bullfrogs (*Lithobates catesbeiana*) were observed in Nature Lake and the adjacent portion of Crawdad Creek. Bullfrogs likely breed in Nature Lake.

Bird species observed include American crow (*Corvus brachyrhynchos*), house finch (*Haemorhous mexicanus*), California scrub jay (*Aphelocoma californica*), mourning dove (*Zenaida macroura*), California towhee (*Melozone crissalis*), oak titmouse (*Baeolophus inornatus*), hooded merganser (*Lophodytes cucullatus*), Canada goose (*Branta canadensis*), and mallard (*Anas platyrhynchos*).

The patches of trees, shrubs, and even turf grass likely provide some value for foraging, cover, and refuge for use by other bird species, as well as by dispersing terrestrial animals. Many animals likely to move through the site despite the development and human activity. Therefore, any additional work on the site would not result in significant further fragmentation of natural habitats or substantial impediments to wildlife movement and any common, urban adapted species that currently move through the project site would continue to be able to do so. As such, the project would not significantly interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors.

The site does not provide extensive and/or high-quality habitat areas that would support large breeding populations of any terrestrial wildlife species; therefore, no native wildlife nursery sites are present. However, several native bird species likely nest within the park each year.

Special-Status Wildlife

The IpaC list contains nine federally protected animal species. The CNDDB query returned 11 special-status animal species with occurrences within 5 miles of the site, 4 of which are also on the IpaC list. LSA also analyzed the potential for one additional species, white-tailed kite (*Elanus leucurus*), to occur on the site. The resulting 17 species and their potential to occur are shown in Table B.

As summarized in Table B, 13 of these 17 species were determined to have no potential to occur due to a total lack of suitable habitat within the park (e.g., tidal salt marshes, vernal pools, caves) and/or because they have not been found within the past 50 years and are therefore likely considered no longer present in the region. For birds, the potential to occur refers only to nesting, as many species may fly over or perch on the site.

The IS/MND stated in the text that, although unlikely, California red-legged frog had some potential to occur in the park. However, CRLF is not included in the IS/MND Appendix 4.5, which includes a list of wildlife species with potential to occur on or near the park. As summarized in Table B, LSA determined the species has no potential to occur in the park.

No special-status wildlife species were observed during the reconnaissance-level site visit, but four species were determined to have some potential to occur and are described in further detail below.

Western Pond Turtle. The western pond turtle (*Emys marmorata*) is classified as a State Species of Special Concern. The species is also known as the northwestern pond turtle (*Actinemys marmorata*), and it is warranted as being listed as a Threatened species under FESA (USFWS 2023). This species will likely be listed under FESA in 2024. The IS/MND states that one western pond turtle was detected basking on a floating log in the northern portion of the lake during a field survey conducted on August 12, 2003. The ICF memo states that an exclusion fence was installed and five turtle eggs were uncovered. The memo states that the eggs were "likely" red-eared slider eggs but provides no rationale for that determination. The ICF memo also states that the eggs were relocated to a "suitable off-site location." California Fish and Game Code Title 14, Section 679, generally prohibits the possession or relocation of wildlife without CDFW approval.

Nesting using occurs in the spring or early summer. Female pond turtles excavate nests in friable soils in areas with short or sparse vegetation and usually on south- or west-facing slopes to allow for exposure to direct sunlight. The nest can be up to 1,600 feet from the water body the female uses but is typically located within 300 feet of the waterbody (Thomson et al. 2016). After depositing the eggs, the female covers them and tamps the soil down. In northern California, the hatching turtles may emerge in the fall or overwinter in the nest and emerge in the spring.

Western pond turtle numbers in Heather Farm Park and the surrounding area are likely suppressed due to competition from the non-native red-eared slider for food and basking locations. Western pond turtle numbers could also be depressed by predation by American bullfrogs, which have been observed eating hatchling western pond turtles. Surrounding development and reduction of habitat also likely has impacted the western pond turtle population.

Due to the lack of protected basking areas and fringing vegetation, western pond turtles are not expected to use Concrete Pond.

Monarch Butterfly. The monarch butterfly (*Danaus plexippus plexippus*) is a Candidate species for listing under FESA. Candidate species have no legal protection under FESA, but the monarch does meet the CEQA definition of a special-status species. In July 2022, the monarch butterfly was classified as "endangered" on the International Union for Conservation of Nature (IUCN) Red List. This classification does not afford legal protection.

Overwintering monarch butterfly populations have declined by over 95 percent since the 1980s (Western Association of Fish and Wildlife Agencies. 2019). The cause of this decline is likely due to some combination of habitat loss, insecticides, climate change, parasites, disease, and predators. Due to longstanding concern over population declines, the CNDDB was already tracking overwintering populations of monarch butterflies.

The species has a multigenerational migration. During the spring and summer, adult monarchs feed on nectar from flowers and mate. They lay eggs on several species of milkweed plants, including tropical milkweed (*Asclepias curassavica*), which is not native to the Bay Area. The final generation in fall migrates to overwintering sites.

There is a recording of monarch caterpillars on tropical milkweed in the park in October 2022 (Western Monarch Milkweed Mapper n.d.). Large overwintering aggregations of monarch butterflies are not expected in Walnut Creek because overwintering sites are typically close to the coast.

San Francisco Dusky-Footed Woodrat. The San Francisco dusky footed woodrat subspecies (*Neotoma fuscipes annectens*) is classified as a State Species of Special Concern. These woodrats build conspicuous, large stick houses. The woodrat is one of the few animals that can feed on oak leaves despite their high tannin content. They also feed on a variety of fruits, nuts, seeds, and foliage. Woodrats are considered a keystone species because their houses also provide shelter for a variety of other small animal species. Woodrats are a prey item for owls, snakes, and carnivorous mammals.

Although no woodrat houses were seen during the site survey, the species does occasionally persist in suburban areas. There is a low potential for San Francisco dusky-footed woodrat to occur in the park.

White-Tailed Kite. The white-tailed kite is considered Fully Protected under the California Fish and Game Code but is not listed under CESA. This raptor hunts in grasslands and savannahs and is known to nest in Contra Costa County. The white-tailed kite is commonly seen hovering over grasslands, where it hunts for the small mammals and reptiles that form the bulk of its diet. Nonnesting white-tailed kites have been seen in the park and there is a low potential that the species could nest in the park.

Sensitive Natural Communities

The CNDDB contains occurrences for one sensitive natural community—Serpentine Bunchgrass—within 5 miles of the site. This sensitive natural community is not present on the site. There are no serpentine soils on the site.

Waters and Wetlands

There are several waters that are likely to be considered under the jurisdiction of the USACE, CDFW, and Regional Water Quality Control Board (RWQCB).

Concrete Pond (also known as Heather Farms Pond)

The NWI classifies Concrete Pond as palustrine, unconsolidated bottom, permanently flooded, and excavated. The lake was built in the 1960s as a decorative feature. The surface areas is approximately 2.3 acres. The pond is surrounded by a paved walkway and its concrete banks preclude the growth of any shoreline vegetation. The lake appears to be dyed in order to reduce the penetration of sunlight, thereby preventing overgrowth of aquatic weeds and algae. The pond is stocked with trout by CDFW. According to a fishing website (Fishbrain n.d.), other species caught in the pond include largemouth bass, bluegill, and channel catfish. The pond has fountains to keep the water aerated and circulated.

Nature Lake

The NWI classifies Nature Lake as palustrine, unconsolidated bottom, permanently flooded, and excavated. The surface area is approximately 5 acres. Nature Lake receives overflow from Concrete Pond during rainstorms in the winter and is also fed by Crawdad Creek. It drains via Otter Creek to the Contra Costa Canal. Nature Lake has an extensive fringe of emergent vegetation, including bulrush and cattails.

Fishing, boating, swimming, and off-leash dogs are prohibited in Nature Lake. An aquatic harvester machine was in the lake. In 2022, approximately 139 cubic yards of vegetation were removed during the summer months.

Ygnacio Canal

Ygnacio Canal is a man-made, low-gradient canal that emerges from a culvert and runs parallel to the western shore of Nature Lake before ultimately emptying into the Contra Costa Canal. The canal is maintained by the Contra Costa Water District and carries untreated water.

Crawdad Creek

Crawdad Creek is channelized and perennial. This ditch carries runoff from neighboring residential developments and enters the park via a culvert under Ygnacio Valley Road and supports cattails and other hydrophytic vegetation. Native willows and oaks also grow along the banks. Portions of this ditch are so densely vegetated that they were impassable. Ruderal non-native vegetation, including a fig tree, grows in the channel.

Rose Creek

Rose Creek is not included in the NWI. Rose Creek is culverted under Marchbanks Drive and feeds into Concrete Pond. At the time of the survey, the drainage had a small amount of water flow, which in the summer is probably runoff from irrigation in nearby neighborhoods. The drainage is shaded by coast redwoods and has non-native Himalayan blackberry and ivy growing in it.

Horse Creek

Horse Creek is not included in the NWI. The creek is a small, narrow channel that runs from the east into Nature Pond and the banks are incised. There was no water in the drainage at the time of the survey.

Otter Creek

Otter Creek starts at a drain from Nature Pond and runs around the dog park at the north end of Heather Farms Park. There are large, non-native eucalyptus trees nearby, as well as some native trees that could be considered a riparian canopy.

CONCLUSION AND RECOMMENDATIONS

Special-Status Species

*Plants*No special-status plant species were observed, but one species has potential to occur in the park. If work occurs in Nature Lake or the water levels are changed, it could potentially affect slender-leaved pondweed. LSA recommends focused surveys for the species prior to any work that could affect Nature Lake, including work that would alter the water chemistry or water depth.

*Wildlife*No special-status wildlife species are expected to occur in the developed areas (including the turf sports fields) or Concrete Pond.

There is a high potential for western pond turtle to occur in Nature Lake and some potential for the species to nest in undisturbed uplands near Nature Lake. LSA recommends focused, appropriately timed surveys for western pond turtle well in advance of any work that could impact Nature Lake.

There is a high potential for monarch butterflies to lay eggs on any milkweeds in the park. Any planned work should avoid the removal of milkweeds or occur in the winter, when monarch caterpillars would not be on the milkweed. Planting annual native milkweeds, such as narrowleaf milkweed (*Asclepias fascicularis*) and California milkweed (*Asclepias californica*), would be preferable to maintain perennial tropical milkweed.

There is a low potential for San Francisco dusky-footed woodrat to live in brushy areas in the park. A biologist should survey for woodrat houses prior to any brush or tree removal activities along the creeks.

Although white-tailed kites have not been observed nesting in the park, there is a low potential that they could. By implementing the measures below to protect other nesting birds, the nests of white-tailed kites would also be protected.

Riparian Habitat or Other Sensitive Natural Communities

The trees and vegetation around Nature Lake, Crawdad Creek, and Otter Creek would likely be considered under CDFW jurisdiction. Any projects that could affect those corridors would require consultation with CDFW.

Protected Waters and Wetlands

The City should consult with the relevant regulatory agencies, including the USACE, CDFW, and RWQCB, for any projects that will have impacts below the top of bank and the ordinary high-water mark of the water bodies in the park. The agencies will likely claim jurisdiction over all of the features and require permits. These permits will include conditions and Best Management Practices that will need to be implemented during construction. These permits will also specify mitigation, which the City will have to provide. Impacted features will likely have to be mitigated at a minimum 1:1 ratio, consistent with the USACE “no net loss” policy. If permits require mitigation at a higher ratio than 1:1, that requirement will have to be met.

Native Wildlife Corridors and Nursery Sites

Because it is surrounded by developed areas, Heather Farms Park is not considered a movement corridor. Native bird nests could be considered nursery sites and are protected by the California Fish and Game Code, as well as the MBTA.

According to the Mt. Diablo Audubon Society, at least 22 species of birds are known to nest in Heather Farms Park (Mt. Diablo Audubon Society n.d.). Depending on the species, nests could be on the ground, in shrubs or trees, or on buildings. Nesting birds in the park are acclimated to some level of regular human activity, but significant new activities could disrupt normal nesting behavior, leading to nest destruction or abandonment. To prevent such impacts, we recommend major new work be restricted to the nonnesting season (August 1 through January 31). If that is not possible, a qualified biologist should conduct a preconstruction survey for nesting birds no more than 7 days prior to the initiation of construction-related activity (e.g., clearing, grading, tree trimming or removal) if this activity occurs between February 1 and July 31. If active bird nests are found on or adjacent to the site, an exclusion zone should be established around the nest as specified by the qualified biologist. The exclusion zone should be centered on the nest. Active nests should be monitored weekly to ensure that the exclusion zones are intact and the young are developing. The exclusion zones should remain in place until the young have fledged and are foraging independently as determined by a qualified biologist.

Other Local Ordinances Related to Biological Resources

Any project in the park that requires the removal of trees with a diameter at breast height (measured 4.5 feet above ground) of 9 inches or more should obtain a tree removal permit.

Attachments: A: References
B: IPaC List
C: Tables

ATTACHMENT A

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ATTACHMENT B

IPAC LIST

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

IPaC resource list

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

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

Location

Contra Costa County, California

Local office

Sacramento Fish And Wildlife Office

(916) 414-6600
(916) 414-6713

Federal Building

2800 Cottage Way, Room W-2605
Sacramento, CA 95825-1846

Endangered species

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

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

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

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

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

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

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

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

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

Birds

NAME	STATUS
California Clapper Rail *Rallus longirostris obsoletus* Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4240	Endangered
California Least Tern *Sterna antillarum browni* Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8104	Endangered

Reptiles

NAME	STATUS
Alameda Whipsnake (=striped Racer) *Masticophis lateralis euryxanthus* Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/5524	Threatened

Amphibians

NAME	STATUS
California Red-legged Frog *Rana draytonii* Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/2891	Threatened
California Tiger Salamander *Ambystoma californiense* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/2076	Threatened

Foothill Yellow-legged Frog Rana boylii — Proposed Threatened

No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/5133

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Crustaceans

NAME	STATUS
Vernal Pool Fairy Shrimp Branchinecta lynchi Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/498	Threatened

Flowering Plants

NAME	STATUS
Contra Costa Goldfields Lasthenia conjugens Wherever found There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/7058	Endangered

Critical habitats

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

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

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

Additional information can be found using the following links:

- Eagle Managment https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

There are bald and/or golden eagles in your project area.

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

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

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

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

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

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

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

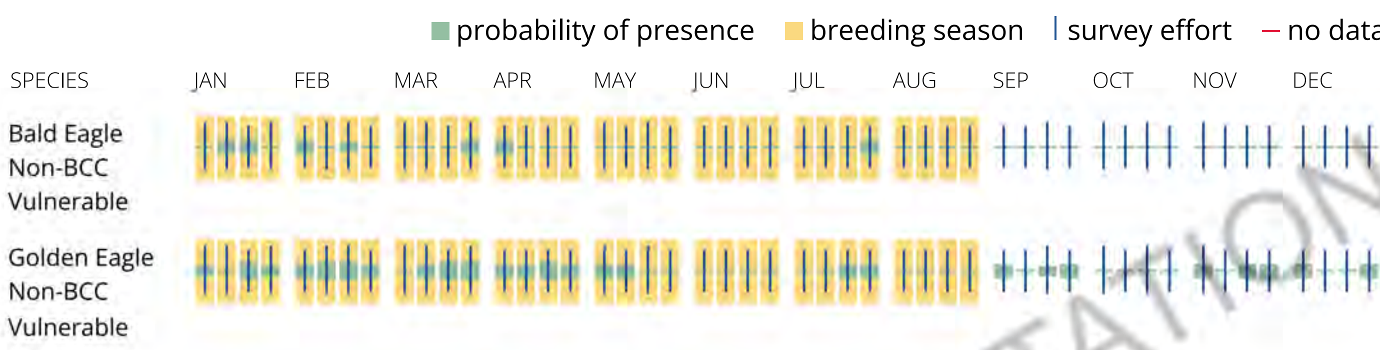
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

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

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

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

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



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply). To see a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

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

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

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

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

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

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

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

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

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

NAME	BREEDING SEASON
Allen's Hummingbird Selasphorus sasin This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9637	Breeds Feb 1 to Jul 15
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jan 1 to Aug 31
Belding's Savannah Sparrow Passerculus sandwichensis beldingi This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8	Breeds Apr 1 to Aug 15
Bullock's Oriole Icterus bullockii This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 21 to Jul 25
California Gull Larus californicus This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 1 to Jul 31
California Thrasher Toxostoma redivivum This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jan 1 to Jul 31
Common Yellowthroat Geothlypis trichas sinuosa This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/2084	Breeds May 20 to Jul 31
Golden Eagle Aquila chrysaetos This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

Lawrence's Goldfinch Carduelis lawrencei | Breeds Mar 20 to Sep 20

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Nuttall's Woodpecker Picoides nuttallii | Breeds Apr 1 to Jul 20

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA
https://ecos.fws.gov/ecp/species/9410

Oak Titmouse Baeolophus inornatus | Breeds Mar 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9656

Olive-sided Flycatcher Contopus cooperi | Breeds May 20 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Tricolored Blackbird Agelaius tricolor | Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3910

Willet Tringa semipalmata | Breeds elsewhere

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Wrentit Chamaea fasciata | Breeds Mar 15 to Aug 10

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

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

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

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

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

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

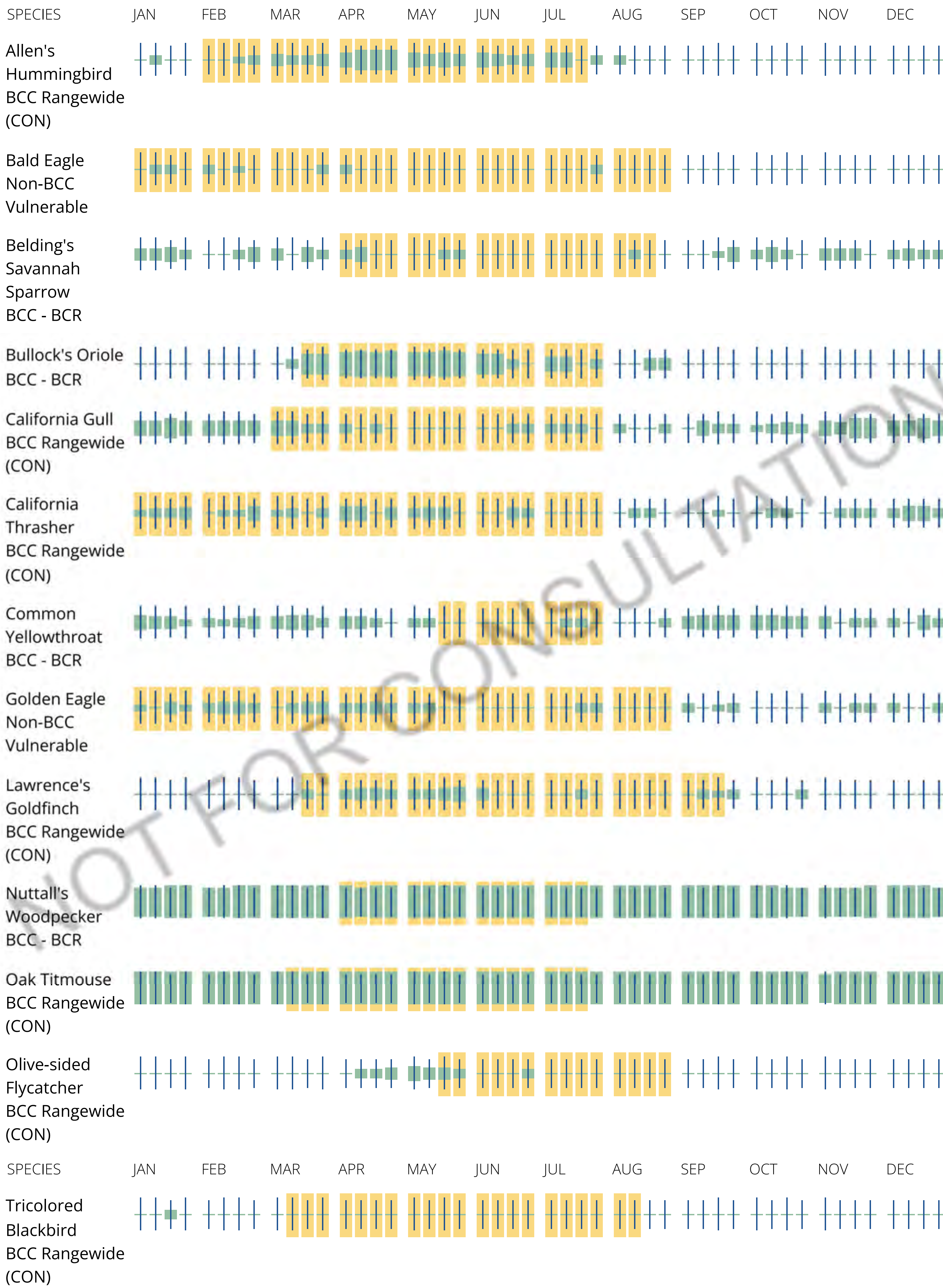
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

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

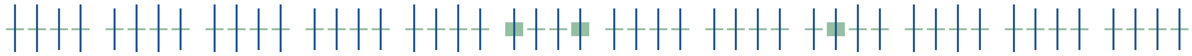
No Data (–)
A week is marked as having no data if there were no survey events for that week.

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

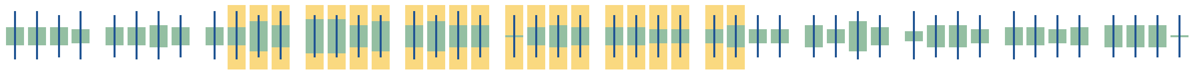
■ probability of presence ■ breeding season | survey effort – no data


SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Allen's Hummingbird BCC Rangewide (CON)
Bald Eagle Non-BCC Vulnerable
Belding's Savannah Sparrow BCC - BCR
Bullock's Oriole BCC - BCR
California Gull BCC Rangewide (CON)
California Thrasher BCC Rangewide (CON)
Common Yellowthroat BCC - BCR
Golden Eagle Non-BCC Vulnerable
Lawrence's Goldfinch BCC Rangewide (CON)
Nuttall's Woodpecker BCC - BCR
Oak Titmouse BCC Rangewide (CON)
Olive-sided Flycatcher BCC Rangewide (CON)
SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Tricolored Blackbird BCC Rangewide (CON)
NOT FOR CONSULTATION

Willet
BCC Rangewide
(CON)



Wrentit
BCC Rangewide
(CON)



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

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

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

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

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

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

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

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

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

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

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

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

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

Details about birds that are potentially affected by offshore projects

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

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

What if I have eagles on my list?

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

Proper Interpretation and Use of Your Migratory Bird Report

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

Facilities

National Wildlife Refuge lands

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

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

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

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

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER POND
PUBHx

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

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

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

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

Data exclusions

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

Data precautions

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

ATTACHMENT C

TABLES

Table A: Special-Status Plant Species Evaluated

Species	Status* (Federal/State/RPR)	Habitat/Elevational Range/Blooming Period	Potential to Occur
Amsinckia lunaris Bent-flowered fiddleneck	--/--/1B	Gravelly slopes, grassland, openings in woodland, often serpentine, in coastal bluff scrub, cismontane woodland, and valley and foothill grassland. Elevation: 5–800 m Blooms: March–June	None. There is one CNDDB occurrence within 5 miles of the site. There is no undeveloped habitat on the site. This has an affinity to grow on gravelly slopes and serpentine soils, which are not present in the park.
Arctostaphylos auriculata Mt. Diablo manzanita	--/--/1B	Chaparral (sandstone), cismontane woodland. Elevation: 135–650 m Blooms: January–March	None. There is one CNDDB occurrence within 5 miles of the site. There is no suitable habitat in the form of chaparral on the site. No manzanitas were seen in the park.
Arctostaphylos manzanita ssp. *laevigata* Contra Costa manzanita	--/--/1B	Chaparral (rocky). Elevation: 233–1,100 m Blooms: January–February	None. There is one CNDDB occurrence within 5 miles of the site. There is no suitable habitat in the form of chaparral on the site. No manzanitas were seen in the park.
Blepharizonia plumosa Big tarplant	-/-/1B	Valley and foothill grassland with clay to clay-loam soils. Elevation: 50–505 m Blooms: July–October	None. There is one CNDDB occurrence within 5 miles of the site, but there is no suitable habitat or undeveloped land on the site.
Calochortus pulchellus Mount Diablo fairy-lantern	--/--/1B	Openings in wooded and brushy slopes/ chaparral, coastal scrub, riparian woodland, and associated grasslands. Elevation: 200–800 m Blooms: April–June	None. There are several CNDDB occurrences within 5 miles of the site, but there is no suitable habitat/undeveloped land on the site.
Centromadia parryi ssp. *congdonii* Congdon's tarplant	--/--/1B	Grazed and ungrazed annual grasslands with alkaline or saline soils and sometimes described as heavy white clay (saline clay soil). Elevation: 1–230 m Blooms: June–November	None. The site is developed and lacks suitable alkali soils. No *Centromadia* tarplant species observed during the field survey. There are two CNDDB occurrences for extirpated populations within 5 miles of the park.

Table A: Special-Status Plant Species Evaluated

Species	Status* (Federal/State/RPR)	Habitat/Elevational Range/Blooming Period	Potential to Occur
Delphinium californicum subsp. *interius* Hospital Canyon larkspur	-/-/1B.2	Generally associated with drainages within chaparral, grassy (and sometimes mesic) openings of cismontane woodland. Elevation: 230–1,095 m Blooms: April–June	None. There is no suitable habitat on the site. There are three CNDDB occurrences within 5 miles of the park.
Eriastrum ertterae Lime Ridge eriastrum	-/CCE/1B.1	Hard packed sand in openings at edge of chaparral (alkaline or semi-alkaline). Elevation: 200–290 m Blooms: June–July	None. There is no suitable habitat on the site. There are two CNDDB occurrences within 5 miles of the park.
Eriogonum truncatum Mt. Diablo buckwheat	-/-/1B	Dry, exposed clay or sandy substrates in chaparral, coastal scrub, and grassland. Elevation: 200–400 m Blooms: April–September	None. There is no suitable habitat on the site. The species was presumed extinct until it was rediscovered on Mount Diablo in 2005 and at Black Diamond Regional Preserve in 2016.
Eryngium jepsonii Jepson's coyote thistle	-/CE/1B	Grows on moist clay soil in valley and foothill grassland and vernal pools. Elevation: 3–30 m Blooms: April–August	None. There are no suitable vernal pools or clay soils on the site. There is one CNDDB occurrence within 5 miles of the site.
Extriplex joaquinana San Joaquin spearscale	--/--/1B	Chenopod scrub, alkali meadow, grassland; in seasonal alkali wetlands or sink scrub. Elevation: 1–250 m Blooms: April–October	None. No suitable habitat is present due to development. There are no CNDDB occurrences within 5 miles of the site.
Fritillaria liliacea Fragrant fritillary	-/-/1B	Coastal scrub, valley and foothill grassland, and coastal prairie. Most often on serpentine soils, but not exclusively as other various soils reported. Elevation: 3–410 m Blooms: February–April	None. There are two CNDDB occurrences within 5 miles of the site, but there is no suitable habitat or undeveloped land on the site.

Table A: Special-Status Plant Species Evaluated

Species	Status* (Federal/State/RPR)	Habitat/Elevational Range/Blooming Period	Potential to Occur
Helianthella castanea Diablo helianthella	--/--/1B	Open, grassy sites, usually rocky, axonal soils. Partial shade in broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, and valley and foothill grassland. Elevation: 200–1300 m. Blooms: April–June	None. There are several CNDDB occurrences within 5 miles of the site, but there is no suitable habitat/undeveloped land on the site.
Hesperolinon breweri Brewer's western flax	-/-/1B.2	Serpentine chaparral, cismontane woodland, and valley and foothill grassland. Elevation: 30–945 m Blooms: May–June	None. There are two CNDDB occurrences within 5 miles of the site, but there is no suitable habitat (serpentine rock) or undeveloped land in the park.
Isocoma arguta Carquinez goldenbush	-/-/1B	Valley and foothill grassland; alkaline. Species may be present in other areas where subsaline conditions are favorable. Elevation: 1–20 m Blooms: August–December	None. The species has no potential to occur on the site due to lack of suitable habitat (alkaline soils). There are no CNDDB occurrences within 5 miles of the site.
Lasthenia conjugens Contra Costa goldfields	FE/-/1B	Mesic areas in valley and foothill grassland, cismontane woodland in vernal pools, swales, and moist depressions (alkaline grasslands and playa pools). Extirpated from most of its range; extremely endangered. Elevation: 0–470 m Blooms: March–June	None. The species has no potential to occur on the site due to the lack of alkaline soils and vernal pools. There are no CNDDB occurrences within 5 miles of the site.
Malacothamnus hallii Hall's bush mallow	-/-/1B.2	Chaparral, coastal scrub. Some populations on serpentine soils. Elevation: 10–760 m Blooms: May–September (October)	None. The species has an affinity to grow on serpentine and rocky slopes on Mt. Diablo. There are six CNDDB occurrences within 5 miles of the site, but there is no suitable habitat or undeveloped land in the park.
Monolopia gracilens Woodland wooly threads	-/-/1B.2	Openings in broadleaf upland forest, chaparral, cismontane woodland, North Coast coniferous forest, and valley and foothill grassland; serpentine. Elevation: 100–1,200 m Blooms: March–July	None. No suitable habitat is present due to development and lack of serpentine soils. There is one CNDDB occurrence within 5 miles of the site.

Table A: Special-Status Plant Species Evaluated

Species	Status* (Federal/State/RPR)	Habitat/Elevational Range/Blooming Period	Potential to Occur
Navarretia gowenii Lime Ridge navarretia	-/-/1B.1	Chaparral, clay and serpentine soils. Elevation: 180–305 m Blooms: May–June	None. No suitable habitat is present due to development. There are two CNDDB occurrences within 5 miles of the site, both based on observations made within Lime Ridge Open Space.
Oenothera deltoides ssp. *howellii* Antioch Dunes evening-primrose	FE/CE/1B	Interior sand dunes. Elevation: 0-30 m Blooms: March–September	None. This species is known only from sandy bluffs and dunes, which are absent from the park. There is one CNDDB occurrence within 5 miles of the site, based on observations made within Lime Ridge Open Space.
Streptanthus glandulosus subsp. *glandulosus* [*S. albidus* ssp. *peramoenus*] Bristly jewelflower	-/-/1B.2	Serpentine or metamorphic (Franciscan formation) soils on rocky, generally barren openings on slopes in chaparral, cismontane woodland, and valley and foothill grassland. Elevation: 150–1,400 m Blooms: April–July	None. No potential to occur on the site due to the lack of serpentine rocks. There are three CNDDB occurrences within 5 miles of the site.
Streptanthus hispidus Mt. Diablo jewel-flower	-/-/1B.3	Chaparral, valley and foothill grassland/rocky. Elevation: 365–1,200 m Blooms: March–June	None. There is one CNDDB occurrence within 5 miles of the site, but there is no suitable habitat or undeveloped land on the site.
Stuckenia filiformis subsp. *alpina* Slender-leaved pondweed	--/--/2B.2	Shallow, clear water of lakes; drainage channels in marshes and swamps (assorted shallow freshwater). Elevation: 300–2,150 m Blooms: May–July	Moderate. Suitable habitat is present in Nature Pond. There is one CNDDB occurrence within 5 miles of the site.
Tropidocarpum capparideum Caper-fruited tropidocarpum	-/-/1B	Alkaline clay soils in low hills and valleys in valley and foothill grassland. Elevation: 1–455 m Blooms: March–April	None. The species has no potential to occur on the site due to lack of alkaline soils. There is only one CNDDB occurrence within 5 miles of the site, and it is based on a collection made in 1896 in Clayton.

Table A: Special-Status Plant Species Evaluated

Species	Status* (Federal/State/RPR)	Habitat/Elevational Range/Blooming Period	Potential to Occur
Viburnum ellipticum Common viburnum	--/--/2B.3	Chaparral, yellow-pine forest, and generally north-facing slopes. Elevation: 160–720 m Blooms: May–June	None. There is one CNDDB occurrence within 5 miles of the site, but there is no suitable habitat or undeveloped land on the site.

Status:

FE - Federally listed as endangered
CE - California State-listed as endangered
CC - California Candidate for Listing
CR - State Rare
1A - California Native Plant Society; plants presumed extinct in California
1B - California Native Plant Society; plants rare, threatened, or endangered in California and elsewhere
2A – Rare Plant Rank 2A – Plants presumed extirpated in California, but common elsewhere
2B - Rare Plant Rank 2B – Plants rare, threatened, or endangered in California but more common elsewhere

CNDDB = California Natural Diversity Database
m = meter(s)
RPR = Rare Plant Rank

Table B: Special-Status Animal Species Evaluated

Species	Status* (Federal/State)	Habitat Requirements	Potential to Occur
Amphibians			
Ambystoma californiense California tiger salamander	FT/CT	Spends most of its life in underground burrows. Breeds in vernal pools and ponds, including cattle stock ponds. Breeds after the first rains in late fall and early winter, when the wet season allows the salamander to migrate to the nearest pond, a journey that may be over 1 mile and take several days. Lays eggs in small clusters or singly, which hatch after 14 to 21 days. The pools must hold water for a minimum of 12 weeks for the larvae to successfully metamorphose into their terrestrial form.	None. This species is not known to occur within the park and was extirpated from the area decades ago. There are no suitable breeding pools on or near the site. There are two CNDDB occurrences within 5 miles of the project site, but they are based on observations made in 1920 and 1954 and are now extirpated.
Rana boylii Foothill yellow-legged frog (Central Coast DPS)	FT/CE	Rarely leaves riparian corridors. Breeds and deposits eggs shortly after streams reach peak flow in the spring after the winter rains end. Egg masses are typically attached to the downstream side or to boulders or cobble, in a sunny, shallow section of low-gradient stream. Breeding rarely occurs in well-shaded (>90 percent closed canopy) sites.	None. This species is not known to occur within the park and was extirpated from the area decades ago. There is no suitable breeding habitat on the site. There is one “possibly extirpated” CNDDB occurrence within 5 miles of the project site, which is based on a collection made in 1920.
Rana draytonii California red-legged frog	FT/CSC	Inhabits temporary pools, streams, freshwater seeps, and marshes in lowlands and foothills. Can persist in permanent waters as well. Uses adjacent upland habitat for foraging and refuge. Breeds from December through March in slow parts of streams, lakes, reservoirs, ponds, and other waters with emergent vegetation. Lays 300 to 4,000 eggs in a large cluster, which is attached to plants near the water surface. Requires water for 4 to 7 months for tadpoles to complete metamorphosis.	None. The species has never been observed in the park. The presence of non-native predatory fish and bullfrogs in Nature Pond severely limits its suitability for breeding. There are 10 CNDDB occurrences within 5 miles of the site, but the park is isolated from these populations by residential and commercial development.
Reptiles			
Anniella pulchra Northern California legless lizard	--/CSC	Found in sandy or loose loamy soils under sparse vegetation. Prefers soils with high moisture content.	None. There is no suitable habitat on the site due to development. There is one CNDDB occurrence within 5 miles of the site, but it is “possibly extirpated” and is based on an observation made in 1935.

Table B: Special-Status Animal Species Evaluated

Species	Status* (Federal/State)	Habitat Requirements	Potential to Occur
Emys marmorata Western pond turtle	--/CSC	Permanent or nearly permanent water (fresh to brackish) in a wide variety of habitat types. Requires basking sites such as steep banks, logs, or rocks. Upland areas with friable soils are required for egg laying.	High. The species has been observed in Nature Pond. There is one CNDDB occurrence within 5 miles of the site.
Coluber lateralis euryxanthus Alameda striped racer	FT/CT	Lives primarily in scrub and chaparral communities but has also been observed in nearby grasslands and woodlands. Feeds primarily on lizards. Retreats from hot temperatures in the summer and cold temperatures in the winter into burrows or other underground refuges.	None. There are 19 CNDDB occurrences are within 5 miles of the site, but the site lacks suitable habitat and is isolated from known populations by residential and commercial development.
Phrynosoma blainvillii Coast horned lizard	--/CSC	Found in a variety of vegetation communities, including annual grasslands, woodlands, and chaparral; but it needs friable fine soils or sandy for burrowing and thermoreulation. Feeds primarily on ants but eats other small insects as well.	None. The species has never been seen in the park. The development of the park has likely reduced the prey base of ants and other small insects. There are no suitable loose sandy soils in the park. There are two CNDDB occurrences within 5 miles of the site.
Birds			
Athene cunicularia Burrowing owl	--/CSC	Nearly or quite level grassland, prairie, and desert floor with short or sparse vegetation. Subterranean nester that generally uses existing mammal burrows (especially of ground squirrels) but will also excavate its own burrows.	None. There are no burrowing owls sightings within the park in eBird. No suitable burrows were seen on the site. There are two CNDDB occurrences within 5 miles of the site.
Agelaius tricolor Tricolored blackbird	--/CT, CSC	Breeds in large colonies near fresh water, preferably emergent wetland such as cattails and tules but also in thickets of willow and other shrubs. Requires nearby foraging areas with large numbers of insects.	None. Although individuals are occasionally seen in the park, the species is not known to nest within the park. There is no suitable foraging habitat on or adjacent to the site. Nature Pond has some marsh with emergent vegetation but not enough to support a breeding colony. There are no CNDDB occurrences within 5 miles of the site.
Aquila chrysaetos Golden eagle	--/--/CFP	Hunts over rolling foothills and mountain areas. Nests in cliff-walled canyons or large trees in open areas. Breeds January 1 to August 31.	None. There is no potential for the species to nest on the site due to the absence of large trees, transmission towers, cliffs, or other suitable nesting sites. May rarely fly over or forage on the site.

Table B: Special-Status Animal Species Evaluated

Species	Status* (Federal/State)	Habitat Requirements	Potential to Occur
Rallus obsoletus Ridgway's rail (formerly California clapper rail *Rallus longirostris obsoletus*)	FE/CE/CFP	Tidal salt marshes with sloughs and substantial cordgrass (Spartina sp.) cover.	None. There is no suitable habitat on or near the site. There are no CNDDB occurrences within 5 miles of the site.
Sternula antillarum browni (formerly *Sterna antillarum browni*) California least tern	FE/CE/CFP	Nest on the ground on sandy beaches, alkali flats, and hard-pan surfaces (salt ponds).	None. There is no suitable habitat on or near the site. There are no CNDDB occurrences within 5 miles of the site.
Elanus leucurus White-tailed kite	-/-/CFP	Open grasslands, meadows, or marshes; requires dense-topped trees or shrubs for nesting and perching. Tolerates human activity and is known to nest in residential neighborhoods in the Bay Area.	Low. A nonnesting individual has been observed in the park. Suitable nesting habitat is present, but the landscaped nature of the site reduces prey availability and suitability for hunting. There are no CNDDB occurrences within 5 miles of the site.
Falco peregrinus anatum American peregrine falcon	--/CFP	Typically nests on cliffs. Will also nest on tall office buildings and bridges. Occasionally uses abandoned stick nests built by other raptors or ravens or electrical transmission towers as nest sites.	None. There is no suitable nesting habitat on the site. There are no CNDDB occurrences within 5 miles of the site.
Mammals			
Neotoma fuscipes annectens San Francisco dusky-footed woodrat	--/CSC	Primarily found along riparian areas within chaparral and woodlands. Feeds mainly on woody plants but also eats acorns, grasses, and fungi. Builds conspicuous stick houses in trees and on the ground.	Not expected to occur. Small patches of potentially suitable habitat are present, but no woodrat houses were seen during the reconnaissance-level site visit. There are two CNDDB occurrences within 5 miles of the site.
Antrozous pallidus Pallid bat	--/CSC	Roosts in caves, tunnels, and occasionally buildings and hollow trees. Forages over a variety of habitats.	None. There are three CNDDB occurrences within 5 miles of the site. No potential to roost in the park due to lack of suitable roosting sites. Individuals may forage over the site.

Table B: Special-Status Animal Species Evaluated

Species	Status* (Federal/State)	Habitat Requirements	Potential to Occur
Invertebrates			
Danaus plexippus Monarch butterfly	FC/--/--	Lays eggs on the larval host plant milkweed and overwinters in large aggregations along the California coast.	High. The CNDDB does not track monarch butterfly observations except at coastal overwintering sites. There is a recording of monarch caterpillars on milkweed in the park in October 2022.[1]
Bombus occidentalis Western bumble bee	--/CC	Feeds upon nectar and pollen from a variety of plants species but is most adapted to native plant species. Nests in abandoned rodent burrows and bird nests. The flight period in California is from early February to late November, peaking from June to September. Little is known about sites where queens overwinter. Species is currently restricted to high-elevation sites in the Sierra Nevada and scattered coastal areas.	None. The species is likely extirpated from the Walnut Creek area. There are three CNDDB occurrences within 5 miles of the site, but they are based on collections made in 1960, 1963, and 1972.
Branchinecta lynchi Vernal pool fairy shrimp	FT/--	Inhabits vernal pools and swales during all stages of its lifecycle.	None. There are no CNDDB occurrences within 5 miles of the site. There are no vernal pools in the park.

*Status:

FT = Federally listed as threatened; FE = Federally listed as endangered
CT = California State listed as threatened; CSC = California Species of Special Concern; CFP = California Fully Protected; CC: California Candidate Species

[1] Western Monarch Milkweed Mapper. Website: https://www.monarchmilkweedmapper.org/ (accessed November 1, 2023).

CDFW = California Department of Fish and Wildlife
CNDDB = California Natural Diversity Database
DPS = Distinct Population Segment

APPENDIX D

RARE PLANT SURVEY REPORT

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CARLSBAD
CLOVIS
IRVINE
LOS ANGELES
PALM SPRINGS
POINT RICHMOND
RIVERSIDE
ROSEVILLE
SAN LUIS OBISPO

MEMORANDUM

DATE: June 14, 2024

TO: Rich Payne, Assistant Public Works Director, City of Walnut Creek

FROM: Anna Van Zuuk and Hannah de la Calle, Botanists
John Kunna, Associate

SUBJECT: Focused Botanical Survey Results for Slender-leaved Pondweed for the New Aquatic and Community Center at Heather Farm Park at 301 North San Carlos Drive, Walnut Creek, California

INTRODUCTION

This memorandum was prepared by LSA to summarize the results of a focused botanical survey for slender-leaved pondweed (*Stuckenia filiformis* ssp. *alpina*) for the New Aquatic and Community Center at Heather Farm Park at 301 North San Carlos Drive, Walnut Creek, Contra Costa County, California. LSA previously conducted a biological resource survey on July 28, 2023, and concluded that slender-leaved pondweed was the only special-status plant species potentially present on site.

Upon review of the blooming period for slender-leaved pondweed, LSA determined that one survey conducted in late May would be sufficient to determine whether or not the species is present.

METHODS

Surveyors

LSA Botanist Anna van Zuuk holds a Bachelor of Science in Environmental Horticulture and Urban Forestry—with Distinction from University of California, Davis. Ms. Van Zuuk is a biologist, botanist, and certified arborist with over 11 years of experience in plant taxonomy and identification, primarily in Northern California. Ms. Van Zuuk conducts biological studies including plant and wildlife surveys, habitat assessments, jurisdictional delineations, and tree inventories.

LSA Botanist Hannah de la Calle has a Bachelor of Science in Evolution, Ecology, and Biodiversity with High Honors from the University of California, Davis. Mx. de la Calle is a botanist with over 2 years of experience in rare plant surveys with LSA and over 4 years of experience in ecological surveys and plant identification. They have conducted biological and botanical studies in a wide variety of habitat types including vernal pool grasslands, coastal dunes, mixed chaparral, Sierra foothills, and aquatic systems.

Field Survey

The LSA botanists conducted the survey of Nature Lake in Heather Farm Park on May 22, 2024. The survey followed California Department of Fish and Wildlife (CDFW) protocol.[1] The level of effort was sufficient for the overall diversity and complexity of the available aquatic habitat. All plant species within Nature Lake were identified to a sufficient taxonomic level necessary to determine whether or not they have special status. A full list of species observed is attached to this memo (Attachment A). Names of plant species are consistent with The Jepson Manual: Vascular Plants of California (2012)[2] and the Jepson Online Interchange for California Floristics (Jepson eFlora, 2024)[3].

SURVEY RESULTS

No slender-leaved pondweed was observed during the botanical survey. There was another *Stuckenia* species observed, but it was determined to be Sago pondweed (*Stuckenia pectinata*). This determination was made based on the shape of the leaf tip, which for slender-leaved pondweed is notched, blunt, and/or rounded and for Sago pondweed is acute or with an abrupt, short to long point (see Photo 1, Attachment B). In addition, slender-leaved pondweed will often have inflated stipule sheaths on the proximal stems which were not observed on any of the *Stuckenia* in the Nature Lake.

Other native aquatic species within the Nature Lake include horned pondweed (*Zannichella palustris*), American water fern (*Azolla filiculoides*), hornwort (*Ceratophyllum demersum*), and whorl leaf watermilfoil (*Myriophyllum verticillatum*). Invasive aquatic species observed include common water hyacinth (*Eichhornia crassipes*), American spongeplant (*Limnobium spongia*), crispate leaved pondweed (*Potamogeton crispus*), and floating water primrose (*Ludwigia peploides*). The emergent wetland species along the edge of Nature Lake is comprised mostly of California bulrush (*Schoenoplectus californicus*), common cattail (*Typha latifolia*), and alkali bulrush (*Bolboschoenus maritimus*).

The full species list is provided in the Attachment A, which also identifies which species are native to the area. For nonnative species, the California Invasive Plant Council (Cal-IPC) ranking is provided.

Attachments: A: List of Observed Plant Species
B: Photographs

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1 California Department of Fish and Wildlife (CDFW). 2018. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities.

2 Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilken, editors, 2012. *The Jepson Manual: Vascular Plants of California*, Second Edition.

3 Jepson eFlora. 2024. Website: www.https://ucjeps.berkeley.edu/interchange/ (accessed May 29, 2024).

ATTACHMENT A

LIST OF OBSERVED PLANT SPECIES

List of Observed Plant Species in or Near Nature Lake

Scientific Name	Common Name	Family	Native ?	Cal-IPC Rating
Typha latifolia	Common cattail	Typhaceae	Y	-
Eichhornia crassipes	Common water hyacinth	Pontederiaceae	N	High
Stuckenia pectinata	Sago pondweed	Potamogetonaceae	Y	-
Azolla filiculoides	American water fern	Azollaceae	Y	-
Schoenoplectus californicus	California bulrush	Cyperaceae	Y	-
Limnobium spongia	American spongeplant	Hydrocharitaceae	N	High
Ceratophyllum demersum	Hornwort	Ceratophyllaceae	Y	-
Potamogeton crispus	Crispate leaved pondweed	Potamogetonaceae	N	Moderate
Zannichellia palustris	Horned pondweed	Zannichelliaceae	Y	-
Najas guadalupensis ssp. *guadalupensis*	Southern waternymph	Hydrocharitaceae	Y	-
Ludwigia peploides	Floating water primrose	Onagraceae	N	High
Chara sp.	Muskgrass	Characeae	Y	-
Myriophyllum verticillatum	Whorl leaf watermilfoil	Haloragaceae	Y	-
Bolboschoenus maritimus	Alkali bulrush	Cyperaceae	Y	-
Polypogon monspeliensis	Rabbitsfoot grass	Poaceae	N	Limited
Lepidium latifolium	Perennial pepperweed	Brassicaceae	N	High
Juncus xiphioides	Iris leaved rush	Juncaceae	Y	-

Source: LSA (2024).
Cal-IPC = California Invasive Plant Council
sp. = species
ssp. = subspecies

ATTACHMENT B

PHOTOGRAPHS

Photo 1: Sago pondweed (*Stuckenia pectinate*) and water fern (*Azolla filiculoides*).

Photo 2: Horned pondweed (*Ancella palustris*).

APPENDIX E

ARBORIST REPORT

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Arborist Report

Heather Farms Park Aquatics and Community Center Project

City of Walnut Creek, Walnut Creek, California

MAY 2024

Prepared for:

MARY ANN BONIFACIO
Associate Engineer
Public Works/Engineering, City of Walnut Creek
1666 N. Main St.
Walnut Creek, California 92660

Prepared by:

DUDEK

1904 Franklin St Ste 600,
Oakland, CA 94612
Contact: Jeremy Cawn
ISA-Certified Arborist

Table of Contents

Acronyms and Abbreviations

Acronym/Abbreviation	Definition
City	City of Walnut Creek
DSH	Diameter at Standard Height (4.5 ft. above ground level)
ISA	International Society of Arboriculture
Project	Heather Farms Park New Aquatics and Community Center

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1 Introduction

This report summarizes Dudek's evaluation and analysis of tree resources within the tree survey area at the new Aquatics and Community Center (Project) site in Heather Farms Park at 301 North San Carlos Drive in the City of Walnut Creek (City), California. The site is approximately 1200 feet northwest of the intersection of North San Carlos Drive and Ygnacio Valley Road. (see Figure 1, Vicinity Map).

The field inventory and assessments of the survey area's trees (development footprint) were conducted on December 19, 2023, and April 29, 2024. The focus of Dudek's field evaluations was to identify and inventory all on-site trees that are subject to regulation by the City of Walnut Creek's Municipal Code, and that could be impacted by the proposed development per the site plan. This report includes a discussion of the tree inventory, evaluation and analysis methods, a summary of findings, identification of anticipated impacts, and tree protection and tree impact mitigation recommendations consistent with the City of Walnut Creek Municipal Code.

The Project is located entirely within a City park; therefore, all of the trees within the area are Park trees. All park trees are protected by City Municipal Code 11-1.506, regardless of size or species. New development in the city is regulated by Title 9, Chapter 9 in the municipal code, and sets requirements for identifying and preserving trees on new development sites.

This report's analysis of potential tree impacts considers the requirements outlined in the appropriate sections of the City of Walnut Creek Municipal Code. The proposed project would involve the removal of 70 trees and the encroachment of eight trees to facilitate the site development of the new aquatics and community center. Removing an additional 52 trees and the encroachment of one tree would be required to complete the proposed Nature Lake expansion.

This arborist report describes the proposed project for the development of the new aquatics and community center in the park and the trees present within the project area. The five chapters in the main body of this report cover the development footprint of the new aquatics and community center. Chapter 2 describes the methodology used by Dudek to conduct the tree survey and prepare the report. Chapter 3 describes the results of our tree survey. Chapter 4 of this report describes the potential impacts that the project will have on the trees within the project area. Chapter 5 describes Dudek's tree removal and tree protection recommendations. Chapter 6 contains the results of the tree appraisal for the trees within the project area. In April 2024, the City finalized plans to expand the Nature Lake to mitigate the loss of the artificial pond at the rear of the existing community center. Dudek prepared an arborist report for the lake expansion that is included with this report as Appendix E. Appendix E is formatted the same as the main body of the arborist, except there is no methodology section since Dudek arborist used the same process for preparing Appendix E.

This report and its appendices are intended to help the City and project staff understand the tree resources present in the project area. Tree management recommendations are consistent with the provisions of the City of Walnut Creek's Municipal Code and tree care industry best management practices.

1.1 Summary

The field survey recorded 252 trees within the survey area; 198 of these trees are within the construction limits for the new aquatics and community center, and 54 of these trees are within the Nature Lake Expansion Area.

Construction of the proposed project, including the lake expansion, is expected to require the removal of up to 122 park trees. Sixty-six of these trees lie within the development footprint of the new aquatics and community center, 52 of these trees lie within the footprint of the Nature Lake Expansion, and four of these trees are dead or dying.

The City's Municipal Code does not have specific mitigation requirements for park trees that are removed for new public facilities; however, the City of Walnut Creek is committed to maintaining its urban tree canopy and intends to provide replacement trees for each healthy tree removed for this project. This report contains tree replacement recommendations based on post-development site conditions and the appearance and distribution of trees in the areas of Heather Farms Park outside of the Project site.

1.2 Assignment

Dudek's International Society of Arboriculture (ISA)-Certified Arborists performed the following tasks:

- Assessed and inventoried all trees within the survey area (based on preliminary plans) and documented species, general health, general structural condition, size, and appearance.
- Mapped the location of trees not shown on the topographic survey base data and used GPS technology, as necessary, to develop a tree location exhibit and for planning reference.
- Prepared a tree information matrix detailing each surveyed tree's attributes.
- Analyzed tree attribute data and coordinated with the project design team to promote tree retention on-site to the maximum extent practicable.
- Evaluated tree impacts based on the project site plans.
- Provided an estimate of the value for all protected trees within the project construction limits.
- Prepared this report and appendices to document the results of field surveys and impact analyses and to provide recommendations for tree protection and impact mitigation measures in accordance with the provisions of the City of Walnut Creek Municipal Code.

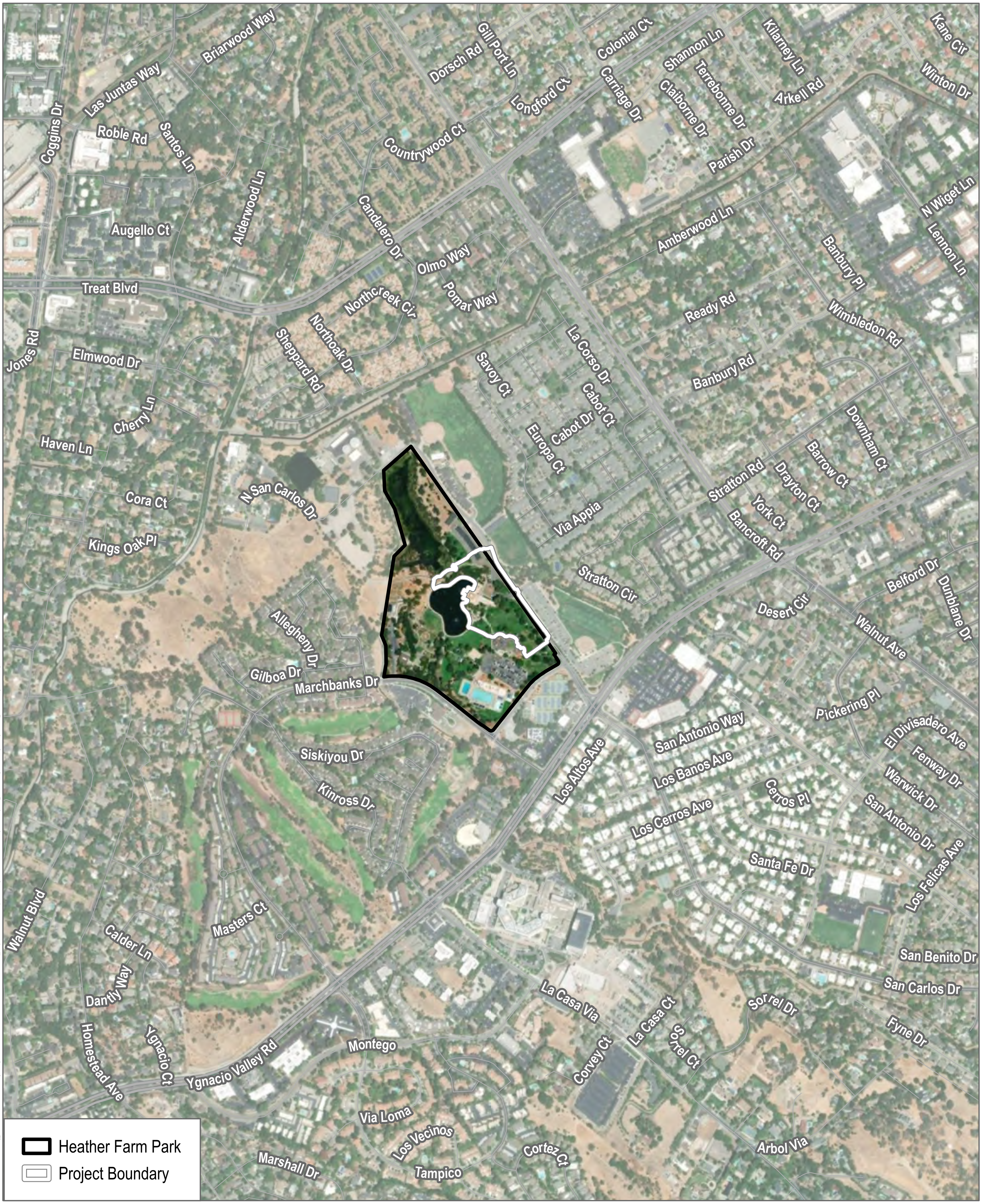
1.3 Project Site Description

The project consists of two components. The first is the 7.36-acre site of the new Aquatics and Community Center. The second, the Nature Lake Expansion Area, is located on the south side of Nature Lake. Both components are located in Heather Farm Park within the City of Walnut Creek. Specifically, the project site is northeast of Marchbanks Drive, directly southwest of N San Carlos Drive, and north of Heather Drive. The project site consists of Assessor's Parcel Number 144-050-019-5.

The new Aquatics and Community Center is located at the existing single-story community center, which comprises the building, parking lots, and surrounding outdoor space. Immediately behind the community center is an artificial pond where a portion of the pond will be filled in for the new development.

The Nature Lake Expansion Area is located on the Nature Lake's south shore, which is approximately 400 feet north of the new Aquatics and Community Center site.Adjacent lands to the two project components are also part of Heather Farms Park and consist of the playing fields, Oak Woodlands,playgrounds, and additional parking lots.

Figure 1 Vicinity Map



SOURCE: Maxar 2022; Contra Costa County 2023; Open Street Map 2023

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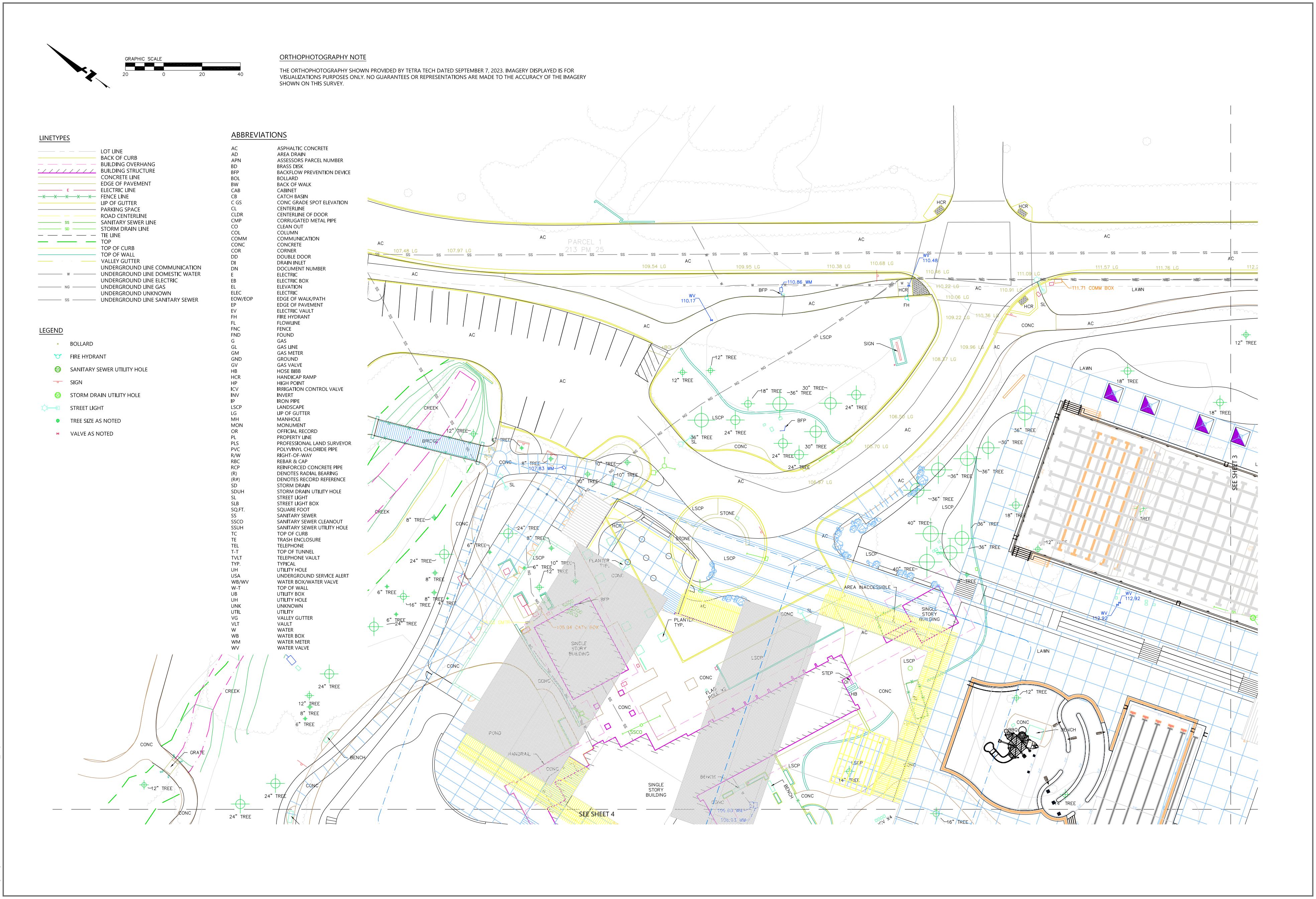
0 500 1,000 Feet

FIGURE 1

Vicinity Map

Arborist Report Heather Farms Park Aquatic and Community Center Project

Figures 2-1 through 2-4 Site Plans



SOURCE: BKK Engineers 2024

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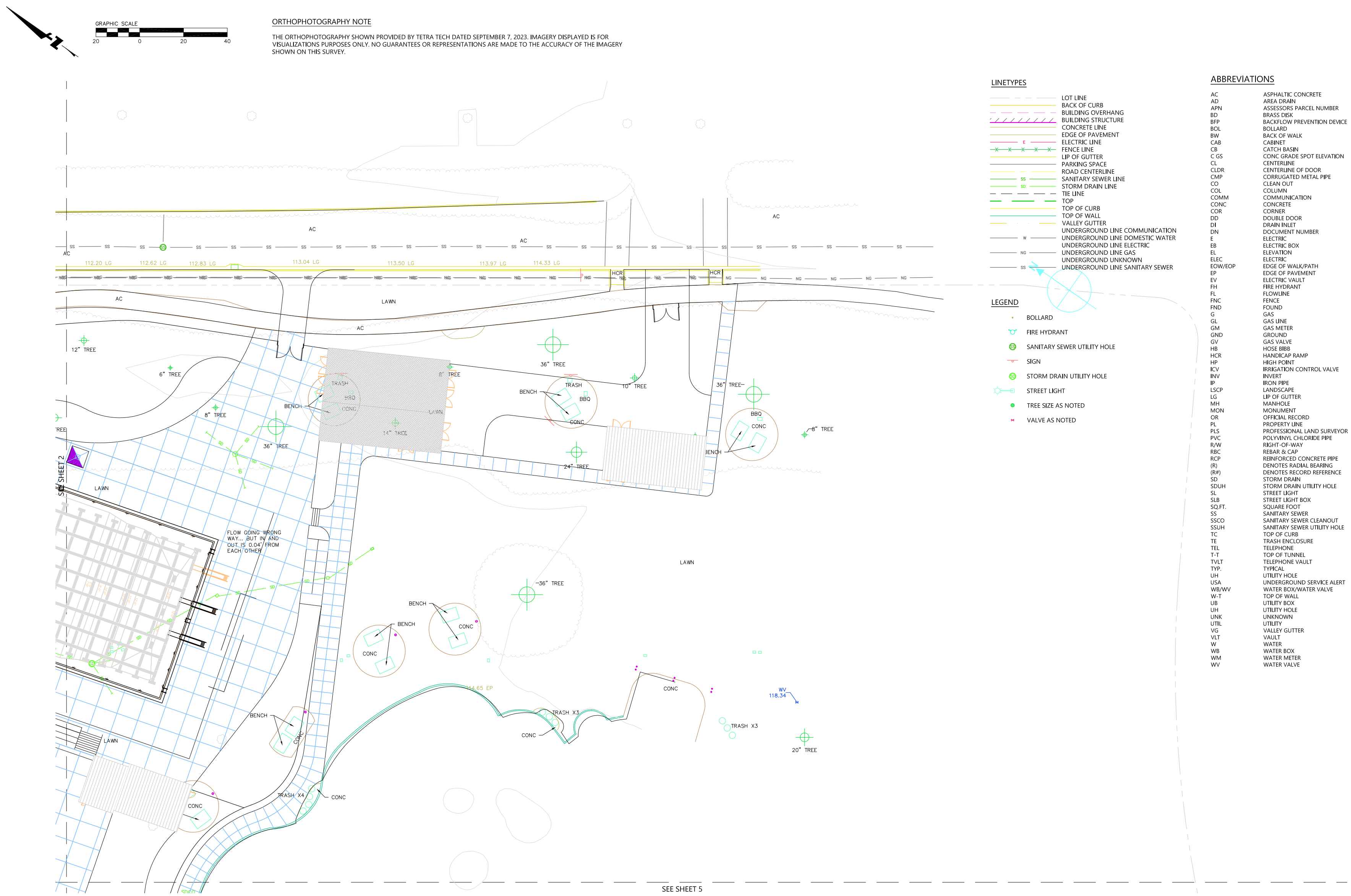
FIGURE 2-1

Site Plan

Arborist Report Heather Farms Park Aquatic and Community Center Project



SOURCE: BKK Engineers 2024

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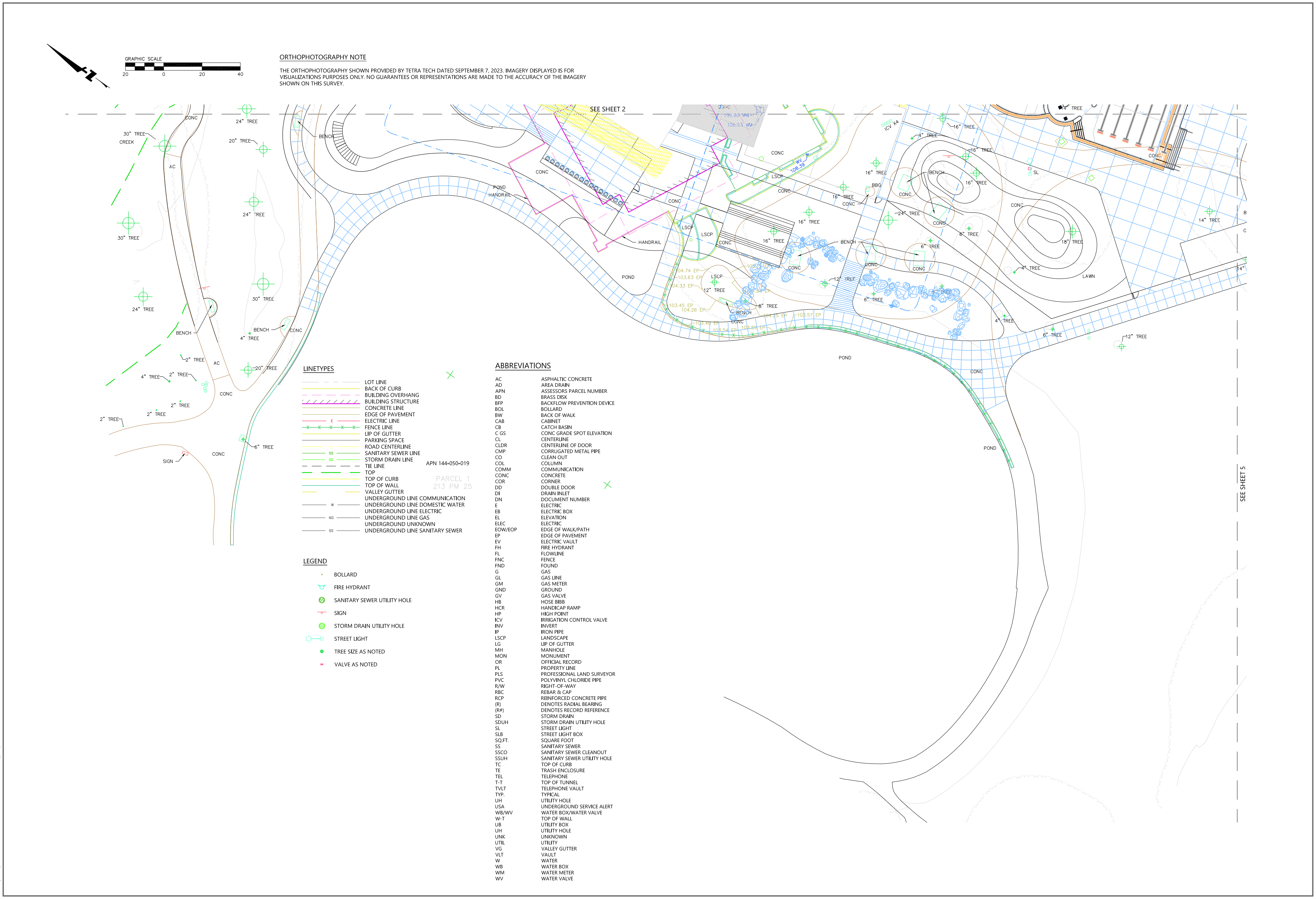
FIGURE 2-2

Site Plan

Arborist Report Heather Farms Park Aquatic and Community Center Project

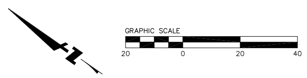


SOURCE: BKK Engineers 2024

FIGURE 2-3

Site Plan

Arborist Report Heather Farms Park Aquatic and Community Center Project



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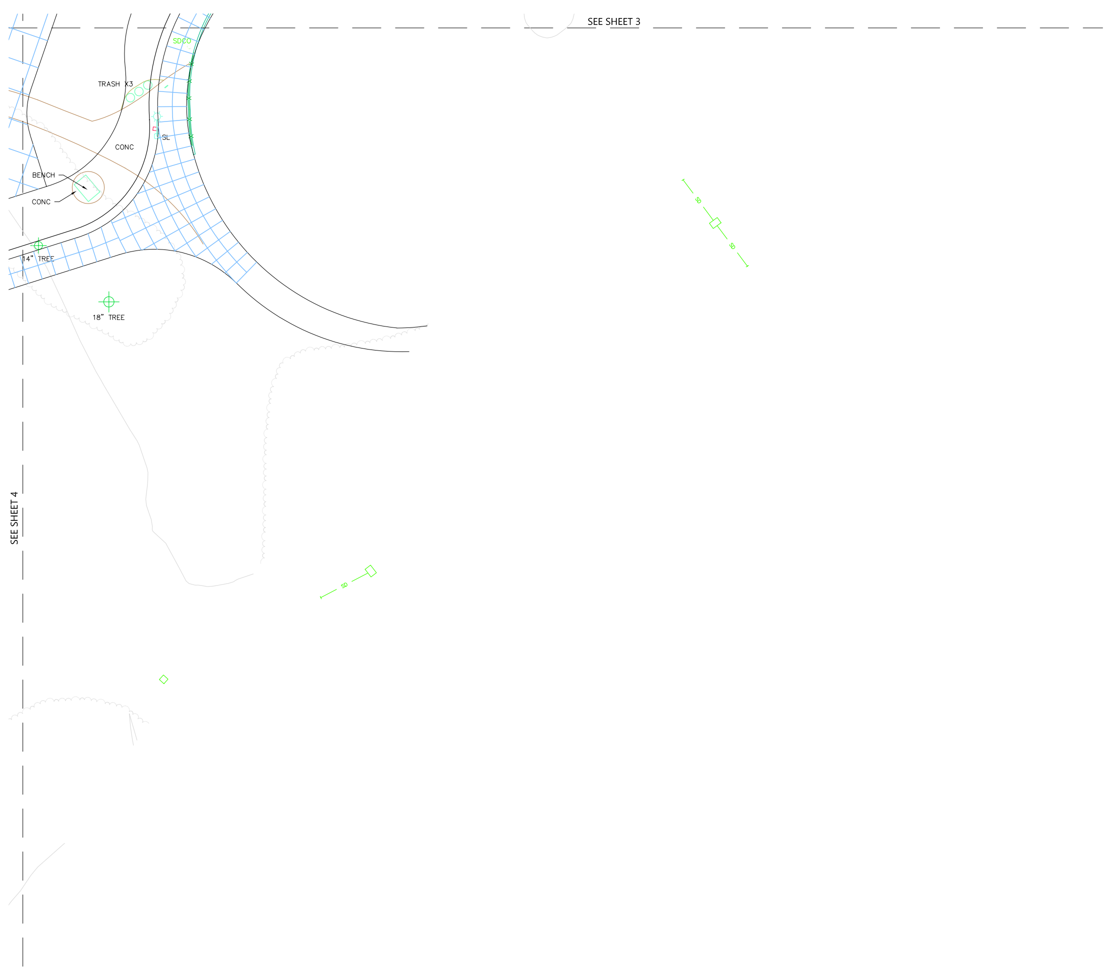

LINETYPES

- LOT LINE
- BACK OF CURB
- BUILDING OVERHANG
- BUILDING STRUCTURE
- CONCRETE LINE
- EDGE OF PAVEMENT
- ELECTRIC LINE
- FENCE LINE
- LIP OF GUTTER
- PARKING SPACE
- ROAD CENTERLINE
- SANITARY SEWER LINE
- STORM DRAIN LINE
- TIE LINE
- TOP
- TOP OF CURB
- TOP OF WALL
- VALLEY GUTTER
- UNDERGROUND LINE COMMUNICATION
- UNDERGROUND LINE DOMESTIC WATER
- UNDERGROUND LINE ELECTRIC
- UNDERGROUND LINE GAS
- UNDERGROUND UNKNOWN
- UNDERGROUND LINE SANITARY SEWER

LEGEND

- BOLLARD
- FIRE HYDRANT
- SANITARY SEWER UTILITY HOLE
- SIGN
- STORM DRAIN UTILITY HOLE
- STREET LIGHT
- TREE SIZE AS NOTED
- VALVE AS NOTED

ABBREVIATIONS

AC	ASPHALTIC CONCRETE
AD	AREA DRAIN
APN	ASSESSORS PARCEL NUMBER
BD	BRASS DISK
BFP	BACKFLOW PREVENTION DEVICE
BOL	BOLLARD
BW	BACK OF WALK
CAB	CABINET
CB	CATCH BASIN
C GS	CONC GRADE SPOT ELEVATION
CL	CENTERLINE
CLDR	CENTERLINE OF DOOR
CMP	CORRUGATED METAL PIPE
CO	CLEAN OUT
COL	COLUMN
COMM	COMMUNICATION
CONC	CONCRETE
COR	CORNER
DD	DOUBLE DOOR
DI	DRAIN INLET
DN	DOCUMENT NUMBER
E	ELECTRIC
EB	ELECTRIC BOX
EL	ELEVATION
ELEC	ELECTRIC
EOW/EOP	EDGE OF WALK/PATH
EP	EDGE OF PAVEMENT
EV	ELECTRIC VAULT
FH	FIRE HYDRANT
FL	FLOWLINE
FNC	FENCE
FND	FOUND
G	GAS
GL	GAS LINE
GM	GAS METER
GND	GROUND
GV	GAS VALVE
HB	HOSE BIBB
HCR	HANDICAP RAMP
HP	HIGH POINT
ICV	IRRIGATION CONTROL VALVE
INV	INVERT
IP	IRON PIPE
LSCP	LANDSCAPE
LG	LIP OF GUTTER
MH	MANHOLE
MON	MONUMENT
OR	OFFICIAL RECORD
PL	PROPERTY LINE
PLS	PROFESSIONAL LAND SURVEYOR
PVC	POLYVINYL CHLORIDE PIPE
R/W	RIGHT-OF-WAY
RBC	REBAR & CAP
RCP	REINFORCED CONCRETE PIPE
(R)	DENOTES RADIAL BEARING
(R#)	DENOTES RECORD REFERENCE
SD	STORM DRAIN
SDUH	STORM DRAIN UTILITY HOLE
SL	STREET LIGHT
SLB	STREET LIGHT BOX
SQ.FT.	SQUARE FOOT
SS	SANITARY SEWER
SSCO	SANITARY SEWER CLEANOUT
SSUH	SANITARY SEWER UTILITY HOLE
TC	TOP OF CURB
TE	TRASH ENCLOSURE
TEL	TELEPHONE
T-T	TOP OF TUNNEL
TVLT	TELEPHONE VAULT
TYP.	TYPICAL
UH	UTILITY HOLE
USA	UNDERGROUND SERVICE ALERT
WB/WV	WATER BOX/WATER VALVE
W-T	TOP OF WALL
UB	UTILITY BOX
UH	UTILITY HOLE
UNK	UNKNOWN
UTIL	UTILITY
VG	VALLEY GUTTER
VLT	VAULT
W	WATER
WB	WATER BOX
WM	WATER METER
WV	WATER VALVE

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SOURCE: BKK Engineers 2024

DUDEK

FIGURE 2-4

Site Plan

Arborist Report Heather Farms Park Aquatic and Community Center Project

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2 Methods

The following sections describe the methods Dudek's ISA-Certified Arborists used to inventory and evaluate trees in the tree survey area.

2.1 Field Tree Inventory and Evaluation

Dudek's urban forestry staff visited the site on two dates to document tree locations and attribute information for all trees within the survey area. First, Dudek certified arborist Jeremy Cawn and forestry technician Drew Morgan conducted the tree inventory and evaluation for the new aquatics and community center footprint on December 19, 2023. On April 29, 2024, Dudek certified arborist Jeremy Cawn conducted the tree survey for the Nature Lake Expansion.

Dudek examined trees within the Project boundaries as identified on the Topographic Survey plans provided to Dudek by the City (Figures 2-1 to 2-4). The Project boundaries included trees within the Project's development and trees in the general area surrounding the Project. Tree attribute data collected during the field survey included species, trunk diameter, number of stems, general health condition, and structural condition. Trunk diameters were measured using a diameter tape, which provides adjusted numbers for diameter measurements when wrapping the tape around the circumference of a tree trunk. Diameter measurements were collected using the standard protocol described by the Council of Tree and Landscape Appraisers in its Guide for Plant Appraisal (ISA, 2019), published by the ISA.

Trunk diameter measurements were taken at 4.5 feet above the ground along the trunk axis, with a few standard exceptions. In cases where the trunk of a tree split into multiple stems at approximately 4.5 feet above the ground, the measurement was made at the location that best represented the trunk's diameter.

According to the Guide for Plant Appraisal (ISA, 2019), tree health and structure were evaluated with respect to five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Health was graded as *Excellent*, *Very good*, good, *fair*, *poor*, critical or *dead*. Tree structure was graded as Very Good, Good, Fair, Poor, and Very Poor. Good-condition trees exhibit acceptable vigor, healthy foliage, minor, if any, structural issues, and no apparent maladies. Fair-condition trees are typical, with few maladies and moderate structural issues, and may exhibit less vigor in foliage and new growth. Trees assigned a poor condition rating exhibit significant health or structural problems or damage.

The City of Walnut Creek provided Dudek with the location of most of the individual trees from the Topographic Survey plan sheet. The locations of trees not provided by the city were mapped using ArcGIS software running on an iPad.

Appendix A, Tree Location Exhibits, presents individual tree locations, while Appendix B, Tree Impact Exhibits, presents individual tree impact determinations. Appendix C, Tree Information Matrices, presents detailed information about each surveyed tree.

2.2 Tree Impact Analysis

Following data collection, processing, and analysis efforts, an impact determination was made for each tree based on proximity to the proposed disturbance area and the tree species tolerance for disturbance by construction if known. Impact determinations used in this report are as follows:

- Not Impacted (tree not affected by project)
- Removal (tree to be removed)
- Encroachment (project disturbance would occur within the protected zone of the tree)

2.3 Tree Appraisal

The appraised value of the trees within the Project site will be determined using the Council of Tree and Plant Appraisers, Guide for Plant Appraisal 10th edition. Dudek used the trunk formula method. This method estimates the value of a tree based on its size, species, condition, functional limitations, and external limitations. An underlying inference of the trunk formula method is that the cost of acquiring a large tree is directly proportional to the unit cost of acquiring a small tree from a nursery (ISA, 2019). Unit cost, which is used to obtain the dollar value of the appraised tree, was obtained from the City and represents the cost for the City to plant a 24-inch box street or park tree ($350.00). Tree diameter, species, and condition (health and structural grades) data were collected from the tree data collected from the inventory conducted on December 19, 2023. Functional limitations and external limitations were determined from observations during site visits and from the preliminary site plans provided by the City for the Project. Using the tree data and the unit cost for a small replacement tree, Dudek calculated the tree value with the following formulas:

Basic Tree Value = cross-sectional area[1] of surveyed tree X unit cost of a replacement tree.

Final Tree Value (depreciated value)= Basic Tree Value X condition X functional limitations X external limitations

Dudek's appraisal amounts represent the value of the tree as it was when the report was created. Functional and external limitations are based on the conditions currently present at the Project site before development, and the impact the Project will have on the tree is not considered.

2.4 Scope of Work Limitations

This report presents tree information as observed in the field. No root crown excavations, investigations, internal probing, or aerial canopy inspections were performed during the tree assessment. Therefore, the presence or absence of internal decay or other hidden or inaccessible inferiorities in individual trees could not be confirmed.

[1] Obtained by multiplying tree diameter times 0.7854

3 Findings/Results

3.1 Inventory Summary

Dudek's arborists recorded 198 trees within the project site plan. Table 1 provides a summary of the trees mapped within the Project site.

Table 1. Summary of Project Site Trees by Species

Scientific Name	Common Name	Tree Quantities
		Total (All Trees)
Alnus cordata	Italian Alder	1
Arbutus menziesii	Pacific Madrone	4
Cedrus atlantica	Blue Atlas Cedar	1
Elaeocarpus sylvestris	Woodland Elaeocarpus	2
Fraxinus spp.	Ash	5
Fraxinus americana	White Ash	1
Fraxinus oxycarpa	Raywood Ash	20
Fraxinus pennsylvanica	Green Ash	2
Garrya elliptica	Silk Tassel	1
Lagerstroemia indica	Crape Myrtle	8
Liquidambar styraciflua	American Sweetgum	4
Olea europaea	Fruitless olive	3
Parrotia persica	Persian Parrotia	3
Pinus thunbergii	Japanese Pine	3
Pistacia chinensis	Chinese Pistache	9
Platanus acerifolia	London Plane	13
Podocarpus gracilior	Fern Pine	1
Populus fremontii	Fremont Cottonwood	1
Pyrus calleryana	Callery Pear	5
Quercus spp.	Oak	2
Quercus agrifolia	Coast Live Oak	39
Quercus kelloggii	California Black Oak	2
Quercus lobata	Valley Oak	28
Quercus robur	English Oak	8
Quercus suber	Cork Oak	1
Salix laevigata	Red Willow	4
Salix nigra	Black Willow	4
Schinus molle	California Pepper Tree	1
Sequoia sempervirens	Coast Redwood	19
Triadica sebifera	Chinese Tallow	1
Unknown	Unknown	2
	Total	198

Generally, most of the 198 trees were observed to be in good health, with 189 (95.5%) trees exhibiting excellent, very good, or good health. Five (2.5%) trees exhibit fair health, and three (1.5%) trees exhibit poor health, and one (0.5%) tree is dead. Structurally, most trees within the Project site were observed to have good structure, with 186 (94%) trees exhibiting very good or good structure. Eleven (5.5%) trees exhibit fair structure, and one (0.5%) tree is dead. No trees exhibited poor or very poor structure.

Of the 198 trees in the tree survey area, trunk diameters range from 1 inch to 35 inches for single-stemmed trees and 2 to 85 inches for multi-stemmed trees (total diameter). The Individual attributes of each tree are presented in Appendix C, Tree Information Matrix. The location of each tree is displayed in Appendix B, the Tree Location Map.

4 Project-Related Impacts

There is wide variation in tolerance to construction impacts among tree species, and the response of an individual tree to impacts also varies with age and condition. Impacts assessed for this project include trees with protected zones within the construction limits as defined in the Topographic Survey plan (Figures 2-1 to 2-4). The impact discussion in this section identifies all impacts anticipated to result from surveyed trees from Project development based on an evaluation of tree locations compared with the project site plan. Trees were assigned a grade of removal, encroachment, or no impact based on how close the tree was to the development footprint, how much of the dripline was impacted, and the species' tolerance for construction. Trees were identified for removal if they were located within the limits of development or within five feet of the limits of development. A significant portion of the Project site will be subject to demolition and grading work to remove the existing structures and features and accommodate the construction of the Project and necessary infrastructure (e.g., utilities, access roads, fire lanes). The Tree Impact Exhibit (Appendix B) graphically presents trees identified for retention and removal.

Based on grading and development plans for the proposed project, it is estimated that 70 (35%) trees will be removed, including 66 trees due to construction impacts and four trees due to poor health or structure. Project development is expected to encroach within the dripline of 8 (4%) trees. The remaining 120 trees at the Project site are outside the development footprint and are not likely to be encroached on or impacted by the construction associated with the Project.

Table 2 summarizes impact determinations for heritage trees within the tree survey area that are subject to regulation under the City of Walnut Creek Municipal Code.

Table 2. Summary of Project Site Tree Impacts

Scientific Name	Common Name	Tree Impact Determination			Total (All Trees)
		Removal	Encroachment	No Impact	
Alnus cordata	Italian Alder	0	0	1	1
Arbutus menziesii	Pacific Madrone	0	0	4	4
Cedrus atlantica	Blue Atlas Cedar	0	0	1	1
Elaeocarpus sylvestris	Woodland Elaeocarpus	1	0	1	2
Fraxinus spp.	Ash	0	0	5	5

Scientific Name	Common Name	Tree Impact Determination			Total (All Trees)
		Removal	Encroachment	No Impact	
Fraxinus americana	White Ash	0	0	1	1
Fraxinus oxycarpa	Raywood Ash	1	0	19	20
Fraxinus pennsylvanica	Green Ash	0	0	2	2
Garrya elliptica	Silk Tassel	0	0	1	1
Lagerstroemia indica	Crape Myrtle	0	0	8	8
Liquidambar styraciflua	American Sweetgum	1	1	2	4
Olea europaea	Fruitless olive	3	0	0	3
Parrotia persica	Persian Parrotia	2	0	1	3
Pinus thunbergii	Japanese Pine	2	0	1	3
Pistacia chinensis	Chinese Pistache	8	0	1	9
Platanus acerifolia	London Plane	11	2	0	13
Podocarpus gracilior	Fern Pine	1	0	0	1
Populus fremontii	Fremont Cottonwood	0	0	1	1
Pyrus calleryana	Callery Pear	4	0	1	5
Quercus spp.	Oak	2	0	0	2
Quercus agrifolia	Coast Live Oak	7	3	29	39
Quercus kelloggii	California Black Oak	2	0	0	2
Quercus lobata	Valley Oak	3	1	24	28
Quercus robur	English Oak	1	1	6	8
Quercus suber	Cork Oak	0	0	1	1
Salix laevigata	Red Willow	0	0	4	4
Salix nigra	Black Willow	1	0	3	4
Schinus molle	California Pepper Tree	0	0	1	1
Sequoia sempervirens	Coast Redwood	19	0	0	19
Triadica sebifera	Chinese Tallow	0	0	1	1
Unknown	Unknown	1	0	1	2
	Total	**70**	**8**	**120**	**198**

5 Tree Removal and Tree Protection Recommendations

5.1 Removal Recommendations

The proposed site plan would require the removal of 70 trees. Sixty-six trees that require removal are in the construction footprint and would be destroyed or severely damaged by development. Four trees require removal due to poor or worse than poor health/ structure. It should be noted that the number of trees recommended for removal is based on preliminary site plans provided by the City. The final number of tree removals may change due to revised site plans as the project progresses. Table 3 below summarizes the recommended tree removals by tree species.

Table 3. Project Tree Removals Due to Development Impacts by Tree Species

Tree Species	Recommended Number of Tree Removals
American Sweetgum	1
California Black Oak	2
Callery Pear	4
Chinese Pistache	8
Coast Live Oak	4
Coast Redwood	19
English Oak	1
Fern Pine	1
Fruitless olive	3
Japanese Pine	2
London Plane	11
Oak	2
Persian Parrotia	2
Raywood Ash	1
Unknown	1
Valley Oak	3
Woodland Elaeocarpus	1
Total	**66**

Table 4. Project Tree Removals Due to Poor Health and Structure

Species	Recommended Number of Tree Removals
Black Willow	1
Coast Live Oak	3
Total	**4**

5.2 Tree Protection Recommendations for Preserved Trees

The preservation of the park trees not recommended for removal in section 5.1 is required by section 11-1.306 of the City's Municipal Code. Based on observations made during the site visits and the preliminary plans provided by the City, 128 park trees are recommended for preservation at the Project site. Eight of these trees have driplines that overlap with the development footprint but are expected to tolerate Project development, and 120 of these trees are located outside of the development footprint and are not expected to be significantly impacted.

5.2.1 Trees Encroached by the Project Development Footprint

For the eight trees with dripline encroachment, Dudek recommends the following tree protection measures to reduce impacts due to Project development and maintain tree health and stability through all phases of development.

Protective Fencing: Six-foot-tall chain link fencing should be installed at the dripline or at the limit of development for the eight encroached trees **prior to the start of grading, demolition, or construction work.** All fence sections shall be marked with a sign stating, "This is a Tree Protection Zone (TPZ), and no one is allowed to disturb this area." The sign shall also list contact information for the contractor and the arborist and clearly state that a violation of the TPZ will result in a stop work order. No oils, gas, chemicals, liquid waste, solid waste, heavy construction machinery, or other construction materials shall be stored or allowed to stand within the dripline of any tree.

Protective fencing should consist of five to six-foot tall metal chain link fencing secured to metal poles either driven two feet into the ground or resting on stable metal bases.

Avoidance: Signs, ropes, cables, or other items shall not be attached to any tree.

Equipment Operation and Storage. Operating heavy machinery around the root zones of trees will increase soil compaction, which decreases soil aeration and subsequently reduces water penetration in the soil. All heavy equipment and vehicles shall stay out of the fenced tree protection zone unless specifically approved in writing by the City Arborist and under the supervision of an ISA Certified Arborist.

Storage and Disposal. Do not store or discard any supply or material within the fenced tree protection zone, including paint, lumber, concrete overflow, etc. Remove all foreign debris within the fenced tree protection zone; it is important to leave the duff, mulch, chips and leaves around the retained trees for water retention and nutrients. Avoid draining or leakage of equipment fluids near retained trees. Fluids such as gasoline, diesel, oils, hydraulics, brake and transmission fluids, paint, paint thinners, and glycol (anti-freeze) should be disposed of properly. Keep equipment parked outside of the fenced tree protection zone of retained trees to avoid the possibility of leakage of equipment fluids into the soil. The effect of toxic equipment fluids on the retained trees could lead to decline and death.

Moving Construction Materials. Care will be taken when moving equipment or supplies near the trees, especially overhead. Avoid damaging the tree(s) when transporting or moving construction materials and working around retained trees (even outside of the fenced tree protection zone). Above-ground tree parts that could be damaged (e.g., low limbs, trunks) should be flagged with a red ribbon. If contact with the tree crown is unavoidable, prune the conflicting branch(es) using ISA or ANSI A300 standards.

Grade Changes. Grade changes, including adding fill, are not permitted within the tree protection zone without special written authorization and under supervision by a Certified Arborist. Lowering the grade within this area will necessitate cutting main support and feeder roots, jeopardizing the health and structural integrity of the tree(s). Adding soil, even temporarily, on top of the existing grade will further compact the soil and decrease water and air availability to the trees' roots.

Root Pruning. Except where specifically approved in writing, all trenching shall be outside the fenced tree protection zone. Roots primarily extend in a horizontal direction, forming a support base to the tree similar to the base of a wineglass. Where trenching is necessary in areas that contain tree roots, prune the roots using a Dosko root pruner or equivalent. All cuts shall be clean and sharp to minimize ripping, tearing, and fracturing of the root system. The trench shall be made no deeper than necessary.

Trenching. All trenching shall be outside the fenced tree protection zone. Roots primarily extend horizontally, forming a support base to the tree similar to the base of a wineglass. Where trenching is necessary in areas that contain tree roots, prune the roots using a Dosko root pruner or equivalent. All cuts should be clean and sharp to minimize ripping, tearing, and fracturing of the root system. The trench should be made no deeper than necessary.

Irrigation. Trees that have been substantially root-pruned (30% or more of their root zone) will require irrigation for the first twelve months. The first irrigation should be within 48 hours of root pruning. They should be deep watered every two to four weeks during the summer and once a month during the winter (adjust accordingly with rainfall). One irrigation cycle should thoroughly soak the root zones of the trees to a depth of 3 feet. The soil should dry out between watering; avoid keeping a consistently wet soil. Designate one person responsible for irrigating (deep watering) the trees. Check soil moisture with a soil probe before irrigating. Irrigation is best accomplished by installing a temporary above-ground micro-spray system that will distribute water slowly (to avoid runoff) and evenly throughout the fenced tree protection zone but never soak the area within six feet *of the tree trunk*.

Pruning. Do not prune any of the trees until all construction is completed. This will help protect the tree canopies from damage. All pruning shall be completed under the direction of an ISA Certified Arborist and using ISA guidelines. Only dead wood shall be removed from tree canopies.

Washing. Periodic washing of the foliage is recommended during construction, but no more than once every two weeks. Washing should include the upper and lower leaf surfaces and the tree bark. This should continue at a less frequent rate beyond the construction period, with a high-powered hose only in the early morning hours. Washing will help control dirt/dust buildup that can lead to mite and insect infestations. Washing should not be done during nesting bird season (February-August).

Inspection. An ISA-certified arborist should inspect the trees at least monthly during construction activity. After each inspection, a summary report documenting observations and management recommendations shall be submitted to the owner. Photographs of representative trees will be included in each report.

Nesting Bird Surveys: Several California Fish and Game Code sections protect nesting birds against needless destruction of birds, nests, or eggs. A qualified biologist should survey Project trees prior to performing any tree work. To the extent feasible, tree work should be scheduled outside of the breeding season (February-August)(CDFW 2023).

Finally, the Project site is near several bodies of water and adjacent riparian areas. Where practical, tree protection measures such as fencing should be incorporated into the protective measures installed for these areas.

5.2.2 Trees Outside of the Development Footprint

One hundred twenty trees within the Project site are not recommended for removal and will not be impacted or encroached upon during construction. These trees are not located within the development footprint, and their driplines do not overlap with any proposed development. Most of these trees are located along the north side of the Project site. While the likelihood of damage to these trees from Project development is low, Dudek recommends that these trees be protected from impacts during development. Trees outside the Project development footprint are more likely to be damaged by the storage of construction materials and debris within their driplines and accidental strikes by vehicles or equipment rather than by the construction of the new buildings. Therefore, the Project development footprint and a reasonable buffer should be contained by construction fencing. This fencing would protect the 120 trees outside of the development footprint and reduce the likelihood of accidental damage to these trees. If any of these 120 trees lie within the Project site construction fencing, the tree protection measures listed in 5.2.1, including additional fencing, should be applied. Finally, it is recommended that construction material storage locations and debris storage locations be identified before development begins so these locations can be placed away from any park trees outside of the development footprint.

Appendix B shows the preliminary site plans with an overlay of the tree locations. Tree points are identified by the disposition of the tree, removal, encroachment, or not impacted.

5.3 Tree Replacement Recommendations

The City of Walnut Creek municipal code contains specific requirements for replacing trees removed for site development or new construction. However, conserving the City's urban forest is important to the City, and it is the City's preference to replant at a 1:1 ratio. This report recommends the removal of 70 trees; therefore, 70replacement trees should be planted to mitigate the loss of the removed trees. Heather Farms Park has several areas surrounding the Project site with adequate space to plant these recommended replacement trees without impacting park facilities or improvements. The replacement tree species selected for each planting site should be adjusted to the conditions at the planting site. Below is a list of viable planting areas near the Project site:

- The irrigated turf area south of the Project site: Chinese Pistache, London Plane Tree, Red Maple, Sour Gum
- The non-irrigated area north of the community center parking lot includes Valley Oak, Coast Live Oak, California Sycamore (closer to the waterline), and California Buckeye (closer to the waterline).

- The non-irrigated area between the equestrian center and the lake's west shore: Valley Oak, Coast Live Oak, California Sycamore (closer to the waterline), and California Buckeye (closer to the water line).

Dudek recommends that the replacement tree be at least a 15-gallon container and planted at least twenty feet apart or twenty feet from the nearest existing tree. Finally, it is recommended that the replacement trees be provided with supplemental irrigation for the first two to three years.

6 Estimate of Value

All 198 trees within the Project site were appraised for this Project. As noted in the Methodology chapter, appraised values are based on the current conditions at the Project site, and this report's recommendation for preservation or removal was not considered when determining its value. Table 5 contains the appraised value of all the Project site trees and is ordered by the tree number Dudek assigned to each tree during the inventory.

Table 5 Estimate of Tree Value

Dudek Tree Number	Common Name	Total Diameter	Basic Reproduction Cost	Depreciated Reproduction Cost
1	Chinese Pistache	11	$ 10,587.50	**$ 10,058.13**
2	Callery Pear	12	$ 12,600.00	**$ 9,450.00**
3	London Plane	12	$ 12,600.00	**$ 11,340.00**
4	Persian Parrotia	13	$ 14,787.50	**$ 11,830.00**
5	Raywood Ash	2	$ 350.00	**$ 210.00**
6	Valley Oak	6	$ 3,150.00	**$ 2,677.50**
7	Coast Live Oak	21	$ 38,587.50	**$ 27,011.25**
8	Ash	8	$ 5,600.00	**$ 3,920.00**
9	Coast Redwood	26	$ 59,150.00	**$ 53,235.00**
10	English Oak	1	$ 87.50	**$ 87.50**
11	Green Ash	8	$ 5,600.00	**$ 4,480.00**
12	California Black Oak	15	$ 19,687.50	**$ 19,687.50**
13	Valley Oak	2	$ 350.00	**$ 297.50**
14	Valley Oak	3	$ 787.50	**$ 275.63**
15	English Oak	1	$ 87.50	**$ 74.38**
16	Coast Redwood	26	$ 59,150.00	**$ 50,277.50**
17	Crape Myrtle	5	$ 2,187.50	**$ 1,859.38**
18	Valley Oak	6	$ 3,150.00	**$ 2,362.50**
19	Callery Pear	8	$ 5,600.00	**$ 3,920.00**
20	Valley Oak	17	$ 25,287.50	**$ 21,494.38**
21	Coast Live Oak	23	$ 46,287.50	**$ 27,772.50**
22	Ash	3	$ 787.50	**$ 496.13**
23	Coast Live Oak	4	$ 1,400.00	**$ 504.00**
24	Cork Oak	6	$ 3,150.00	**$ 1,890.00**
25	London Plane	17	$ 25,287.50	**$ 21,494.38**
26	English Oak	30	$ 78,750.00	**$ 66,937.50**
27	Ash	1	$ 87.50	**$ 61.25**
28	Ash	4	$ 1,400.00	**$ 1,260.00**

Dudek Tree Number	Common Name	Total Diameter	Basic Reproduction Cost	Depreciated Reproduction Cost
29	Raywood Ash	27	$ 63,787.50	**$ 38,272.50**
30	Coast Live Oak	4	$ 1,400.00	**$ 784.00**
31	Coast Redwood	30	$ 78,750.00	**$ 70,875.00**
32	Unknown	13	$ 14,787.50	**$ 12,569.38**
33	Pacific Madrone	14	$ 17,150.00	**$ 15,435.00**
34	Coast Live Oak	4	$ 1,400.00	**$ 882.00**
35	Black Willow	14	$ 17,150.00	**$ 10,804.50**
36	English Oak	1	$ 87.50	**$ 74.38**
37	Coast Live Oak	7	$ 4,287.50	**$ 3,858.75**
38	Raywood Ash	3	$ 787.50	**$ 669.38**
39	Coast Redwood	22	$ 42,350.00	**$ 38,115.00**
40	Coast Live Oak	2	$ 350.00	**$ 315.00**
41	Crape Myrtle	5	$ 2,187.50	**$ 1,378.13**
42	Coast Redwood	22	$ 42,350.00	**$ 26,680.50**
43	Black Willow	5	$ 2,187.50	**$ 1,378.13**
44	Valley Oak	6	$ 3,150.00	**$ 850.50**
45	Coast Live Oak	7	$ 4,287.50	**$ 3,644.38**
46	Chinese Tallow	28	$ 68,600.00	**$ 18,522.00**
47	Fruitless olive	12	$ 12,600.00	**$ 11,340.00**
48	Coast Live Oak	19	$ 31,587.50	**$ 31,587.50**
49	Valley Oak	15	$ 19,687.50	**$ 17,718.75**
50	Raywood Ash	13	$ 14,787.50	**$ 6,284.69**
51	Coast Live Oak	19	$ 31,587.50	**$ 14,214.38**
52	Japanese Pine	10	$ 8,750.00	**$ 3,937.50**
53	Chinese Pistache	16	$ 22,400.00	**$ 20,160.00**
54	Persian Parrotia	5	$ 2,187.50	**$ 1,968.75**
55	Valley Oak	1	$ 87.50	**$ 61.25**
56	Valley Oak	15	$ 19,687.50	**$ 13,781.25**
57	English Oak	1	$ 87.50	**$ 61.25**
58	Raywood Ash	4	$ 1,400.00	**$ 980.00**
59	London Plane	11	$ 10,587.50	**$ 7,411.25**
60	Coast Live Oak	1	$ 87.50	**$ 61.25**
61	Valley Oak	6	$ 3,150.00	**$ 2,205.00**
62	Coast Redwood	17	$ 25,287.50	**$ 15,172.50**
63	Coast Live Oak	2	$ 350.00	**$ 210.00**
64	Crape Myrtle	7	$ 4,287.50	**$ 964.69**

Dudek Tree Number	Common Name	Total Diameter	Basic Reproduction Cost	Depreciated Reproduction Cost
65	Coast Live Oak	4	$ 1,400.00	**$ 980.00**
66	London Plane	14	$ 17,150.00	**$ 4,287.50**
67	Valley Oak	5	$ 2,187.50	**$ 546.88**
68	English Oak	3	$ 787.50	**$ 551.25**
69	American Sweetgum	8	$ 5,600.00	**$ 3,920.00**
70	Black Willow	26	$ 59,150.00	**$ 41,405.00**
71	Valley Oak	9	$ 7,087.50	**$ 4,961.25**
72	Raywood Ash	3	$ 787.50	**$ 551.25**
73	Coast Redwood	29	$ 73,587.50	**$ 51,511.25**
74	Coast Live Oak	6	$ 3,150.00	**$ 2,520.00**
75	Raywood Ash	10	$ 8,750.00	**$ 7,437.50**
76	London Plane	10	$ 8,750.00	**$ 7,875.00**
77	Unknown	2	$ 350.00	**$ 332.50**
78	Blue Atlas Cedar	3	$ 787.50	**$ 425.25**
79	Coast Redwood	21	$ 38,587.50	**$ 20,837.25**
80	Coast Redwood	22	$ 42,350.00	**$ 22,869.00**
81	Crape Myrtle	15	$ 19,687.50	**$ 10,631.25**
82	Fremont Cottonwood	31	$ 84,087.50	**$ 45,407.25**
83	Callery Pear	11	$ 10,587.50	**$ 5,717.25**
84	Coast Live Oak	3	$ 787.50	**$ 472.50**
85	Valley Oak	3	$ 787.50	**$ 425.25**
86	Chinese Pistache	9	$ 7,087.50	**$ 3,827.25**
87	California Pepper Tree	2	$ 350.00	**$ 157.50**
88	Valley Oak	5	$ 2,187.50	**$ 984.38**
89	Valley Oak	30	$ 78,750.00	**$ 40,162.50**
90	Coast Live Oak	2	$ 350.00	**$ 189.00**
91	Crape Myrtle	1	$ 87.50	**$ 47.25**
92	Coast Redwood	33	$ 95,287.50	**$ 57,172.50**
93	Coast Live Oak	7	$ 4,287.50	**$ 2,572.50**
94	Raywood Ash	1	$ 87.50	**$ 18.59**
95	Coast Live Oak	3	$ 787.50	**$ 448.88**
96	Raywood Ash	6	$ 3,150.00	**$ 1,795.50**
97	Coast Live Oak	14	$ 17,150.00	**$ 15,435.00**
98	Coast Live Oak	23	$ 46,287.50	**$ 41,658.75**
99	Valley Oak	8	$ 5,600.00	**$ 4,760.00**
100	Raywood Ash	8	$ 5,600.00	**$ 4,760.00**

Dudek Tree Number	Common Name	Total Diameter	Basic Reproduction Cost	Depreciated Reproduction Cost
101	Pacific Madrone	27	$ 63,787.50	**$ 54,219.38**
102	Red Willow	85	$ 632,187.50	**$ 568,968.75**
103	Crape Myrtle	5	$ 2,187.50	**$ 1,859.38**
104	Woodland Elaeocarpus	6	$ 3,150.00	**$ 2,992.50**
105	Valley Oak	21	$ 38,587.50	**$ 34,728.75**
106	Red Willow	4	$ 1,400.00	**$ 1,190.00**
107	Chinese Pistache	12	$ 12,600.00	**$ 11,340.00**
108	Valley Oak	7	$ 4,287.50	**$ 4,287.50**
109	Coast Redwood	30	$ 78,750.00	**$ 74,812.50**
110	American Sweetgum	9	$ 7,087.50	**$ 6,378.75**
111	Chinese Pistache	12	$ 12,600.00	**$ 11,340.00**
112	Coast Redwood	21	$ 38,587.50	**$ 32,799.38**
113	Coast Live Oak	3	$ 787.50	**$ 669.38**
114	Coast Redwood	31	$ 84,087.50	**$ 71,474.38**
115	London Plane	19	$ 31,587.50	**$ 28,428.75**
116	Fruitless olive	10	$ 8,750.00	**$ 7,875.00**
117	Pacific Madrone	19	$ 31,587.50	**$ 28,428.75**
118	Coast Live Oak	6	$ 3,150.00	**$ 2,677.50**
119	Coast Live Oak	11	$ 10,587.50	**$ 9,528.75**
120	English Oak	21	$ 38,587.50	**$ 32,799.38**
121	Coast Live Oak	6	$ 3,150.00	**$ 2,835.00**
122	Raywood Ash	12	$ 12,600.00	**$ 11,340.00**
123	Silk Tassel	9	$ 7,087.50	**$ 6,378.75**
124	Coast Live Oak	11	$ 10,587.50	**$ 9,528.75**
125	Japanese Pine	7	$ 4,287.50	**$ 3,858.75**
126	Chinese Pistache	12	$ 12,600.00	**$ 12,600.00**
127	Valley Oak	9	$ 7,087.50	**$ 6,378.75**
128	Persian Parrotia	12	$ 12,600.00	**$ 11,340.00**
129	Raywood Ash	3	$ 787.50	**$ 708.75**
130	Valley Oak	8	$ 5,600.00	**$ 4,760.00**
131	Raywood Ash	13	$ 14,787.50	**$ 13,308.75**
132	Chinese Pistache	17	$ 25,287.50	**$ 21,494.38**
133	Coast Live Oak	10	$ 8,750.00	**$ 7,437.50**
134	Coast Live Oak	8	$ 5,600.00	**$ 5,040.00**
135	Raywood Ash	10	$ 8,750.00	**$ 7,875.00**
136	Coast Live Oak	3	$ 787.50	**$ 630.00**

Dudek Tree Number	Common Name	Total Diameter	Basic Reproduction Cost	Depreciated Reproduction Cost
137	Fern Pine	20	$ 35,000.00	**$ 31,500.00**
138	Coast Live Oak	2	$ 350.00	**$ 350.00**
139	American Sweetgum	7	$ 4,287.50	**$ 3,644.38**
140	Coast Redwood	28	$ 68,600.00	**$ 54,880.00**
141	Callery Pear	9	$ 7,087.50	**$ 6,024.38**
142	London Plane	15	$ 19,687.50	**$ 13,781.25**
143	Valley Oak	22	$ 42,350.00	**$ 38,115.00**
144	Coast Live Oak	5	$ 2,187.50	**$ 1,859.38**
145	Coast Redwood	27	$ 63,787.50	**$ 57,408.75**
146	Raywood Ash	5	$ 2,187.50	**$ 1,968.75**
147	Oak	12	$ 12,600.00	**$ 11,340.00**
148	Green Ash	22	$ 42,350.00	**$ 38,115.00**
149	Chinese Pistache	12	$ 12,600.00	**$ 10,710.00**
150	London Plane	16	$ 22,400.00	**$ 20,160.00**
151	Raywood Ash	2	$ 350.00	**$ 315.00**
152	Coast Live Oak	3	$ 787.50	**$ 708.75**
153	London Plane	12	$ 12,600.00	**$ 11,970.00**
154	Pacific Madrone	15	$ 19,687.50	**$ 16,734.38**
155	Crape Myrtle	7	$ 4,287.50	**$ 3,858.75**
156	California Black Oak	16	$ 22,400.00	**$ -**[2]
157	Coast Redwood	24	$ 50,400.00	**$ 45,360.00**
158	Red Willow	12	$ 12,600.00	**$ 7,560.00**
159	Coast Live Oak	3	$ 787.50	**$ 472.50**
160	Chinese Pistache	10	$ 8,750.00	**$ 4,375.00**
161	Coast Live Oak	7	$ 4,287.50	**$ 3,858.75**
162	Woodland Elaeocarpus	9	$ 7,087.50	**$ 4,252.50**
163	Coast Live Oak	10	$ 8,750.00	**$ 7,875.00**
164	Valley Oak	14	$ 17,150.00	**$ 15,435.00**
165	London Plane	14	$ 17,150.00	**$ 15,435.00**
166	Red Willow	7	$ 4,287.50	**$ 3,858.75**
167	Coast Redwood	35	$ 107,187.50	**$ 96,468.75**
168	Oak	14	$ 17,150.00	**$ 15,435.00**
169	Valley Oak	20	$ 35,000.00	**$ 31,500.00**
170	Coast Live Oak	13	$ 14,787.50	**$ 13,308.75**

[2] Dead tree

Dudek Tree Number	Common Name	Total Diameter	Basic Reproduction Cost	Depreciated Reproduction Cost
171	Valley Oak	15	$ 19,687.50	**$ 17,718.75**
172	Valley Oak	7	$ 4,287.50	**$ 3,858.75**
173	Raywood Ash	4	$ 1,400.00	**$ 1,260.00**
174	Coast Live Oak	2	$ 350.00	**$ 315.00**
175	Raywood Ash	3	$ 787.50	**$ 590.63**
176	Ash	7	$ 4,287.50	**$ 3,858.75**
177	Coast Redwood	26	$ 59,150.00	**$ 53,235.00**
178	Raywood Ash	7	$ 4,287.50	**$ 3,858.75**
179	Japanese Pine	9	$ 7,087.50	**$ 6,378.75**
180	Coast Live Oak	3	$ 787.50	**$ 708.75**
181	Italian Alder	19	$ 31,587.50	**$ 26,849.38**
182	London Plane	15	$ 19,687.50	**$ 17,718.75**
183	Callery Pear	9	$ 7,087.50	**$ 6,378.75**
184	Valley Oak	9	$ 7,087.50	**$ 6,378.75**
185	American Sweetgum	8	$ 5,600.00	**$ 5,040.00**
186	Crape Myrtle	9	$ 7,087.50	**$ 6,378.75**
187	Valley Oak	25	$ 54,687.50	**$ 49,218.75**
188	London Plane	14	$ 17,150.00	**$ 15,435.00**
189	Black Willow	46	$ 185,150.00	**$ 166,635.00**
190	Valley Oak	4	$ 1,400.00	**$ 1,190.00**
191	Raywood Ash	13	$ 14,787.50	**$ 13,308.75**
192	Coast Redwood	26	$ 59,150.00	**$ 53,235.00**
193	Fruitless olive	12	$ 12,600.00	**$ 11,340.00**
194	English Oak	26	$ 59,150.00	**$ 53,235.00**
195	Coast Live Oak	2	$ 350.00	**$ 315.00**
196	Coast Live Oak	7	$ 4,287.50	**$ 3,858.75**
197	London Plane	12	$ 12,600.00	**$ 11,340.00**
198	White Ash	6	$ 3,150.00	**$ 2,835.00**

7 Conclusion

Based on preliminary plans provided by the City, there are 198 trees within the project site. Seventy of these trees are recommended for removal, sixty-six because the tree is located within the development footprint or five feet of it and not anticipated to tolerate construction impacts, and four because of the poor condition of the tree. One hundred twenty-eight trees are recommended for preservation. Eight of these trees are expected to have construction within their driplines, and protective measures are recommended to be installed to minimize the impact this construction has on the trees' health and stability. The remaining one hundred twenty trees are located outside of the development footprint and are not expected to be impacted by the development of the Project. Dudek recommends installing protective fencing at the edge of these tree driplines to separate them from construction activities and any inadvertent damage.

As noted throughout this report, the findings and recommendations are based on preliminary plans provided by the City. Dudek arborists may need to revise the number of trees recommended for removal and preservation, as well as the protective measures, as the project progresses and updated plans become available.

8 Disclosure

This arborist report provides conclusions and recommendations based only on a visual examination of the trees within the tree survey area by ISA-certified arborists and reasonable reliance on the completeness and accuracy of the information provided to the arborists. The examination did not include subterranean or internal examination of the trees.

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near them. Although trees provide many benefits to those who live near them, they also include inherent risks from breakage or failure that can be minimized but not eliminated.

Arborists cannot detect every condition that could possibly lead to the failure of a tree. Trees are living organisms subject to attack by disease, insects, fungi, weather, and other forces of nature, and conditions that lead to failure are often hidden within trees and belowground. There are some inherent risks with trees that cannot be predicted with any degree of certainty, even by a skilled and experienced arborist. Arborists cannot predict acts of nature, including, without limitation, storms of sufficient strength, which can cause an apparently healthy tree to fail. Additionally, arborists cannot guarantee that a tree will be healthy or safe under all circumstances or for any specific period of time. A tree’s condition could change over a short or long period of time due to climatic, cultural, or environmental conditions. Further, there is no guarantee or certainty that recommendations or efforts to correct unsafe conditions will prevent future breakage or failure of a tree.

To live or work near trees is to accept some degree of risk. Neither the author of this arborist report nor Dudek assume any responsibility for or will be liable for any claims, losses, or damages for damage to any tree, death or injury to any person, or any loss of or damage to any personal or real property.

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References

ISA (International Society of Arboriculture). 2019. *Guide for Plant Appraisal.* 10th ed. Council of Tree and Landscape Appraisers.

California Department of Fish and Wildlife. 2016. *Nest Regulations (Section 681, Title 14, CCR)*. Accessed on February 28, 2024 at https://wildlife.ca.gov/Notices/Regulations/Nesting-Birds

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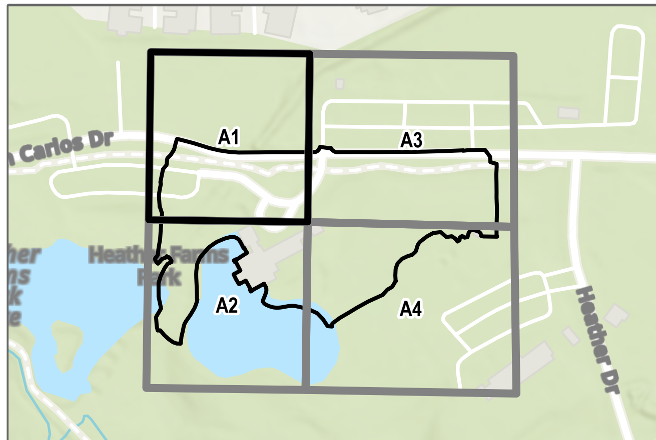
Appendix A
Tree Location Exhibit



Project Boundary

Project Tree

SOURCE: BKF Engineers 2024; Open Street Map 2023; Maxar 2022

DUDEK

0 50 100 Feet

APPENDIX A1

Tree Location Exhibit

Arborist Report Heather Farms Park Aquatic and Community Center Project

SOURCE: BKF Engineers 2024; Open Street Map 2023; Maxar 2022

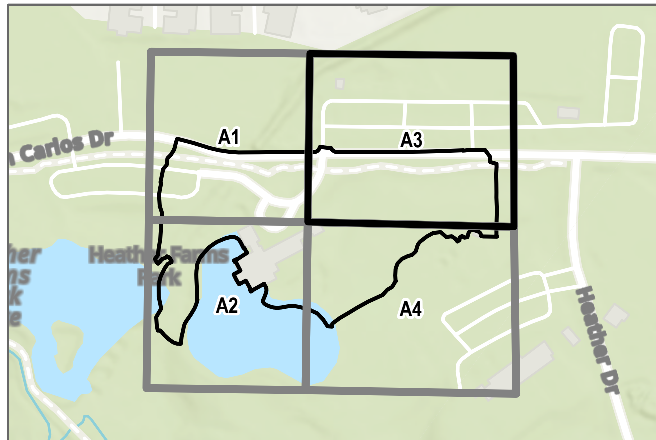
DUDEK

0 50 100 Feet

APPENDIX A2

Tree Location Exhibit

Arborist Report Heather Farms Park Aquatic and Community Center Project



Project Boundary

Project Tree

SOURCE: BKF Engineers 2024; Open Street Map 2023; Maxar 2022

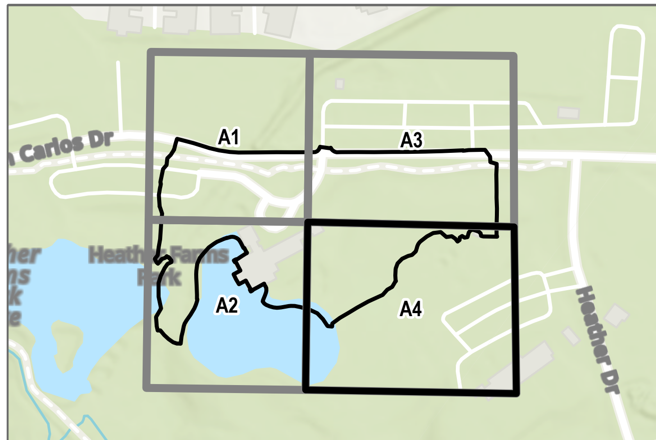
DUDEK

0 50 100 Feet

APPENDIX A3

Tree Location Exhibit

Arborist Report Heather Farms Park Aquatic and Community Center Project



Project Boundary

Project Tree

SOURCE: BKF Engineers 2024; Open Street Map 2023; Maxar 2022

DUDEK

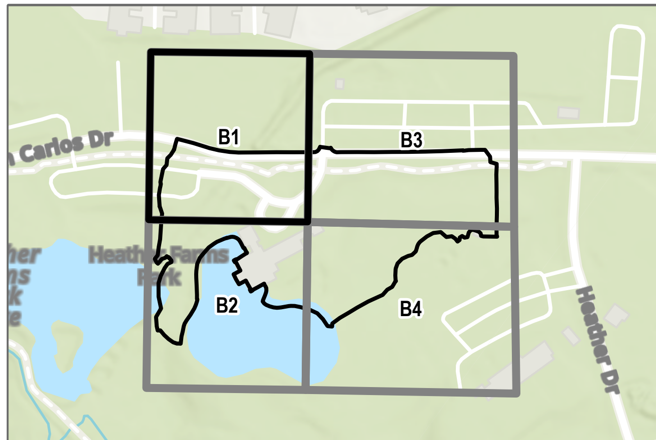
0 50 100 Feet

APPENDIX A4

Tree Location Exhibit

Arborist Report Heather Farms Park Aquatic and Community Center Project

Appendix B
Tree Impact Exhibit



Project Boundary

Project Tree

- No Impact
- Encroachment
- Removal

SOURCE: BKF Engineers 2024; City of Walnut Creek 2024; Open Street Map 2023; Maxar 2022

DUDEK

0 50 100 Feet

APPENDIX B1

Tree Impact Exhibit

Arborist Report Heather Farms Park Aquatic and Community Center Project

SOURCE: BKF Engineers 2024; City of Walnut Creek 2024; Open Street Map 2023; Maxar 2022

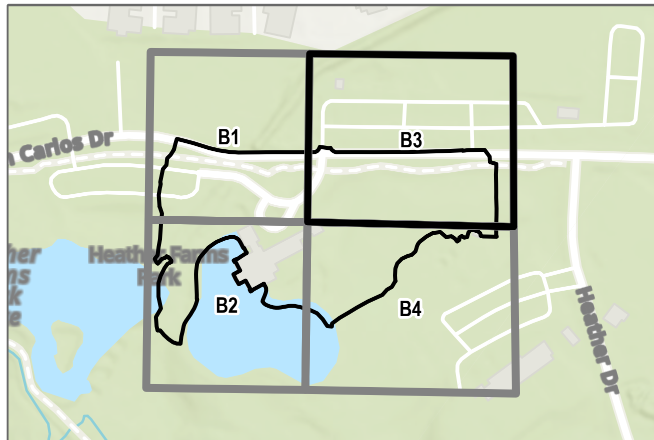
DUDEK

0 50 100 Feet

APPENDIX B2

Tree Impact Exhibit

Arborist Report Heather Farms Park Aquatic and Community Center Project



Project Boundary

Project Tree

- No Impact
- Encroachment
- Removal

SOURCE: BKF Engineers 2024; City of Walnut Creek 2024; Open Street Map 2023; Maxar 2022

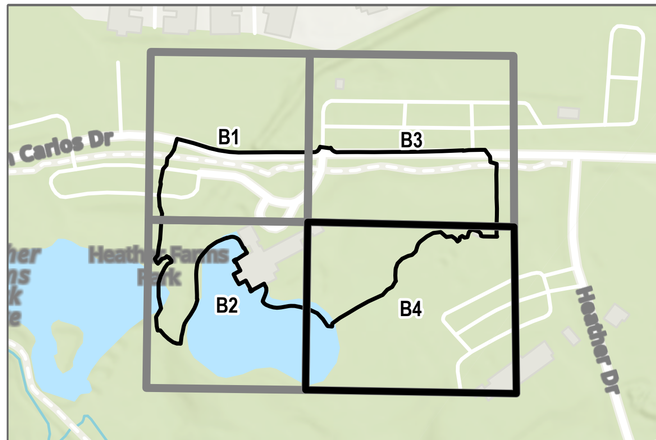
APPENDIX B3

Tree Impact Exhibit

Arborist Report Heather Farms Park Aquatic and Community Center Project

DUDEK

0 50 100 Feet



Project Boundary

Project Tree

- No Impact
- Encroachment
- Removal

SOURCE: BKF Engineers 2024; City of Walnut Creek 2024; Open Street Map 2023; Maxar 2022

DUDEK

0 50 100 Feet

APPENDIX B4

Tree Impact Exhibit

Arborist Report Heather Farms Park Aquatic and Community Center Project

Appendix C
Tree Information Matrix

Tree Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structural Integrity
1	Removal	Chinese Pistache	11	1	Very good	Very good
2	Removal	Callery Pear	12	1	Very good	Very good
3	Removal	London Plane	12	1	Very good	Very good
4	Removal	Persian Parrotia	13	4	Very good	Very good
5	No Impact	Raywood Ash	2	2	Very good	Very good
6	No Impact	Valley Oak	6	1	Excellent	Excellent
7	Encroachment	Coast Live Oak	21	1	Very good	Good
8	No Impact	Ash	8	3	Very good	Very good
9	Removal	Coast Redwood	26	1	Excellent	Excellent
10	No Impact	English Oak	1	1	Excellent	Excellently
11	No Impact	Green Ash	8	1	Very good	Very good
12	Removal	California Black Oak	15	1	Very good	Very good
13	No Impact	Valley Oak	2	1	Very good	Good
14	No Impact	Valley Oak	3	2	Very good	Good
15	No Impact	English Oak	1	1	Excellent	Excellent
16	Removal	Coast Redwood	26	1	Excellent	Excellent
17	No Impact	Crape Myrtle	5	4	Very good	Very good
18	No Impact	Valley Oak	6	1	Very good	Very good
19	Removal	Callery Pear	8	1	Very good	Very good
20	No Impact	Valley Oak	17	1	Very good	Good
21	No Impact	Coast Live Oak	23	1	Very good	Fair
22	No Impact	Ash	3	1	Very good	Very good
23	Encroachment	Coast Live Oak	4	1	Very good	Very good
24	Removal	Cork Oak	6	1	Excellent	Excellent
25	Removal	London Plane	17	1	Very good	Very good
26	Encroachment	English Oak	30	1	Very good	Very good
27	No Impact	Ash	1	1	Very good	Very good
28	No Impact	Ash	4	2	Very good	Very good
29	Removal	Raywood Ash	27	1	Very good	Good
30	No Impact	Coast Live Oak	4	1	Good	Very good
31	Removal	Coast Redwood	30	1	Excellent	Excellent
32	Removal	Unknown	13	1	Very good	Good
33	No Impact	Pacific Madrone	14	6	Very good	Good
34	No Impact	Coast Live Oak	4	1	Very good	Very good
35	Removal	Black Willow	14	3	Poor	Fair
36	No Impact	English Oak	1	1	Good	Fair

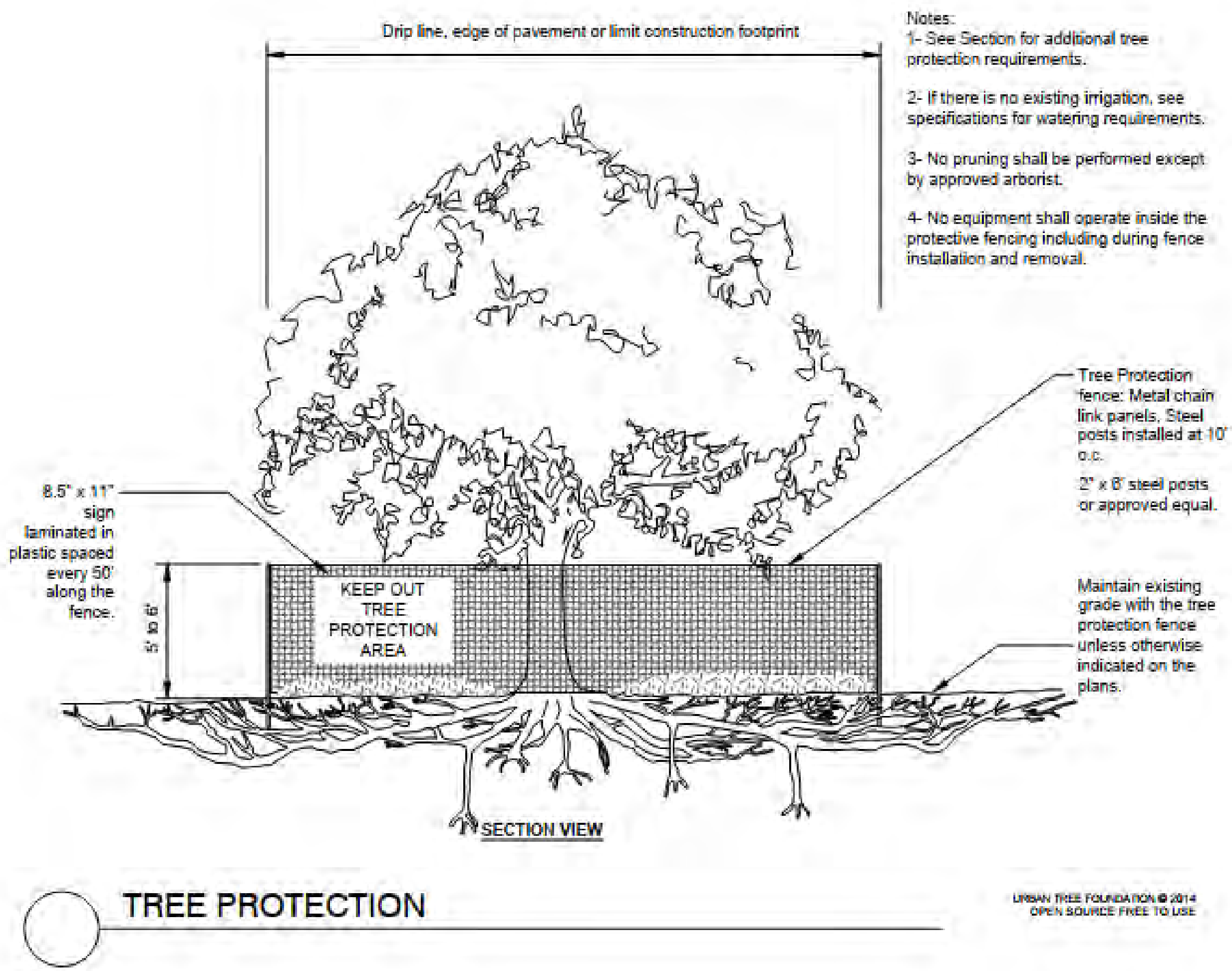
Tree Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structural Integrity
37	No Impact	Coast Live Oak	7	1	Very good	Very good
38	No Impact	Raywood Ash	3	1	Very good	Very good
39	Removal	Coast Redwood	22	1	Excellent	Excellent
40	No Impact	Coast Live Oak	2	1	Very good	Very good
41	Removal	Crape Myrtle	5	1	Very good	Very good
42	Removal	Coast Redwood	22	1	Excellent	Excellent
43	No Impact	Black Willow	5	2	Very good	Very good
44	No Impact	Valley Oak	6	2	Very good	Good
45	Removal	Coast Live Oak	7	1	Good	Very good
46	No Impact	Chinese Tallow	28	3	Very good	Good
47	Removal	Fruitless olive	12	11	Very good	Very good
48	No Impact	Coast Live Oak	19	1	Fair	Fair
49	No Impact	Valley Oak	15	1	Fair	Fair
50	No Impact	Raywood Ash	13	1	Very good	Very good
51	Removal	Coast Live Oak	19	1	Poor	Good.
52	Removal	Japanese Pine	10	4	Very good	Very good
53	Removal	Chinese Pistache	16	1	Good	Good
54	Removal	Persian Parrotia	5	1	Excellent	Very good
55	No Impact	Valley Oak	1	1	Good	Good
56	Removal	Valley Oak	15	1	Very good	Good
57	No Impact	English Oak	1	1	Very good	Very good
58	No Impact	Raywood Ash	4	1	Very good	Very good
59	Removal	London Plane	11	1	Very good	Good
60	No Impact	Coast Live Oak	1	1	Very good	Very good
61	No Impact	Valley Oak	6	1	Good	Very good
62	Removal	Coast Redwood	17	1	Excellent	Excellent
63	No Impact	Coast Live Oak	2	1	Very good	Very good
64	Removal	Crape Myrtle	7	1	Very good	Very good
65	No Impact	Coast Live Oak	4	1	Very good	Very good
66	Removal	London Plane	14	1	Very good	Very good
67	No Impact	Valley Oak	5	1	Very good	Good.
68	No Impact	English Oak	3	1	Good	Good
69	Removal	American Sweetgum	8	1	Very good	Very good
70	No Impact	Black Willow	26	3	Very good	Good
71	No Impact	Valley Oak	9	2	Very good	Good
72	No Impact	Raywood Ash	3	1	Very good	Very good
73	Removal	Coast Redwood	29	1	Excellent	Excellent
74	No Impact	Coast Live Oak	6	1	Good	Good
75	No Impact	Raywood Ash	10	3	Very good	Very good
76	Encroachment	London Plane	10	1	Very good	Very good
77	Removal	Unknown	2	1	Very good	Very good

Tree Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structural Integrity
78	Removal	Blue Atlas Cedar	3	1	Excellent	Excellent
79	Removal	Coast Redwood	21	1	Excellent	Excellent
80	Removal	Coast Redwood	22	1	Excellent	Excellent
81	No Impact	Crape Myrtle	15	10	Very good	Very good
82	No Impact	Fremont Cottonwood	31	2	Very good	Good
83	Removal	Callery Pear	11	1	Very good	Very good
84	No Impact	Coast Live Oak	3	1	Very good	Very good
85	No Impact	Valley Oak	3	1	Very good	Very good
86	Removal	Chinese Pistache	9	1	Very good	Very good
87	No Impact	California Pepper Tree	2	1	Very good	Good.
88	No Impact	Valley Oak	5	1	Very good	Good
89	Removal	Valley Oak	30	1	Very good	Very good
90	No Impact	Coast Live Oak	2	2	Very good	Very good
91	No Impact	Crape Myrtle	1	1	Very good	Very good
92	Removal	Coast Redwood	33	1	Excellent	Excellent
93	Encroachment	Coast Live Oak	7	1	Very good	Very good
94	No Impact	Raywood Ash	1	1	Very good	Very good
95	No Impact	Coast Live Oak	3	1	Very good	Very good
96	No Impact	Raywood Ash	6	1	Very good	Very good
97	No Impact	Coast Live Oak	14	1	Very good	Very good
98	No Impact	Coast Live Oak	23	1	Good	Fair
99	No Impact	Valley Oak	8	1	Fair	Good
100	No Impact	Raywood Ash	8	4	Very good	Very good
101	No Impact	Pacific Madrone	27	8	Very good	Very good
102	No Impact	Red Willow	85	9	Very good	Good
103	Removal	Crape Myrtle	5	3	Very good	Very good
104	Removal	Woodland Elaeocarpus	6	1	Very good	Very good
105	No Impact	Valley Oak	21	1	Good	Fair
106	No Impact	Red Willow	4	2	Very good	Very good
107	No Impact	Chinese Pistache	12	1	Very good	Excellent
108	No Impact	Valley Oak	7	1	Very good	Very good
109	Removal	Coast Redwood	30	1	Excellent	Excellent
110	Removal	American Sweetgum	9	1	Excellent	Excellent
111	Removal	Chinese Pistache	12	1	Very good	Very good
112	Removal	Coast Redwood	21	1	Excellent	Excellent
113	No Impact	Coast Live Oak	3	1	Very good	Very good
114	Removal	Coast Redwood	31	1	Excellent	Excellent
115	Removal	London Plane	19	1	Very good	Good
116	Removal	Fruitless olive	10	10	Very good	Very good
117	No Impact	Pacific Madrone	19	5	Very good	Very good
118	No Impact	Coast Live Oak	6	3	Very good	Very good

Tree Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structural Integrity
119	No Impact	Coast Live Oak	11	1	Very good	Very good
120	Removal	English Oak	21	1	Very good	Very good
121	No Impact	Coast Live Oak	6	1	Very good	Very good
122	No Impact	Raywood Ash	12	5	Very good	Very good
123	No Impact	Silk Tassel	9	6	Good	Very good
124	No Impact	Coast Live Oak	11	1	Good	Very good
125	Removal	Japanese Pine	7	2	Very good	Very good
126	Removal	Chinese Pistache	12	1	Very good	Good
127	No Impact	Valley Oak	9	2	Very good	Good
128	Removal	Persian Parrotia	12	5	Excellent	Very good
129	No Impact	Raywood Ash	3	1	Very good	Very good
130	No Impact	Valley Oak	8	1	Very good	Very good
131	No Impact	Raywood Ash	13	4	Very good	Very good
132	Removal	Chinese Pistache	17	1	Very good	Good
133	Removal	Coast Live Oak	10	1	Very good	Very good
134	No Impact	Coast Live Oak	8	1	Very good	Very good
135	No Impact	Raywood Ash	10	1	Good	Good
136	No Impact	Coast Live Oak	3	1	Very good	Excellent
137	Removal	Fern Pine	20	1	Very good	Very good
138	No Impact	Coast Live Oak	2	1	Very good	Very good
139	Encroachment	American Sweetgum	7	1	Very good	Very good
140	Removal	Coast Redwood	28	1	Excellent	Excellent
141	Removal	Callery Pear	9	1	Very good	Very good
142	Removal	London Plane	15	1	Very good	Very good
143	No Impact	Valley Oak	22	1	Good	Fair
144	No Impact	Coast Live Oak	5	1	Very good	Very good
145	Removal	Coast Redwood	27	1	Excellent	Excellent
146	No Impact	Raywood Ash	5	1	Very good	Very good
147	Removal	Oak	12	1	Very good	Very good
148	No Impact	Green Ash	22	6	Very good	Very good
149	Removal	Chinese Pistache	12	1	Very good	Very good
150	Removal	London Plane	16	1	Very good	Good
151	No Impact	Raywood Ash	2	1	Very good	Very good
152	No Impact	Coast Live Oak	3	1	Good	Good
153	Removal	London Plane	12	1	Very good	Good
154	No Impact	Pacific Madrone	15	8	Very good	very good
155	No Impact	Crape Myrtle	7	6	Very good	Very good
156	Removal	California Black Oak	16	1	Very good	Excellent
157	Removal	Coast Redwood	24	1	Excellent	Excellent
158	No Impact	Red Willow	12	1	Fair	Fair
159	No Impact	Coast Live Oak	3	1	Very good	Very Good

Tree Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structural Integrity
160	Removal	Chinese Pistache	10	1	Very good	Very good
161	Removal	Coast Live Oak	7	1	Dead	Dead
162	Removal	Woodland Elaeocarpus	9	1	Very good	Good
163	Removal	Coast Live Oak	10	1	Very good	Very good
164	No Impact	Valley Oak	14	1	Very good	Good
165	Removal	London Plane	14	1	Excellent	Excellent
166	No Impact	Red Willow	7	1	Good	Fair
167	Removal	Coast Redwood	35	1	Excellent	Excellent
168	Removal	Oak	14	1	Very good	Very good
169	No Impact	Valley Oak	20	1	Very good	Good
170	Removal	Coast Live Oak	13	1	Very good	Very good
171	No Impact	Valley Oak	15	1	Very good	Good
172	Encroachment	Valley Oak	7	1	Very good	Very good
173	No Impact	Raywood Ash	4	1	Very good	Very good
174	No Impact	Coast Live Oak	2	1	Very good	Very good
175	No Impact	Raywood Ash	3	1	Very good	Very good
176	No Impact	Ash	7	6	Very good	Very good
177	Removal	Coast Redwood	26	1	Excellent	Excellent
178	No Impact	Raywood Ash	7	3	Very good	Very good
179	Removal	Japanese Pine	9	6	Very good	Good
180	No Impact	Coast Live Oak	3	1	Very good	Very good
181	No Impact	Italian Alder	19	1	Very good	Fair
182	Encroachment	London Plane	15	1	Very good	Good
183	Removal	Callery Pear	9	1	Very good	Very good
184	Removal	Valley Oak	9	1	Very good	Very good
185	Removal	American Sweetgum	8	1	Very good	Excellent
186	No Impact	Crape Myrtle	9	6	Very good	Very good
187	No Impact	Valley Oak	25	1	Very good	Good
188	Removal	London Plane	14	1	Very good	Good
189	No Impact	Black Willow	46	8	Very good	Very good
190	No Impact	Valley Oak	4	1	Very good	Very good
191	No Impact	Raywood Ash	13	6	Very good	Very good
192	Removal	Coast Redwood	26	1	Excellent	Excellent
193	Removal	Fruitless olive	12	11	Very good	Very good
194	No Impact	English Oak	26	1	Very good	Good
195	No Impact	Coast Live Oak	2	1	Excellent	Excellent
196	Removal	Coast Live Oak	7	1	Poor	Good.
197	Removal	London Plane	12	1	Excellent	Very good
198	No Impact	White Ash	6	2	Fair	Very good

Appendix D
Tree Protection Fencing Detail



Appendix E Nature Lake Expansion

Arborist Report

Heather Farms Park Aquatics and Community Center Project-Nature Lake Expansion Area

City of Walnut Creek, Walnut Creek, California

MAY 2024

Prepared for:

MARY ANN BONIFACIO
Associate Engineer
Public Works/Engineering, City of Walnut Creek
1666 N. Main St.
Walnut Creek, California 92660

Prepared by:

DUDEK

1904 Franklin St Ste 600,
Oakland, CA 94612
Contact: Jeremy Cawn
ISA-Certified Arborist

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
City	City of Walnut Creek
DSH	Diameter at Standard Height (4.5 ft. above ground level)
ISA	International Society of Arboriculture
Project	Heather Farms Park New Aquatics and Community Center

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1 Introduction

This report summarizes Dudek's evaluation and analysis of tree resources within the tree survey area at the Nature Lake Expansion Area, part of the new Aquatics and Community Center (Project) site, located in Heather Farms Park at 301 North San Carlos Drive in the City of Walnut Creek (City), California. The site is approximately 1200 feet northwest of the intersection of North San Carlos Drive and Ygnacio Valley Road. (see Figure 1, Vicinity Map).

The field inventory and assessments of the Nature Lake Expansion Area were conducted on April 29, 2024. The focus of Dudek's field evaluations was to identify and inventory all on-site trees that are subject to regulation by the City of Walnut Creek's Municipal Code, and that could be impacted by the proposed development per the site plan. This report includes a discussion of the tree inventory, evaluation and analysis methods, a summary of findings, identification of anticipated impacts, and tree protection and tree impact mitigation recommendations consistent with the City of Walnut Creek Municipal Code.

The Project is located entirely within a City park; therefore, all of the trees within the area are Park trees. All park trees are protected by City Municipal Code 11-1.506, regardless of size or species. New development in the city is regulated by Title 9, Chapter 9 in the municipal code, and sets requirements for identifying and preserving trees on new development sites.

This report's analysis of potential tree impacts considers the requirements outlined in the appropriate sections of the City of Walnut Creek Municipal Code. The proposed Nature Lake Expansion would require the removal of 52 park trees and the encroachment of one park tree.

This arborist report describes the anticipated impacts on trees within and near the proposed project for the development of the Lake Expansion Area, which is intended to mitigate the loss of an existing artificial pond at the site of the new aquatics and community center in the park. The five chapters in this report's main body cover the development footprint of this lake expansion. Chapter 2 describes the methodology used by Dudek to conduct the tree survey and prepare the report. Chapter 3 describes the results of our tree survey. Chapter 4 of this report describes the potential impacts that the project will have on the trees within the project area. Chapter 5 describes Dudek's tree removal and tree protection recommendations. Chapter 6 contains the results of the tree appraisal for the trees within the project area. Tables and maps detailing each surveyed tree are attached to the report as Sub Appendices A, B, and C.

This report and its included sub appendices are intended to provide the City and project staff with an understanding of the tree resources present in the project area. Tree management recommendations are consistent with the provisions of the City of Walnut Creek's Municipal Code and tree care industry best management practices.

1.1 Summary

The field survey recorded 54 trees within the Nature Lake Expansion Area; 52 are within the Nature Lake Expansion Area, two are located just beyond the lake expansion boundary. Subappendix A provides detailed information about each surveyed tree, subappendix B depicts the inventoried tree locations, and subappendix C depicts the proposed project tree impacts.

Up to 52 park trees are expected to be removed when the Nature Lake Expansion is completed. All these trees lie within the lake expansion's footprint and will be destroyed when the soil is removed to lower the grade below the water line.

The City's Municipal Code does not have specific mitigation requirements for park trees that are removed for new public facilities; however, the City of Walnut Creek is committed to maintaining its urban tree canopy and intends to provide replacement trees for each healthy tree removed for this project. This report contains tree replacement recommendations based on post-development site conditions and the appearance and distribution of trees in the areas of Heather Farms Park outside of the Project site.

1.2 Assignment

Dudek's International Society of Arboriculture (ISA)-Certified Arborists performed the following tasks:

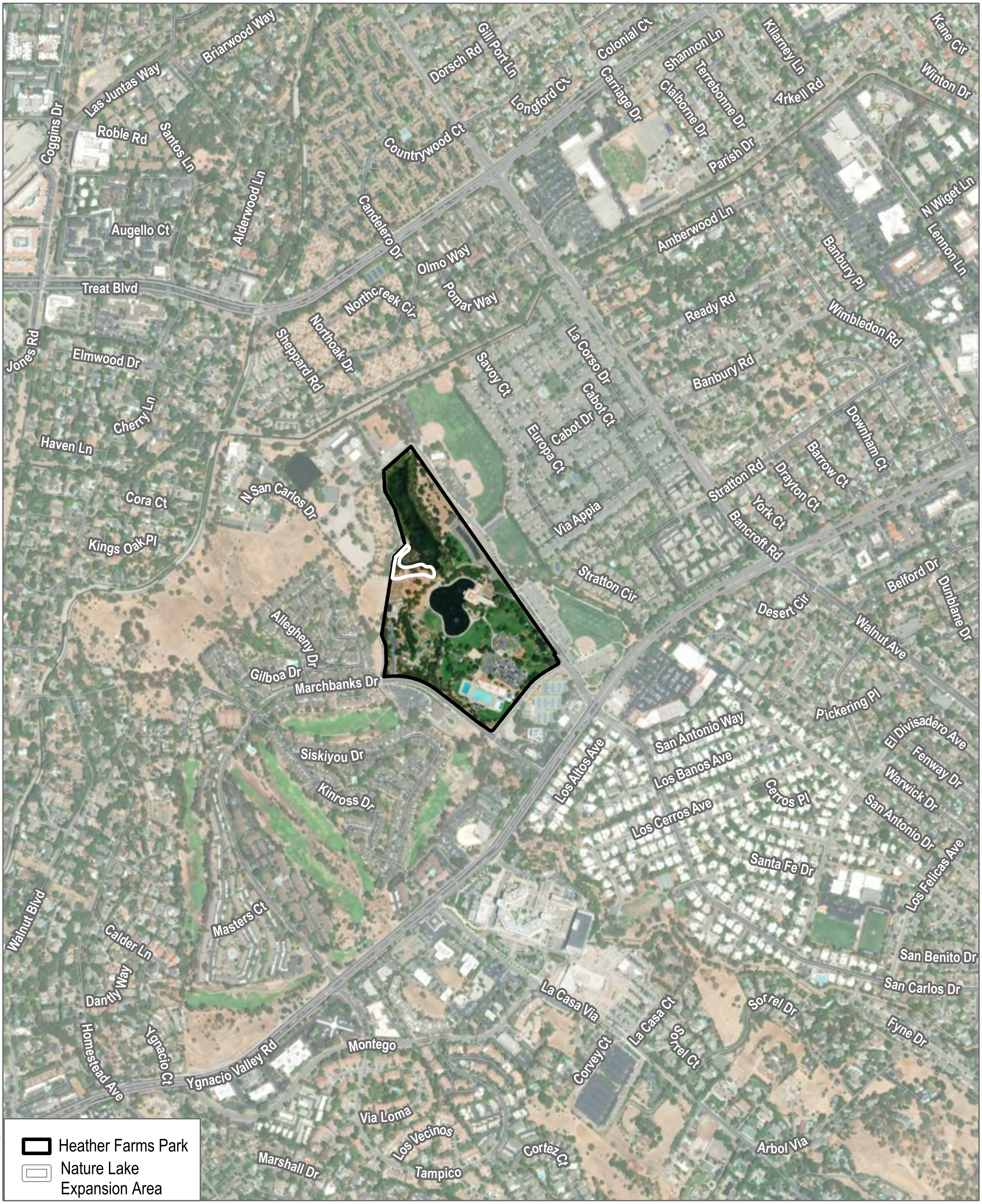
- Assessed and inventoried all trees within the survey area (based on preliminary plans) and documented species, general health, general structural condition, size, and appearance.
- Mapped the location of trees not shown on the topographic survey base data and used GPS technology, as necessary, to develop a tree location exhibit and for planning reference.
- Prepared a tree information matrix detailing each surveyed tree's attributes.
- Analyzed tree attribute data and coordinated with the project design team to promote tree retention on-site to the maximum extent practicable.
- Evaluated tree impacts based on the project site plans.
- Provided an estimate of the value for all protected trees within the project construction limits.
- Prepared this report and appendices to document the results of field surveys and impact analyses and to provide recommendations for tree protection and impact mitigation measures in accordance with the provisions of the City of Walnut Creek Municipal Code.

1.3 Project Site Description

The project comprises the Nature Lake Expansion Area northeast of Marchbanks Drive, directly southwest of N San Carlos Drive, and north of Heather Drive. The project site consists of Assessor's Parcel Number 144-050-019-5.

The Nature Lake Expansion Area is located on the lake's south shore, approximately 400 feet north of the new Aquatics and Community Center site. Adjacent lands to the two project components are also part of Heather Farms Park and consist of playing fields, Oak Woodlands, playgrounds, and additional parking lots.

Figure 1 Vicinity Map



SOURCE: Maxar 2022; Contra Costa County 2023; Open Street Map 2023

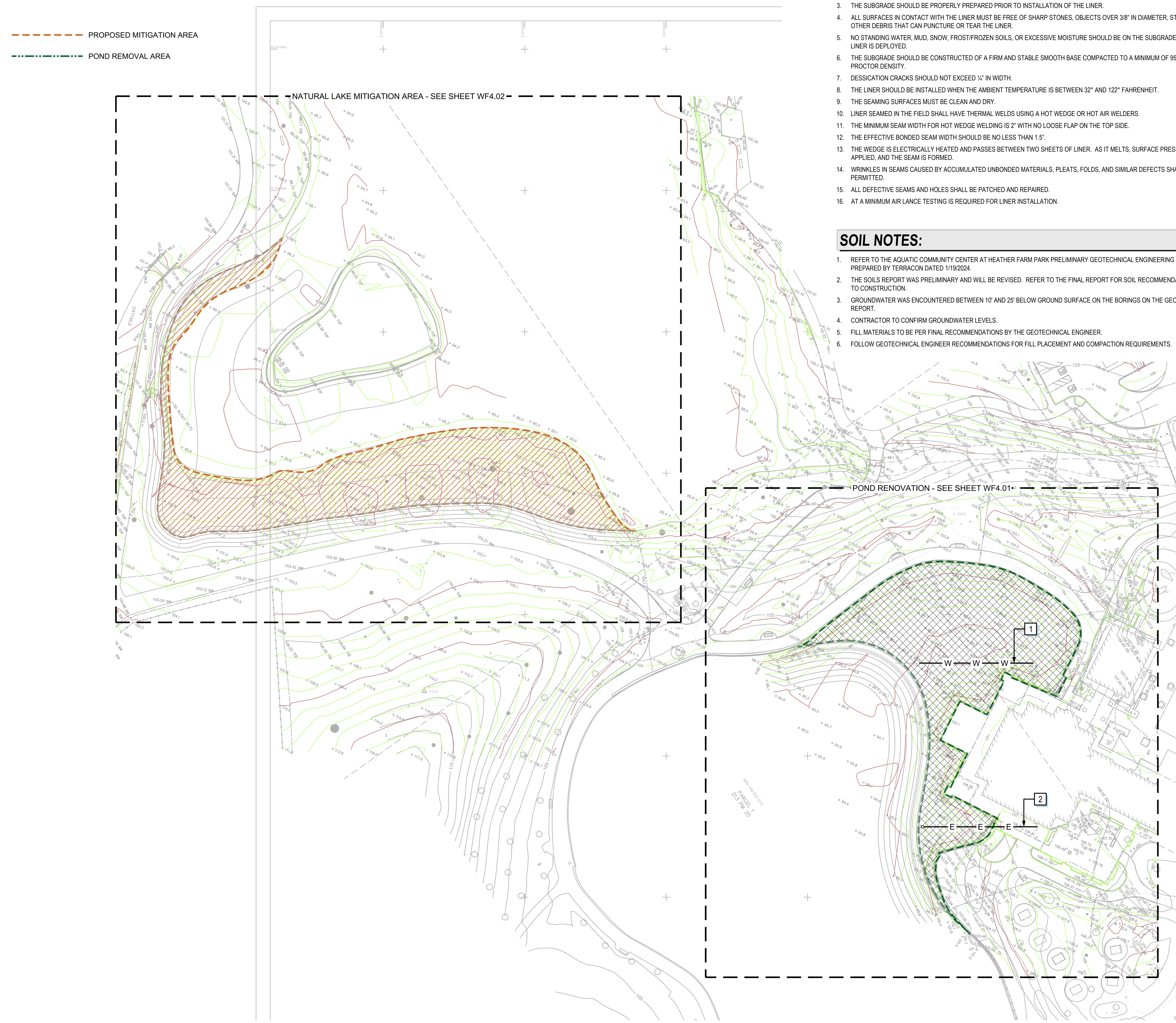
FIGURE 1

Nature Lake Expansion Area Vicinity Map

DUDEK

Arborist Report Heather Farms Park Aquatic and Community Center Project

Figures 2-1 through 2-4 Site Plans



0 20 40 80

Scale: 1"= 40'-0"

LINER SEAMING NOTES

1. THE LINER SPECIFIED SHALL BE PER PLANS.
2. PANEL LAYOUT DRAWINGS SHALL BE PROVIDED TO THE ENGINEER FOR APPROVAL SHOWING DIRECTION OF FACTORY SEAMS AND THE LENGTH OF EACH SHEET OF GEMEMBRANE USED IN THE PANEL.
3. THE SUBGRADE SHOULD BE PROPERLY PREPARED PRIOR TO INSTALLATION OF THE LINER.
4. ALL SURFACES IN CONTACT WITH THE LINER MUST BE FREE OF SHARP STONES, OBJECTS OVER 3/8" IN DIAMETER, STICKS AND OTHER DEBRIS THAT CAN PUNCTURE OR TEAR THE LINER.
5. NO STANDING WATER, MUD, SNOW, FROST/FROZEN SOILS, OR EXCESSIVE MOISTURE SHOULD BE ON THE SUBGRADE WHEN THE LINER IS DEPLOYED.
6. THE SUBGRADE SHOULD BE CONSTRUCTED OF A FIRM AND STABLE SMOOTH BASE COMPACTED TO A MINIMUM OF 95% STANDARD PROCTOR DENSITY.
7. DESSICATION CRACKS SHOULD NOT EXCEED ¼" IN WIDTH.
8. THE LINER SHOULD BE INSTALLED WHEN THE AMBIENT TEMPERATURE IS BETWEEN 32° AND 122° FAHRENHEIT.
9. THE SEAMING SURFACES MUST BE CLEAN AND DRY.
10. LINER SEAMED IN THE FIELD SHALL HAVE THERMAL WELDS USING A HOT WEDGE OR HOT AIR WELDERS.
11. THE MINIMUM SEAM WIDTH FOR HOT WEDGE WELDING IS 2" WITH NO LOOSE FLAP ON THE TOP SIDE.
12. THE EFFECTIVE BONDED SEAM WIDTH SHOULD BE NO LESS THAN 1.5".
13. THE WEDGE IS ELECTRICALLY HEATED AND PASSES BETWEEN TWO SHEETS OF LINER. AS IT MELTS, SURFACE PRESSURE IS APPLIED, AND THE SEAM IS FORMED.
14. WRINKLES IN SEAMS CAUSED BY ACCUMULATED UNBONDED MATERIALS, PLEATS, FOLDS, AND SIMILAR DEFECTS SHALL NOT BE PERMITTED.
15. ALL DEFECTIVE SEAMS AND HOLES SHALL BE PATCHED AND REPAIRED.
16. AT A MINIMUM AIR LANCE TESTING IS REQUIRED FOR LINER INSTALLATION.

SOIL NOTES:

1. REFER TO THE AQUATIC COMMUNITY CENTER AT HEATHER FARM PARK PRELIMINARY GEOTECHNICAL ENGINEERING REPORT PREPARED BY TERRACON DATED 1/19/2024.
2. THE SOILS REPORT WAS PRELIMINARY AND WILL BE REVISED. REFER TO THE FINAL REPORT FOR SOIL RECOMMENDATIONS PRIOR TO CONSTRUCTION.
3. GROUNDWATER WAS ENCOUNTERED BETWEEN 10' AND 25' BELOW GROUND SURFACE ON THE BORINGS ON THE GEOTECHNICAL REPORT.
4. CONTRACTOR TO CONFIRM GROUNDWATER LEVELS.
5. FILL MATERIALS TO BE PER FINAL RECOMMENDATIONS BY THE GEOTECHNICAL ENGINEER.
6. FOLLOW GEOTECHNICAL ENGINEER RECOMMENDATIONS FOR FILL PLACEMENT AND COMPACTION REQUIREMENTS.

GENERAL LAKE NOTES

1. CONCRETE FOR LAKE CONSTRUCTION UNLESS OTHERWISE SPECIFIED ON PLANS SHALL BE 6 SACK MINIMUM PEA GRAVEL PUMP MIX AND SHALL BE ABLE TO BE PUMPED AT A 3" SLUMP WITH A TRAILER MOUNTED GROUT PUMP WITH A 2" HOSE.THESE PLANS ARE INTENDED FOR LAKE CONSTRUCTION ONLY. SEE DRAWINGS BY OTHERS FOR SPECIFIC ASPECTS OF CONSTRUCTION.
2. VERIFY ELEVATIONS OF THE TOP OF CONCRETE SHORELINES AND HINGE POINTS PER THE ROUGH GRADING SECTIONS. CONFIRM THAT THE ELEVATIONS ARE WITHIN ±0.10' OF THE MAXIMUM WATER SURFACE ELEVATION SHOWN ON THE PLANS.
3. LAKE CONTRACTOR IS RESPONSIBLE FOR FINISHED GRADES PER PLAN.
4. CONTRACTOR TO STAKE ALL CRITICAL POINTS INCLUDING TOP OF SHORELINE, PIPING LOCATIONS, AND ALL LAKE COMPONENTS SHOWN ON THE PLANS.
5. LAKE CONTRACTOR TO COORDINATE WITH THE GRADING CONTRACTOR AND LAYOUT THE LAKE EDGE ON THE GROUND.
6. WATER LEVELS SHOWN INDICATE WATER SURFACE ELEVATIONS DURING OPERATION. ELEVATIONS MAY DIFFER DURING SHUTDOWN CONDITIONS.
7. ALL MANUFACTURER PRODUCT CALL-OUTS SHOWN IN THESE PLANS SHALL BE CONSIDERED "OR APPROVED EQUAL" UNLESS OTHERWISE NOTED. CONTRACTOR TO PROVIDE SHOP DRAWINGS OF SUBSTITUTIONS FOR APPROVAL.
8. THE LAKE CONTRACTOR SHALL VERIFY THE AVAILABLE ELECTRICAL POWER PRIOR TO PURCHASING EQUIPMENT.
9. REFER TO LANDSCAPE ARCHITECT SPECIFICATIONS FOR COLOR, TYPE OF BOULDERS TO BE USED, AND INSTALLATION REQUIREMENTS. THE LAKE CONTRACTOR SHALL FURNISH AND INSTALL BOULDERS SUBJECT TO APPROVAL OF THE OWNER. NOTIFY OWNER'S REPRESENTATIVE PRIOR TO SETTING ANY BOULDERS TO WITNESS THE BOULDER INSTALLATION AND TO MAKE ADJUSTMENTS AS NECESSARY.
10. CRITICAL ELEVATIONS INCLUDING TOP OF CONCRETE SHORELINE & CONTROL WEIR ELEVATIONS SHALL BE INSTALLED ±0.05' OF ELEVATION PER PLAN.
11. GENERAL PIPELINE NOTES:
 11.1. ALL RE-CIRCULATION PIPE SHALL BE INSTALLED WITHOUT HIGH POINTS. PREVENT AIR TRAPS AND PROVIDE A 3'-0" (MIN) COVER OUTSIDE WATER FEATURE LIMITS AND A 1'-0" (MIN) COVER WITHIN UNLESS OTHERWISE NOTED ON THE PLANS.
 11.2. ALL PVC PIPE SHALL BE PER THE FOLLOWING SCHEDULE UNLESS OTHERWISE NOTED:

30"Ø AND LARGER	80 PSI PVC PIPE OR AS SPECIFIED ON PLAN
15"Ø - 27"Ø	80 PSI PVC IRRIGATION PIPE (P.I.P.)
10"Ø - 12"Ø	100 PSI PVC IRRIGATION PIPE (P.I.P.)
8"Ø	RING-TITE (RT) CLASS 160
6"Ø AND SMALLER	SCHEDULE 40 IPS PVC PIPE

 11.3. PROVIDE THRUST BLOCK ON PIPE BENDS IF REQUIRED. PIPELINES WITH PUSH ON JOINTS REQUIRE THRUST BLOCKS. ALL SOLVENT WELDED PIPELINE DO NOT REQUIRE THRUST BLOCKS. REFER TO THE THRUST BLOCK DETAIL.
 11.4. PAINT ALL EXPOSED PVC PIPE WITHIN THE LAKE AREA WITH BLACK OR DARK BLUE PAINT SUITABLE FOR PIPE MATERIAL.
12. GENERAL LINER NOTES:
 12.1. THE PRIMARY OPTION IS AN AMENDED EXISTING SOIL. THERE ARE PORTIONS OF THE SHORELINE THAT USES A GEOMEMBRANE LINER INSTEAD OF AMENDED EXISTING SOIL.
 12.2. AS AN ALTERNATE, CONTRACTOR TO PROVIDE COST FOR THE USE OF A GEOMEMBRANE LINER IF DETERMINED THAT THE EXISTING SOIL IS NOT SUITABLE TO BE USED AS A LINER.
 12.3. THE GEOMEMBRANE LINER SHALL BE 30MIL REINFORCED POLYETHYLENE (RPE) - SEE LINER SPECIFICATIONS FOR ADDITIONAL INFORMATION.
 12.4. THE SUBGRADE TO BE COMPACTED PER GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.

SEEPAGE CONTROL (ESS-13) NOTES

1. EXISTING SOIL AMMENDED WITH SEEPAGE CONTROL'S ESS-13 PRODUCT WILL BE THE PRIMARY LINER USED FOR THIS PROJECT. AS AN ALTERNATE, 30 MIL RPE LINER WILL BE INSTALLED IF IT IS DETERMINED THAT THE EXISTING SOIL IS NOT APPROPRIATE FOR THIS PROJECT.
2. PRIOR TO THE START OF CONSTRUCTION, CONTRACTOR TO PROVIDE SOIL SAMPLES IN TWO FIVE GALLON BUCKETS FROM A LOCATION TO BE COORDINATED WITH THE LAKE ENGINEER.
3. SOIL SAMPLES TO BE SENT TO SEPAGE CONTROL IN PHOENIX, ARIZONA - (480)763-1180.
4. SEEPAGE CONTROL TO PROVIDE THE GEOTECHNICAL ENGINEERING COMPANY TO USE AND THE TYPE OF TESTS REQUIRED.
5. CONTRACTOR WILL PROVIDE AT THEIR OWN EXPENSE THE FOLLOWING TESTING OF SOIL SAMPLES TO DETERMINE THE QUANTITIES OF ESS-13 PRODUCT TO BE USED:
 a. SIEVE ANALYSIS
 b. STANDARD PROCTOR COMPACTION TEST
 c. PERMEABILITY TESTING WITH STANDARD ESS-13 APPLICATION RATES
3. THE SOIL LINER METHOD TO BE USED FOR THIS PROJECT IS THE TREATED AND COMPACTED METHOD USING ESS-13 BY SEEPAGE CONTROL, INC.
4. THE LAKE CONTRACTOR SHALL COORDINATE WITH THE GRADING CONTRACTOR TO PROVIDE THE CORRECT ELEVATIONS FOR THE LAKE GRADES.
5. GRADING CONTRACTOR TO OVEREXCAVATE AND STOCKPILE THE SOIL AT AN APPROPRIATE AREA ON SITE TO BE USED FOR THE LAKE LINING.
6. THE EXISTING SOIL STOCKPILED WILL BE AMENDED WITH ESS-13 AND PLACED BACK INTO THE BOTTOM OF THE LAKE PER PLAN.
7. THE AMENDED SOIL WILL BE INSTALLED IN SIX INCH LIFTS.
8. ON LAKE DEPTHS LESS THAN 12', THERE WILL BE TWO (2) 6" LAYERS OF TREATED AND COMPACTED SOIL. ON DEPTHS GREATER THAN 12', THREE (3) 6" LAYERS WILL BE REQUIRED. SEEPAGE CONTROL SHALL CONFIRM THE QUANTITY AND DEPTH OF SOIL LAYERS FOR THE LINING SYSTEM FOR INSTALLATION.
9. LAKE CONTRACTOR SHALL INSTALL ALL PIPING AND LAKE COMPONENTS PRIOR TO THE PLACING OF THE SOIL LINER. THE LAKE LINER SHALL BE SEALED TO THE LAKE COMPONENTS AS REQUIRED PER PLAN.
10. INSTALL SOIL LINING IN 6" COMPACTED LIFTS TO AT LEAST 97% STANDARD PROCTOR AS DETERMINED BY ASTM D698 OR AS APPROVED BY SEEPAGE CONTROL REPRESENTATIVE ON SITE DURING INSTALLATION OF THE LINER.
11. CONSTRUCTION OF THE SOIL LINER TO BE UNDER THE SUPERVISION AND CONTROL OF THE SEEPAGE CONTROL FIELD REPRESENTATIVE.
12. IF VOIDS OR COURSE SOIL ARE ENCOUNTERED DURING ROUGH GRADING, PREPARE LAKE LINING SUBGRADE PER GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.
13. AFTER THE SOIL HAS BEEN TREATED, THE LAKE BOTTOM SHOULD REMAIN MOIST AT ALL TIMES TO PREVENT DRYING OUT AND CRACKING. CONTRACTOR TO TIME THE FILLING OF THE LAKE TO THE END OF THE LINER INSTALLATION TO MINIMIZE THE COST OF MAINTAINING THE SOIL MOISTURE.

UTILITY REQUIREMENTS

TAG	SYMBOL	ITEM DESCRIPTION	REMARKS
BY OTHERS - FOR REFERENCE			
1	— W —	POTABLE WATER	ONE 2" POTABLE WATER POINT OF CONNECTION WILL BE REQUIRED AT THE PUMP STATION WITH PRESSURE BETWEEN 30 PSI AND 50 PSI. SEE WATER LEVEL DETAIL. CONTRACTOR TO PROVIDE BACKFLOW PREVENTOR PER PLUMBING PLANS (BY OTHERS).
2	— E —	ELECTRICAL	A NEW ELECTRICAL FEED WITH 5 AMPS, 120 VOLTS, 1Ø, GFI PROTECTED OUTLET IS REQUIRED. PROVIDE TERMINATION AT AERATION PANEL ADJACENT TO THE LAKE AS SHOWN ON THE PLAN.

NOLL & TAM ARCHITECTS
729 Heinz Avenue
Berkeley, CA 94710
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APPROVALS

PROJECT TITLE

CITY OF WALNUT CREEK

The New Aquatic & Community Center at Heather Farm Park

301 N SAN CARLOS DR
WALNUT CREEK, CA 94598

DESIGN DEVELOPMENT

ISSUE DATE 04/26/2024
N&T JOB NUMBER 22323.00

REVISIONS

#	DATE	DESCRIPTION

DRAWN BY SAS CHECKED BY SOS

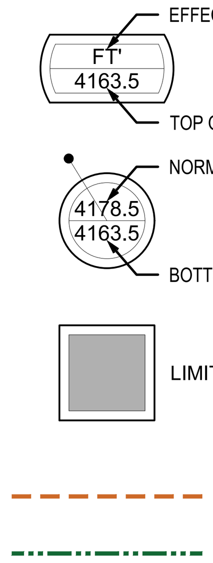
SHEET TITLE

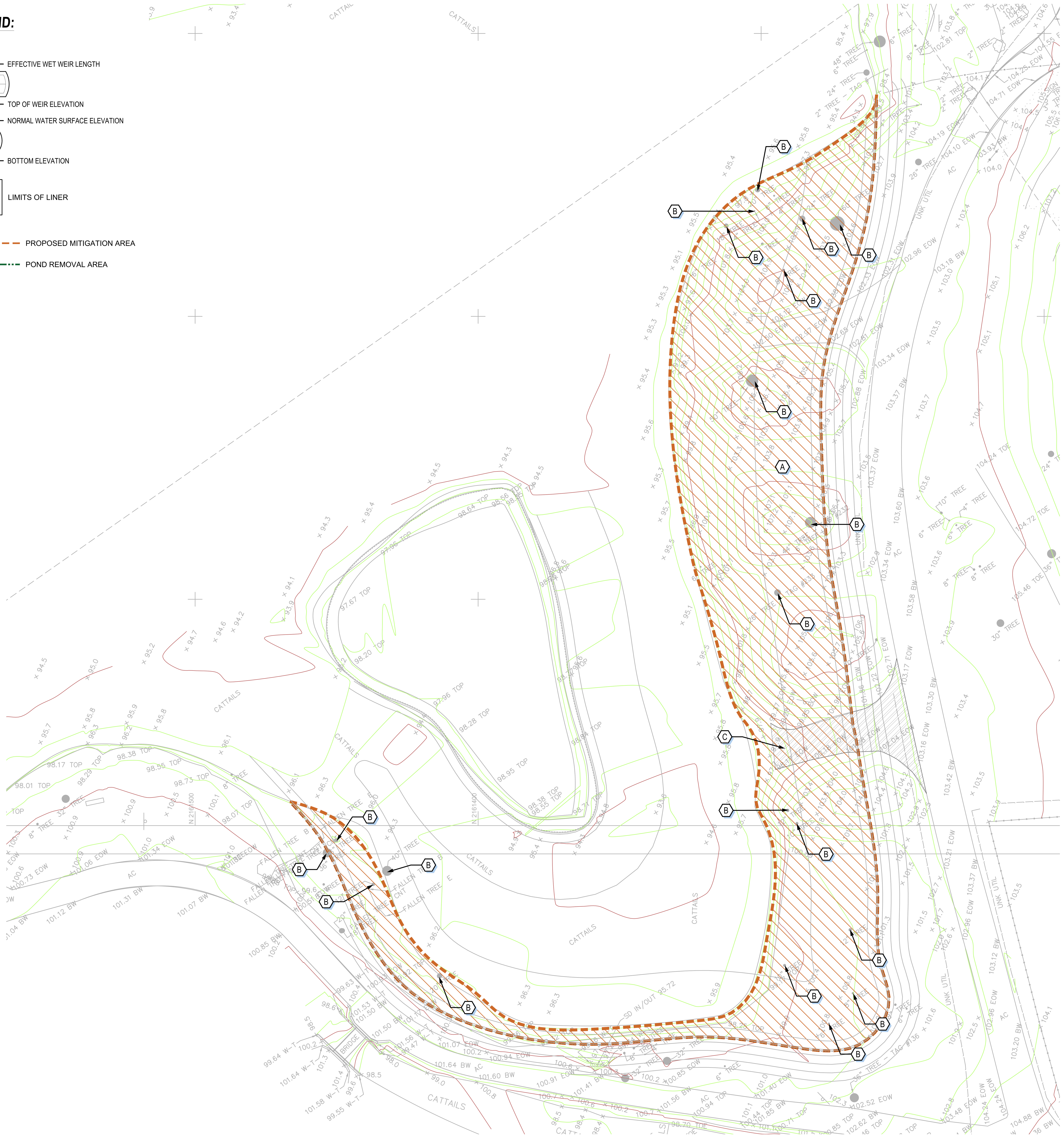
LAKE TITLE SHEET

SHEET NUMBER

WF1.01

LEGEND:





DEMOLITION NOTES

1. CONTRACTOR SHALL REVIEW AND CONFIRM WITH THE CITY, ANY AND ALL DEMOLITION NOTES BELOW THAT ARE APPLICABLE PER PROJECT SCOPE.
2. THE DEMOLITION CONTRACTOR SHALL VERIFY ALL PROPERTY LINES, LIMITS OF WORK LINES, AND LOT LINES PRIOR TO COMMENCING ANY DEMOLITION WORK.
3. THE DEMOLITION CONTRACTOR SHALL COORDINATE ALL WORK THROUGH THE GENERAL CONTRACTOR AND THE OWNER'S REPRESENTATIVE. CONTRACTOR SHALL NOT WILLFULLY PROCEED WITH DEMOLITION WHEN IT IS OBVIOUS IN THE FIELD THAT UNKNOWN OBSTRUCTIONS OR CONDITIONS EXIST THAT MAY NOT HAVE BEEN KNOW DURING PREPARATION OF THESE PLANS.
4. NO CHANGE IN CONTRACT AMOUNT SHALL BE ALLOWED DUE TO ACTUAL OR CLAIMED DISCREPANCIES BETWEEN EXISTING CONDITIONS, AND THOSE SHOWN ON THE PLAN, INCLUDING QUANTITIES CALLED OUT ON PLAN, UNLESS SUCH DISCREPANCIES ARE BROUGHT TO THE IMMEDIATE ATTENTION OF THE GENERAL CONTRACTOR AND OWNER'S REPRESENTATIVE IN WRITING.
5. ALL EXISTING PLANT MATERIAL NOT SPECIFICALLY CALLED OUT TO BE BOXED-UP, OR PROTECTED IN PLACE SHALL BE REMOVED BY THE DEMOLITION CONTRACTOR INCLUDING A REASONABLE AMOUNT OF THE ROOT BALL WITH EACH TREE, OR SHRUB. ALL PLANT MATERIAL REMOVED SHALL BE DISPOSED OF LEGALLY OFF-SITE.
6. THE CONTRACTOR SHALL DISPOSE OF ALL MATERIALS AS NOTED HERE OFF-SITE IN A LEGAL MANNER.
7. THE DEMOLITION BASE SHEET WAS PREPARED FROM EXISTING INFORMATION DOCUMENTED IN THE FIELD. THE INFORMATION REPRESENTED ON THIS PLAN IS NOT FROM `AS-BUILT' PLANS, THEREFORE ALL CONDITIONS SHALL BE VERIFIED BY CONTRACTOR. THE CONTRACTOR SHALL CONFIRM ALL CONDITIONS IN THE FIELD AFFECTING THE SATISFACTORY COMPLETION OF ALL DEMOLITION WORK DESCRIBED ON THE PLAN AND REPORT ANY AND ALL DISCREPANCIES TO THE OWNER/LANDSCAPE ARCHITECT IMMEDIATELY. THE OWNER/LANDSCAPE ARCHITECT SHALL PROVIDE RESOLUTION DIRECTION PRIOR TO PROCEEDING W/ ANY FURTHER DEMOLITION WORK.
8. THIS PLAN IS FOR THE PURPOSE OF IDENTIFYING THE PRESERVATION, REMOVAL, DEMOLITION AND OR SALVAGE OF LANDSCAPE AND HARDSCAPE CONSTRUCTION ITEMS ONLY. REFER TO PLANS BY CIVIL ENGINEER, ARCHITECT AND OR LIGHTING DESIGNERS FOR ADDITIONAL INFORMATION.
9. THE CONTRACTOR SHALL PROTECT-IN-PLACE ALL ADJACENT PROPERTIES AND IMPROVEMENTS. NOTIFY ADJACENT PROPERTY OWNERS A MINIMUM OF TWENTY-FOUR (24) HOURS IN ADVANCE IF ENCROACHMENT ONTO ADJACENT PROPERTY IS NECESSARY.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIR AND REPLACEMENT OF ANY DAMAGE TO ADJACENT PROPERTIES CAUSED BY HIS OPERATIONS.
11. THE CONTRACTOR SHALL PERFORM ALL CLEARING AND GRUBBING WORK NECESSARY TO ALLOW FOR ALL NEW CONSTRUCTION.
12. THE DEMOLITION CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING HIMSELF FAMILIAR WITH ALL UNDERGROUND UTILITIES, PIPES AND STRUCTURES. CONTRACTOR SHALL TAKE SOLE RESPONSIBILITY FOR COST INCURRED, DUE TO DAMAGE AND REPLACEMENT OF SAID UTILITIES.
13. THE CONTRACTOR SHALL CONFIRM AND PROTECT ALL EXISTING UTILITY SERVICES & METERS IN PLACE
14. THE CONTRACTOR SHALL CONTACT DIG ALERT PRIOR TO ANY DEMOLITION OR CONSTRUCTION FOR VERIFICATION OF UNDERGROUND UTILITIES.

DEMOLITION LEGEND

TAG	SYMBOL	ITEM DESCRIPTION
TO BE REMOVED		
A		DEMOLISH EXISTING SHORELINE AND LINER IN THIS AREA FOR PREPARATION FOR THE NEW SHORELINE EDGE. THIS AREA WILL HAVE ENGINEERED FILL PER GEOTECHNAL RECOMMENDATIONS.
B		REMOVE TREES
C		REMOVE BOAT RAMP
D		ITEM DESCRIPTION
E		ITEM DESCRIPTION

0 20 40 80

Scale: 1"= 40'-0"

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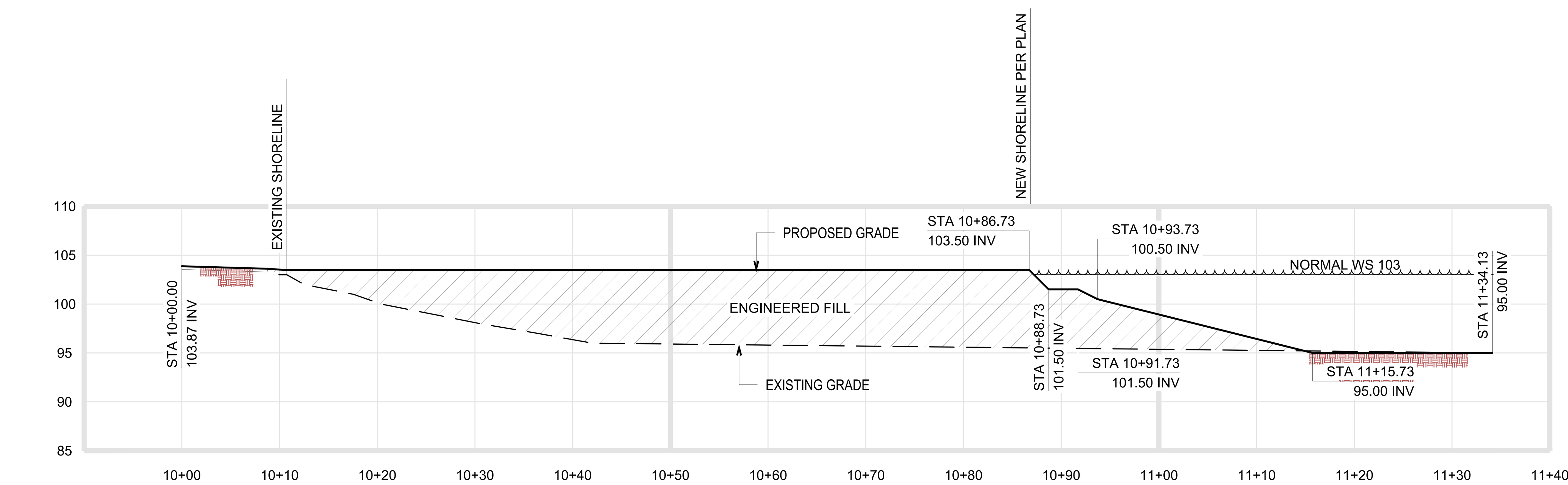
DRAWN BY SAS CHECKED BY SOS

SHEET TITLE

LAKE DEMOLITION SHEET

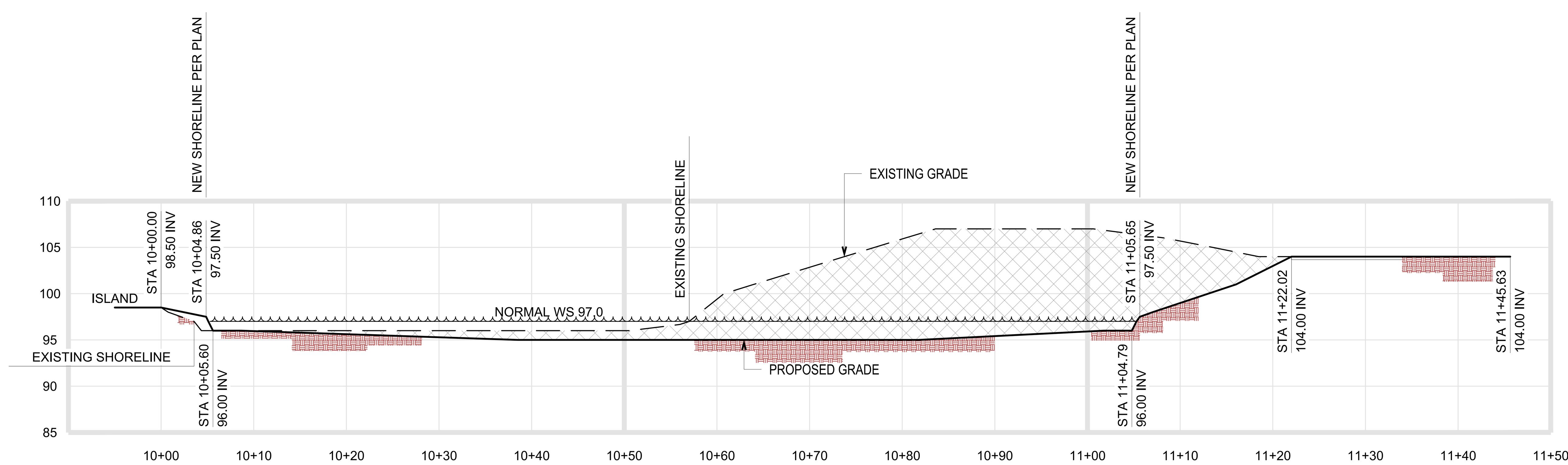
SHEET NUMBER

WF2.02



POND GRADING SECTION

Scale: 1" = 10'-0"



NATURAL LAKE GRADING SECTION

Scale: 1" = 10'-0"

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SHEET TITLE

LAKE GRADING

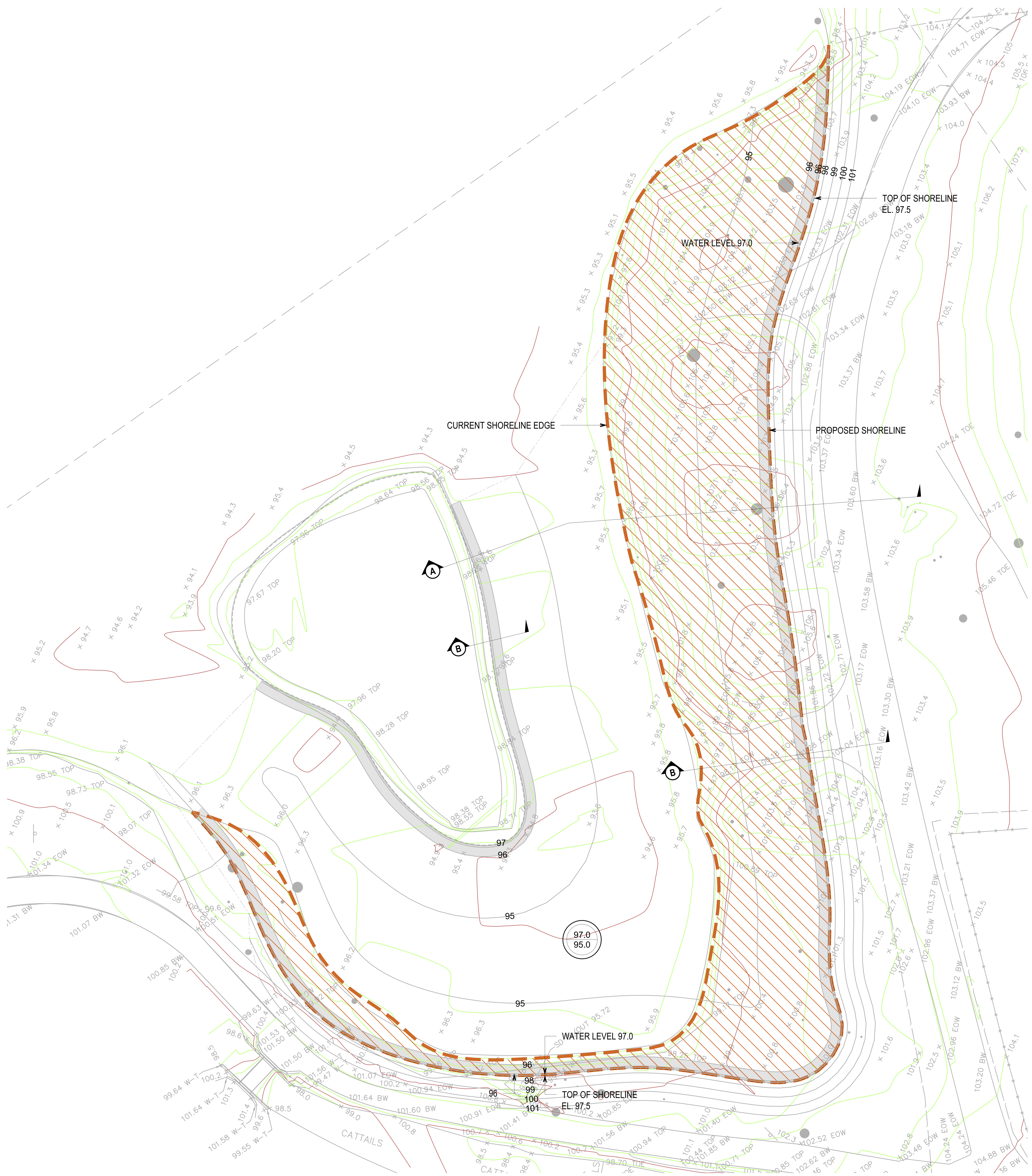
SHEET NUMBER

WF3.01

LEGEND:

- EFFECTIVE WET WEIR LENGTH
- TOP OF WEIR ELEVATION (FT' 4163.5)
- NORMAL WATER SURFACE ELEVATION
- BOTTOM ELEVATION (4178.5 / 4163.5)
- LIMITS OF GEOMEMBRANE LINER
- PROPOSED MITIGATION AREA
- POND REMOVAL AREA

POND REMOVAL AREA	15,289 SF
PROPOSED MITIGATION AREA	16,364 SF



ROUGH GRADING NOTES

1. THE LAKE SHALL BE EXCAVATED BY THE GRADING CONTRACTOR. REFER TO THE ROUGH GRADING SECTION (PLUS 2 INCHES OR AS OTHERWISE NOTED).
2. USE THE TOP OF CONCRETE SHORELINE FINISH GRADE ELEVATION PER PLAN (VARIES DEPENDING ON THE TYPE OF SHORELINE) AS THE CONTROL LINE ON PLAN VIEW.
3. STAKE CRITICAL POINTS SUCH AS TOP OF SHORELINE, HINGE POINTS, AND LAKE BOTTOM ELEVATIONS.
4. MARK TOP OF SHORELINE ON THE GROUND FOR APPROVAL BY OWNER OR AUTHORIZED REPRESENTATIVE. WATERLINE SHALL BE WITHIN $\pm\frac{1}{2}$" FROM THE ELEVATION SHOWN ON PLANS.
5. EXCAVATE USING THE MARKED TOP OF SHORELINE AS THE STARTING POINT. START FROM TOP OF SHORELINE & GRADE ACCORDING TO ROUGH GRADE SLOPES & OFFSETS AS SHOWN ON THE ROUGH GRADING SECTIONS.
6. LAKE CONTRACTOR TO COMPLETE LAKE LINER FOLLOWING UNDERGROUND PIPE INSTALLATION. FINAL LINER GRADES TO BE PER PLAN (PLUS 2 INCHES).
7. FOLLOW GEOTECHNICAL ENGINEER'S RECOMMENDATIONS FOR ROUGH GRADING OPERATIONS. REFER TO THE LATEST GEOTECHNICAL REPORT.
8. THE ON SITE GEOTECHNICAL ENGINEER TO MAKE RECOMMENDATIONS BASED ON EXISTING CONDITIONS FOUND DURING ROUGH GRADING OPERATIONS.
9. GENERAL OR GRADING CONTRACTOR TO PREPARE LAKE GRADES PER LAKE ROUGH GRADING PLANS.
10. LAKE CONTRACTOR IS RESPONSIBLE FOR APPROVING AND ACCEPTING THE ROUGH GRADE. GENERAL CONTRACTOR TO MAKE THE GRADING CHANGES PER LAKE CONTRACTOR'S DIRECTION.
11. CONTRACTOR TO REMOVE SEDIMENT ON TOP OF THE EXISTING LINER PRIOR TO ROUGH GRADING. SEDIMENT TO BE REMOVED FOR DISPOSAL.

CONSTRUCTION LEGEND

TAG	QUANTITY	ITEM DESCRIPTION	DETAIL
A	N/A	NATURAL LAKE GRADING SECTION	WF3.01
B	800'	NATURAL LAKE SHORELINE	3 / WF5.01 & 2 / WF5.03

0 10 20 40

Scale: 1"= 20'-0"

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SHEET TITLE

NATURAL LAKE MITIGATION AREAS

SHEET NUMBER

WF4.02

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2 Methods

The following sections describe the methods Dudek's ISA-Certified Arborists used to inventory and evaluate trees in the tree survey area.

2.1 Field Tree Inventory and Evaluation

Dudek's urban forestry staff visited the site on April 29, 2024, to document tree locations and attribute information for all trees within the survey area. Dudek-certified arborist Jeremy Cawn conducted the tree survey for the Nature Lake Expansion Area.

Dudek examined trees within the Project boundaries as identified on the Topographic Survey plans provided to Dudek by the City (Figures 2-1 to 2-4). The Project boundaries included trees within the Project's development and trees in the general area surrounding the Project. Tree attribute data collected during the field survey included species, trunk diameter, number of stems, general health condition, and structural condition. Trunk diameters were measured using a diameter tape, which provides adjusted numbers for diameter measurements when wrapping the tape around the circumference of a tree trunk. Diameter measurements were collected using the standard protocol described by the Council of Tree and Landscape Appraisers in its Guide for Plant Appraisal (ISA, 2019), published by the ISA.

Trunk diameter measurements were taken at 4.5 feet above the ground along the trunk axis, with a few standard exceptions. In cases where the trunk of a tree split into multiple stems at approximately 4.5 feet above the ground, the measurement was made at the location that best represented the trunk's diameter.

According to the Guide for Plant Appraisal (ISA, 2019), tree health and structure were evaluated concerning five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Health was graded as *Excellent*, *Very good*, good, *fair*, *poor*, critical or *dead*. Tree structure was graded as Very Good, Good, Fair, Poor, and Very Poor. Good-condition trees exhibit acceptable vigor, healthy foliage, minor, if any, structural issues, and no apparent maladies. Fair-condition trees are typical, with few maladies and moderate structural issues, and may exhibit less vigor in foliage and new growth. Trees assigned a poor condition rating exhibit significant health or structural problems or damage.

The City of Walnut Creek provided Dudek with the location of most of the individual trees from the Topographic Survey plan sheet. The locations of trees not provided by the city were mapped using ArcGIS software running on an iPad.

2.2 Tree Impact Analysis

Following data collection, processing, and analysis efforts, an impact determination was made for each tree based on proximity to the proposed disturbance area and the tree species tolerance for disturbance by construction if known. Impact determinations used in this report are as follows:

Not Impacted (tree not affected by the project)

Removal (tree to be removed)

Encroachment (project disturbance would occur within the protected zone of the tree)

2.3 Tree Appraisal

The appraised value of the trees within the Project site will be determined using the Council of Tree and Plant Appraisers, Guide for Plant Appraisal 10th edition. Dudek used the trunk formula method. This method estimates the value of a tree based on its size, species, condition, functional limitations, and external limitations. An underlying inference of the trunk formula method is that the cost of acquiring a large tree is directly proportional to the unit cost of acquiring a small tree from a nursery (ISA, 2019). Unit cost, used to obtain the dollar value of the appraised tree, was obtained from the City and represents the cost for the City to plant a 24-inch box street or park tree ($350.00). Tree diameter, species, and condition (health and structural grades) data were collected from the tree data collected from the inventory conducted on December 19, 2023. Functional and external limitations were determined from observations during site visits and the preliminary site plans provided by the City for the Project. Using the tree data and the unit cost for a small replacement tree, Dudek calculated the tree value with the following formulas:

Basic Tree Value = cross-sectional area[1] of Surveyed Tree X unit cost of a replacement tree.

Final Tree Value (depreciated value)= Basic Tree Value X condition X functional limitations X external limitations

Dudek's appraisal amounts represent the value of the tree as it was when the report was created. Functional and external limitations are based on the conditions currently present at the Project site before development, and the impact the Project will have on the tree is not considered.

2.4 Scope of Work Limitations

This report presents tree information as observed in the field. No root crown excavations, investigations, internal probing, or aerial canopy inspections were performed during the tree assessment. Therefore, the presence or absence of internal decay or other hidden or inaccessible inferiorities in individual trees could not be confirmed.

[1] Obtained by multiplying tree diameter times 0.7854

3 Findings/Results

3.1 Inventory Summary

Dudek's arborists recorded 54 trees within the Lake Expansion Area. Table 1 provides a summary of the trees mapped within the Project site.

Table 1. Summary of Nature Lake Expansion Area by Species

Scientific Name	Common Name	Tree Quantities
		Total (All Trees)
Pinus halepensis	Aleppo Pine	1
Juglans nigra	Black Walnut	1
Eucalyptus globulus	Blue Gum	3
Schinus molle	California Pepper Tree	2
Melia azedarach	Chinaberry	3
Quercus agrifolia	Coast Live Oak	2
Eucalyptus spp.	Eucalyptus	1
Pinus radiata	Monterey Pine	1
Prunus cerasifera	Purple Leaf Plum	1
Salix laevigata	Red Willow	26
Quercus lobata	Valley Oak	12
Pittosporum phillyreoides	Willow Pittosporum	1
	Total	**54**

Generally, most of the 54 trees were observed to be in fair or better health, with 29 (53.7%) trees exhibiting excellent, very good, or good health. Eleven (20.3%) trees exhibit fair health. Fourteen (25.9%) trees exhibit poor or critical health. There were no dead trees. Structurally, most of the trees within the Project site were observed to have good to fair structure, with 21 (38.8%) trees exhibiting good structure, 25 (46.2%) trees exhibiting fair structure, and eight (14.8%) trees exhibiting poor structure. Dead branches were the most common reason for a fair structure rating. Poor structure rating was attributed to dieback and decay in the Eucalyptus species. In contrast, Red Willow trees with poor structure resulted from the trees falling over in the past and the current tree being composed of shoots from the fallen trunk.

Of the 54 trees in the Lake Expansion Area, trunk diameters range from 1 inch to 52 inches. Approximately 61% of the trees surveyed were single-stem specimens; the remainder were multi-stemmed. The Individual attributes of each tree are presented in Sub Appendix A, Lake Expansion Area Tree Information Matrix.

3.2 Nature Lake Expansion-Related Impacts

There is wide variation in tolerance to construction impacts among tree species, and the response of an individual tree to impacts also varies with age and condition. Impacts assessed for this project include trees with protected zones within the construction limits as defined in the Topographic Survey plan (Figure 1). The impact discussion in this section identifies all impacts anticipated from surveyed trees from the lake expansion based on an evaluation of tree locations compared with the project site plan. Trees were assigned a grade of removal, encroachment, or no impact based on how close the tree was to the development footprint, how much of the dripline was impacted, and the species' tolerance for construction. Trees were identified for removal if they were located within the limits of development or within five feet of the limits of development. Any trees within the Lake Expansion Area will require removal. Trees whose driplines significantly overlap the expansion area are also expected to require removal due to the loss of roots and growing space. The Tree Impact Exhibit (Sub Appendix B) graphically presents trees identified for retention and removal.

Based on the proposed project activities in the Lake Expansion Area, it is estimated that 52 (96%) trees will be removed. Project development is expected to encroach within the dripline of the remaining tree. One of the surveyed trees is outside the development footprint and is not expected to be impacted by the lake expansion.

Table 2 summarizes impact determinations for heritage trees within the Lake Expansion Area, which is subject to regulation under the City of Walnut Creek Municipal Code.

Table 2. Summary of Nature Lake Expansion Area Tree Impacts

Scientific Name	Common Name	Tree Impact Determination			Total (All Trees)
		Removal	Encroachment	No Impact	
Pinus halepensis	Aleppo Pine	1	0	0	1
Juglans nigra	Black Walnut	1	0	0	1
Eucalyptus globulus	Blue Gum	3	0	0	3
Schinus molle	California Pepper Tree	1	1	0	2
Melia azedarach	Chinaberry	3	0	0	3
Quercus agrifolia	Coast Live Oak	2	0	0	2
Eucalyptus spp.	Eucalyptus	1	0	0	1
Pinus radiata	Monterey Pine	1	0	0	1
Prunus cerasifera	Purple Leaf Plum	1	0	0	1
Salix laevigata	Red Willow	25	0	1	26
Quercus lobata	Valley Oak	12	0	0	12
Pittosporum phillyreoides	Willow Pittosporum	1	0	0	1
Total		**52**	**1**	**1**	**54**

4 Tree Removal and Tree Protection Recommendations

4.1 Removal Recommendations

The proposed site plan for the Nature Lake Expansion would require the removal of 52 trees. All 52 trees recommended for removal are located within the footprint of the lake expansion or close enough to the lake expansion that the tree will be substantially damaged. It should be noted that the number of trees recommended for removal is based on preliminary site plans provided by the City. The final number of tree removals may change due to revised site plans as the project progresses. Table 3 below summarizes the recommended tree removals by tree species.

Table 3. Nature Lake Expansion Area Tree Removals Due to Development Impacts by Tree Species

Tree Species	Recommended Number of Tree Removals
Aleppo Pine	1
Black Walnut	1
Blue Gum	3
California Pepper Tree	1
Chinaberry	3
Coast Live Oak	2
Eucalyptus	1
Monterey Pine	1
Purple Leaf Plum	1
Red Willow	25
Valley Oak	12
Willow Pittosporum	1
Total	**52**

4.2 Tree Protection Recommendations for Preserved Trees

The preservation of the park trees not recommended for removal in the previous is required by section 11-1.306 of the City's Municipal Code. Based on observations made during the site visits and the preliminary plans provided by the City, two park trees within the Nature Lake Expansion Area are recommended for preservation. One of these trees (Tree # 199) has a dripline that overlaps with the development footprint but is expected to tolerate Project development, and one of these trees (Tree #251) is located outside of the development footprint and is not expected to be significantly impacted.

4.2.1 Trees Encroached by the Project Development Footprint

For the one tree with a dripline that overlaps with the Nature Lake Expansion, Dudek recommends the following tree protection measures to reduce impacts due to project development and maintain tree health and stability through all phases of development.

Protective Fencing: Six-foot-tall chain link fencing should be installed at the dripline or the limit of development for the encroached trees prior to the start of grading, demolition, or construction work. All fence sections shall be marked with a sign stating, "This is a Tree Protection Zone (TPZ), and no one is allowed to disturb this area." The sign shall also list contact information for the contractor and the arborist and clearly state that a violation of the TPZ will result in a stop work order. No oils, gas, chemicals, liquid waste, solid waste, heavy construction machinery, or other construction materials shall be stored or allowed to stand within the dripline of any tree.

Protective fencing should consist of five to six-foot tall metal chain link fencing secured to metal poles either driven two feet into the ground or resting on stable metal bases.

Avoidance: Signs, ropes, cables, or other items shall not be attached to any tree.

Equipment Operation and Storage. Operating heavy machinery around the root zones of trees will increase soil compaction, which decreases soil aeration and subsequently reduces water penetration in the soil. All heavy equipment and vehicles shall stay out of the fenced tree protection zone unless specifically approved in writing by the City Arborist and under the supervision of an ISA Certified Arborist.

Storage and Disposal. Do not store or discard any supply or material within the fenced tree protection zone, including paint, lumber, concrete overflow, etc. Remove all foreign debris within the fenced tree protection zone; it is important to leave the duff, mulch, chips and leaves around the retained trees for water retention and nutrients. Avoid draining or leakage of equipment fluids near retained trees. Fluids such as gasoline, diesel, oils, hydraulics, brake and transmission fluids, paint, paint thinners, and glycol (anti-freeze) should be disposed of properly. Keep equipment parked outside of the fenced tree protection zone of retained trees to avoid leaking equipment fluids into the soil. The effect of toxic equipment fluids on the retained trees could lead to decline and death.

Moving Construction Materials. Care will be taken when moving equipment or supplies near the trees, especially overhead. Avoid damaging the tree(s) when transporting or moving construction materials and working around retained trees (outside the fenced tree protection zone). Above-ground tree parts that could be damaged (e.g., low limbs, trunks) should be flagged with a red ribbon. If contact with the tree crown is unavoidable, prune the conflicting branch(es) using ISA or ANSI A300 standards.

Grade Changes. Grade changes, including adding fill, are not permitted within the tree protection zone without special written authorization and under supervision by a Certified Arborist. Lowering the grade within this area will necessitate cutting the main support and feeder roots, jeopardizing the health and structural integrity of the tree(s). Adding soil, even temporarily, to the existing grade will further compact the soil and decrease water and air availability to the trees' roots.

Root Pruning. Except where specifically approved in writing, all trenching shall be outside the fenced tree protection zone. Roots primarily extend in a horizontal direction, forming a support base to the tree similar to the base of a wineglass. Where trenching is necessary in areas that contain tree roots, prune the roots using a Dosko root pruner or equivalent. All cuts shall be clean and sharp to minimize ripping, tearing, and fracturing of the root system. The trench shall be made no deeper than necessary.

Trenching. All trenching shall be outside the fenced tree protection zone. Roots primarily extend horizontally, forming a support base to the tree similar to the base of a wineglass. Where trenching is necessary in areas that contain tree roots, prune the roots using a Dosko root pruner or equivalent. All cuts should be clean and sharp to minimize ripping, tearing, and fracturing of the root system. The trench should be made no deeper than necessary.

Irrigation. Trees that have been substantially root-pruned (30% or more of their root zone) will require irrigation for the first twelve months. The first irrigation should be within 48 hours of root pruning. They should be deep watered every two to four weeks during the summer and once a month during the winter (adjust accordingly with rainfall). One irrigation cycle should thoroughly soak the root zones of the trees to a depth of 3 feet. The soil should dry out between watering; avoid keeping a consistently wet soil. Designate one person responsible for irrigating (deep watering) the trees. Check soil moisture with a soil probe before irrigating. Irrigation is best accomplished by installing a temporary above-ground micro-spray system that will distribute water slowly (to avoid runoff) and evenly throughout the fenced tree protection zone but never soak the area within six feet *of the tree trunk*.

Pruning. Do not prune any of the trees until all construction is completed. This will help protect the tree canopies from damage. All pruning shall be completed under the direction of an ISA Certified Arborist and using ISA guidelines. Only dead wood shall be removed from tree canopies.

Washing. Periodic washing of the foliage is recommended during construction, but no more than once every two weeks. Washing should include the upper and lower leaf surfaces and the tree bark. This should continue less frequently beyond the construction period, with a high-powered hose only in the early morning hours. Washing will help control dirt/dust buildup that can lead to mite and insect infestations. Washing should not be done during nesting bird season (February-August)

Inspection. An ISA-certified arborist should inspect the trees at least monthly during construction activity. After each inspection, a summary report documenting observations and management recommendations shall be submitted to the owner. Photographs of representative trees will be included in each report.

Nesting Bird Surveys: Several California Fish and Game Code sections protect nesting birds against needless destruction of birds, nests, or eggs. A qualified biologist should survey Project trees prior to performing any tree work. To the extent feasible, tree work should be scheduled outside of the breeding season (February-August)(CDFW 2023).

Finally, the Project site is near several bodies of water and adjacent riparian areas. Where practical, tree protection measures such as fencing should be incorporated into the protective measures installed for these areas.

4.2.2 Trees Outside of the Development Footprint

One tree immediately adjacent to the Lake Expansion Area is not recommended for removal and will not be impacted or encroached upon during construction. This tree is not located within the development footprint, and its driplines do not overlap with any work. This tree (Tree # 251) is located north of the Lake Expansion Area boundaries. While the likelihood of damage to these trees from the lake expansion is low, Dudek recommends that these trees be protected from impacts during development. Trees outside the Project development footprint are more likely to be damaged by the storage of construction materials and debris within their driplines and accidental strikes by vehicles or equipment rather than by the construction of the new buildings. Therefore, the Project development footprint and a reasonable buffer should be contained by construction fencing. This fencing would protect this surveyed tree and the other trees further from the Lake Expansion Area boundary and reduce the likelihood of accidental damage to these trees. Finally, it is recommended that construction material storage locations and debris storage locations be identified before development begins so these locations can be placed away from any park trees outside of the development footprint.

Sub Appendix C shows the preliminary site plans with an overlay of the tree locations. Tree points are identified by the disposition of the tree, removal, encroachment, or not impacted.

4.2.3 Tree Replacement Recommendations

Replacement trees are not required to mitigate the loss of the trees within the Nature Lake Expansion Area since the lake expansion is a mitigation for removing the artificial pond. However, conserving the City's urban forest is important to the City, and it is the City's preference to replant native trees removed at a 1:1 ratio. This report recommends the removal of 41 native trees; therefore, 41 replacement trees should be planted to mitigate the loss of the removed trees. Heather
Farms Park has several areas surrounding the Project site with adequate space to plant these recommended replacement trees without impacting park facilities or improvements. The replacement tree species selected for each planting site should be adjusted to the conditions at the planting site.

Most trees recommended for removal are Red Willow trees, a riparian species that typically grows along waterways. Planting replacement Red Willow trees is recommended for areas within 30 feet of a waterway with year-round water. There will not be sufficient space along the new shoreline for a 1:1 replacement of the Red Willow trees recommended for removal. It is recommended that an alternative species be selected for the areas more than 30 feet from the shoreline. Dudek recommends the following tree species for replacement trees:

- Less than 30 feet of a waterway-Red Willow, Valley Oak, Northern California Black Walnut, and California Sycamore
- Greater than 30 feet of a waterway-Valley Oak, Coast Live Oak, Northern California Black Walnut, and California Buckeye

Dudek recommends that the replacement tree be at least a 15-gallon container planted at least twenty feet apart or twenty feet from the nearest existing tree. Finally, it is recommended that the replacement trees be provided with supplemental irrigation for the first two to three years.

5 Estimate of Value

All 54 trees within the Nature Lake Expansion Area were appraised for this Project. As noted in the Methodology chapter, appraised values are based on the current conditions at the Project site, and this report's recommendation for preservation or removal was not considered when determining its value. Table 4 contains the appraised value of all the project site trees, which is ordered by the tree number Dudek assigned to each tree during the inventory.

Table 4 Nature Lake Expansion Area Estimate of Tree Value

Dudek Tree Number	Common Name	Total Diameter	Basic Reproduction Cost	Depreciated Reproduction Cost
199	California Pepper Tree	32	$ 89,600.00	**$ 53,760.00**
200	Red willow	9	$ 7,087.50	**$ 4,961.25**
201	Coast Live Oak	7	$ 4,287.50	**$ 3,644.38**
202	Willow Pittosporum	37	$ 119,787.50	**$ 59,893.75**
203	Purple Leaf Plum	28	$ 68,600.00	**$ 34,300.00**
204	Valley oak	4	$ 1,400.00	**$ 1,120.00**
205	Red Willow	5	$ 2,187.50	**$ 1,531.25**
206	Red Willow	11	$ 10,587.50	**$ 6,352.50**
207	Valley oak	3	$ 787.50	**$ 393.75**
208	Red Willow	3	$ 787.50	**$ 275.63**
209	Red Willow	9	$ 7,087.50	**$ 2,480.63**
210	Valley oak	12	$ 12,600.00	**$ 8,820.00**
211	Black Walnut	9	$ 7,087.50	**$ 2,835.00**
212	Red Willow	5	$ 2,187.50	**$ 1,859.38**
213	Blue Gum	52	$ 236,600.00	**$ 115,934.00**
214	Blue Gum	42	$ 154,350.00	**$ 64,827.00**
215	Blue Gum	5	$ 2,187.50	**$ 459.38**
216	Aleppo Pine	21	$ 38,587.50	**$ 27,011.25**
217	Red Willow	3	$ 787.50	**$ 551.25**
218	Chinaberry	11	$ 10,587.50	**$ 8,470.00**
219	Chinaberry	6	$ 3,150.00	**$ 1,890.00**
220	Red Willow	2	$ 350.00	**$ 280.00**
221	Chinaberry	9	$ 7,087.50	**$ 5,670.00**
222	Eucalyptus	3	$ 787.50	**$ 165.38**
223	Red Willow	15	$ 19,687.50	**$ 13,781.25**
224	Red Willow	5	$ 2,187.50	**$ 1,531.25**
225	Red Willow	19	$ 31,587.50	**$ 12,635.00**
226	Red Willow	9	$ 7,087.50	**$ 2,126.25**

Dudek Tree Number	Common Name	Total Diameter	Basic Reproduction Cost	Depreciated Reproduction Cost
227	Red Willow	7	$ 4,287.50	**$ 3,001.25**
228	Coast Live Oak	9	$ 7,087.50	**$ 6,024.38**
229	Valley Oak	7	$ 4,287.50	**$ 3,001.25**
230	Valley Oak	5	$ 2,187.50	**$ 1,050.00**
231	Valley Oak	8	$ 5,600.00	**$ 4,200.00**
232	Valley Oak	3	$ 787.50	**$ 590.63**
233	Valley Oak	32	$ 89,600.00	**$ 53,760.00**
234	Red Willow	9	$ 7,087.50	**$ 3,543.75**
235	Red Willow	6	$ 3,150.00	**$ 2,520.00**
236	Valley Oak	6	$ 3,150.00	**$ 1,512.00**
237	Red Willow	12	$ 12,600.00	**$ 8,820.00**
238	Red Willow	20	$ 35,000.00	**$ 28,000.00**
239	Valley Oak	22	$ 42,350.00	**$ 21,175.00**
240	California Pepper Tree	3	$ 787.50	**$ 330.75**
241	Red Willow	19	$ 31,587.50	**$ 25,270.00**
242	Red Willow	18	$ 28,350.00	**$ 17,010.00**
243	Valley Oak	15	$ 19,687.50	**$ 13,781.25**
244	Red Willow	14	$ 17,150.00	**$ 4,802.00**
245	Red Willow	14	$ 17,150.00	**$ 6,002.50**
246	Red Willow	14	$ 17,150.00	**$ 8,575.00**
247	Red Willow	16	$ 22,400.00	**$ 11,200.00**
248	Red Willow	10	$ 8,750.00	**$ 6,125.00**
249	Red Willow	6	$ 3,150.00	**$ 2,520.00**
250	Valley Oak	1	$ 87.50	**$ 74.38**
251	Red Willow	6	$ 3,150.00	**$ 2,677.50**
252	Monterey Pine	1	$ 87.50	**$ 44.63**

6 Conclusion

Based on preliminary plans provided by the City, there are 54 trees within the Nature Lake Expansion Area. Fifty-two of these trees are recommended for removal because the trees are located within the development footprint or five feet of it and are not anticipated to tolerate construction impacts. Two trees are recommended for preservation. One of these trees is expected to have construction within their driplines, and protective measures are recommended to be installed to minimize the impact this construction has on the trees' health and stability. The remaining tree is located outside the development footprint and is not expected to be impacted by the lake expansion. Dudek recommends implementing several tree protection measures, including installing protective fencing at the edge of these tree driplines to separate them from construction activities and any inadvertent damage.

As noted throughout this report, the findings and recommendations are based on preliminary plans provided by the City. Dudek arborists may need to revise the number of trees recommended for removal and preservation, as well as the protective measures as the project progresses and updated plans become available.

Sub appendix A Tree Information Table

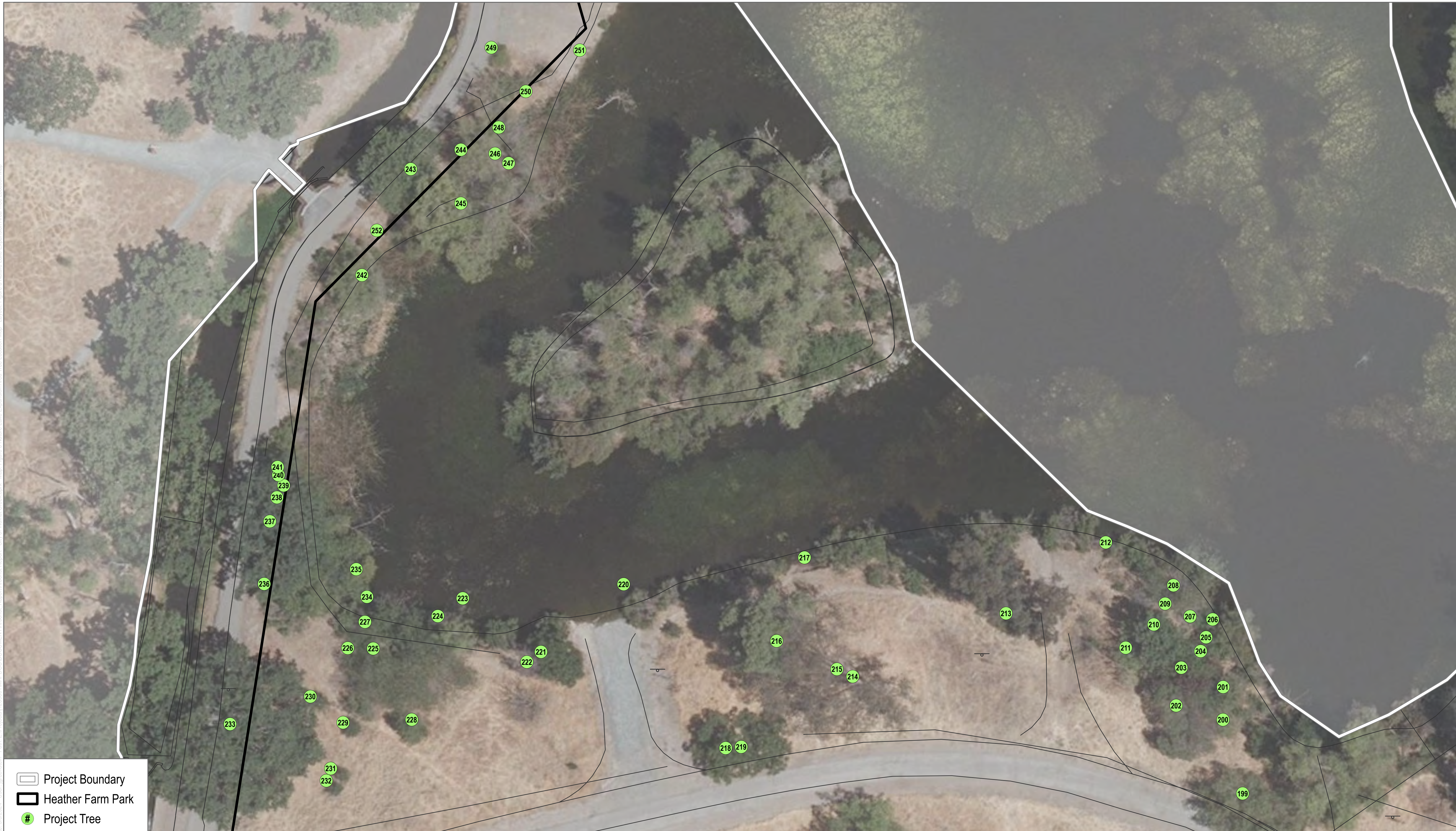
Tree ID Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structure
199	**Encroachment**	California Pepper Tree	32	3	Poor	Good
200	**Removal**	Red willow	9	3	Fair	Good
201	**Removal**	Coast Live Oak	7	1	Very Good	Good
202	**Removal**	Willow Pittosporum	37	6	Poor	Fair
203	**Removal**	Purple Leaf Plum	28	6	Poor	Fair
204	**Removal**	Valley oak	4	1	Good	Good
205	**Removal**	Red Willow	5	1	Fair	Good
206	**Removal**	Red Willow	11	1	Fair	Fair
207	**Removal**	Valley oak	3	1	Good	Critical
208	**Removal**	Red Willow	3	1	Fair	Poor
209	**Removal**	Red Willow	9	2	Fair	Poor
210	**Removal**	Valley oak	12	1	Good	Fair
211	**Removal**	Black Walnut	9	2	Critical	Fair
212	**Removal**	Red Willow	5	2	Very Good	Good
213	**Removal**	Blue Gum	52	3	Good	Fair
214	**Removal**	Blue Gum	42	2	Fair	Fair

Tree ID Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structure
215	**Removal**	Blue Gum	5	1	Critical	Poor
216	**Removal**	Aleppo Pine	21	1	Good	Fair
217	**Removal**	Red Willow	3	1	Good	Fair
218	**Removal**	Chinaberry	11	1	Good	Good
219	**Removal**	Chinaberry	6	1	Fair	Fair
220	**Removal**	Red Willow	2	1	Good	Good
221	**Removal**	Chinaberry	9	1	Good	Good
222	**Removal**	Eucalyptus	3	1	Critical	Poor
223	**Removal**	Red Willow	15	4	Good	Fair
224	**Removal**	Red Willow	5	1	Good	Fair
225	**Removal**	Red Willow	19	3	Poor	Poor
226	**Removal**	Red Willow	9	3	Critical	Poor
227	**Removal**	Red Willow	7	2	Good	Fair
228	**Removal**	Coast Live Oak	9	1	Very Good	Good
229	**Removal**	Valley Oak	7	2	Good	Fair
230	**Removal**	Valley Oak	5	1	Good	Good
231	**Removal**	Valley Oak	8	1	Very Good	Fair

Tree ID Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structure
232	**Removal**	Valley Oak	3	1	Very Good	Fair
233	**Removal**	Valley Oak	32	1	Fair	Fair
234	**Removal**	Red Willow	9	3	Poor	Fair
235	**Removal**	Red Willow	6	2	Good	Good
236	**Removal**	Valley Oak	6	1	Good	Good
237	**Removal**	Red Willow	12	1	Good	Fair
238	**Removal**	Red Willow	20	2	Good	Good
239	**Removal**	Valley Oak	22	1	Poor	Fair
240	**Removal**	California Pepper Tree	3	1	Fair	Good
241	**Removal**	Red Willow	19	2	Good	Good
242	**Removal**	Red Willow	18	1	Fair	Fair
243	**Removal**	Valley Oak	15	1	Good	Fair
244	**Removal**	Red Willow	14	1	Poor	Poor
245	**Removal**	Red Willow	14	2	Poor	Fair
246	**Removal**	Red Willow	14	2	Poor	Fair
247	**Removal**	Red Willow	16	1	Poor	Fair
248	**Removal**	Red Willow	10	1	Fair	Good

Tree ID Number	Expected Impact	Common Name	Total Diameter (in inches)	Number of Stems	Health	Structure
249	**Removal**	Red Willow	6	2	Good	Good
250	**Removal**	Valley Oak	1	1	Very Good	Good
251	**No Impact**	Red Willow	6	1	Very Good	Good
252	**Removal**	Monterey Pine	1	1	Very Good	Good

Sub Appendix B
Tree Location Map



SOURCE: BKF Engineers 2024; Open Street Map 2023; Maxar 2022

DUDEK

0 25 50 Feet

Sub Appendix B

Nature Lake Expansion Area Tree Location Map

Arborist Report Heather Farms Park Aquatic and Community Center Project

Sub Appendix C
Tree Impact Map

SOURCE: BKF Engineers 2024; Open Street Map 2023; Maxar 2022

DUDEK

0 25 50 Feet

Sub Appendix C

Nature Lake Expansion Area Tree Impact Map

Arborist Report Heather Farms Park Aquatic and Community Center Project

APPENDIX F

PRELIMINARY GEOTECHNICAL ENGINEERING REPORT

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Aquatic-Community Center at Heather Farm Park

Preliminary Geotechnical Engineering Report

Prepared for:

City of Walnut Creek
1666 N Main Street
Walnut Creek, California 94596

Terracon
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P (925) 609-7224
Terracon.com

January 19, 2024

City of Walnut Creek
1666 N Main Street
Walnut Creek, California 94596

Attn: Steve Waymire, Assistant Public Works Director
P: 925-256-3507
E: waymire@walnut-creek.org

Re: Preliminary Geotechnical Engineering Report
Aquatic-Community Center at Heather Farm Park
301 N San Carlos Drive
Walnut Creek, Contra Costa County, California
Terracon Project No. R1235045

Dear Mr. Waymire:

We have completed the scope of Preliminary Geotechnical Engineering services for the referenced project in general accordance with Terracon Proposal No. PR1235045 dated July 6, 2023. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Brandon R. Western, PE (MT)
Project Engineer

Noah T. Smith, PE, GE
Principal

Table of Contents

Figures

Attachments

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

Refer to each individual Attachment for a listing of contents.

Report Summary

Topic [1]	Overview Statement [2]
Project Description	The project will consist of backfilling about 1/3 of the existing pond and construction of a new combined Community Center and Aquatic Facility at Heather Farm Park that will include several multi-purpose rooms and classrooms, outdoor event terraces, a 50-meter lap pool, a recreational pool, and a pool mechanical building.
Geotechnical Characterization	Subgrade soil conditions encountered in our borings generally consisted of interbedded layers of soft to hard lean clay, very stiff to hard silt, and medium dense to dense sand with variable amounts of silt and clay to the maximum depth explored of 53 feet below the existing ground surface (bgs). Groundwater was observed at depths varying from 10 feet to 25 feet bgs in our borings during our exploration.
Earthwork	Cuts and fills on the order of 3 feet or less are anticipated for general grading to develop final grades. Excavations up to 8 feet deep are anticipated for construction of the 50-meter pool and associated surge tanks, and excavations up to 5 feet deep are anticipated for construction of the recreational pool and the pump pit. Existing clays are not suitable for use as structural fill. Clays are sensitive to moisture variation.
Shallow Foundations	Shallow foundations are preliminarily recommended for building support and for the support of the pool surge tanks, pump pit, and ADA lifts. Allowable bearing pressure: - 1,500 psf – footings bearing on firm native soil - 2,000 psf – footings bearing on at least 24 inches of granular structural fill Expected settlements: < 1-inch total, < 1/2-inch differential
Swimming Pools	The swimming pools may be constructed utilizing conventional in-ground construction. We have assumed the 50-meter lap pool will be approximately 3½ feet to 7 feet deep and the recreational pool will be 3½ feet to 5 feet deep. The pools should bear into firm native soil.

Pavements	Paved driveway and parking will be constructed. We have assumed both rigid (concrete) and flexible (asphalt) pavement sections will be constructed.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics in the table can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and Preliminary Geotechnical Engineering services performed for the proposed community center, pool mechanical building, storage building, 50-meter lap pool, and recreational pool to be located at 301 N San Carlos Drive in Walnut Creek, Contra Costa County, California. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per the 2022 California Building Code (CBC)
- Site preparation and earthwork
- Demolition considerations
- Preliminary Foundation design and construction
- Preliminary Floor slab design and construction
- Lateral earth pressures
- Pavement design and construction
- Liquefaction potential
- Corrosivity considerations

The geotechnical engineering Scope of Services for this project included the advancement of test borings, laboratory testing, engineering analysis, and preparation of this preliminary report.

The proposed community center building will partially extend over a portion of the existing pond that will be backfilled. Exploration within the pond footprint could not be performed at this time and additional borings with the pond footprint will be performed at a later date. Our current exploration only included borings performed outside of the pond footprint. As a result, the recommendations presented in this report should be considered preliminary and should not be relied on for final design. This report will be updated to provide final recommendations once the pond can be drained and the remaining borings can be performed within the pond footprint.

Drawings showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and/ as separate graphs in the **Exploration Results** section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	A Request for Proposal for Geotechnical Services was provided to Terracon by the City of Walnut Creek. The request included general project and proposal information and a proposed project layout. A Heather Farms Park Sediment Mapping Report prepared by Solitude Lake Management was provided to Terracon for review by the City of Walnut Creek on August 23, 2023, via email. Additionally, an updated project layout was provided by the City of Walnut Creek on October 26, 2023.
Project Description	The project will consist of the backfilling of about 1/3 of the existing pond and construction of a new combined Community Center and Aquatic Facility at Heather Farm Park that will include several multi-purpose rooms and classrooms, outdoor event terraces, a 50-meter lap pool, a recreational pool, and a pool mechanical building.
Proposed Structures	The primary structures associated with the project include: ▪ A single-story community building approximately 22,500 square feet (sf) in size ▪ A single-story pool mechanical building approximately 2,250 sf in size ▪ A single-story park storage building approximately 925 sf in size. ▪ 50-meter lap pool. Anticipated to vary approximately 3½ feet to 7 feet in depth. ▪ Recreational pool approximately 5,400 sf in size. Anticipated to vary approximately 3½ feet to 5 feet in depth.
Proposed Construction	We have assumed building construction will consist of wood-frame and/or masonry with concrete slab-on-grade floors, and the swimming pools will consist of shotcrete with possible cast-in-place concrete floors.
Finished Floor Elevations	Not provided; we have assumed finished floor elevations for the buildings will not be more than 2 feet below/above existing grades.

Item	Description
Maximum Loads	Anticipated structural loads were not provided. In the absence of information provided by the design team, we have used the following loads in estimating preliminary settlements based on our experience with similar projects. ▪ Columns: 40 to 80 kips ▪ Walls: 2 to 4 kips per linear foot (klf) ▪ Slabs: 150 pounds per square foot (psf)
Grading	A preliminary grading plan was not available for review at the time this report was prepared. We have assumed general grading will consist of cuts and fills on the order of 3 feet or less to develop final grade, excluding remedial grading requirements, partial backfilling of the existing pond, and excavation of the swimming pools, surge tanks, and pump pit.
Below-Grade Structures	In addition to the swimming pools, we have assumed below-grade construction will include surge tanks up to 8 feet deep and a pump pit up to 5 feet deep.
Free-Standing Retaining Walls	Retaining walls are expected to be constructed as part of site development to achieve final grades. Wall heights of up to 3 feet are anticipated. We have assumed retaining walls will consist of cantilevered concrete or masonry construction.

Item	Description
Pavements	Paved driveways and parking will be constructed as part of the project. A preferred pavement surfacing has not been identified to us as part of the preliminary information. Asphalt and Concrete surfacing are common in the area for projects of this nature and are the assumed preferences. The following ACI traffic categories and daily truck traffic were used to develop recommended concrete pavement sections: ■ Category A: Car parking areas and access lanes, 10 truck per day ■ Category B: Entrance and truck service lanes, 10 trucks per day ■ Category C: Buses ■ Category E: Garbage or fire truck lanes The following traffic indices (TIs) were used to develop recommended asphalt concrete pavement sections: ■ Auto Parking Areas: TI = 5.0: ■ Auto Road: TI = 5.5 ■ Truck Parking Areas: TI = 6.0 ■ Truck Ramps and Roads: TI = 8.0 The pavement design period is 20 years.
Building Code	2022 California Building Code (CBC)

Terracon should be notified if any of this information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 301 N San Carlos Drive in Walnut Creek, Contra Costa County, California. The project area will cover approximately 4.7 acres. Latitude/Longitude (approximate center of community center building) 37.9199°N, 122.0425°W See **Site Location**
Existing Improvements	The project area is currently developed with the existing Heather Farm Community Center building, a pond, picnic areas, and associated hardscape, landscaping, and paved parking and drives. The Solitude Lake Management report indicated the pond has a maximum depth of approximately 7 feet at the center of the pond and the pond bottom is covered in relatively soft sediments. The report did not indicate if the pond was lined with a membrane or concrete/shotcrete.
Current Ground Cover	Lawn, concrete hardscape, asphalt pavement, landscape bark.
Existing Topography	A topographic plan was not available for review at the time this report was prepared. However, the project area topography generally descends from the southeast down to the northwest with approximately 10 feet of relief over a distance of about 650 feet based on a review of GoogleEarth and from observations made during our field exploration.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting, and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description

1	**Lean Clay**	Soft to hard lean clay with variable amounts of silt and sand.
2	**Silt**	Very stiff to hard silt with variable amounts of sand.
3	**Silty Sand**	Medium dense to dense silty sand with variable amounts of gravel.
4	**Poorly Graded Sand**	Medium dense to dense poorly graded sand.
5	**Clayey Sand**	Medium dense to very dense clayey sand with variable amounts of gravel.

Additional borings, test pits, or geophysical testing could be performed to obtain more specific subgrade information.

Groundwater Conditions

The borings were advanced using hollow stem auger that allowed short term groundwater observations to be made while drilling. The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the boreholes can be found on the boring logs in **Exploration Results** and are summarized in the following table.

Boring Number	Approximate Depth to Groundwater while Drilling[1] (feet)
B-1	20
B-3, B-4, B-6	15
B-7	15
B-8	25
B-9, B-10	10

1. Below ground surface.

Groundwater and/or seepage were not encountered within the maximum depths of borings B-2 and B-5 at the time of our field exploration, or for the short duration the borings could remain open. Since the borings were backfilled relatively soon after completion, the water levels summarized in the table for the borings are not stable groundwater levels. Due to the low permeability of soils encountered in the borings, a relatively long period may be necessary for a groundwater level to develop and stabilize in a borehole. Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type. Long-term groundwater monitoring was outside the scope of services for this project. Terracon is experienced in installing groundwater monitoring wells/piezometers to provide more groundwater data prior to construction if required.

Groundwater conditions may be different at the time of construction. Publicly available well logs from the State Water Resources Control Board indicate Mapping by the Natural Resources Conservation Service (NRCS) indicates historical high groundwater levels near the site range from about 14½ to 15 feet below ground surface.

Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structures may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Geologic Hazards

Geologic maps indicate subsurface conditions at the site consist of Holocene age Surficial Sediments with alluvial gravel, sand and clay of valley areas[1]. The subgrade soils encountered in our borings were generally consistent with mapped geology.

Faulting and Estimated Ground Motions

The site is located in the Bay Area of California, which is a relatively high seismicity region. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. The following table indicates the distance of the fault zones and the associated maximum credible earthquake that can be produced by nearby seismic events, as calculated using the USGS Unified Hazard Tool. Segments of the Concord Fault, which is located approximately 3¼ kilometers from the site, are considered to have the most significant effect at the site from a design standpoint.

[1] Dibblee, T. W., & Minch, J. A. (2005). Geologic map of the Walnut Creek quadrangle, Contra Costa County, California. Retrieved December 13, 2023, *https://ngmdb.usgs.gov/Prodesc/proddesc_71826.htm*.

Fault Name	Approximate Contribution (%)	Approximate Distance to Site (kilometers)	Maximum Credible Earthquake (MCE) Magnitude
UC33brAvg_FM32: Concord [2]	25.12	4.05	6.64
UC33brAvg_FM31: Concord [2]	15.82	4.05	6.50
UC33brAvg_FM31: Mount Diablo Thrust North CFM [1]	10.32	2.80	7.15

Based on the ASCE 7-16 Standard, the peak ground acceleration (PGA_M) at the subject site is approximately 1.095g. Based on the USGS 2014 interactive deaggregations, the PGA at the subject site for a 2% probability of exceedance in 50 years (return period of 2475 years) is expected to be about 1.046g. The site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.[1]

Liquefaction

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils or low plasticity fine grained soils exist below groundwater. The California Geological Survey (CGS) has designated certain areas within California as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table. The project site is not located within a mapped CGS liquefaction hazard zone. However, the Association of Bay Area Governments (ABAG) has mapped the western half of the project site to be within an area having moderate liquefaction susceptibility. The eastern half of the project site is showed to be within an area having a very low liquefaction susceptibility. Due to the relatively high anticipated groundwater, and potentially liquefiable material encountered in our borings, a liquefaction evaluation was performed to estimate the potential for liquefaction induced settlement. The results of our evaluation are presented in the **Liquefaction** section of this report

[1] California Geological Survey (CGS), *"California Earthquakes Hazards Zone Application (EQ Zapp)", September 23, 2021, https://maps.conservation.ca.gov/cgs/EQZApp/app/.*

Flooding

Based on a review of the Federal Emergency Management Agency (FEMA) National Flood Layer (NFHL), the project site is not located within a mapped flood zone. The project site is in an area with a FEMA Flood Zone X designation and is considered to be an area of minimal flood hazard.

Seismic Considerations

The 2022 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16, and 2022 CBC. The 2022 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_s value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented in the following table were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2022 CBC.

Description	Value
2022 California Building Code (CBC) Site Classification[1]	F[2,5]
Risk Category	II
Site Latitude[3]	37.9199°
Site Longitude[3]	-122.0425°
S_S, Spectral Acceleration for a Short Period[4]	2.233
S_1, Spectral Acceleration for a 1-Second Period[4]	0.716
Fa, Site Coefficient	1.2

Description	Value
Fv, Site Coefficient (1-Second Period)	1.7
S_{DS}, Spectral Acceleration for a Short Period	1.787
S_{D1}, Spectral Acceleration for a 1-Second Period	0.811

1. Seismic site soil classification in general accordance with the *2022 California Building Code*, which refers to ASCE 7-16. Site Classification is required to determine the Seismic Design Category for a structure.
2. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7-16 and the CBC. Subsurface explorations at this site were extended to a maximum depth of approximately 53 feet bgs. The site properties below the maximum exploration depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper exploration or geophysical testing may be performed to confirm the conditions below the current maximum depth of exploration.
3. Provided coordinates represent a point located at the general center of the site.
4. These values were obtained using online seismic design maps and tools provided by SEAOC and OSHPD (**https://seismicmaps.org/**).
5. This site qualifies as a site class F due to the presence of liquefiable soils. A site class D-Default was used to develop the listed seismic design parameters using N-values from the collected blow counts in our borings. Based on the exception for liquefiable soils provided in ASCE 7-16 Section 20.3.1, structures may use the listed design parameters provided they have a period of 0.5s or less. Should the anticipated structures have a period greater than 0.5s, a site-specific ground motion analysis is required to develop seismic design parameters. Terracon is qualified to perform such an analysis.

Typically, a site-specific ground motion study may reduce construction costs. We recommend consulting with a structural engineer to evaluate the need for such a study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Liquefaction

We performed a liquefaction hazard evaluation in general compliance with the California Geological Survey (CGS) Special Publication 117A (2008) and the Southern California Earthquake Center "Recommended Procedures for Implementation of DMG Special

Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California," 1999 report.

As recommended in these reports, we performed a screening analysis to determine if there is a potential for liquefaction to occur at the site. We evaluated the soils encountered in our borings advanced to a maximum depth of approximately 53 feet below the existing ground surface (bgs). We evaluated these soils based on soil classification, corrected SPT blow counts, water content, Atterberg limits, groundwater elevation, shear strength, and peak ground acceleration. In our screening investigation we looked at the Atterberg limits for cohesive soils in the upper 50 feet of our soil borings. The Atterberg limits for these cohesive soils exhibited a liquid limit ranging from 27 to 37 and a plasticity index ranging from 10 to 22. We also calculated the ratio of the in-situ moisture content to the liquid limit. This data was then compared to the criteria by Idriss and Boulanger (2006) and Bray and Sancio (2006) for potential liquefaction or cyclic softening of fine-grained soils. The clay soils classify as "clay-like" and non-liquefiable by Idriss/Boulanger. Additionally, due to the in-situ moisture content to the liquid limit being less than 85 percent in the clay soils, we believe the clay soils have a low susceptibility to liquefaction by Bray/Sancio. However, cohesionless soils and silts were present in the soil profile that do have the potential for liquefaction. As a result, we performed a quantitative evaluation of the potential for liquefaction to occur considering cohesionless soils and silt only and the effects if liquefaction were to occur on this project.

A Peak Ground Acceleration (PGA) of 1.095g and an earthquake magnitude of 6.67 for the project site was used in our evaluation. Groundwater was encountered in our borings at depths varying from 10 feet to 25 feet bgs at the time they were performed. As a result, a groundwater depth of 10 feet was utilized in our evaluation.

The liquefaction study and analysis of seismic settlement of unsaturated sands utilized the software "LiquefyPro" by CivilTech Software. The analysis was based on the soil data obtained from our borings. Our analysis was performed on data obtained from boring B-8. Fines corrections were made using the Modify Stark/Olson method. The settlement analysis used the Ishihara/Yoshimine method. A factor of safety of 1.3 was used against liquefaction. The liquefaction potential analysis was calculated from a depth of 10 feet to 50 feet bgs. A summary of the results of our analysis has been attached to this report.

Based on the analysis, the soil layers contributing to the majority of potential liquefaction settlement were encountered between the depths of approximately 20 feet and 50 feet bgs. Based on our review of the calculations, the anticipated potential total liquefaction-induced settlement is about 1½ inches at the location of Boring B-8. We estimate the differential liquefaction-induced settlement may be about ¾ inch over 30 feet.

Due to the surficial soils across the site consisting primarily of stiff to hard lean clay and sandy lean clay, we believe the probability for liquefaction to manifest at the surface is relatively low.

With regards to the potential for lateral spreading, we note that the site and surrounding area is relatively level and the soils susceptible to liquefaction are located below the bottom of the adjacent pond. As a result, we believe the potential for lateral spreading is low at the project site.

If the estimated settlement due to liquefaction is acceptable and can be accommodated by the structural design of the proposed buildings, the buildings may be supported by **Shallow Foundations** directly bearing on firm native soil or on a minimum 24 inches of granular structural fill. If the design of the proposed buildings cannot accommodate such settlement, we recommend the effects of total and differential settlement on the proposed buildings from liquefaction be mitigated by supporting the buildings with **Shallow Foundations** bearing on a geogrid **Reinforced Building Pad** or on subgrade mitigated by **Ground Improvement**.

Based on our experience, swimming pools perform relatively well during a liquefaction event. However, some cracking and differential settlement could occur requiring repair and releveling of the pools. If the risk of some potential repair is not acceptable for the swimming pools, the effects of liquefaction settlement can be mitigated by supporting the proposed pools on deep foundations that derive support below the soils prone to these conditions. If supporting the pools on deep foundations is desired, Terracon can provide additional recommendations for the design of such a foundation system.

Corrosivity

The following table lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary

Boring	Sample Depth (feet)	Soil Description	Soluble Sulfate (%)	Soluble Chloride (%)	Electrical Resistivity (Ω-cm)	pH
B-1	2.5	Sandy Clay	0.016	0.004	2000	7.72
B-6	2.5	Clay with Sand	0.019	0.008	740	7.47
B-10	2.5	Sandy Clay	0.003	0.003	1300	7.38

Results of soluble sulfate testing can be classified in accordance with ACI 318 – Building Code Requirements for Structural Concrete. Numerous sources are available to characterize corrosion potential to buried metals using the parameters presented in the previous table. ANSI/AWWA is commonly used for ductile iron, while threshold values for evaluating the effect on steel can be specific to the buried feature (e.g., piling, culverts, welded wire reinforcement, etc.) or agency for which the work is performed. Imported fill materials may have significantly different properties than the site materials noted in the table and should be evaluated if expected to be in contact with metals used for construction. Consultation with a NACE certified corrosion professional is recommended for buried metals on the site.

Mapping by the NRCS includes qualitative severity of corrosion to concrete and steel. Based on this source, the near-surface materials are rated “Moderate” for corrosion to concrete and “Moderate” to “High” for corrosion of steel.

Geotechnical Overview

The subject site has geotechnical considerations that will affect the construction and performance of the proposed improvements that are discussed in this report. The primary geotechnical considerations that have been identified at the subject site that will affect development are the following:

- Expansive soils
- Pre-Existing fill
- Liquefaction settlement
- Foundation and Slab Support Considerations
- Pool Considerations

Expansive Soils

Expansive soils are present on this site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and (at least minor) cracking in the structures should be anticipated. The severity of cracking and other damage such as uneven floor slabs will probably increase if modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction such as supporting the improvements on deep foundations.

The near surface, plastic clays could become unstable with typical earthwork and construction traffic, especially after precipitation events. The effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, the grading should be performed during the warmer and drier times of the year. If grading is performed during the winter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

The soils which form the bearing stratum for shallow foundations are plastic and exhibit potential for shrink-swell movements with changes in moisture. Additional areas of localized moderately to highly plastic soils are likely present where borings were not performed. Maintaining above optimum moisture conditions in the bearing soils and a minimum dead load pressure on footings should reduce the anticipated swell movements to tolerable levels. The **Shallow Foundations** section addresses support of buildings directly bearing on firm native soil or structural fill. We do not expect significant dead load on the floors and recommend either over-excavation or chemical treatment of near-surface moderate to high plasticity clays to reduce the heave potential. The **Floor Slabs** section addresses slab-on-grade support of the buildings using over-excavation or chemical treatment techniques.

Pre-Existing Fill

While not encountered by our borings, we anticipate pre-existing fill will be present within and around the footprint of the existing building, utilities, and pavement. Specific excavation, backfill, and site grading details for any pre-existing fill are not known. The thickness of fill may vary.

No compaction records were located or made available for review for any pre-existing fill. As a result, we have considered any pre-existing fill may be undocumented and uncontrolled. Such uncontrolled fill can result in excessive erratic and differential settlements causing damage to proposed structures supported on shallow foundations relying on the fill for structural support. Subsequently, we recommend any pre-existing fill encountered within the footprints of proposed structures be over-excavated down to firm native soil during earthwork operations.

While pre-existing fill would not be suitable to support proposed structures, the fill may be adequate to support proposed pavements and exterior hardscape and should be evaluated by the Geotechnical Engineer during Earthwork. Pre-existing fill encountered at the site may be reused, provided the material is cleaned of any debris and meets the criteria for general or structural fill in ***Fill Material Types.***

Support of pavements and hardscape on or above existing fill materials is discussed in this report. However, even with the recommended construction procedures, an inherent risk remains for the owner that compressible fill or unsuitable material, within or buried by the fill, will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill but can be reduced by following the recommendations contained in this report. To take advantage of the cost benefit of not removing the entire amount of undocumented fill, the owner must be willing to accept the risk of increased differential performance which can result in increased cracking and abrupt differential settlement.

Liquefaction Settlement

The primary seismic hazards for the site are the potential for strong to very strong earthquake shaking within the lifetime of the structures, and the potential for liquefaction at the site. Seismically-induced settlement up to 1½ inches should be expected in the event of liquefaction during the design earthquake. However, potentially liquefiable soils are not likely continuous or of uniform thickness across the site and ground settlements are expected to be irregular around and below the improvements.

The buildings may be supported by **Shallow Foundations** directly bearing on firm native soil or a minimum 24 inches of granular structural fill over firm native soil provided the estimated settlements due to liquefaction can be accommodated in the structural design. If the design of the proposed buildings cannot accommodate such settlement, we recommend the effects of total and differential settlement on the proposed buildings from liquefaction be mitigated by supporting the buildings with **Shallow Foundations** bearing on a geogrid **Reinforced Building Pad** or on subgrade mitigated by **Ground Improvement**.

Based on our experience, swimming pools perform relatively well during a liquefaction event. However, some cracking and differential settlement could occur requiring repair and releveling of the pools. If the risk of some potential repair is not acceptable for the swimming pools, the effects of liquefaction settlement can be mitigated by supporting the proposed pools on deep foundations that derive support below the soils prone to these conditions. If supporting the pools on deep foundations is desired, Terracon can provide additional recommendations for the design of such a foundation system.

Foundation and Slab Support Considerations

The proposed community center building will partially extend over a portion of the existing pond that will be backfilled. The proposed community center building may span over both native soil and engineered fill. Damage is likely to occur in structures constructed over a native soil/fill transition. The support characteristics of the differing materials increase the risk that differential settlement may occur and cause damage to the structure. In order to reduce the potential for damage to proposed buildings from differential settlement, we recommend the buildings **not** be partially supported on both the native soil and structural fill. We recommend spread footings bear completely on either firm native soil **or** a minimum 24 inches of compacted structural fill, **but not both**. In addition, floor slabs that span native soil/fill transitions should be underlain by a minimum 36 inches of compacted structural fill. This may require the over-excavation of native soils in some areas.

Pool Considerations

If the risk that some potential repair of the pools may be required due to the anticipated liquefaction settlement that could occur following a design seismic event is acceptable, the pools may be constructed using a conventional pool shell provided the pools bear into the underlying firm native soil. We understand the new pool depths will vary from 3½ to 7 feet for the 50-meter pool and 3½ feet to 5 feet for the recreational pool. Terracon should be contacted to provide additional recommendations as necessary if this is not the case.

Additional geotechnical design considerations for the swimming pools and items that may affect the future geotechnical stability of the pool systems are as follows:

- **Isolate pool shells** – The proposed pools should be isolated from any source that could cause additional settlement of the pool. Foundations from buildings and other structures related to the pools should be kept a minimum distance equal to the depth of the pools from the pool's edge to reduce the effect of the foundation on the pool shells. Additionally, pool decks should not be tied into the pool shells.

- **Groundwater concerns** – Groundwater was encountered at depths varying from 10 feet to 25 feet bgs in our borings at the time of our field exploration. The presence of groundwater could cause the pool shells to float if the pools are emptied. A hydrostatic pressure relief valve should be installed in the deep end of each pool and an underdrain should be placed below the floors of the pools in accordance with the recommendations provided in the **Pool Recommendations** section of this report.

- **Avoid fill material below the pools** – Fill material placed below the pools is to be avoided due to the potential for excessive differential settlements within the fill material. This includes documented fills that have been placed correctly.

- **Avoid surcharge loading on pool shells** – The addition of surcharge loads on the pool shells either during construction or after construction should be avoided to limit the possibility of damaging the pool walls.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results**), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

Earthwork

We anticipate general grading may consist of cuts and fills on the order of 3 feet or less and that site grades will remain near the same elevation as existing. Additionally, we anticipate the project will include excavations up to 8 feet deep associated with construction of the 50-meter pool and surges tanks, and excavations up to 5 feet associated with construction of the recreational pool and pump pit. Specific site grading information was unavailable at the time this report was prepared. If elevation and site grading differ from our stated assumptions, Terracon should be contacted to determine if additional earthwork recommendations are warranted, particularly with regard to potential ground settlement.

Earthwork is anticipated to include demolition, clearing and grubbing, excavations, and engineered fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, swimming pools, and pavements.

Demolition

The proposed community center building will be constructed within the footprint of the existing community center which will need to be demolished, along with exterior sidewalks, pavements, and utilities. We recommend existing foundations, slabs, and utilities be removed from within the proposed community center building footprint and at least 5 feet beyond the outer edge of foundations. This should include removal of any loose backfill found adjacent to existing foundations. If pipes are abandoned in-place, they should be filled completely with lean cement grout, or other suitable material, to avoid collapse in the future. All materials derived from the demolition of existing structures and pavements should be removed from the site and not be allowed for use as on-site fill, unless processed in accordance with the fill requirements included in this report.

For areas outside the proposed building footprints and foundation bearing zones, existing foundations, floor slabs, and utilities should be removed where they conflict with proposed utilities, retaining walls, and pavements. In such cases, existing foundations, floor slabs, and utilities should be removed to a depth of at least 2 feet below the affected utility or design pavement subgrade elevation.

Site Preparation

Prior to placing fill, existing vegetation, topsoil, and root mats should be removed. Complete stripping of the topsoil should be performed in the areas of the proposed improvements. Stripping should extend laterally a minimum of 5 feet beyond the limits of proposed improvements.

Mature trees are located within or near the footprint of some of the proposed improvements, which will require removal at the onset of construction. Tree root systems can remove substantial moisture from surrounding soils. Where trees are removed, the full root ball and all associated dry and desiccated soils should be removed. The soil materials which contain less than 3 percent organics can be reused as engineered fill provided the material is moisture conditioned and properly compacted.

Although no evidence of underground facilities (such as septic tanks, cesspools, and basements) was observed during the exploration and site reconnaissance, such features could be encountered during construction. If underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

After clearing, any required cuts and over-excavation should be made.

The subgrade soils should be removed to a minimum depth of 18 inches below the bottom of floor slabs and exterior hardscape to allow for the placement of granular structural fill. Alternatively, the subgrade soils below floor slabs and/or exterior hardscapes may be chemically treated with high calcium quicklime to a minimum depth of 18 inches. Additionally, in order to reduce the potential for damage to the proposed buildings from differential settlement, we recommend the buildings **not** be partially supported on both native soil and structural fill. If the building will footprint span over both native soil and structural fill, footing excavations should be over-excavated to allow for a minimum 24 inches of compacted structural fill below the footings and floor slab areas should be over-excavated to allow for a minimum 36 inches of compacted structural fill below floor slabs. This will likely require the over-excavation of native soils in some areas.

Any pre-existing fill encountered within the footprints of proposed structures should be completely over-excavated to firm native soil and recompacted as structural fill provided the material meets the requirements for structural fill as specified in the ***Fill Material Types*** section of this report. A representative from Terracon should be on-site during earthwork to observe the subgrade conditions and over-excavation of fill and help identify the extent of pre-existing fill that may be present.

If the owner elects to construct exterior hardscape and/or pavements over pre-existing fill, the following protocol should be followed. The pre-existing fill below exterior hardscape and pavement areas should be over-excavated to a depth of 2 feet and the resulting subgrade should be scarified to a minimum depth of 12 inches, moisture conditioned, and compacted per the recommendations in ***Fill Placement and Compaction Requirements***. Following compaction of the subgrade, the over-excavated areas may be backfilled with compacted structural fill or general fill.

Excavated material may be stockpiled for use as fill provided it is cleaned of organic material, debris, and any other deleterious material and meets the criteria for general fill or structural fill specified in the ***Fill Material Types*** section of this report.

Once cuts and over-excavation operations are complete, the resulting subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proofrolling should be performed under the observation of the Geotechnical Engineer or their representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified by stabilizing as noted in the ***Soil Stabilization*** section of this report. Excessively wet or dry material should either be removed, or moisture conditioned and recompacted.

Once the proof rolling has been performed and the subgrade is approved by the Geotechnical Engineer, all exposed areas which will receive fill should be scarified, moisture conditioned as necessary, and compacted per the compaction requirements in this report. The depth of scarification of subgrade soils and moisture conditioning of the subgrade is highly dependent upon the time of year of construction and the site conditions that exist immediately prior to construction. If construction occurs during the winter or spring, when the subgrade soils are typically already in a moist condition, scarification and compaction may only be 8 inches. If construction occurs during the summer or fall when the subgrade soils have been allowed to dry out deeper, the depth of scarification and moisture conditioning may be as much as 18 inches or more. A representative from Terracon should be present to observe the exposed subgrade and confirm the depth of scarification and moisture conditioning required.

Following scarification, moisture conditioning, and compaction of the subgrade soils, compacted fill soils should then be placed to the proposed design grade and the moisture content and compaction of subgrade soils should be maintained until foundation, slab, or pavement construction.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable; however, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Reinforced Building Pad

If it is chosen to support the buildings with a geogrid reinforced building pad to help mitigate the effects of settlement due to liquefaction, the building pad should be over-excavated to a depth of 3 feet below the bottom of the planned foundation during ***Subgrade Preparation*** and be backfilled with Caltrans Class II aggregate base reinforced with geogrid. The first layer of geogrid should be placed directly on the bottom of the excavation and should extend 5 feet to 10 feet past the footprint of the building and up the sides of the excavation. Mirafi 140N filter fabric should be installed between the bottom of the excavation and the first layer of geogrid if free water is present. The building pad excavation should then be backfilled with aggregate base in 12-inch lifts with a layer of geogrid being installed at each lift. The aggregate base should be compacted to at least 95 percent relative compaction per ASTM D1557. The geogrid material shall be Tensar TriAx TX7 or an equivalent conforming to the physical properties in the most current Greenbook Standard Specifications, Multi-Axial Geogrid Table 213-5.2 (E) Type R3. Adjacent rolls of geogrid shall be overlapped a minimum of 1 foot. Soft subgrade conditions may require up to 3 feet of overlap at the discretion of the geotechnical engineer. Each layer of geogrid should be pinned taut prior to aggregate base placement. The development of wrinkles in the geogrid shall be avoided. A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. When underlying substrate is trafficable with minimal rutting, rubber-tired equipment may pass over the geogrid reinforcement at slow speeds (less than 10 mph).

Excavation

We anticipate that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Soil Stabilization

Methods of subgrade improvement, as described in this section, could include scarification, moisture conditioning and recompaction, removal of unstable materials and replacement with granular fill (with or without geosynthetics), and chemical stabilization. The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs. Performing site grading operations during warm seasons and dry periods would help reduce the amount of subgrade stabilization required.

If the exposed subgrade is unstable during proof rolling or geotechnical observations, it could be stabilized using one of the following methods:

- **Scarification and Recompaction** - It may be feasible to scarify, dry, and recompact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades likely would not be achievable if the thickness of the unstable soil is greater than about 1 foot, if the unstable soil is at or near groundwater, or if construction is performed during a period of wet or cool weather when drying is difficult.
- **Aggregate Base** - The use of Caltrans Class II aggregate base is a common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 8 to 18 inches below finished subgrade elevation. The use of high modulus geosynthetics (i.e., engineering fabric or geogrid) could also be considered after underground work such as utility construction is completed. Prior to placing the fabric or geogrid, we recommend that all below grade construction, such as utility line installation, be completed to avoid damaging the fabric or geogrid. Equipment should not be operated above the fabric or geogrid until one full lift of aggregate base is placed above it. The maximum particle size of granular material placed over geotextile fabric or geogrid should meet the manufacturer's specifications.
- **Chemical Stabilization** - Improvement of subgrades quicklime could be considered for improving unstable soils. Chemical stabilization should be performed by a pre-qualified contractor having experience with successfully stabilizing subgrades in the project area on similar sized projects with similar soil conditions. The hazards of chemicals blowing across the site or onto adjacent property should also be considered. Additional testing would be needed to develop specific recommendations to improve subgrade stability by blending chemicals with the site soils. Additional testing could include, but not be limited to, determining the most suitable stabilizing agent, the optimum amounts required, and the presence of sulfates in the soil. <u>If this method is chosen to stabilize subgrade soils the actual amount of high calcium quicklime to be used should be determined by Terracon and by laboratory testing **at least three weeks prior** to the start of grading operations</u>.

Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the geotechnical conditions are exposed.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 5 feet of structures and within 3 feet of pavements. General fill is material used to achieve grade outside of these areas.

Reuse of On-Site Soil: On-site cohesive soils are not suitable for reuse as Structural Fill and should not be placed beneath slabs, exterior hardscape and within foundation bearing zones. The remaining on-site soils may be selectively reused as general fill or structural fill. Portions of the on-site soil have an elevated fines content and will be sensitive to moisture conditions (particularly during seasonally wet periods) and may not be suitable for reuse when above optimum moisture content.

Material property requirements for on-site soil for use as general fill and structural fill are noted in the following table:

Property	General Fill	Structural Fill
Composition	Free of deleterious material	Free of deleterious material
Maximum particle size	6 inches (or 2/3 of the lift thickness)	3 inches
Fines content	Not limited	Less than 40% Passing No. 200 sieve
Plasticity	Not limited	Maximum liquid limit of 30 Maximum plasticity index of 10
GeoModel Layer Expected to be Suitable[1]	1, 2, 3, 4, 5	3, 4, 5

1. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris. For all import material, the contractor shall submit current verified reports from a recognized analytical laboratory indicating that the import has a “not applicable” (Class S0) potential for sulfate attack based upon current ACI criteria and is “mildly corrosive” to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the project.

Soil Type [1]	USCS Classification	Acceptable Parameters (for Structural Fill)
Low Plasticity Cohesive	CL	Liquid Limit less than 30 Plasticity index less than 10 Less than 70% passing the No. 200 sieve
Granular[2]	GW, GM, SW, SM	Less than 40% passing No. 200 sieve

1. Structural and general fill should consist of approved materials free of organic matter and debris and should contain no material larger than 3 inches and 6 inches in greatest dimension, respectively. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation at least two weeks prior to use on this site.
2. Caltrans Class II aggregate base may be used for this material. Recycled aggregate base should not be used without prior approval by the Geotechnical Engineer.

Fill Placement and Compaction Requirements

Compacted native soil and structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used	Same as structural fill
Minimum Compaction Requirements [1,2]	95% of max. for structural fill below foundations and slabs, within 1 foot of finished pavement subgrade, for aggregate base and chemically treated soil, and for fills thicker than 5 feet 90% of max. for all other locations	90% of max.
Water Content Range [1]	Low plasticity cohesive: +1% to +3% above optimum Medium plasticity cohesive: +2% to +4% above optimum Granular: -2% to +2% of optimum	As required to achieve min. compaction requirements

Item	Structural Fill	General Fill

1. Maximum density and optimum water content as determined by the Modified Proctor test (ASTM D 1557).
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254). Materials not amenable to density testing should be placed and compacted to a stable condition observed full time by the Geotechnical Engineer or representative.

Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance with public works specifications for the utility be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from existing foundations without engineering review of shoring requirements and geotechnical observation during construction.

It is recommended utilities and piping be designed with flexible connections and/or other means to accommodate soil movement to preclude damage due to excessive settlement from liquefaction. Utility and drain lines designed for gravity flow should consider steeper gradients to account for these settlements, especially where such lines enter a building supported over soil mitigated by **Ground Improvement**.

On-site materials are considered suitable for backfill of utility and pipe trenches from 1 foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and Atterberg limit requirements for structural fill discussed in this report.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Flooding or jetting for placement and compaction of backfill is not recommended.

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cementitious flowable fill or cohesive fill in non-pavement areas to reduce the infiltration and conveyance of surface water through the trench backfill. Attempts should also be made to limit the amount of fines migration into the clean granular material. Fines migration into clean granular fill may result in unanticipated localized settlements over a period of time. To help limit the amount of fines migration, Terracon recommends the use of a geotextile fabric that is designed to prevent fines migration in areas of contact between clean granular material and fine-grained soils. Terracon also recommends that clean granular fill be tracked or tamped in place where possible to limit the amount of future densification which may cause localized settlements over time.

For low permeability subgrades, utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath buildings should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the buildings. The trench should provide an effective trench plug that extends at least 5 feet from the face of the building exterior. The plug material should consist of cementitious flowable fill or low permeability clay. The trench plug material should be placed to surround the utility line. If used, the clay trench plug material should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

If chemical treatment of subgrade soils occurs before utility construction, Controlled Low Strength Material (CLSM) or sand/cement slurry should be used as backfill material to cap utility trenches in all areas where trenches have cut through the treated subgrade. The thickness of the CLSM or slurry should be at least the thickness or depth of chemically treated subgrade. Below that depth, imported structural fill or moisture conditioned native soil may be used for backfill. Such areas trenched through chemically treated soil should not be backfilled with aggregate base, native soil, or disturbed chemically treated soil.

Post construction trenching through geogrid reinforced pavement areas shall be accomplished with conventional trenching equipment. Repairs to the trenched section shall be accomplished using a full structural replacement of the displaced materials or with a repaired section that is identical to the original section. If the trench section is repaired to match the original, the trench backfill must be compacted to the same or higher density and the geogrid must be over-lapped a minimum 3-inches at the proper geogrid elevation.

Grading and Drainage

All grades must provide effective drainage away from the improvements during and after construction and should be maintained throughout the life of the improvements. Water retained next to the improvements can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roofs should have gutters/drains with downspouts that discharge onto splash blocks a distance of at least 10 feet from the buildings, onto pavements, or are tied to tight lines that discharge into a storm drain system.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the buildings for at least 10 feet beyond the perimeter of the buildings. If a minimum 5 percent slope cannot be achieved due to site grades, a minimum 2½ percent slope could be used provided pavement or hardscape surrounds and extends to the buildings, or a subdrain could be installed around the perimeter of the foundations that carries water away from the buildings. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structures should also be periodically inspected and adjusted, as necessary, as part of the structures' maintenance programs. Where paving or flatwork abuts the structures, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Any planters and/or bio-swales located within 10 feet of the buildings or swimming pools should be self-contained or lined with an impermeable membrane to prevent water from accessing subgrade soils below the improvements. Sprinkler mains and spray heads should be located a minimum of 5 feet away from the building and swimming pool perimeters.

No vegetation over six feet in height shall be planted within 20 feet of the buildings and swimming pool perimeters unless a root barrier is provided between the structure and tree to limit roots within 10 feet of the improvements. Roots can draw additional moisture from the soils and cause excessive volume changes in the soil resulting in movement.

Implementation of adequate drainage for this project can affect the surrounding developments. Consequently, in addition to designing and constructing drainage for this project, the effects of site drainage should be taken into consideration for the planned structures on this property, the undeveloped portions of this property, and surrounding sites. Extra care should be taken to ensure irrigation and drainage from adjacent areas do not drain onto the project site or saturate the construction area.

Earthwork Construction Considerations

Shallow excavations for the proposed buildings and swimming pools are anticipated to be accomplished with conventional construction equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs, exterior hardscape, and pavements. Construction traffic over the completed subgrades should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade should become desiccated, saturated, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to construction.

Groundwater was encountered as shallow as 10 feet bgs in our borings. Groundwater levels can fluctuate and may be different at the time of construction. The potential for encountering groundwater should be considered if excavations will be within 2 feet of the groundwater table.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigation measures beyond that which would be expected during the drier summer and fall months. This could include ground stabilization utilizing chemical treatment of the subgrade, diversion of surface runoff around exposed soils, and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations. Stockpiles of soil, construction materials, and construction equipment should not be placed near trenches or excavations. ***The Contractor is responsible for maintaining the stability of adjacent structures during construction.***

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of demolition debris and surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 1,500 square feet of compacted fill in the building areas and 3,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 50 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

In areas of foundation and swimming pool excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Preliminary Shallow Foundations

Provided the estimated settlement due to liquefaction can be accommodated in the structural design of the buildings, the buildings may be supported by spread footings that bear completely on either firm native soil **or** a minimum 24 inches of compacted granular structural fill, **but not both**. This may require the over-excavation of native soils in some areas.

If the design of the proposed buildings cannot accommodate the anticipated settlement due to liquefaction, we recommend the effects of total and differential settlement on the proposed buildings from liquefaction be mitigated by supporting the buildings with spread footings bearing on a geogrid **Reinforced Building Pad** or on subgrade mitigated by **Ground Improvement**.

The following preliminary design parameters are applicable for shallow foundations bearing on firm native soil or at least 24 inches of compacted granular structural fill. Shallow foundation design parameters and estimated settlement should be reevaluated in more detail during final design when the remaining borings have been completed, and foundation system geometry and structural load information is available in more detail.

Preliminary Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing Pressure [1, 2]	1,500 psf – footings bearing on firm native soil 2,000 psf – footings bearing on at least 24 inches of granular structural fill
Required Bearing Stratum [3]	Firm native soil or a minimum 24 inches of compacted granular structural fill
Minimum Foundation Dimensions	Per CBC 1809.7
Maximum Foundation Dimensions	7 feet – Pad Footing 3 feet – Continuous Footing
Passive Resistance[4, 8] **(equivalent fluid pressures)**	250 pcf
Sliding Resistance [5, 8]	130 psf allowable cohesion - native clay 0.35 allowable coefficient of friction - granular structural fill
Minimum Embedment below Finished Subgrade [6]	18 inches
Estimated Total Settlement from Static Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement from Static Structural Loads [2, 7]	About 1/2 of total settlement

1. **The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. This bearing pressure can be increased by 1/3 for transient loads unless those loads have been factored to account for transient conditions. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.**
2. **Values provided are for maximum loads noted in** Project Description**. Additional geotechnical consultation will be necessary if higher loads are anticipated. Estimated settlements do not include settlement due to liquefaction.**
3. **Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in** Earthwork**.**

Item	Description

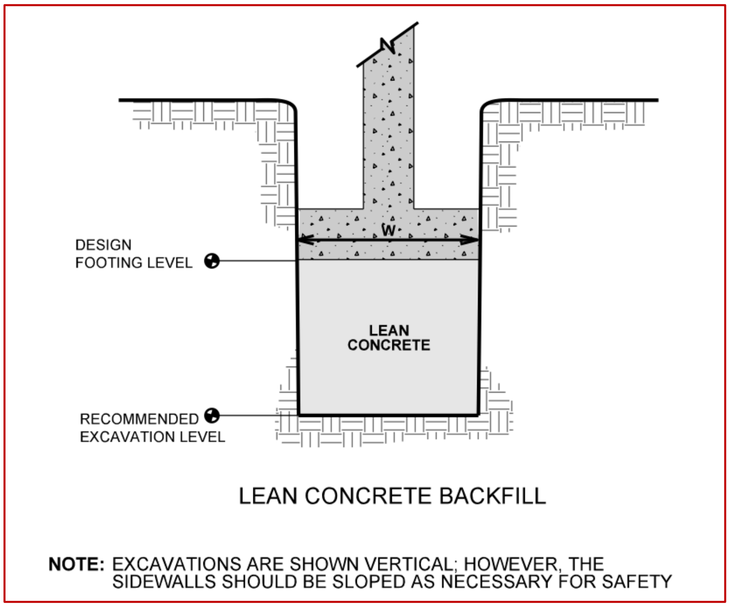
4. **Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. Assumes no hydrostatic pressure.**
5. **Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations. For fine-grained materials, lateral resistance using cohesion should not exceed ½ the dead load.**
6. **Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior subgrade within 5 horizontal feet of the structure.**
7. **Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.**
8. **Passive Resistance and Sliding Resistance may be combined to resist sliding provided the Passive Resistance is reduced by 50 percent.**

Foundation Construction Considerations

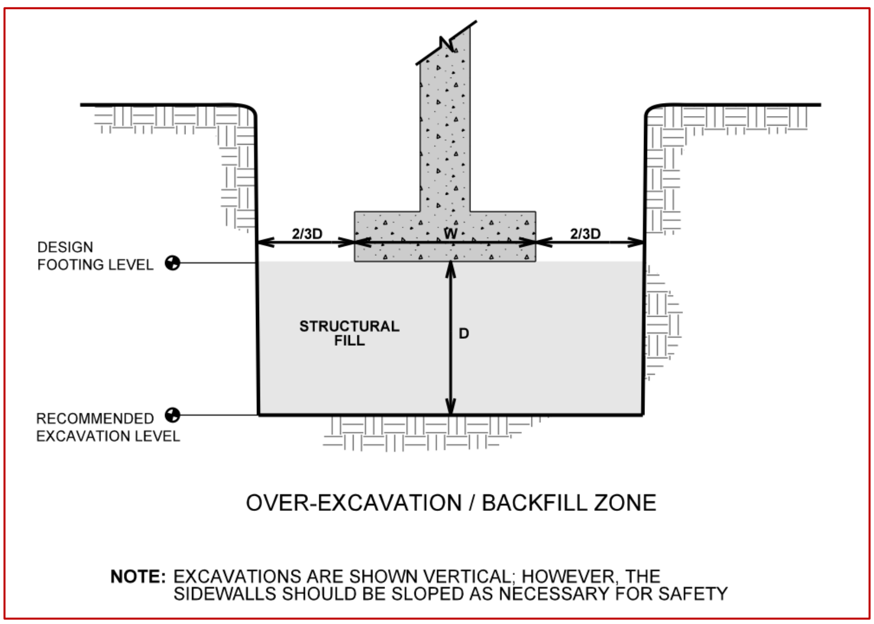
As noted in **Earthwork**, the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

To ensure foundations have adequate support, special care should be taken when footings are located adjacent to trenches. The bottom of such footings should be at least 1 foot below an imaginary plane with an inclination of 1.5 horizontal to 1.0 vertical extending upward from the nearest edge of the adjacent trench.

If footings will bear on firm native soil and unsuitable bearing soils are observed at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The lean concrete replacement zone is illustrated on the following sketch.



Over-excavation for structural fill placement below footings should be conducted as shown in the following sketch. The over-excavation should be backfilled up to the footing base elevation, with granular structural fill placed, as recommended in the **Earthwork** section.



Ground Improvement

Ground improvement may be utilized to help mitigate the anticipated excessive settlement due to the potential liquefaction of the underlying sand layers. Ground improvement methods, such as aggregate piers and drilled displacement columns (DDC), are proprietary systems designed by licensed contractors who could provide further information regarding support options. Considering the various methods available for ground improvement, it is our opinion aggregate piers would be a suitable option for ground improvement at this site. However, if the Contractor or Structural Engineer have worked with a different ground improvement method that has proven successful to mitigate the hazards present at this site with similar subgrade soil conditions, Terracon could consider such options if desired.

Aggregate Piers

As a way to mitigate the effects of liquefaction below the proposed improvements, the subgrade soils could be improved with aggregate piers installed on a grid pattern. This option would allow for the use of **Shallow Foundations** over the aggregate pier-reinforced subgrade. Aggregate pier systems are typically installed after clearing. Aggregate piers can be used to densify the liquefiable cohesionless soils.

Aggregate piers are typically constructed by advancing a drill or mandrel to design depths, then building a bottom bulb of clean, open-graded stone. The pier is built on top of the bottom bulb, using graded aggregate placed in thin lifts (12 to 24 inches compacted thickness). The result is a reinforced zone of soils directly under the foundations, which allows for the design and construction of foundations for relatively higher bearing pressures and with lower anticipated settlements. Aggregate piers can also be installed where differential movement is a concern between underground utility lines; site development such as hardscape, entrances, and pavements adjacent to structures supported by **Ground Improvement**; and site drainage.

We anticipate foundations supported over aggregate piers installed following fill placement could be designed using an allowable bearing pressure of 2,500 to 3,000 pound per square foot (psf) for dead plus live loads. However, the final design allowable bearing pressure should be specified and confirmed by the design-build contractor installing the aggregate piers and coordinated with the structural engineer. The aggregate pier ground improvement system for this project should meet the following design criteria:

Bearing Capacity Factor of Safety = 2.0
Global Stability (static) = 1.3
Global Stability (dynamic) = 1.1
Post-construction Settlement: <1 inch for combined static and liquefaction settlement
Post-construction Differential Settlement: < ½ inch / 40 feet for combined static and liquefaction settlement

Aggregate pier systems should be designed and constructed by a specialty ground improvement contractor. At least one load test should be performed in the footprint of each improvement to confirm the aggregate pier design capacity prior to full production of aggregate piers. Since this would be specialty work, we recommend consideration of using a design-build process if this alternative is selected. A design and installation package including a quality control plan for aggregate pier installation should be prepared by the design-build contractor license in the State of California and submitted to Terracon for review and approval prior to construction. The package should also include information regarding load testing such as proposed test location, set-up, and testing parameters. Terracon should be present on-site during load test and production to observe installation and testing of the aggregate piers.

Preliminary Floor Slabs

Preliminary design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the floor slab support course beneath the floor slab.

Pre-existing fill materials may be encountered at the site associated with construction of the existing community center. As previously specified, any existing fill present in the area of proposed floor slabs should be completely removed to firm native soil.

The subgrade soils are comprised of medium plasticity clays exhibiting the potential to shrink/swell with variations in water content. Construction of the floor slab, combined with the removal of trees, and revising site drainage creates the potential for gradual increased water contents within the clays. Increases in water content will cause the clays to swell and damage the floor slab. To reduce the potential effects of the medium plasticity clays on the building floor slabs, at least the upper 18 inches of subgrade soils below floor slabs should consist of granular structural fill or be chemically treated with high calcium quicklime.

Chemical treatment involves treating the subgrade soils with a certain percentage of high calcium quicklime, usually 3.5 to 5.5 percent based on the dry unit weight of the soil, for a depth of 18 inches. For estimating purposes, we recommend using 4.5 percent lime, and a soil unit weight of 110 pounds per cubic foot. For an 18-inch treatment depth, this results in an estimated minimum spread rate of 7.4 pounds per square foot lime. The actual amount of lime to be used should be determined by Terracon and by laboratory testing **at least three weeks prior** to the start of grading operations. Chemical treatment is performed after rough grading is completed. This procedure reduces the swell potential of the surface soils and creates a stable working platform on which construction can proceed. All chemical treatment operations should be observed by a representative of the project Geotechnical Engineer.

Due to the potential for significant moisture fluctuations of subgrade material beneath floor slabs supported at-grade, the Geotechnical Engineer should evaluate the material within 18 inches of the bottom of the structural granular fill or chemically treated zone immediately prior to placement of additional fill or floor slabs. In chemically treated areas, this can be accomplished by having the grading contractor excavate several test pits within the proposed construction areas prior to the start of grading operations to determine the moisture condition of the subgrade soils. A representative of the Geotechnical Engineer should be present during the excavation of these test pits and samples of the subgrade soils should be obtained for moisture content testing. Soils below the specified water contents within this zone should be moisture conditioned or replaced with structural fill as stated in our **Earthwork** section.

The proposed community center building will partially extend over a portion of the existing pond that will be backfilled. The proposed community center building may span over both native soil and engineered fill. Damage is likely to occur in structures constructed over a native soil/fill transition. The support characteristics of the differing materials increase the risk that differential settlement may occur and cause damage to the building. In order to reduce the potential for damage the building from differential settlement, we recommend the building **not** be partially supported on both the native soil and structural fill. As a result, we recommend floor slabs that span native soil/fill transitions should be underlain by a minimum 36 inches of compacted granular structural fill. This will likely require over-excavation of native soils in some areas.

Preliminary Floor Slab Design Parameters

Item	Description
Floor Slab Support[1]	Use 6 inches of Caltrans Class 2 aggregate base for warehouse or industrial floors. Use 4 inches of ¾ inch free draining rushed rock[3] for conditioned spaces or slabs with floor coverings.
Estimated Modulus of Subgrade Reaction [2]	115 pounds per square inch per inch (psi/in) for point loads

1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

Item	Description
	3. Free-draining granular material should have less than 5% fines (material passing the No. 200 sieve). Other design considerations such as cold temperatures and condensation development could warrant more extensive design provisions.

It is common to reduce the k-value to account for dimensional effects of large, loaded areas. For such features, the value of K_c in the following formula is the corrected or design modulus value in units of psi/in, k is the value provided in the previous table, and b is the mat width (short dimension), or tributary loaded area measured in units of feet. Soft or unstable subgrade will be remediated by scarifying and re-compacting or by over-excavation and replacement. For sand subgrades, this can be estimated as:

$$K_c = k\left(\frac{b+1}{2b}\right)^2$$

For clay subgrades, this can be estimated as:

$$K_c = k(\frac{1}{b})$$

Terracon can provide refined estimates of K_c if provided more detailed information regarding the loads and application area to conduct settlement analysis.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, when the project includes humidity-controlled areas, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut contraction joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations, refer to the ACI Design Manual. Joints or cracks should be sealed with a waterproof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing, or other means.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

Exterior Hardscape

In order to help protect the exterior hardscape against the swell pressure of the surficial moderately plastic clays, we recommend the subgrade soil below hardscapes either be over-excavated to a minimum depth of 18 inches and replaced with compacted granular structural fill per the recommendations provided in this report or be chemically treated to a depth of 18 inches.

If the owner elects to construct exterior hardscape over pre-existing fill that may be encountered, the following protocol should be followed. The pre-existing fill below exterior hardscape areas should be over-excavated to a depth of 2 feet and the resulting subgrade should be scarified to a minimum depth of 12 inches, moisture conditioned, and compacted per the recommendations in ***Fill Placement and Compaction Requirements***. Following compaction of the subgrade, the over-excavated areas may be backfilled with compacted granular structural fill.

Exterior hardscape, exterior architectural features, and utilities may experience some movement due to the volume change of the subgrade soils. To reduce the potential for damage caused by movement, we recommend:

- Slabs should be underlain by a minimum of 18 inches of compacted granular structural fill or chemically treated material as indicated. However, at the contractor’s discretion, gravel may be placed between the slab and granular structural fill or chemically treated material to assist with constructability.
- Minimizing moisture increases in the subgrade soils and backfill;
- Controlling moisture-density during placement of fill;
- Using designs which allow vertical movement between the exterior features and adjoining structural elements;
- Placing effective control joints on relatively close centers.

- Ensuring clay subgrade soils are in a moist condition prior to slab construction.
- Reinforcing exterior slabs and flatwork with a minimum No. 4 bars at 12 inches on center.

Pool Recommendations

As indicated, seismically-induced settlement up to 1½ inches should be expected at the site in the event of liquefaction during the design earthquake. Based on our experience, swimming pools perform relatively well during a liquefaction event. However, some cracking and differential settlement could occur requiring repair and releveling of the pools. If the risk of some potential repair is not acceptable for the swimming pools, the effects of liquefaction settlement can be mitigated by supporting the proposed pools on deep foundations that derive support below the soils prone to these conditions. If supporting the pools on deep foundations is desired, Terracon can provide additional recommendations for the design of such a foundation system.

If the risk that some potential repair of the pools may be required due to the anticipated liquefaction settlement that could occur following a design seismic event is acceptable, the pool shells may be constructed as a conventional in-ground pool shells provided the pools bear into firm native soil. Loose/soft soils at the bottom of the pool excavations should be over-excavated to firm native soil. Areas where over-excavation may be required due to the presence of loose/soft soil may be backfilled with a 2-sack lean concrete mix or ¾ inch clean crushed gravel wrapped in a geotextile fabric and compacted by vibratory methods.

Pool walls should be designed to resist a lateral earth pressure of 85 pounds per cubic foot (pcf) equivalent fluid pressure for walls with flat backfill. Pool walls that may be partially placed against engineered fill should be designed for both retaining and free-standing hydrostatic pressure conditions.

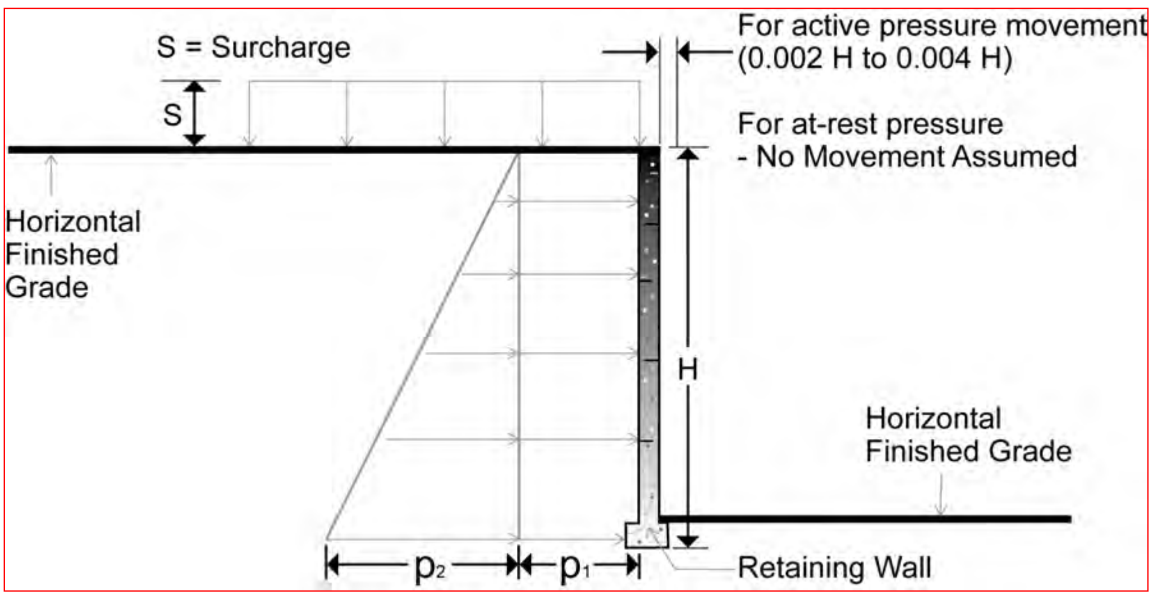
Expansive soils within the pool excavations should be maintained in a moist condition during construction and should not be allowed to dry out.

A hydrostatic pressure relief system should be installed in the deep end of the pools and the pools should be underlain by a minimum 6-inch-thick layer of 3/4-inch clean gravel underlain by Mirafi 140N filter fabric or Caltrans Class II permeable material. A 4-inch diameter perforated Schedule 40 PVC or ABS pipe should be installed in the gravel at the deepest point. The perforated pipe should slope at a 2 percent minimum grade to a tight line at the edge of the pools that carries the drainage to an existing drainage system or to an observation well where water can be removed by pumping.

Preliminary Lateral Earth Pressures

Design Parameters

Besides the swimming pool construction, below-grade construction is expected to be limited to surge tanks, a pump pit, and low height site retaining walls. Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction, and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the following diagram. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters

Earth Pressure Condition [1]	Coefficient for Backfill Type [2]	Surcharge Pressure [3] p_1 (psf)	Equivalent Fluid Pressures (psf) [2,4]	
			Unsaturated [5]	Submerged [5]
Active (Ka)	Granular - 0.31 Fine Grained - 0.53	(0.31)S (0.53)S	(40)H (65)H	(80)H (95)H
At-Rest (Ko)	Granular - 0.47	(0.47)S	(55)H	(90)H

Lateral Earth Pressure Design Parameters

Earth Pressure Condition [1]	Coefficient for Backfill Type [2]	Surcharge Pressure [3] p_1 (psf)	Equivalent Fluid Pressures (psf) [2,4]	
			Unsaturated [5]	Submerged [5]
	Fine Grained - 0.69	(0.69)S	(85)H	(105)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. Fat clay or other expansive soils should not be used as backfill behind the wall.
2. Uniform, horizontal backfill, with a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. To achieve "Unsaturated" conditions, follow guidelines in the following **Subsurface Drainage for Below-Grade Walls** or **Retaining Wall Drainage** section of this report. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.
6. Values in the table are for flat backfill only.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 degrees from vertical for the active case.

Total lateral earth pressure acting on retaining or below grade walls during a seismic event will likely include the active or at-rest static force and a dynamic increment. The dynamic increment should be applied to the wall as resultant force acting at 0.6H height from the base of the wall. Such increments should be added to the static earth pressures. A dynamic lateral earth resultant force of $16H^2$ (in units of pounds per linear foot (plf), where H (in units of feet) is the height of the soil behind the wall[1] should be used in design.

Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to prevent lateral pressures more than those provided. Compaction of each lift adjacent to wall should be accomplished with hand-operated tampers for other lightweight compactors. Over-compaction may cause excessive lateral earth pressures which could result in wall movement.

[1] *Seed & Whitman (1970)*

Footings, floor slabs or other loads bearing on backfill behind walls may have a significant influence on the lateral earth pressure. Placing footings within wall backfill and in the zone of active soil influence on the wall should be avoided unless structural analyses indicate the wall can safely withstand the increased pressure.

The lateral earth pressure recommendations given in this section are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever, or gravity type concrete walls. These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls (also termed MSE walls). Recommendations covering these types of wall systems are beyond the scope of services for this assignment. However, we would be pleased to develop a proposal for evaluation and design of such wall systems upon request.

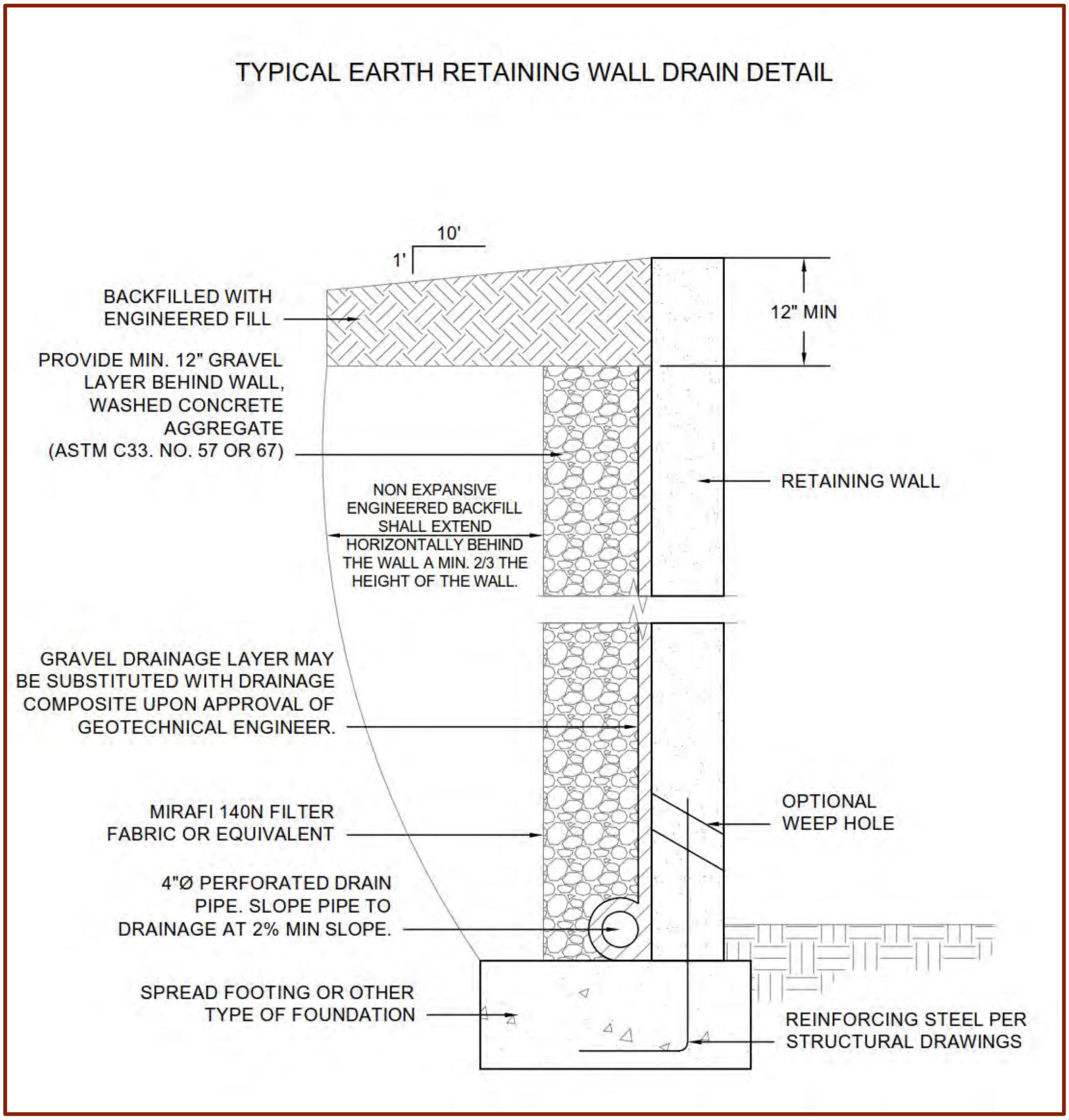
Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.

As an alternative to free-draining granular fill, a prefabricated drainage composite may be used. A prefabricated drainage composite is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion and is fastened to the wall prior to placing backfill.

Retaining Wall Drainage

To control hydrostatic pressure behind the wall we recommend that a drain be installed at the bottom of the wall with a collection pipe leading to a reliable discharge. The drainage should consist of either a prefabricated drainage composite or a 12-inch-thick free draining gravel blanket. Free draining gravel should consist of Caltrans Class II permeable material or ¾ inch clean gravel wrapped in Mirafi 140N filter fabric or equivalent. The drainage should extend from the bottom of the wall to within 12 inches of the top of the wall. The drainage should be capped with 12 inches of compacted cohesive soil. The collection pipe should be designed by the Civil Engineer but should be a minimum 4-inch diameter perforated Schedule 40 PVC or ABS drain pipe and should slope to an existing drainage system or to a positive gravity outlet. A typical earth retaining wall drain detail is illustrated on the following sketch.



Pavements

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Support characteristics of subgrade for pavement design do not account for shrink/swell movements of an expansive clay subgrade, such as soils observed on this project. Thus, the pavement may be adequate from a structural standpoint, yet still experience cracking and deformation due to shrink/swell related movement of the subgrade.

On most project sites, the site grading is accomplished relatively early in the construction phase. Fills are placed and compacted in a uniform manner. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade and many surface irregularities are filled in with loose soils to improve trafficability temporarily. As a result, the pavement subgrades, initially prepared early in the project, should be carefully evaluated as the time for pavement construction approaches.

We recommend the moisture content and density of the top 12 inches of the subgrade be evaluated and the pavement subgrades be proof-rolled within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills.

If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

Pavement Design Parameters

Design of Asphaltic Concrete (AC) pavement sections were calculated using the Caltrans Highway Design Manual, latest edition, and a 20-year design life. Design of Portland Cement Concrete (PCC) pavement sections were designed using ACI 330R-21, “Guide for the Design and Construction of Concrete Parking Lots.”

Bulk samples of the near surface native soils were collected to perform Hveem Stabilometer (R-Value) testing. A representative bulk sample from Boring B-6 was selected for testing. The testing resulted in an R-Value of less than 5. Subsequently, an R-Value of 5 was used for the subgrade for the asphaltic concrete (AC) pavement designs. Additional R-Value testing may be performed following rough grading of the site on the subgrade soils that will ultimately support proposed pavements in order to determine if a more favorable R-Value result may be used in design reducing planning pavement sections. A modulus of subgrade reaction of 50 pci was used for the Portland cement concrete (PCC) pavement designs. A modulus of rupture of 550 psi was used in design for the concrete (based on correlations with a minimum 28-day compressive strength of 4,500 psi).

Based on this relatively low R-value the conventional pavement sections will be relatively thick. The deeper pavement sections will require more off haul of material on site if the same grades are kept. As an alternative to conventional pavement sections, reinforcing the pavement sections with geogrid or chemical treatment of the subgrade soils may be performed to improve their physical support characteristics and reduce the pavement section.

Recommendations for conventional, geogrid reinforced, and chemically treated pavement sections are presented next. The recommendations are based on the subgrade being in a firm and unyielding condition.

Pavement Section Thicknesses

The following table provides our opinion of minimum thickness for AC sections:

Asphaltic Concrete Design

Layer	Thickness (inches)			
	Auto Parking Areas (TI=5.0)[1]	Auto Road (TI=5.5)[1]	Truck Parking Areas (TI=6.0)[1]	Truck Parking Areas (TI=8.0)[1]
AC [2, 3]	3.0	3.5	3.5	5.0
Aggregate Base[2]	10.0	11.0	13.0	18.0

1. See **Project Description** for more specifics regarding traffic assumptions.
2. All materials should meet the current Caltrans Highway Design Manual specifications.
    - Base – Caltrans Class 2 aggregate base
3. A minimum 1.5-inch surface course should be used on ACC pavements.

The following table provides options for AC pavement sections reinforced with geogrid. The sections were calculated using the Tensar SpectraPave4PRO-California software. The geogrid material shall be Tensar TriAx TX5 or an equivalent conforming to the physical properties in the latest Greenbook Standard Specifications, Multi-Axial Geogrid Table 213-5.2 (E) Type R2. The geogrid shall be placed directly on the subgrade below the aggregate base layer. Adjacent rolls of geogrid shall be overlapped a minimum of 1 foot. Soft subgrade conditions may require up to 3 feet of overlap at the discretion of the geotechnical engineer. The development of wrinkles in the geogrid shall be avoided. A minimum loose fill thickness of 6 inches is required prior to operation of tracked vehicles over the geogrid. When underlying substrate is trafficable with minimal rutting, rubber-tired equipment may pass over the geogrid reinforcement at slow speeds (less than 10 mph).

Reinforced pavement design procedures developed by grid producers rely on product specific field and laboratory research. In some cases, this research has tested pavement sections within a limited range of subgrade conditions and pavement thicknesses. Extrapolations are typically used for thicker pavement sections outside those parameters based on computer modeling. These methods represent the state of the practice but have not always been specifically verified by performance testing.

Asphaltic Concrete Design with Geogrid Reinforcement

Layer	Thickness (inches)			
	Auto Parking Areas (TI=5.0)[1]	Auto Road (TI=5.5)[1]	Truck Parking Areas (TI=6.0)[1]	Truck Parking Areas (TI=8.0)[1]
AC [2, 3]	3.0	3.5	3.5	5.0
Aggregate Base[2]	5.0	6.0	8.0	11.0

1. See **Project Description** for more specifics regarding traffic assumptions.
2. All materials should meet the current Caltrans Highway Design Manual specifications.
   - Base – Caltrans Class 2 aggregate base
3. A minimum 1.5-inch surface course should be used on ACC pavements.

The following table provides options for AC pavement sections supported by chemically treated soil. Chemical treatment involves treating the pavement subgrade soils with a certain percentage of high calcium quick lime. Usually, 4.0 to 6.0 percent based on the dry unit weight of the soil, for a depth of 12 inches. For estimating purposes, we recommend using 4.5 percent high calcium quick lime and a soil unit weight of 110 pounds per cubic foot. For a 12-inch treatment depth, this results in an estimated minimum spread rate of 5.0 pounds per square foot of lime. The actual amount of lime to be used should be determined by Terracon and by laboratory testing **at least three weeks prior** to the start of grading operations. Chemical treatment is performed after rough grading of the pavement areas is completed.

Asphaltic Concrete Design with Chemically Treated Subgrade

Layer	Thickness (inches)			
	Auto Parking Areas (TI=5.0)[1]	Auto Road (TI=5.5)[1]	Truck Parking Areas (TI=6.0)[1]	Truck Parking Areas (TI=8.0)[1]
AC [2, 3]	3.0	3.5	3.5	5.0
Aggregate Base [2]	4.0	4.0	4.0	8.0
Chemically Treated Subgrade[4]	12.0	12.0	12.0	12.0

1. See **Project Description** for more specifics regarding traffic assumptions.
2. All materials should meet the current Caltrans Highway Design Manual specifications.
   - Base – Caltrans Class 2 aggregate base
3. A minimum 1.5-inch surface course should be used on ACC pavements.
4. Chemically treated material shall have a minimum unconfined compressive strength of 300 psi.

The following table provides our estimated minimum thickness of PCC pavements.

Portland Cement Concrete Design

Layer	Thickness (inches)		
	Traffic Category A [1]	Traffic Category B [1]	Traffic Category E [1]
PCC [2]	5.0	6.5	7.5
Aggregate Base[2]	4.0	6.0	6.0

1. See **Project Description** for more specifics regarding traffic classifications.
2. All materials should meet the current Caltrans Highway Design Manual specifications.

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles.

Although not required for structural support, a minimum 4-inch-thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its “green” state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. Islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils are particular areas of concern. The civil design for the pavements with these conditions should include features to restrict or collect and discharge excess water from the islands. Examples of features are edge drains connected to the stormwater collection system, longitudinal subdrains, or other suitable outlets and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

The pavement surfacing, and adjacent sidewalks should be sloped to provide rapid drainage of surface water. Water should not be allowed to pond on or adjacent to these grade-supported slabs, since this could saturate the subgrade and contribute to premature pavement or slab deterioration. In areas where pavement sections abut bioswales, curb should extend below the planned AB section to intercept water infiltration below the pavement section. Water migration in and out of the pavement sections may result in repeated shrinkage and swelling and increasing pavement section fatigue.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic upkeep should be anticipated. Preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Pavement care consists of both localized (e.g., crack, and joint sealing and patching) and global maintenance (e.g., surface sealing). Additional engineering consultation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.

General Comments

The recommendations provided are strictly preliminary and should only be used for planning and preliminary design and not be used for final design and development of construction drawings and specifications.

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the

Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials, or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing. This report should not be used after 3 years without written authorization from Terracon.

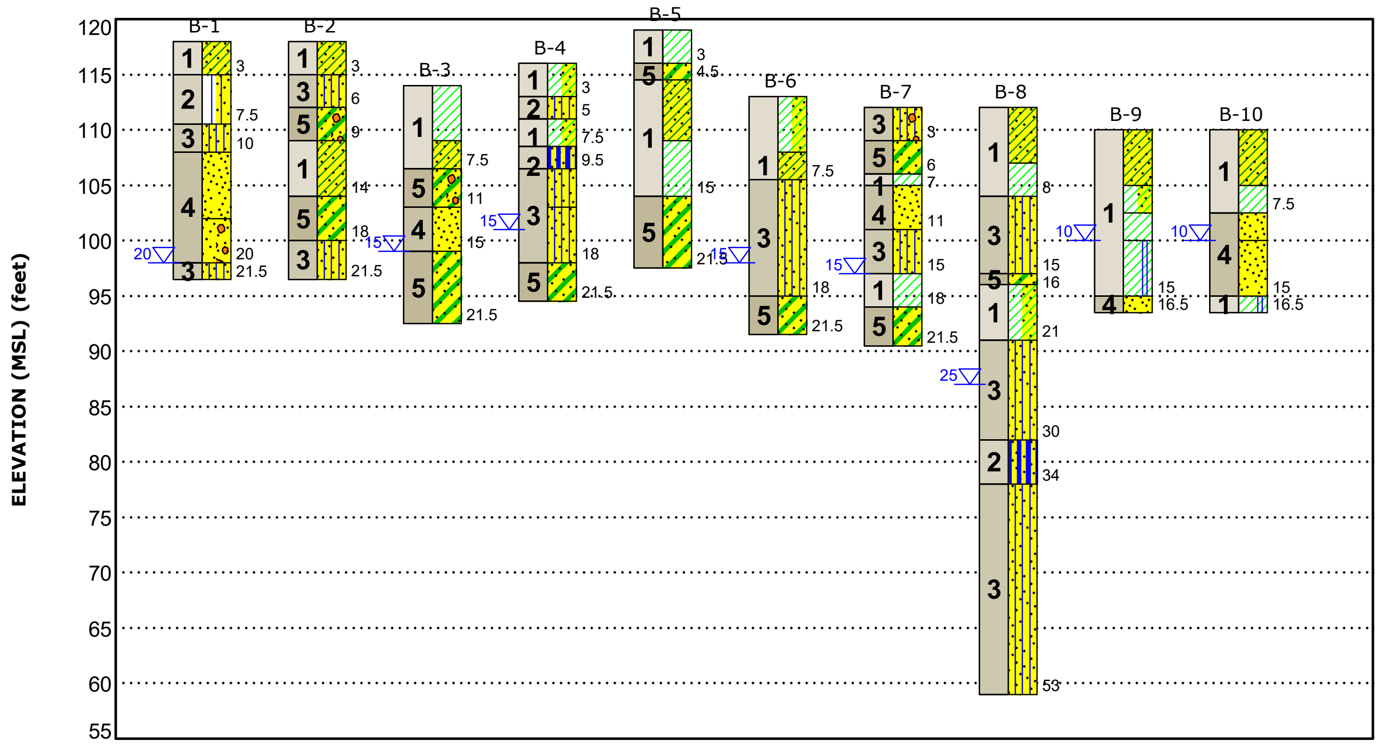
Figures

Contents:

GeoModel

Terracon
1220 Concord Ave, Ste 450
Concord, CA

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Lean Clay	Soft to hard lean clay with variable amounts of silt and sand.
2	Silt	Very stiff to hard silt with variable amounts of sand.
3	Silty Sand	Medium dense to dense silty sand with variable amounts of gravel.
4	Poorly Graded Sand	Medium dense to dense poorly graded sand.
5	Clayey Sand	Medium dense to very dense clayey sand with variable amounts of gravel.

Legend

- Sandy Lean Clay
- Silt with Sand
- Silty Sand
- Poorly-graded Sand
- Poorly-graded Sand with Gravel
- Clayey Sand with Gravel
- Clayey Sand
- Lean Clay
- Lean Clay with Sand
- Sandy Silt
- Silty Sand with Gravel
- Lean Clay with Silt

First Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Approximate Boring Depth (feet)	Location
7	21½	Building/Pool areas
2	16½	Storage Building/Red. Pool area
1	53	Building area

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. Approximate ground surface elevations were estimated using Google Earth. If elevations and a more precise boring layout are desired, we recommend the exploration locations be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted rotary drill rig using continuous flight augers (solid stem and/or hollow stem, as necessary, depending on soil conditions). Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge was pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. Split-barrel sampling procedures are similar to standard split spoon sampling procedure; however, blow counts are typically recorded for 6-inch intervals for a total of 12 inches of penetration. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with cement-grout after their completion.

We also observed the boreholes while drilling for the presence of groundwater. The groundwater levels are shown on the attached boring logs.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Dry Unit Weight
- Unconfined Compression
- Atterberg Limits
- Grain Size Analysis
- One Dimensional Consolidation
- Chemical Analysis – pH, sulfates, chloride ion, electrical resistivity
- Hveem Stabilometer (R-Value)

The laboratory testing program often included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

Contents:

Note: All attachments are one page unless otherwise noted.

Site Location

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES
MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

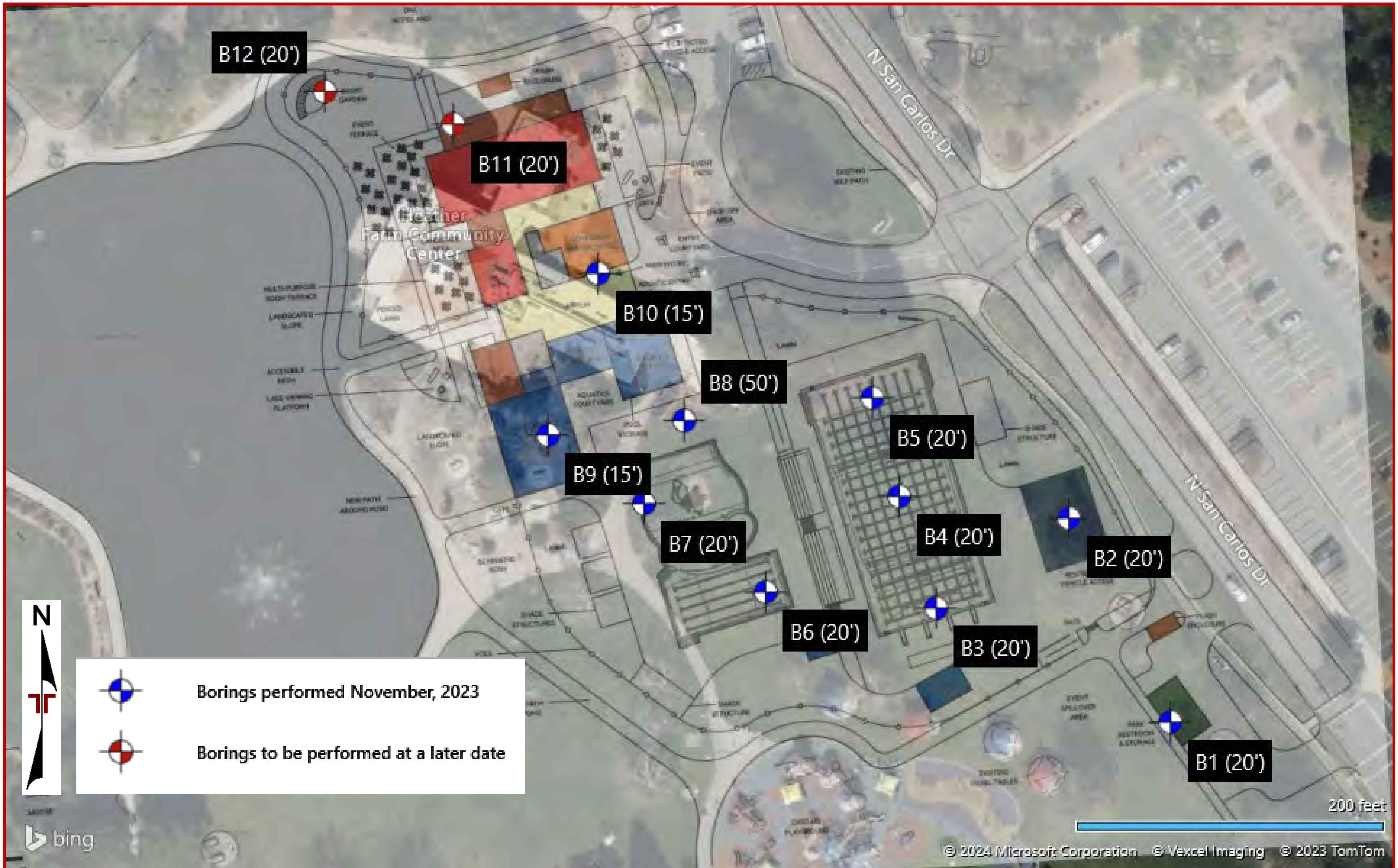


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-1 through B-10)
Atterberg Limits
Grain Size Distribution (6 pages)
Consolidation (2 pages)
Unconfined Compressive Strength (3 pages)
R-Value
Corrosivity

Note: All attachments are one page unless otherwise noted.

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-1

Location: See Exploration Plan

Latitude: 37.9191° Longitude: -122.0412°

Depth (Ft.) Elevation: 118 (Ft.) +/-

Model Layer	Depth (Ft.)	Material Description	Elevation (Ft.)
1	3.0	**SANDY LEAN CLAY (CL)**, trace roots, dark brown, stiff	115
2	7.5	**SILT WITH SAND (ML)**, dark brown, very stiff	110.5
3	10.0	**SILTY SAND (SM)**, fine grained, light brown, very dense	108
4	16.0	**POORLY GRADED SAND (SP)**, fine to medium grained, light brown to pale brown, dense	102
4	20.0	**POORLY GRADED SAND WITH GRAVEL (SP)**, fine to coarse grained, brown, dense	98
3	21.5	**SILTY SAND (SM)**, fine to coarse grained, olive brown with mottled white, medium dense	96.5

Boring Terminated at 21.5 Feet

Depth (Ft.)	Water Level Observations	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
2.5–4		16-18-19		4.5+ (HP)		12.0	110		
5–6.5		4-5-11							
7.5–9		13-32-42				16.2	102		
10–11.5		11-20-28				9.6	104		
15–16.5		12-22-26				21.5	105		
20–21.5	▽ (20)	5-13-22				23.4	101		

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Elevation estimated using Google Earth

Water Level Observations

▽ While drilling

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-28-2023

Boring Completed
11-28-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-2

Location: See Exploration Plan

Latitude: 37.9195° Longitude: -122.0414°

Model Layer	Graphic Log	Depth (Ft.) / Description / Elevation: 118 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		**SANDY LEAN CLAY (CL)**, dark gray brownish, stiff 3.0 — 115											
3		**SILTY SAND (SM)**, dark gray brownish, medium dense			Split spoon	7-10-11				13.4		NP	48
		6.0 — 112	5		Split spoon	5-13-24				11.4	119		
5		**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, brown to yellow brown, medium dense 9.0 — 109			Bulk					10.9			
1		**SANDY LEAN CLAY (CL)**, dark brown, hard	10		Split spoon	19-20-23		4.0 (HP)		14.8	116		
		14.0 — 104											
5		**CLAYEY SAND (SC)**, fine grained, light brown with mottled white, dense	15		Split spoon	7-17-27				26.5	97		
		18.0 — 100											
3		**SILTY SAND (SM)**, fine grained, light brown to gray, medium dense	20		Split spoon	6-10-16				19.1	110		
		21.5 — 96.5											
		Boring Terminated at 21.5 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed during drilling

Notes
Elevation Reference: Elevation estimated using Google Earth

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-29-2023

Boring Completed
11-29-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-3

Location: See Exploration Plan

Latitude: 37.9193° Longitude: -122.0417°

Depth (Ft.) Elevation: 114 (Ft.) +/-

Model Layer	Material Description	Depth (Ft.)	Elevation	Water Level Observations	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1	**LEAN CLAY (CL)**, trace sand and roots, dark brown to brown, very stiff	5.0	109		4-8-17			2.29	25.0	96		
1	**SANDY LEAN CLAY (CL)**, dark brown to light brown, soft	7.5	106.5			450			17.1			
5	**CLAYEY SAND WITH GRAVEL (SC)**, fine to coarse grained, light brown to brown, medium dense	11.0	103		9-15-25				22.5	101		
					8-22-27				23.7	104		
4	**POORLY GRADED SAND (SP)**, fine grained, light brown, dense	15.0	99	▽ (15 ft)								
5	**CLAYEY SAND (SC)**, brownish gray with mottled white, medium dense	21.5	92.5		6-8-19				20.9	108		
					9-21-40				20.7	109		

Boring Terminated at 21.5 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Notes
Elevation Reference: Elevation estimated using Google Earth

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-28-2023

Boring Completed
11-28-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-4

Location: See Exploration Plan

Latitude: 37.9195° Longitude: -122.0418°

Depth (Ft.) Elevation: 116 (Ft.) +/-

Model Layer	Graphic Log	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		**LEAN CLAY WITH SAND (CL)**, trace roots, brown, stiff 3.0 — 113											
2		**SILTY SAND (SM)**, fine grained, brown, medium dense 5.0 — 111				8-12-13				9.8	107		
1		**LEAN CLAY WITH SAND (CL)**, trace gravel, gray to brown, very stiff 7.5 — 108.5	5			10-15-22		4.5+ (HP)		7.7	124		
2		**SANDY SILT (ML)**, fine grained, brown, hard 9.5 — 106.5				10-25-43				15.0	109	NP	60
3		**SILTY SAND (SM)**, fine grained, light brown, medium dense 13.0 — 103	10			8-16-20				13.5	104		
3		**SILTY SAND (SM)**, fine grained, pale brown, medium dense 18.0 — 98	15	▽		6-8-16				18.5	108		
5		**CLAYEY SAND (SC)**, fine grained, pale brown to light brown with mottled white, medium dense 21.5 — 94.5	20			4-11-21				21.0	104		
		Boring Terminated at 21.5 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Notes
Elevation Reference: Elevation estimated using Google Earth

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-28-2023

Boring Completed
11-28-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-5

Location: See Exploration Plan

Latitude: 37.9197° Longitude: -122.0418°

Depth (Ft.) Elevation: 119 (Ft.) +/-

Model Layer	Graphic Log	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		**LEAN CLAY (CL)**, trace roots, dark brown, stiff											
		3.0 — 116											
5		**CLAYEY SAND (SC)**, trace roots, fine grained, light brown to brown, medium dense			X	5-8-11				14.2			
		4.5 — 114.5											
1		**SANDY LEAN CLAY (CL)**, brown to dark brown, stiff	5		X	8-10-10		3.5 (HP)		9.7	95		
					X	6-5-8		4.0 (HP)		16.5	111		
		10.0 — 109											
1		**LEAN CLAY (CL)**, light brown with mottled white, very stiff	10		X	6-9-18		4.5+ (HP)		18.6	108		
		15.0 — 104											
5		**CLAYEY SAND (SC)**, fine grained, light brown to pale brown, medium dense to dense	15		X	8-15-27				18.3	110		
			20		X	4-14-24				22.3	113		
		21.5 — 97.5											
		Boring Terminated at 21.5 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No free water observed during drilling

Notes
Elevation Reference: Elevation estimated using Google Earth

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-29-2023

Boring Completed
11-29-2023

1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-6

Location: See Exploration Plan

Latitude: 37.9194° Longitude: -122.0421°

Model Layer	Graphic Log	Depth (Ft.) / Material Description / Elevation: 113 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		**LEAN CLAY WITH SAND (CL)**, trace roots, dark brown, hard											
						8-13-38				15.8	95		
		5.0 — 108	5										
		SANDY LEAN CLAY (CL), fine grained, light brown, hard				12-28-45				16.3	116	27-17-10	51
		7.5 — 105.5											
3		**SILTY SAND (SM)**, brown, medium dense				7-9-13				20.8	104		
			10			7-13-28				17.3	110	NP	41
			15	▽									
						4-9-14				23.2	102		
		18.0 — 95											
5		**CLAYEY SAND (SC)**, fine to medium grained, brown, dense	20										
		21.5 — 91.5				12-21-28				22.9	102		

Boring Terminated at 21.5 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Notes
Elevation Reference: Elevation estimated using Google Earth

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Logged by
A.M.

Boring Started
11-28-2023

Boring Completed
11-28-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-7

Location: See Exploration Plan

Latitude: 37.9195° Longitude: -122.0424°

Depth (Ft.) Elevation: 112 (Ft.) +/-

Model Layer	Depth (Ft.) / Material Description	Elevation	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
3	**SILTY SAND WITH GRAVEL (SM)**, fine to coarse grained, light brown, dense, gravels consist of pieces of decomposed sandstone											
	3.0	109										
5	**CLAYEY SAND (SC)**, trace gravel, fine grained, brown, dense, weak cementation			X	9-22-45				16.1	106		
				X	10-23-40			3.76	16.4	113		
	6.0	106										
1	**LEAN CLAY (CL)**, brown with mottled white, hard											
	7.0	105										
4	**POORLY GRADED SAND (SP)**, trace gravel, fine to medium grained, dark brown, medium dense			X	4-17-18				21.8	100		
				X	7-15-22				16.4	111		
	11.0	101										
3	**SILTY SAND (SM)**, fine grained, brown, medium dense											
	15.0	97	▽									
1	**LEAN CLAY (CL)**, brown, very stiff, blocky, weak cementation			X	4-12-23		3.0 (HP)		22.0	105		
	18.0	94										
5	**CLAYEY SAND (SC)**, fine grained, light brown to pale brown, medium dense			X	6-16-21				21.0	109		
	21.5	90.5										

Boring Terminated at 21.5 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Elevation estimated using Google Earth

Water Level Observations

▽ At completion of drilling

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-29-2023

Boring Completed
11-29-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-8

Location: See Exploration Plan

Latitude: 37.9197° Longitude: -122.0423°

Depth (Ft.) Elevation: 112 (Ft.) +/-

Model Layer	Depth (Ft.)	Description	Elevation (Ft.)
1	5.0	**SANDY LEAN CLAY (CL)**, brown to light brown, stiff	107
1	8.0	**LEAN CLAY (CL)**, light brown with mottled black, hard	104
3	15.0	**SILTY SAND (SM)**, trace gravel, fine to coarse grained, light brown to brown, medium dense	97
5	16.0	**CLAYEY SAND (SC)**, fine grained, pale brown to brown, medium dense	96
1	21.0	**LEAN CLAY WITH SAND (CL)**, brown, very stiff	91
3		**SILTY SAND (SM)**, brown, medium dense	

Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
Shelby tube		500			3.1		37-15-22	69
Split spoon	9-21-35			4.79	16.4	111		
Split spoon	6-18-17				11.9	118		
Shelby tube		400			21.0		NP	16
Split spoon	5-12-18				25.0	102	36-20-16	78
Split spoon	8-12-20				24.1	105		

Depth (Ft.): 5, 10, 15, 20, 25

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Notes
Elevation Reference: Elevation estimated using Google Earth

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-30-2023

Boring Completed
11-30-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-8

Location: See Exploration Plan

Latitude: 37.9197° Longitude: -122.0423°

Depth (Ft.) Elevation: 112 (Ft.) +/-

Model Layer	Depth (Ft.) / Elevation	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
3		**SILTY SAND (SM)**, brown, medium dense *(continued)*				9-12-21				22.0	102		
	30.0 / 82		30										
2		**SANDY SILT (ML)**, brown, stiff				7-9-21				23.7			54
						7-9-3 N=12				22.9			
	34.0 / 78												
3		**SILTY SAND (SM)**, fine grained, pale brown to brown, dense	35			5-41-23				19.5	106		
		medium dense				9-10-13 N=23				29.5			
			40			5-12-18				26.2	99		
		dense				12-17-19 N=36				19.4			
			45			9-15-22				18.5	108		26
		medium dense				9-10-16 N=26				27.1			
			50										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
While drilling

Notes
Elevation Reference: Elevation estimated using Google Earth

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-30-2023

Boring Completed
11-30-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-8

Location: See Exploration Plan

Latitude: 37.9197° Longitude: -122.0423°

Depth (Ft.) Elevation: 112 (Ft.) +/-

Model Layer	Graphic Log	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
3		**SILTY SAND (SM)**, fine grained, pale brown to brown, dense *(continued)*				5-10-21		4.5+ (HP)		19.5	105		
						12-15-21 N=36				17.8			
		53.0 59											
		Boring Terminated at 53 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Elevation estimated using Google Earth

Water Level Observations

While drilling

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
A.M.

Boring Started
11-30-2023

Boring Completed
11-30-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-9

Location: See Exploration Plan

Latitude: 37.9196° Longitude: -122.0426°

Depth (Ft.) Elevation: 110 (Ft.) +/-

Model Layer	Depth / Elev.	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		**SANDY LEAN CLAY (CL)**, light brown, hard											
					Split spoon	25-36-42		4.5+ (HP)		13.9	111	31-20-11	57
	5.0 / 105	**LEAN CLAY WITH SAND (CL)**, olive brown, very stiff, weak cementation	5		Split spoon	8-16-25		3.5 (HP)		18.2	97	33-18-15	76
	7.5 / 102.5	**LEAN CLAY (CL)**, olive brown, stiff			Split spoon	6-8-9		2.25 (HP)		26.5	93		
	10.0 / 100	**LEAN CLAY WITH SILT (CL)**, olive brown, very stiff	10	▽	Split spoon	8-14-23		4.5+ (HP)		24.3	96		
4	15.0 / 95	**POORLY GRADED SAND (SP)**, trace clay, fine grained, dark brown, dense	15		Split spoon	18-24-31				29.3	97		
	16.5 / 93.5	***Boring Terminated at 16.5 Feet***											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes

Elevation Reference: Elevation estimated using Google Earth

Water Level Observations

▽ While drilling

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
T.B.

Boring Started
11-29-2023

Boring Completed
11-29-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Boring Log No. B-10

Location: See Exploration Plan

Latitude: 37.9199° Longitude: -122.0425°

Depth (Ft.) Elevation: 110 (Ft.) +/-

Model Layer	Graphic Log	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Shelby Tube Pressure (psi)	HP (tsf)	Unconfined Compressive Strength (tsf)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		**SANDY LEAN CLAY (CL)**, olive brown to dark brown, very stiff				8-12-20		4.5+ (HP)		18.1	98		
		5.0 — 105	5										
1		**LEAN CLAY (CL)**, trace sand, olive brown, very stiff				8-13-13				13.6	107		
		7.5 — 102.5											
4		**POORLY GRADED SAND (SP)**, trace gravel, fine grained, olive brown with dark brown, medium dense				9-12-22				18.8	104		
		10.0 — 100	10	▽									
4		**POORLY GRADED SAND (SP)**, trace clay, fine grained, dark brown, medium dense				14-16-24				24.8	98		
		15.0 — 95	15										
1		**LEAN CLAY WITH SILT (CL)**, olive brown, very stiff				6-8-11 N=19				27.5			
		16.5 — 93.5											
		Boring Terminated at 16.5 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ While drilling

Notes
Elevation Reference: Elevation estimated using Google Earth

Advancement Method
6" Hollow Stem Auger

Abandonment Method
Boring backfilled with cement-bentonite grout upon completion.

Drill Rig
D-90

Hammer Type
Automatic

Driller
Terracon

Logged by
T.B.

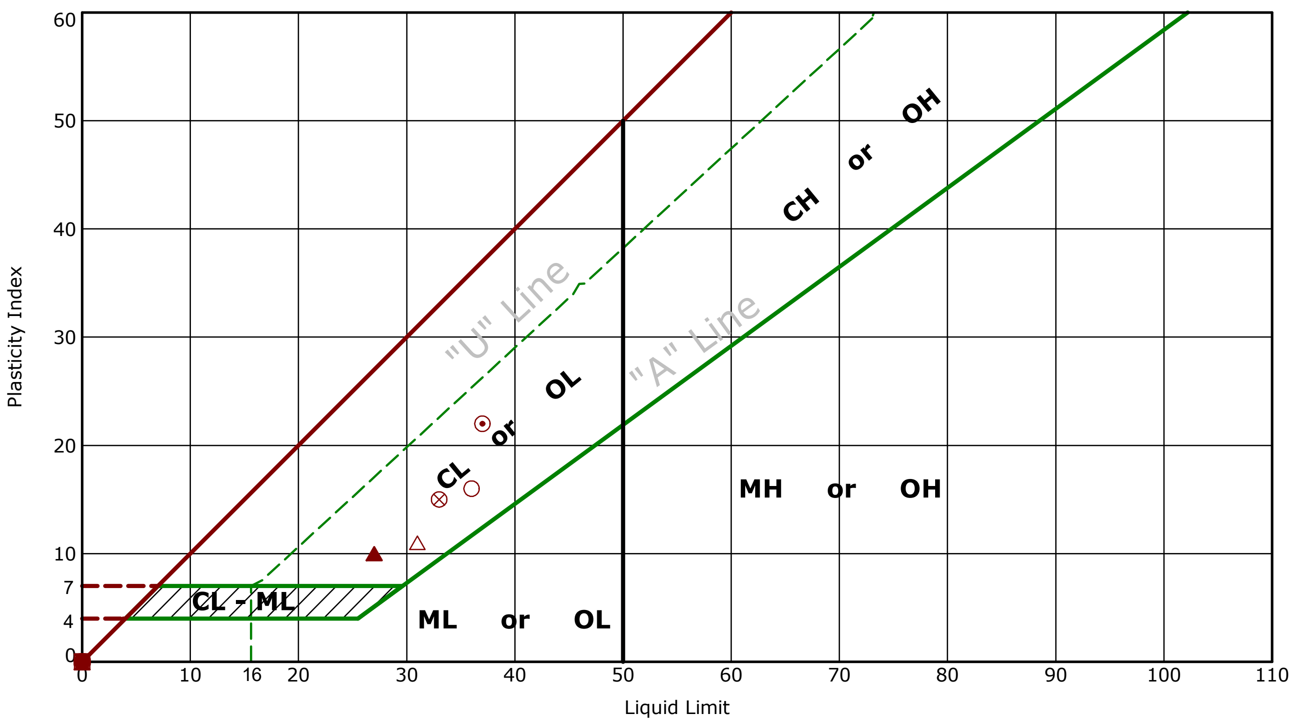
Boring Started
11-29-2023

Boring Completed
11-29-2023

Terracon
1220 Concord Ave, Ste 450
Concord, CA

Atterberg Limit Results

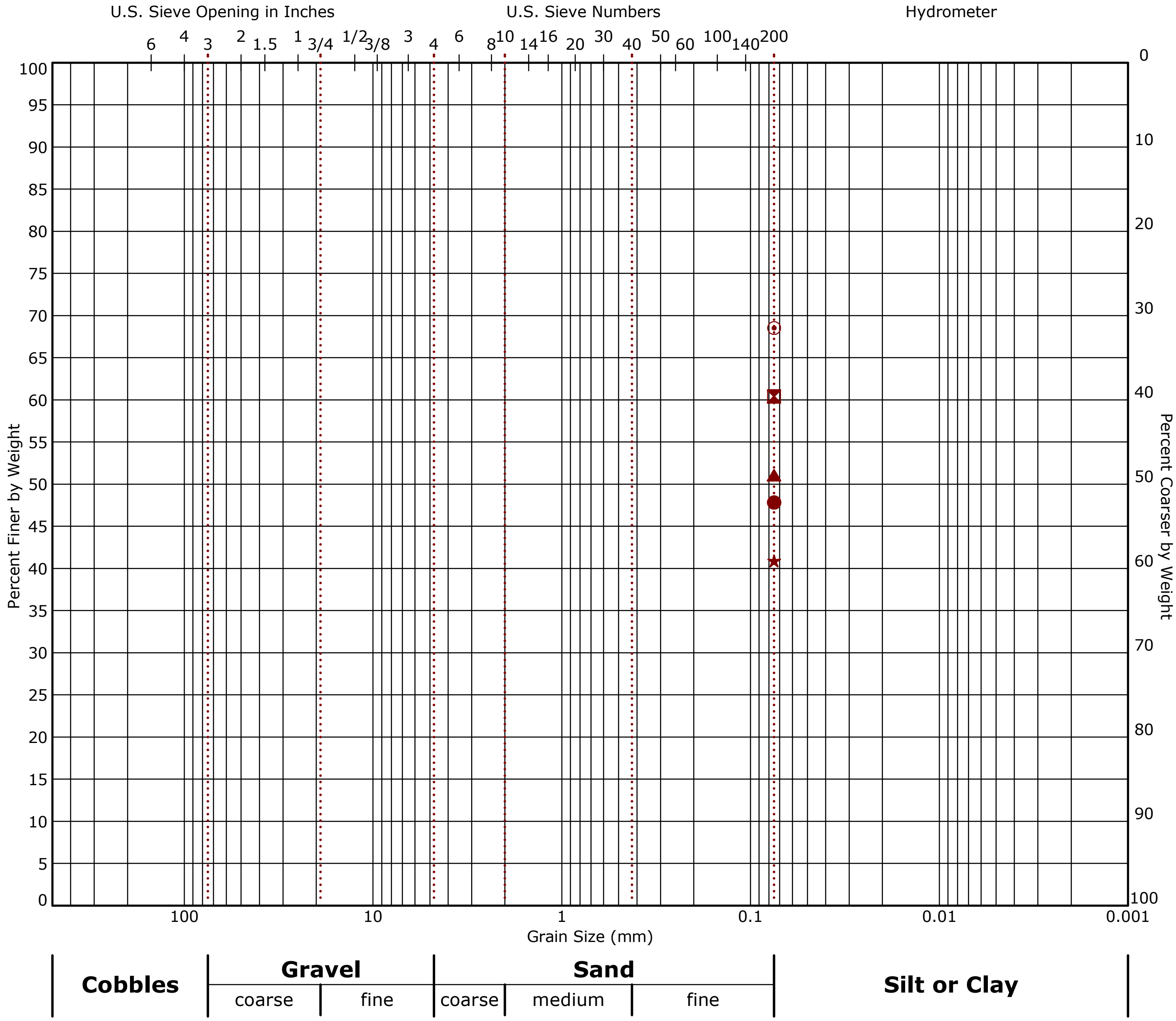
ASTM D4318



	Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	B-2	2.5 - 4	NP	NP	NP	47.8	SM	SILTY SAND
⊠	B-4	7.5 - 9	NP	NP	NP	60.4	ML	SANDY SILT
▲	B-6	5 - 6.5	27	17	10	51.1	CL	SANDY LEAN CLAY
★	B-6	10 - 11.5	NP	NP	NP	40.9	SM	SILTY SAND
⊙	B-8	2.5 - 4.5	37	15	22	68.5	CL	SANDY LEAN CLAY
✤	B-8	10 - 12	NP	NP	NP	16.5	SM	SILTY SAND
○	B-8	15 - 16.5	36	20	16	77.8	SC	CLAYEY SAND
△	B-9	2.5 - 4	31	20	11	57.4	CL	SANDY LEAN CLAY
⊗	B-9	5 - 6.5	33	18	15	75.7	CL	LEAN CLAY with SAND

Grain Size Distribution

ASTM D422 / ASTM C136

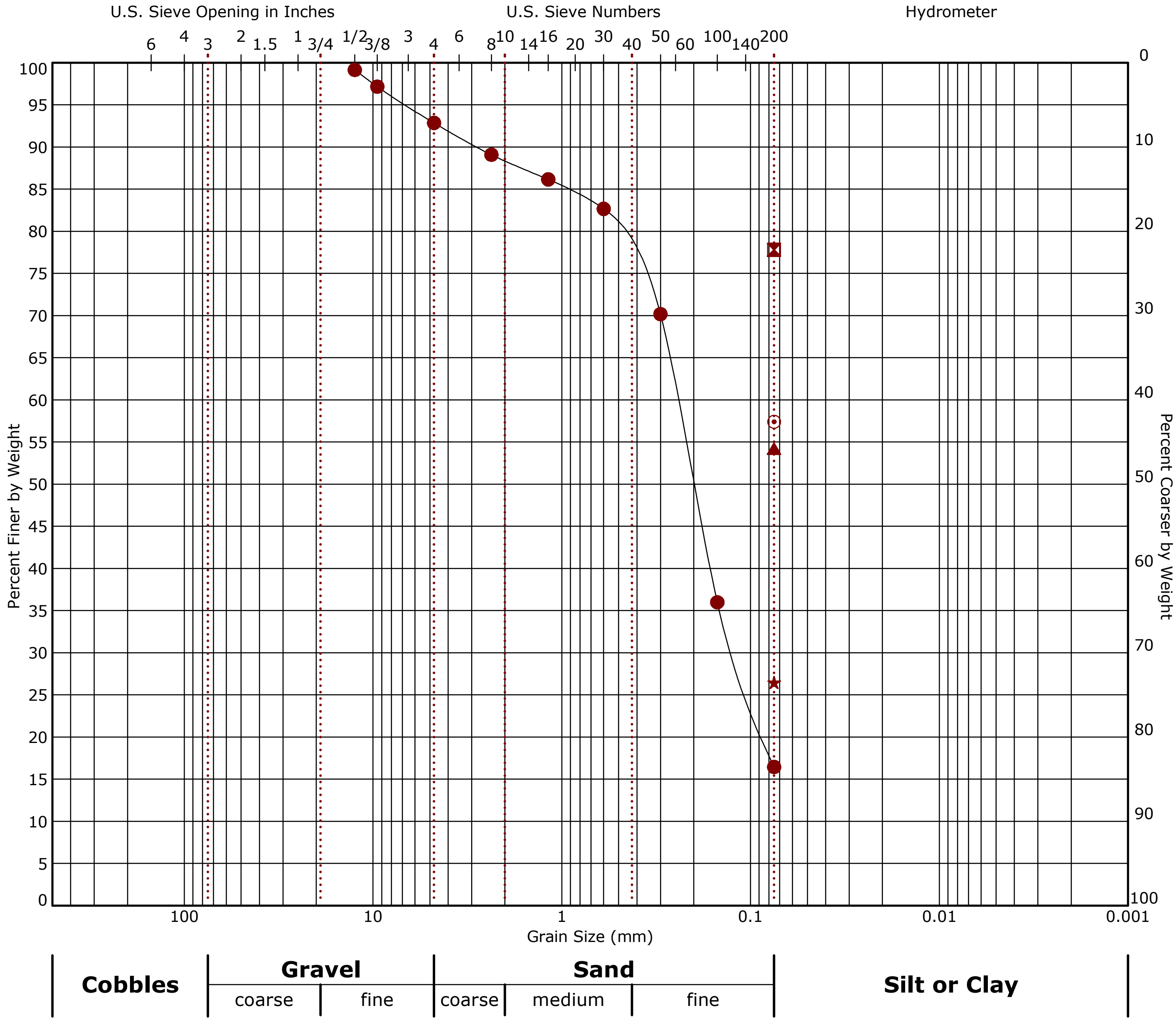


	Boring ID	Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
●	B-2	2.5 - 4	SILTY SAND	SM	NP	NP	NP		
⊠	B-4	7.5 - 9	SANDY SILT	ML	NP	NP	NP		
▲	B-6	5 - 6.5	SANDY LEAN CLAY	CL	27	17	10		
★	B-6	10 - 11.5	SILTY SAND	SM	NP	NP	NP		
⊙	B-8	2.5 - 4.5	SANDY LEAN CLAY	CL	37	15	22		

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	B-2	2.5 - 4	0.075							47.8		
⊠	B-4	7.5 - 9	0.075							60.4		
▲	B-6	5 - 6.5	0.075							51.1		
★	B-6	10 - 11.5	0.075							40.9		
⊙	B-8	2.5 - 4.5	0.075							68.5		

Grain Size Distribution

ASTM D422 / ASTM C136



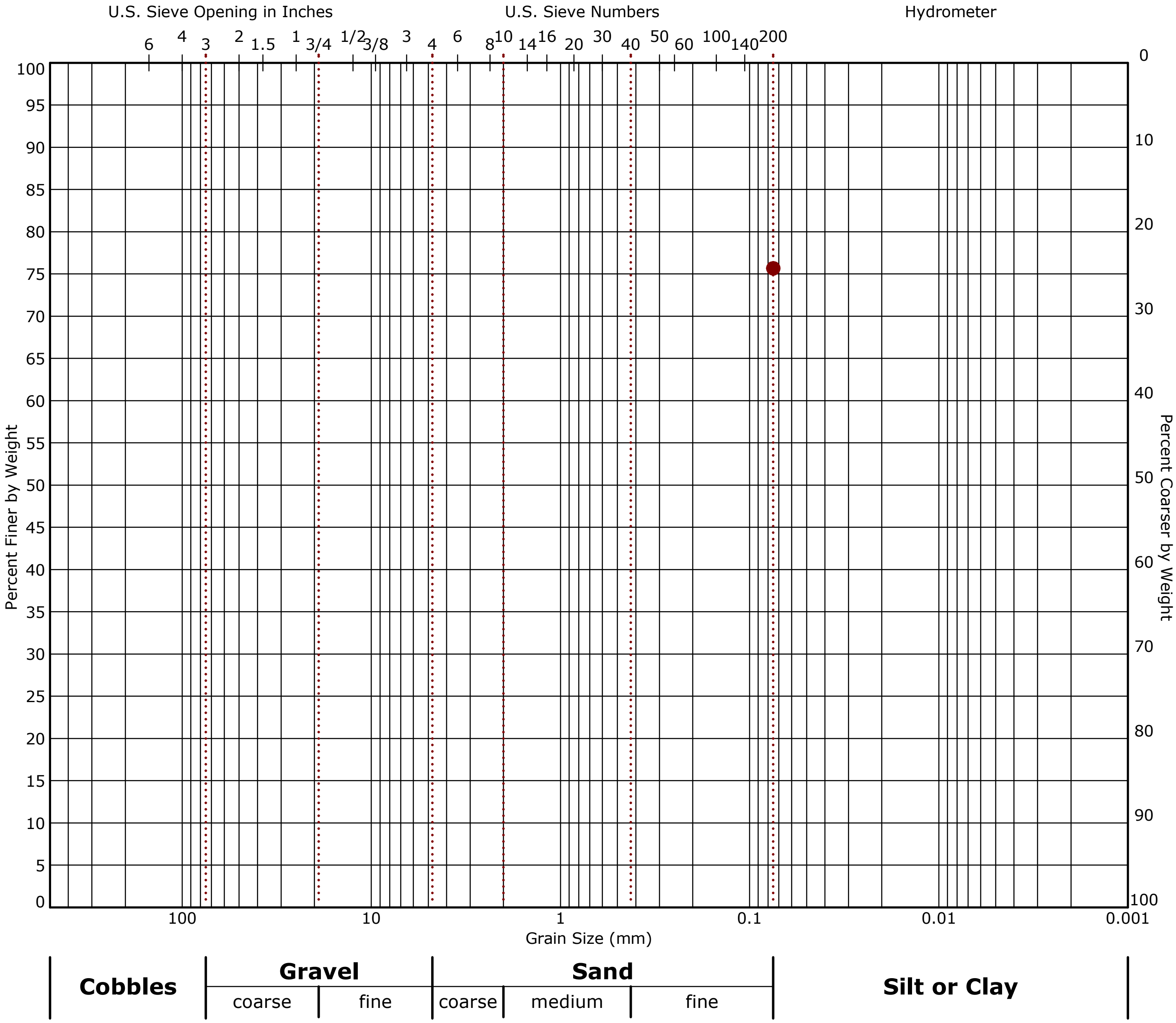
	Boring ID	Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
●	B-8	10 - 12	SILTY SAND	SM	NP	NP	NP		
⌧	B-8	15 - 16.5	CLAYEY SAND	SC	36	20	16		
▲	B-8	30 - 31.5	SANDY SILT	ML					
★	B-8	45 - 46.5	SILTY SAND	SM					
⊙	B-9	2.5 - 4	SANDY LEAN CLAY	CL	31	20	11		

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	B-8	10 - 12	12.5	0.244	0.121			6.3	76.4	16.5		
⌧	B-8	15 - 16.5	0.075							77.8		
▲	B-8	30 - 31.5	0.075							54.2		
★	B-8	45 - 46.5	0.075							26.5		
⊙	B-9	2.5 - 4	0.075							57.4		

1220 Concord Ave, Ste 450
Concord, CA

Grain Size Distribution

ASTM D422 / ASTM C136



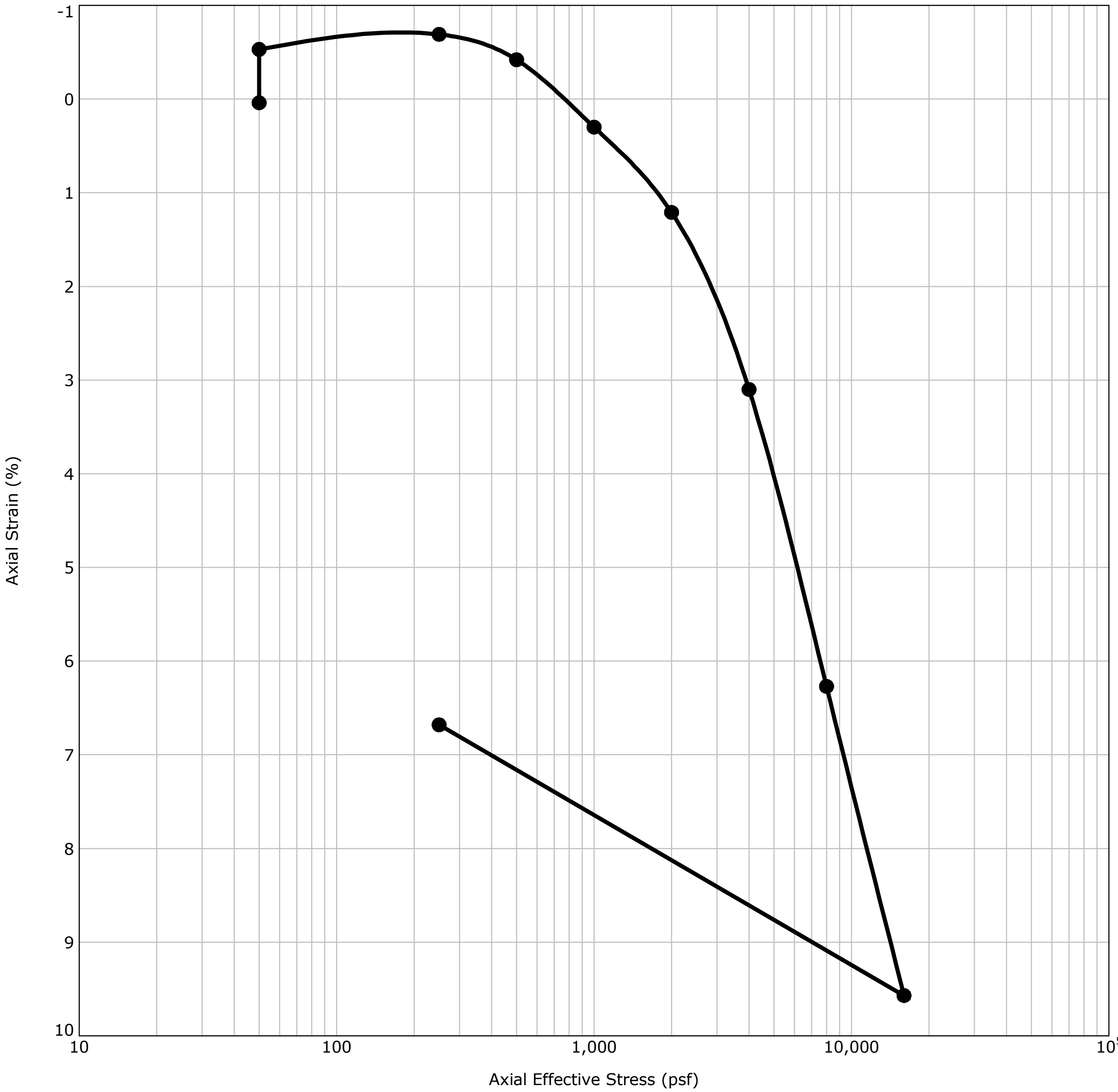
	Boring ID	Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
●	B-9	5 - 6.5	LEAN CLAY with SAND	CL	33	18	15		

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	B-9	5 - 6.5	0.075							75.7		

1220 Concord Ave, Ste 450
Concord, CA

One-Dimensional Consolidation Test

ASTM ASTM D2435



Boring ID	Depth (Ft)	Specimen #	Material Description	USCS	AASHTO
B-8	2.5 - 4.5	1	SANDY LEAN CLAY	CL	A-6

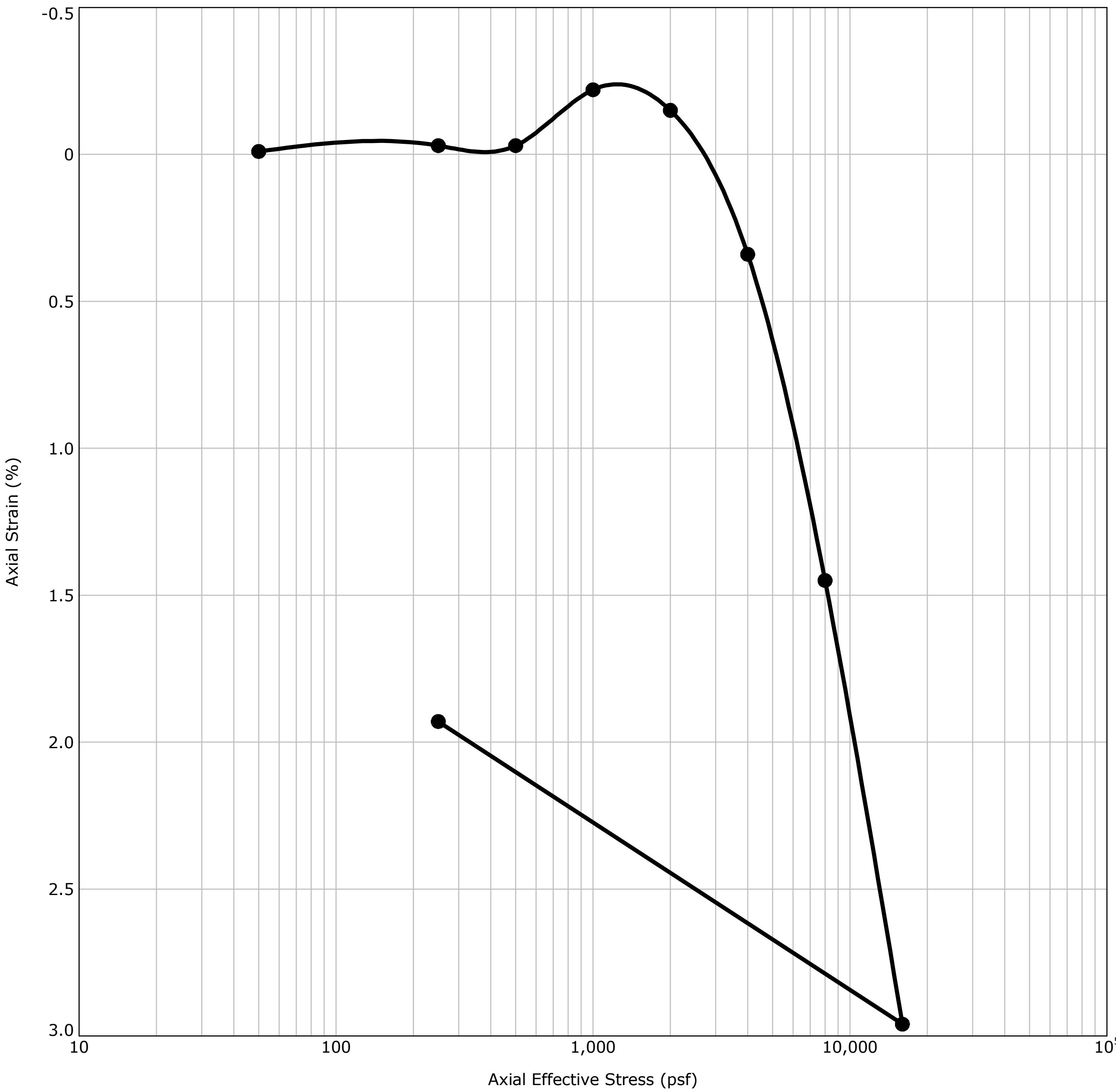
Natural		Initial Dry Density (pcf)	LL	PI	Specific Gravity	Overburden (psf)	P_c (psf)	C_c (% / log stress)	C_r (% / log stress)	Initial Void Ratio
Saturation (%)	Moisture (%)									
62.3	15.7	100.3	37	22	2.70	300				

Notes:

1220 Concord Ave, Ste 450
Concord, CA

One-Dimensional Consolidation Test

ASTM ASTM D2435



Boring ID	Depth (Ft)	Specimen #	Material Description	USCS	AASHTO
B-9	10 - 11.5	4	LEAN CLAY with SILT	CL	

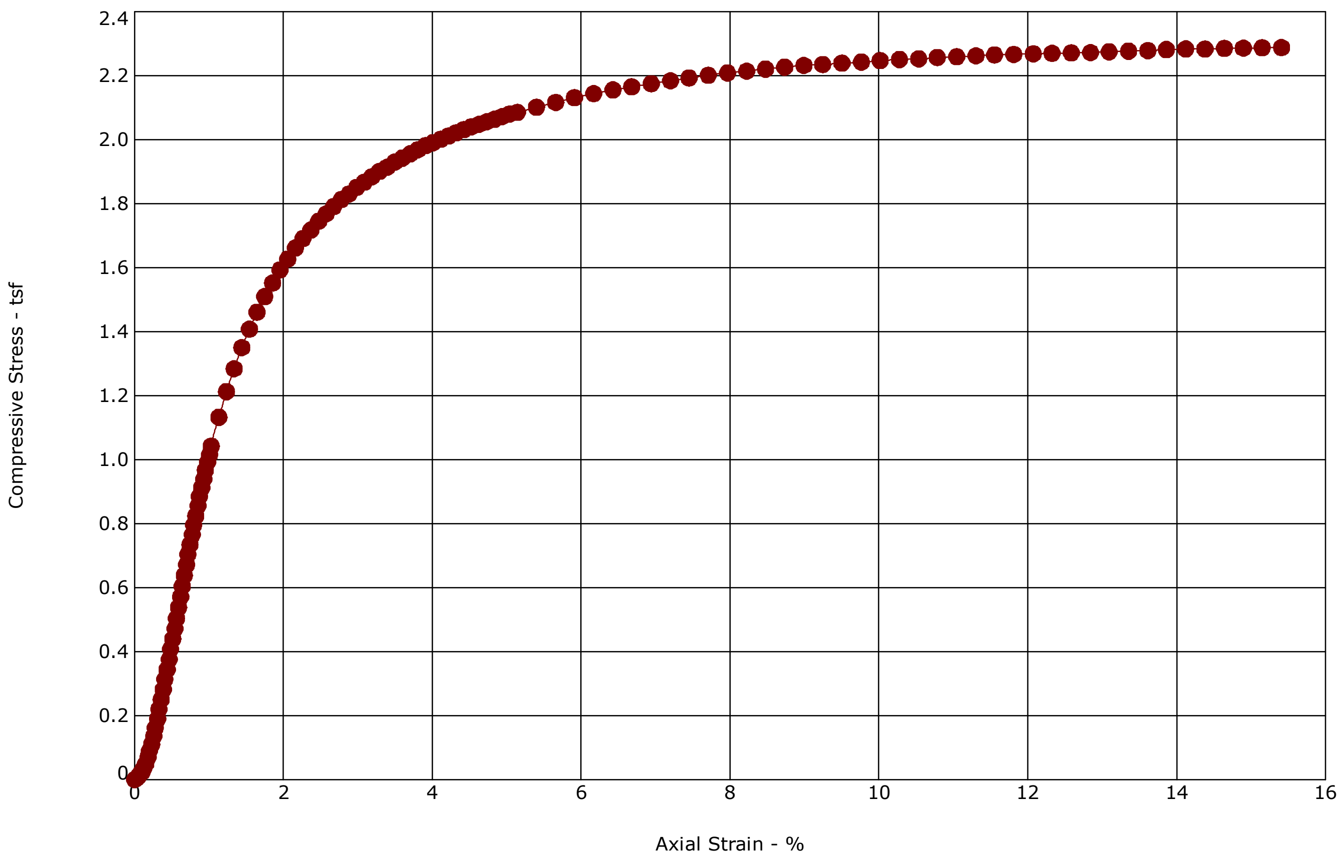
Natural		Initial Dry Density (pcf)	LL	PI	Specific Gravity	Overburden (psf)	P_c (psf)	C_c (% / log stress)	C_r (% / log stress)	Initial Void Ratio
Saturation (%)	Moisture (%)									
100.7	24.7	101.5			2.70	1200				

Notes:

1220 Concord Ave, Ste 450
Concord, CA

Unconfined Compression Test

ASTM D2166



Boring ID	Depth (Ft)	Sample type	LL	PL	PI	Fines (%)	Description
B-3	2.5 - 4	CARS					LEAN CLAY

Specimen Failure Mode

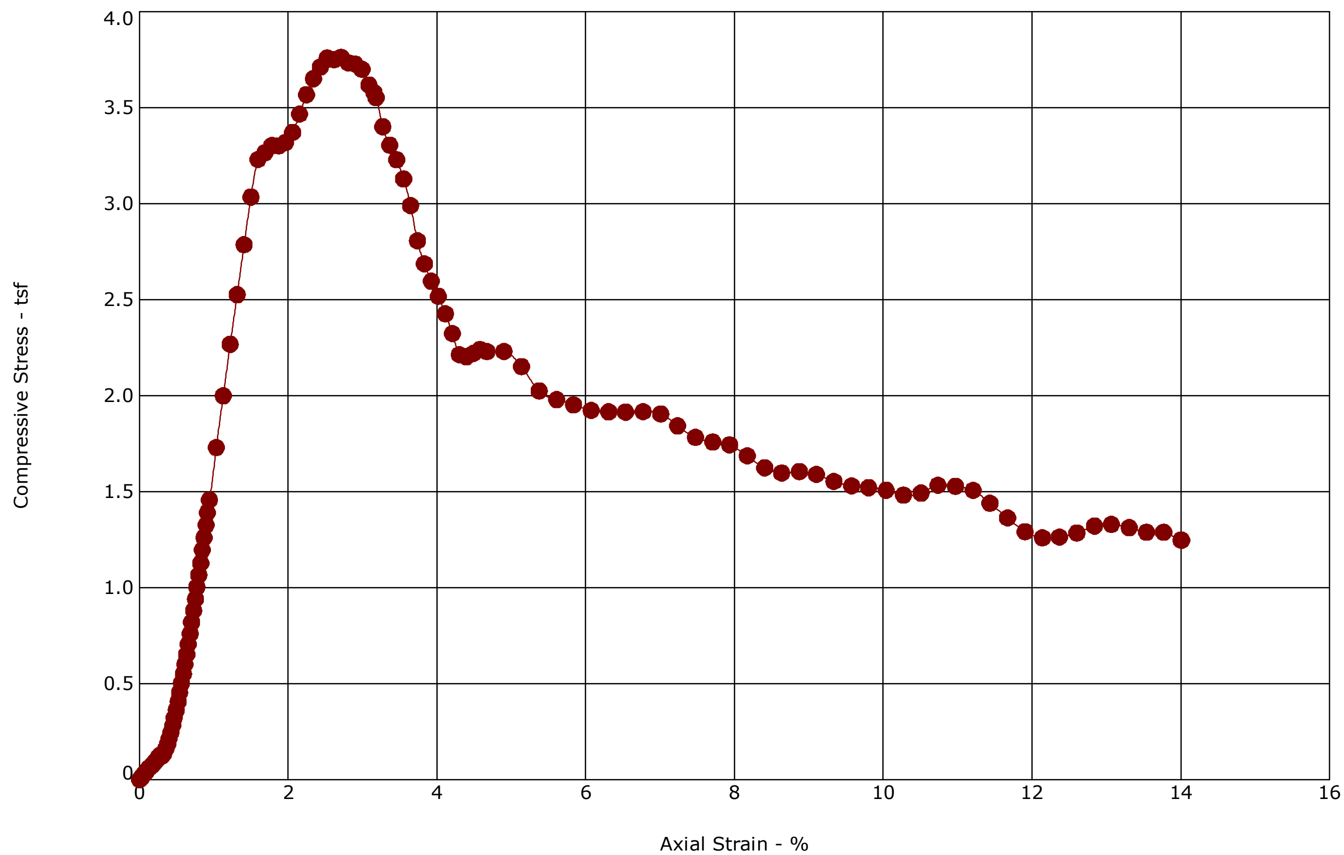
Specimen Test Data

Moisture Content (%):	25.0
Dry Density (pcf):	104
Diameter (in.):	2.40
Height (in.):	3.90
Height / Diameter Ratio:	1.62
Calculated Saturation (%):	107.50
Calculated Void Ratio:	0.63
Assumed Specific Gravity:	2.7
Failure Strain (%):	15.00
Unconfined Compressive Strength (tsf):	2.29
Undrained Shear Strength (tsf):	1.14
Strain Rate (in/min):	
Remarks:	

1220 Concord Ave, Ste 450
Concord, CA

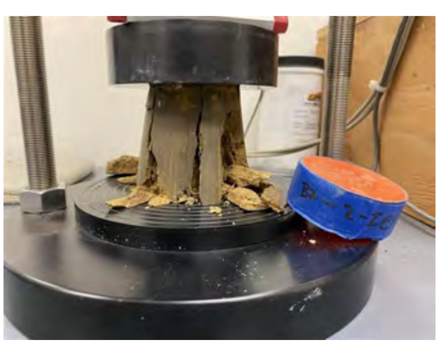
Unconfined Compression Test

ASTM D2166



Boring ID	Depth (Ft)	Sample type	LL	PL	PI	Fines (%)	Description
B-7	5 - 6.5	CARS					CLAYEY SAND

Specimen Failure Mode



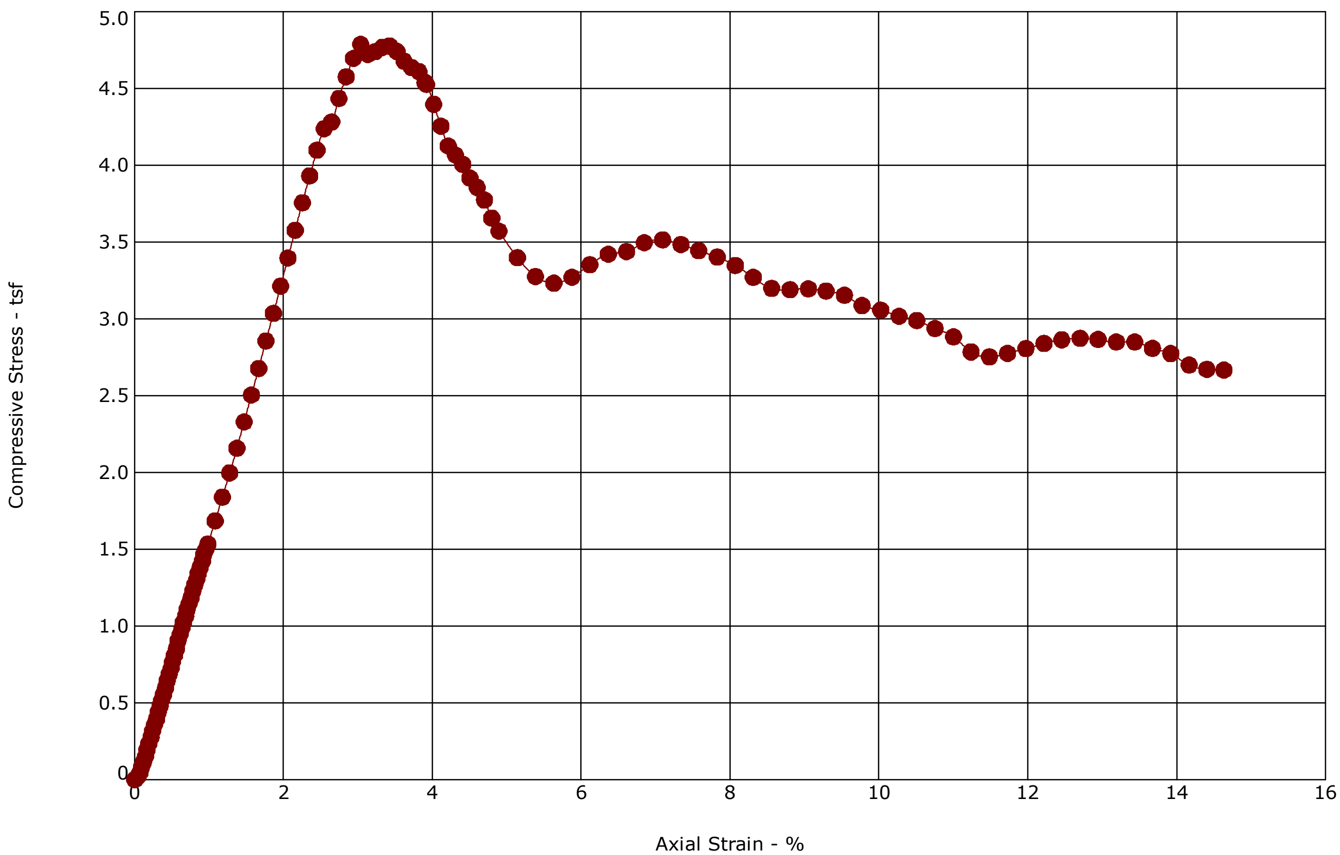
Specimen Test Data

Moisture Content (%):	16.4
Dry Density (pcf):	111
Diameter (in.):	2.39
Height (in.):	3.22
Height / Diameter Ratio:	1.34
Calculated Saturation (%):	86.00
Calculated Void Ratio:	0.52
Assumed Specific Gravity:	2.7
Failure Strain (%):	2.71
Unconfined Compressive Strength (tsf):	3.76
Undrained Shear Strength (tsf):	1.88
Strain Rate (in/min):	
Remarks:	

1220 Concord Ave, Ste 450
Concord, CA

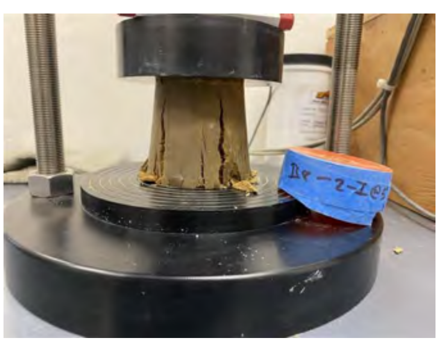
Unconfined Compression Test

ASTM D2166



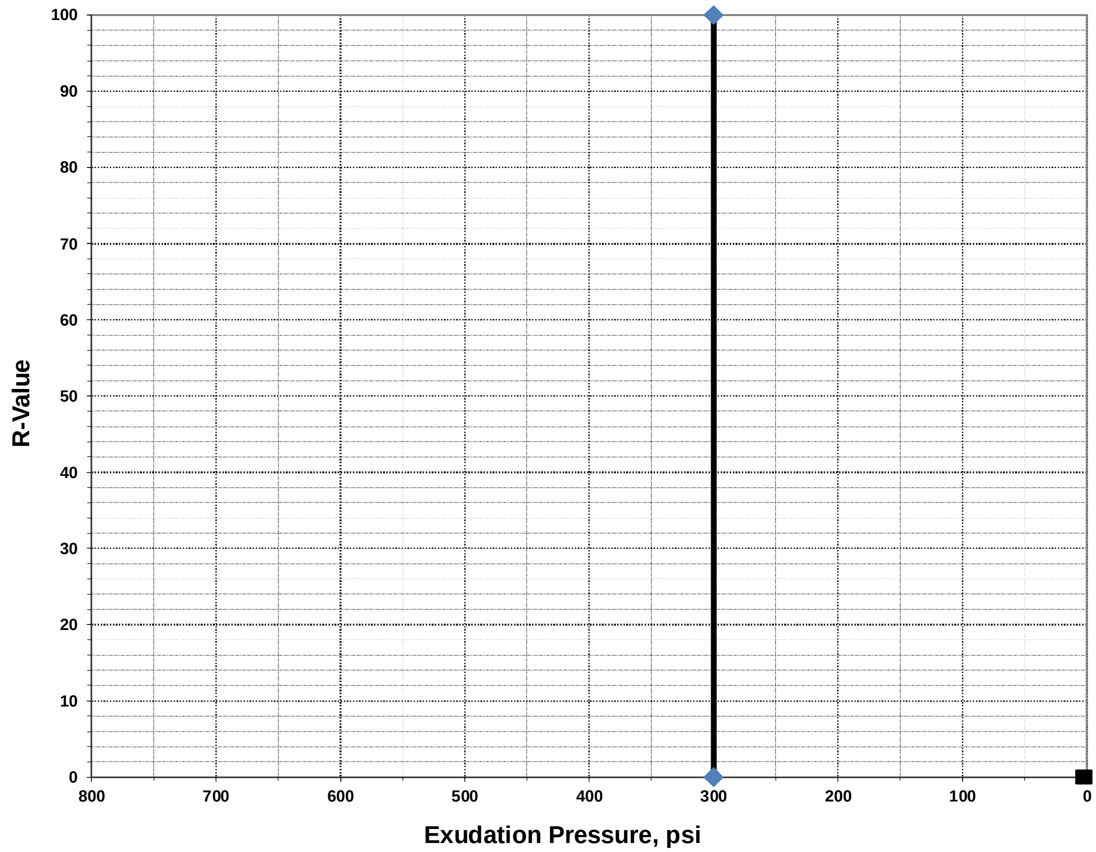
Boring ID	Depth (Ft)	Sample type	LL	PL	PI	Fines (%)	Description
B-8	5 - 6.5	CARS					LEAN CLAY

Specimen Failure Mode



Specimen Test Data

Moisture Content (%):	16.4
Dry Density (pcf):	114
Diameter (in.):	2.37
Height (in.):	3.08
Height / Diameter Ratio:	1.30
Calculated Saturation (%):	91.18
Calculated Void Ratio:	0.48
Assumed Specific Gravity:	2.7
Failure Strain (%):	3.04
Unconfined Compressive Strength (tsf):	4.79
Undrained Shear Strength (tsf):	2.39
Strain Rate (in/min):	
Remarks:	



Specimen Identification	Compaction Pressure (psi)	R-Value at 300 psi
B-6 @ 0.0 Ft	**90.0**	**<5**

Material extruded from bottom of mold during exudation on 1st attempt. Test aborted. Material has an R-value of <5

R-Value Test

Client: City of Walnut Creek

Project: Aquatic-Community Center at Heather Farm Park

Site:

Project No.: R1235045

902 Industrial Way
Lodi, California 95240
(209) 367-3701

Terracon
Explore with us

Client
City of Walnut Creek

Project
Aquatic-Community Center at Heather Farm Park

Sample Submitted By: Terracon (R1) **Date Tested:** 12/20/2023 **Project Number:** R1235045

Results of Corrosion Analysis

Sample Type	CARS	CARS	CARS
Sample Location	B1-1-1	B6-1-1	B10-1-1
Sample Depth (ft.)	2.5-4.0	2.5-4.0	2.5-4.0
pH Analysis, ASTM G 51	7.72	7.47	7.38
Water Soluble Sulfate (SO4), ASTM D516 (%)	0.016	0.019	0.003
Sulfides, AWWA 4500-S^{2-} D, (mg/kg)	<0.1	0.89	<0.1
Chlorides, AWWA 4500-CL^{-} E (%)	0.004	0.008	0.003
Red-Ox, ASTM G 200, (mV)	+365	+341	+368
Total Salts, AWWA 2520 B, (mg/kg)	340.0	379.0	178.5
Saturated Minimum Resistivity, ASTM G 57, (ohm-cm)	2,000	740	1,300

Reviewed By: *Paula Arends*
Paula Arends
Laboratory Manager

Supporting Information

Contents:

Note: All attachments are one page unless otherwise noted.

Terracon
1220 Concord Ave, Ste 450
Concord, CA

General Notes

Sampling

- Modified California Ring Sampler
- Grab Sample
- No Recovery
- Shelby Tube
- Standard Penetration Test

Water Level

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time
- Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

Field Tests

N	Standard Penetration Test Resistance (Blows/Ft.)
(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
UC	Unconfined Compressive Strength
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**Consistency of Fine-Grained Soils** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	**Standard Penetration or N-Value (Blows/Ft.)**	**Consistency**	**Unconfined Compressive Strength Qu (tsf)**	**Standard Penetration or N-Value (Blows/Ft.)**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

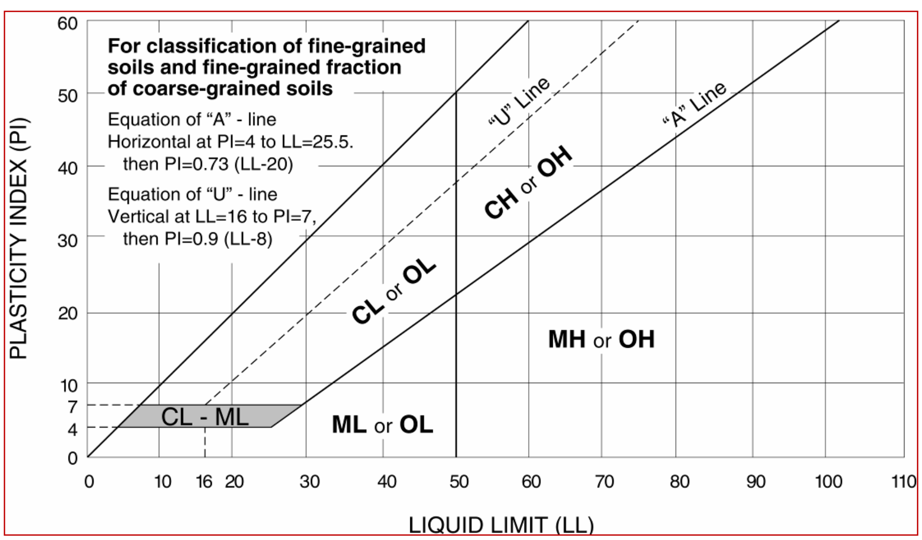
Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.

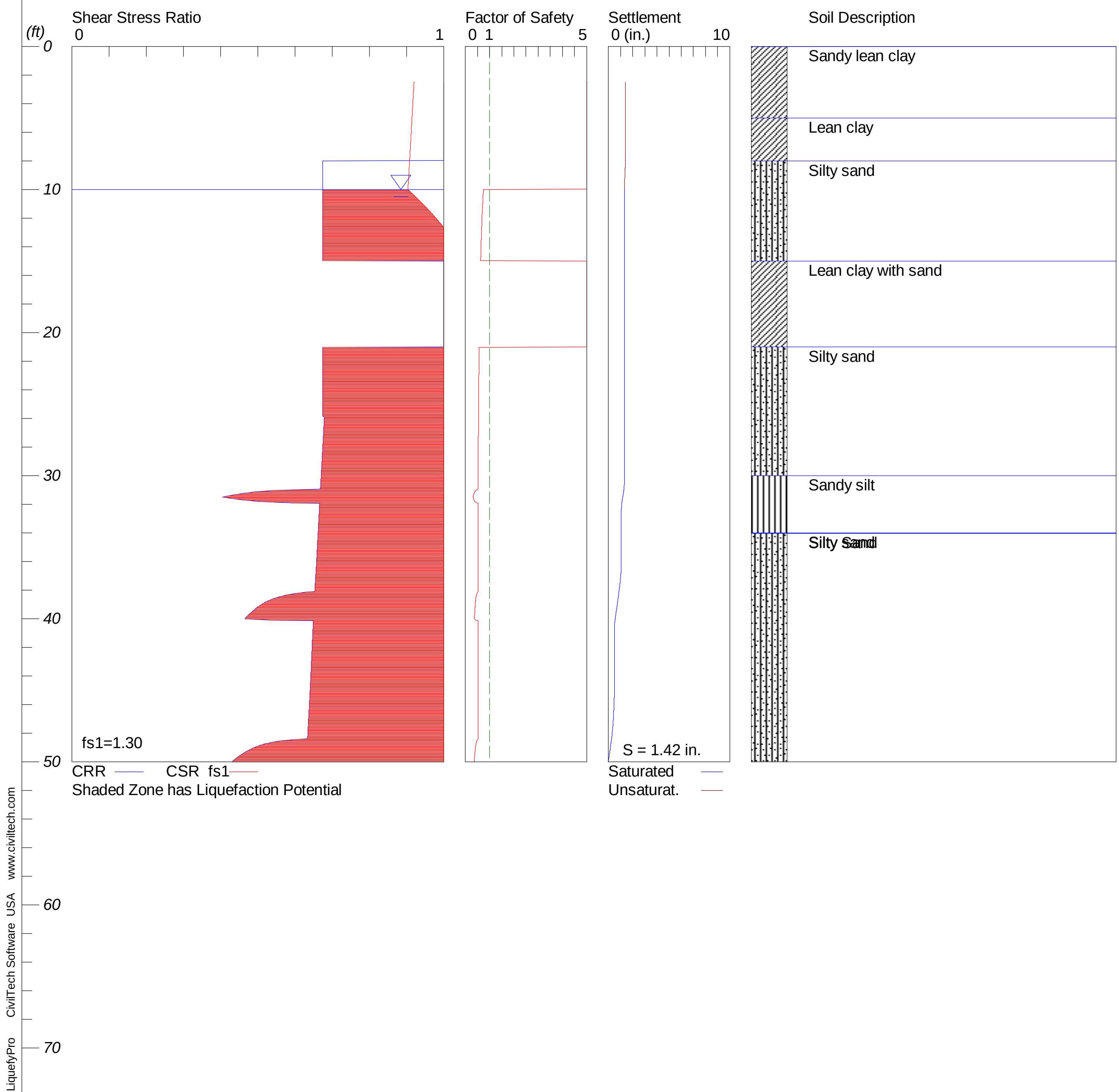


LIQUEFACTION ANALYSIS

Heather Farms

Hole No.=B-8 Water Depth=10 ft Surface Elev.=112

Magnitude=6.67
Acceleration=1.095g



APPENDIX G

NOISE MEASUREMENTS

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Noise Measurement Survey – 24 HR

Project Number: 20231287
Project Name: Heather Farm Park

Test Personnel: Dana Kwan
Equipment: Spark 706RC (SN:17637)

Site Number: LT-1 Date: 2/15/24

Time: From 6:00 p.m. To 6:00 p.m.

Site Location: On a tree east of North San Carlos Drive, approximately 300 feet from centerline, southeast part of Heather Farm Field 2 bordering the nearest residences

Primary Noise Sources: Light traffic from North San Carlos Drive

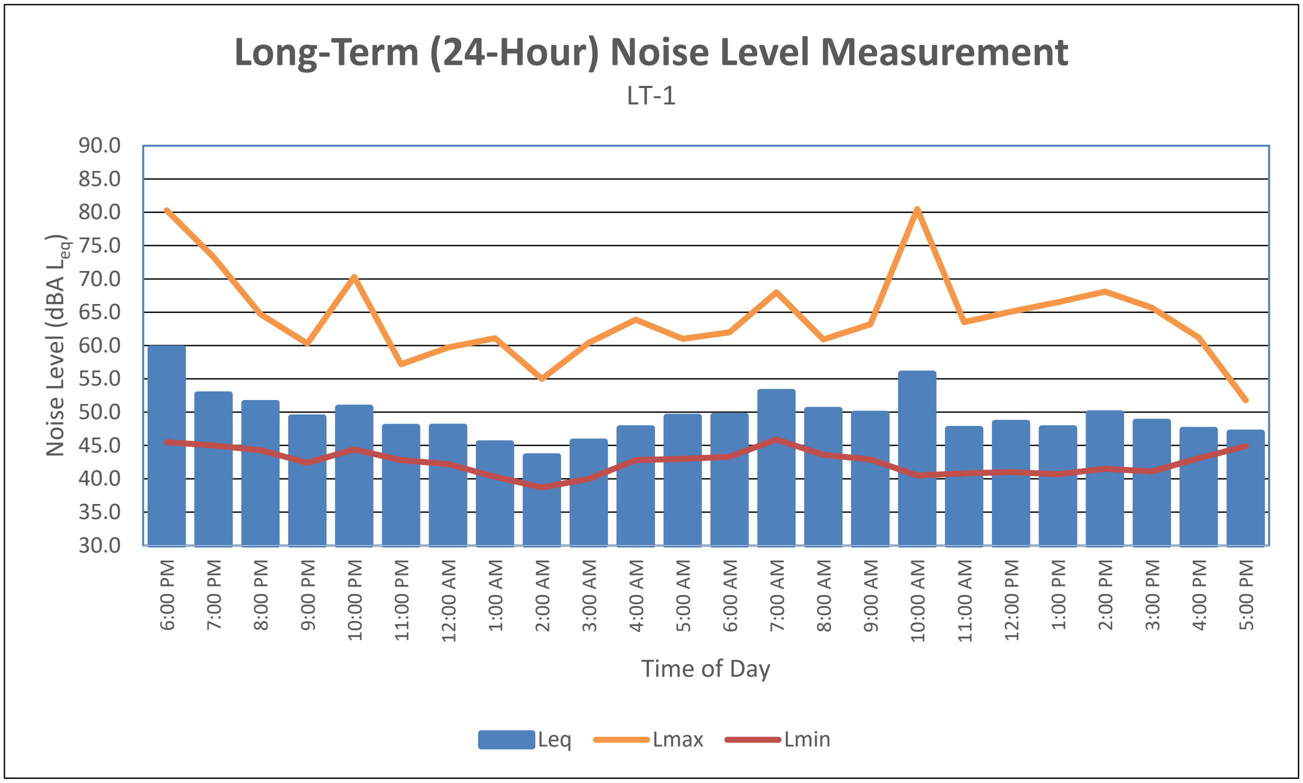
Comments: Children playing soccer on field.

Photo:

Long-Term (24-Hour) Noise Level Measurement Results at LT-1

Start Time	Date	Noise Level (dBA)		
		L_{eq}	L_{max}	L_{min}
6:00 PM	2/15/24	59.6	80.3	45.5
7:00 PM	2/15/24	52.7	73.3	45.0
8:00 PM	2/15/24	51.4	64.7	44.3
9:00 PM	2/15/24	49.2	60.3	42.4
10:00 PM	2/15/24	50.7	70.3	44.4
11:00 PM	2/15/24	47.8	57.2	42.8
12:00 AM	2/16/24	47.8	59.7	42.2
1:00 AM	2/16/24	45.3	61.1	40.3
2:00 AM	2/16/24	43.4	55.0	38.7
3:00 AM	2/16/24	45.6	60.4	40.0
4:00 AM	2/16/24	47.6	63.9	42.8
5:00 AM	2/16/24	49.3	61.0	43.0
6:00 AM	2/16/24	49.5	62.0	43.3
7:00 AM	2/16/24	53.0	68.0	45.9
8:00 AM	2/16/24	50.4	60.9	43.6
9:00 AM	2/16/24	49.8	63.2	42.9
10:00 AM	2/16/24	55.8	80.5	40.5
11:00 AM	2/16/24	47.5	63.5	40.8
12:00 PM	2/16/24	48.4	65.1	41.0
1:00 PM	2/16/24	47.6	66.5	40.7
2:00 PM	2/16/24	49.8	68.1	41.5
3:00 PM	2/16/24	48.6	65.7	41.1
4:00 PM	2/16/24	47.3	61.2	43.1
5:00 PM	2/16/24	47.0	51.8	44.9

Source: Compiled by LSA Associates, Inc. (2024).
dBA = A-weighted decibel
L_{eq} = equivalent continuous sound level
L_{max} = maximum instantaneous noise level
L_{min} = minimum measured sound level



Long-Term (24-Hour) Noise Level Measurement
LT-1
Noise Level (dBA Leq)
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
50.0
45.0
40.0
35.0
30.0
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
Time of Day
Leq
Lmax
Lmin

Noise Measurement Survey

Project Number: 20231287 Test Personnel: Dana Kwan
Project Name: Heather Farm Park Equipment: LD 720
Site Number: ST-1 Date: 2/15/24 Time: From 5:43 p.m To 5:58 p.m.

Site Location: Dirt area southeast of Diablo Hills Golf Course, adjacent to driveway, 90 feet from Marchbanks Drive centerline

Noise Sources: Traffic from Marchbanks Drive, occasional car on Diablo Hills Golf Course driveway

Measurement Results

	dBA
L_{eq}	54.0
L_{max}	74.5
L_{min}	49.5
L_2	57.7
L_8	56.1
L_{25}	54.7
L_{50}	53.2

Atmospheric Conditions:

Maximum Wind Velocity (mph)	2.0
Average Wind Velocity (mph)	0.7
Temperature (F)	58.5
Relative Humidity (%)	75.5
Comments: Calm	

Comments: Noise from Walnut Creek Masters Swimming School across from Marchbanks Drive, metal clanging coming from facility synchronized swimming practice, faint skateboard on concrete noises from skate park

Location Photo:

APPENDIX H

CONSTRUCTION EQUIPMENT CALCULATIONS

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Construction Calculations

Phase: Demolition

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Concrete Saw	1	90	20	50	0.5	90	83
Dozer	2	82	40	50	0.5	82	81
Excavator	3	81	40	50	0.5	81	82
					Combined at 50 feet	**91**	**87**
					Combined at Receptor 530 feet	**71**	**66**

Phase: Site Preparation

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Dozer	3	82	40	50	0.5	82	83
Tractor	4	84	40	50	0.5	84	86
					Combined at 50 feet	**86**	**88**
					Combined at Receptor 530 feet	**66**	**67**

Phase: Grading

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Excavator	1	81	40	50	0.5	81	77
Grader	1	85	40	50	0.5	85	81
Dozer	1	82	40	50	0.5	82	78
Tractor	3	84	40	50	0.5	84	85
					Combined at 50 feet	**89**	**87**
					Combined at Receptor 530 feet	**69**	**67**

Phase: Building Construction

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Crane	1	81	16	50	0.5	81	73
Man Lift	3	75	20	50	0.5	75	73
Generator	1	81	50	50	0.5	81	78
Tractor	3	84	40	50	0.5	84	85
Welder / Torch	1	74	40	50	0.5	74	70
					Combined at 50 feet	**87**	**86**
					Combined at Receptor 530 feet	**67**	**66**

Phase: Paving

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Drum Mixer	2	80	50	50	0.5	80	80
Paver	1	77	50	50	0.5	77	74
All Other Equipment > 5 HP	2	85	50	50	0.5	85	85
Roller	2	80	20	50	0.5	80	76
Tractor	1	84	40	50	0.5	84	80
					Combined at 50 feet	**89**	**88**
					Combined at Receptor 530 feet	**69**	**67**

Phase: Architectural Coating

Equipment	Quantity	Reference (dBA) 50 ft Lmax	Usage Factor[1]	Distance to Receptor (ft)	Ground Effects	Noise Level (dBA)	
						Lmax	Leq
Compressor (air)	1	78	40	50	0.5	78	74
					Combined at 50 feet	**78**	**74**
					Combined at Receptor 530 feet	**57**	**54**

Sources: RCNM

[1]- Percentage of time that a piece of equipment is operating at full power.

dBA – A-weighted Decibels

Lmax- Maximum Level

Leq- Equivalent Level

APPENDIX I

CEQA TRANSPORTATION ANALYSIS

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FEHR PEERS

Draft Memorandum

Date: June 14, 2024

To: Shanna Guiler, LSA

From: Kayla Gonzalez and Ian Barnes, PE, Fehr & Peers

Subject: Walnut Creek Heather Farm Park Projects – CEQA Transportation Analysis

WC24-4055

This technical memorandum documents the findings of the California Environmental Quality Act (CEQA) Transportation section vehicle-miles traveled (VMT) assessment and site plan evaluation for the Heather Farm Park Aquatics and Community Center Project (Project) located in Walnut Creek, California.

The following sections provide a description of the proposed Project, trip generation estimates, CEQA VMT analysis, a site plan evaluation, and conclusions.

Project Description

The Project is located in Heather Farm Park on North San Carlos Drive in Walnut Creek, California. The Project site is bound by Heather Farm Park Lake to the north, North San Carlos Drive to the east, Heather Drive to the south, and open space to the west including the Gardens at Heather Farm. The Project includes demolition of the existing and construction of the new Heather Farm Park Community Center and Aquatics. Modifications and improvements to the Concrete Pond, parking, and surrounding site are also proposed in the Project.

Local vehicular access to the site is provided via North San Carlos Drive, and regional vehicular access is provided by the Ygnacio Valley Road on- and off-ramp of Interstate 680 (I-680). Pedestrian access to and throughout the Project site is provided by sidewalks and concrete pathways.

CEQA Vehicle-Miles Traveled (VMT) Analysis

Senate Bill 743 (Steinberg, 2013) instructed the State Office of Planning and Research (OPR) to update the CEQA Guidelines to remove congestion-based analysis (such as level of service analysis) from CEQA Transportation analysis, and to install a new metric (vehicle-miles traveled, or

VMT). The intent of SB 743 was to encourage infill development, promote healthier communities through active transportation (e.g. walking and bicycling), and align CEQA Transportation analysis to aid California in meeting greenhouse gas reduction targets set by other pieces of legislation (i.e. AB 32). Ultimately, SB 743 has shifted CEQA transportation analysis from measuring the effects of a project on drivers, to measuring the environmental effects of driving generated by a project. Adopted in December 2018, Section 15064.3 of the CEQA Guidelines notes that VMT is the most appropriate metric for the analysis of impacts in the Transportation section of CEQA analysis.

VMT Screening Criteria

In October 2020, the City of Walnut Creek adopted VMT-based analysis methods, which include VMT metrics, thresholds, and screening criteria for evaluating a project's VMT impact. Based on the City thresholds and screening criteria, a project can be screened out for a formal VMT analysis if certain criteria are met that would signify that a project would be presumed to result in a less-than-significant CEQA Transportation section impact with respect to VMT. A project's impact on VMT is considered less-than-significant and should not require further VMT analysis if the project meets at least one of the following criteria[1]:

- Projects that:
  - Generate or attract fewer than 110 daily vehicle trips, or
  - Projects of 10,000 square feet or less of non-residential space or 20 residential units or less, or otherwise generating less than 836 VMT per day
- Residential, retail, office projects, or mixed-use projects proposed within one half miles of an existing major transit stop[2] or an existing stop along a high-quality transit corridor[3].
- Residential projects (home-based VMT) at 15% or below baseline County-wide home-based average VMT per capita, or employment projects (employee VMT) at 15% or below the baseline Bay Area average commute VMT per employee in areas with low VMT that incorporate similar VMT reducing features (i.e., density, mix of uses, transit accessibility).
- Public facilities (e.g., emergency vehicles, passive parks [low-intensity recreation, open space], libraries, community centers, public utilities) and government buildings.

[1] The screening criteria is based on the City of Walnut Creek's thresholds adopted October 6, 2020.

[2] Pub. Resources Code, § 21064.3 ("'Major transit stop' means a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.").

[3] Pub. Resources Code, § 21155 ("For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.").

If the proposed Project does not meet any of the criteria, then the City of Walnut Creek may require a formal CEQA impact analysis, including a detailed VMT analysis, and additional local transportation analysis.

VMT Screening Assessment

The following section summarizes Fehr & Peers' findings from the VMT screening assessment.

Trip Generation Analysis

Trip generation refers to the process of estimating the amount of vehicular traffic a project would add to the surrounding roadway system. Data was provided by City of Walnut Creek staff (detailed calculations are provided in **Appendix A**) with information regarding the existing allowable trip generation, the proposed Project trip generation, and the annual average trips per day for each use that would result in an expected net change. For the purposes of the CEQA Transportation section VMT assessment, the annual average trip generation was evaluated – the annual average is inclusive of weekdays, weekends, peak and off-peak seasons. It assumes the maximum allowable capacities of existing and proposed rental facilities.

The proposed trip generation for the special event rentals and classes were compared to the estimated trip generation of the existing allowable use. The aquatics center and office land uses are expected to be generally equivalent to the existing allowable use based on anticipated programmed use of the pool facility and number of employees for the office use; therefore, the aquatics and office uses are not anticipated to generate net new annual average daily trips.

Table 1 summarizes the vehicle trip generation comparison for daily average trips.

Table 1: Annual Average Trip Generation Summary

Land Use	Existing Daily Trips	Proposed Daily Trips	Net New Trips
Pool	Uses will be similar between Existing Allowable and Proposed Conditions		0
Special Event Rentals	250	302	52
Classes	192	230	38
Office	Uses will be similar between Existing Allowable and Proposed Conditions		0
Total Net New Daily Trips			***90***

Source: City of Walnut Creek, January 2024.

The proposed Project is expected to generate an annual average of 532 daily vehicle trips from the special event rentals and classes combined, whereas the existing allowable uses generate approximately 442 annual average daily vehicle trips. The Project office space and aquatics center uses are expected to operate similarly to the existing allowable use of office space and aquatics, with the same number of employees using the office and similar swim programming; therefore, no net change in annual average daily trips is anticipated. The Project is expected to generate 90 net new annual average daily vehicle trips.

Criteria: Does the Project generate or attract fewer that 110 daily vehicle trips?

The proposed Project trip generation estimates were used to determine whether the Project would generate fewer than 110 daily vehicle trips to meet the VMT screening criteria. Existing and proposed trip generation estimates were compared to determine whether the Project would add net new vehicle trips. As presented in **Table 1**, the Project is not expected to generate more than 110 daily trips and therefore meets the VMT screening criteria related to trip generation.

Criteria: Does the Project generate less than 836 VMT per day?

As an additional reasonableness check, the trip generation estimates were compared against the 836 VMT per day criteria to determine the average trip length for the special event rentals under the screening scenario. Given that City of Walnut Creek residents represent about two-thirds of registrants, and the fact that almost all of Walnut Creek (save for the southern reaches of the Rossmoor neighborhood that is served by the Rossmoor Event Center and recreational clubhouses/pool) is within a 4.0-mile radius of Heather Farm Park, the maximum reasonable trip length for Walnut Creek residents to access the Project site is approximately four miles. With 38 of the net new class-related trips at this four-mile trip length, this equates to 152 vehicle-miles traveled per day and 680 VMT per day for the remaining trips related to special events.

This results in the average trip length for the remaining 52 net-new special event trips of approximately 13 miles in order to meet the 836 VMT per day threshold. The 13-mile radius from Heather Farm Park covers the vast majority of central Contra Costa County and into eastern Oakland, Berkeley, and Piedmont, and includes Oakland International Airport. Because there are numerous other special event spaces within this area, this 13-mile trip length assumption is reasonable. The project would also likely fall under 836 VMT per day screening threshold as well.

Criteria: Is the Project a public facility and/or government building?

A public facility is defined as an institutional response to basic human needs, such as health, education, and recreation to name a few. The Project includes the demolition and reconstruction and/or improvements to the current facilities on-site: a new community center and aquatic center, and improved concrete pond and parking facilities. These new and improved facilities will be accessible to the public as they currently are now and will continue to serve the surrounding community. Therefore, the Project qualifies as a public facility, and so would meet the City's VMT screening criteria based on this type of community-serving facility.

Assessment Result

The Project satisfies three of the City-established screening criteria and, therefore, is presumed to result in a ***less-than-significant*** VMT impact.

CEQA Site Plan Evaluation

This section evaluates potential multimodal impacts to the existing network. The proposed site plan for the Project was reviewed to evaluate the multimodal site access and on-site circulation.

Vehicular Access and Circulation

The Project, as currently proposed, provides access to the public circulation system with four new project driveways; three driveways along North San Carlos Drive and one within the existing parking lot to the north of the site. Two project driveways are proposed on the north-end of the site by the community center, giving access to the drop-off area and to the restricted vehicle path located by the northern parking lot. The driveway just south of the site will be a restricted service vehicle entrance to the open pool deck area. The southernmost driveway will provide entrance to a combined fire apparatus and service vehicle road to provide access to the park storage building and trash enclosure.

The posted speed limit along North San Carlos Drive is 25 miles per hour. According to Table 201.1 of the Caltrans *Highway Design Manual* (HDM), the stopping sight distance at 25 miles per hour is 150 feet. The observed sight distance along North San Carlos Drive appears to be over 250 feet, indicating that the sight distance is adequate. It is strongly recommended that the final site improvement plan be reviewed for potential sight distance impediments including any new signs, above ground utility boxes, or landscaping proposed in the sight triangle.

Pedestrian and Bicycle Access and Circulation

The proposed project is not anticipated to eliminate off-site pedestrian facilities, create hazardous conditions for pedestrians by changing off-site geometric features or introducing incompatible vehicle types to the roadway system, or conflict with any existing or planned pedestrian facilities. Therefore, pedestrian system impacts are ***less-than-significant*** as the Project is not anticipated to degrade the off-site pedestrian network.

The proposed project design would not eliminate bicycle facilities that connect to the area circulation system, does not conflict with existing or planned bicycle facilities, nor would it create a hazardous condition for bicyclists by changing off-site geometric features or introducing incompatible vehicle types to the roadway system. Therefore, the impacts to bicyclists are ***less-than-significant***.

Emergency Vehicle Access

Factors such as the number of access points, roadway width, and proximity to fire stations determine whether a site provides sufficient emergency access. Emergency vehicle access is provided by the four project driveways, in which two driveways are dedicated restricted vehicle access paths.

The fire stations most likely to serve the site are the Contra Costa Fire Department Stations 1, 7, and 10, all of which are within one and a half mile from the project site. While the Project may increase traffic congestion in the vicinity of the Project, emergency vehicles would still retain the right to preempt traffic signals and use lights and sirens to indicate to drivers that they need to yield. Thus, the Project's impacts to emergency vehicle access are ***less-than-significant***.

Transit Access

Fixed-route public transit services operate within one-quarter of a mile of the project site. Passenger rail transit service operates within one mile of the project site. While the Project could generate new demand for the public transit services and facilities that serve the area, transit system and transit vehicle capacities are not expected to be exceeded; the Project is not in conflict with existing or planned public transit facilities. Therefore, impacts to public transit are ***less-than-significant***.

Conclusion

A project is considered to have a less-than-significant VMT impact if it satisfies one of the following criteria:

- Projects that:
  - Generate or attract fewer than 110 daily vehicle trips, or
  - Projects of 10,000 square feet or less of non-residential space or 20 residential units or less, or otherwise generating less than 836 VMT per day
- Residential, retail, office projects, or mixed-use projects proposed within one half miles of an existing major transit stop[4] or an existing stop along a high-quality transit corridor[5].

[4] Pub. Resources Code, § 21064.3 ("'Major transit stop' means a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods.").
[5] Pub. Resources Code, § 21155 ("For purposes of this section, a high-quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours.").

- Residential projects (home-based VMT) at 15% or below baseline County-wide home-based average VMT per capita, or employment projects (employee VMT) at 15% or below the baseline Bay Area average commute VMT per employee in areas with low VMT that incorporate similar VMT reducing features (i.e., density, mix of uses, transit accessibility).
- Public facilities (e.g., emergency vehicles, passive parks [low-intensity recreation, open space], libraries, community centers, public utilities) and government buildings.

The VMT analysis concludes the Project qualifies as a community facility, generates fewer than 110 daily vehicle trips, and is anticipated to generate less than 836 VMT per day. Therefore, the Project is presumed not to have a VMT-related transportation impact under the City's guidelines and is screened out of additional VMT analysis. Thus, the Project satisfies the City-established screening criteria and results in a ***less-than-significant*** VMT impact.

The Project's proposed site plan was reviewed to evaluate multimodal site access and on-site circulation. The Project was found to have a less-than-significant impact on all modes of travel, including emergency vehicles, and its features do not conflict with established City goals and policies related to the off-site circulation system (bicycle, pedestrian, and transit), as required by CEQA.