Appendix A

Air Quality Modeling Results
1.0 Project Characteristics

1.1 Land Usage

<table>
<thead>
<tr>
<th>Land Uses</th>
<th>Size</th>
<th>Metric</th>
<th>Lot Acreage</th>
<th>Floor Surface Area</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0.30</td>
<td>Acre</td>
<td>0.30</td>
<td>13,068.00</td>
<td>0</td>
</tr>
</tbody>
</table>

1.2 Other Project Characteristics

<table>
<thead>
<tr>
<th>Urbanization</th>
<th>Rural</th>
<th>Wind Speed (m/s)</th>
<th>2.2</th>
<th>Precipitation Freq (Days)</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Zone</td>
<td>5</td>
<td>Operational Year</td>
<td>2019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utility Company</td>
<td>Pacific Gas &amp; Electric Company</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2 Intensity (lb/MWhr)</td>
<td>641.35</td>
<td>CH4 Intensity (lb/MWhr)</td>
<td>0.029</td>
<td>N2O Intensity (lb/MWhr)</td>
<td>0.006</td>
</tr>
</tbody>
</table>

1.3 User Entered Comments & Non-Default Data

Project Characteristics -
Land Use -
Construction Phase - Assume 6 months of construction
Off-road Equipment - A drill rig will be used.
Grading - 0.3 acres graded
## 2.0 Emissions Summary

<table>
<thead>
<tr>
<th>Table Name</th>
<th>Column Name</th>
<th>Default Value</th>
<th>New Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>tblConstructionPhase</td>
<td>NumDays</td>
<td>2.00</td>
<td>130.00</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>NumDays</td>
<td>5.00</td>
<td>10.00</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>NumDays</td>
<td>1.00</td>
<td>20.00</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>PhaseEndDate</td>
<td>4/4/2018</td>
<td>10/26/2018</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>PhaseEndDate</td>
<td>4/11/2018</td>
<td>11/9/2018</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>PhaseStartDate</td>
<td>4/3/2018</td>
<td>4/28/2018</td>
</tr>
<tr>
<td>tblProjectCharacteristics</td>
<td>OperationalYear</td>
<td>2018</td>
<td>2019</td>
</tr>
<tr>
<td>tblProjectCharacteristics</td>
<td>UrbanizationLevel</td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>tblGrading</td>
<td>AcresOfGrading</td>
<td>10.00</td>
<td>0.30</td>
</tr>
<tr>
<td>tblGrading</td>
<td>MaterialImported</td>
<td>0.00</td>
<td>1,500.00</td>
</tr>
<tr>
<td>tblOffRoadEquipment</td>
<td>OffRoadEquipmentType</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tblOffRoadEquipment</td>
<td>OffRoadEquipmentType</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tblOffRoadEquipment</td>
<td>OffRoadEquipmentType</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tblOffRoadEquipment</td>
<td>OffRoadEquipmentType</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 2.1 Overall Construction

### Unmitigated Construction

<table>
<thead>
<tr>
<th>Year</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tons/yr</td>
<td>MT/yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>0.0856</td>
<td>0.7908</td>
<td>0.6156</td>
<td>1.0700e-003</td>
<td>0.0571</td>
<td>0.0474</td>
<td>0.1045</td>
<td>0.0290</td>
<td>0.0450</td>
<td>0.0741</td>
<td>0.0450</td>
<td>0.0290</td>
<td>0.1045</td>
<td>0.0000</td>
<td>96.3223</td>
<td>96.3223</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.0856</td>
<td>0.7908</td>
<td>0.6156</td>
<td>1.0700e-003</td>
<td>0.0571</td>
<td>0.0474</td>
<td>0.1045</td>
<td>0.0290</td>
<td>0.0450</td>
<td>0.0741</td>
<td>0.0450</td>
<td>0.0290</td>
<td>0.1045</td>
<td>0.0000</td>
<td>96.3222</td>
<td>96.3222</td>
</tr>
</tbody>
</table>

### Mitigated Construction

<table>
<thead>
<tr>
<th>Year</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tons/yr</td>
<td>MT/yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>0.0856</td>
<td>0.7908</td>
<td>0.6156</td>
<td>1.0700e-003</td>
<td>0.0571</td>
<td>0.0474</td>
<td>0.1045</td>
<td>0.0290</td>
<td>0.0450</td>
<td>0.0740</td>
<td>0.0450</td>
<td>0.0290</td>
<td>0.1045</td>
<td>0.0000</td>
<td>96.3222</td>
<td>96.3222</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.0856</td>
<td>0.7908</td>
<td>0.6156</td>
<td>1.0700e-003</td>
<td>0.0571</td>
<td>0.0474</td>
<td>0.1045</td>
<td>0.0290</td>
<td>0.0450</td>
<td>0.0740</td>
<td>0.0450</td>
<td>0.0290</td>
<td>0.1045</td>
<td>0.0000</td>
<td>96.3222</td>
<td>96.3222</td>
</tr>
</tbody>
</table>

### Percent Reduction

<table>
<thead>
<tr>
<th>% Reduction</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00%</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
## 2.2 Overall Operational

### Unmitigated Operational

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Start Date</th>
<th>End Date</th>
<th>Maximum Unmitigated ROG + NOX (tons/quarter)</th>
<th>Maximum Mitigated ROG + NOX (tons/quarter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4-2-2018</td>
<td>7-1-2018</td>
<td>0.3554</td>
<td>0.3554</td>
</tr>
<tr>
<td>2</td>
<td>7-2-2018</td>
<td>9-30-2018</td>
<td>0.3602</td>
<td>0.3602</td>
</tr>
<tr>
<td></td>
<td>Highest</td>
<td></td>
<td>0.3602</td>
<td>0.3602</td>
</tr>
</tbody>
</table>

Complete the Gap - San Mateo County, Annual
### 2.2 Overall Operational

**Mitigated Operational**

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive</th>
<th>Exhaust</th>
<th>PM10 Total</th>
<th>Fugitive</th>
<th>Exhaust</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Mobile</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Waste</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Water</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Total</td>
<td>1.1200e-003</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percent Reduction</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive</th>
<th>Exhaust</th>
<th>PM10 Total</th>
<th>Fugitive</th>
<th>Exhaust</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### 3.0 Construction Detail

**Construction Phase**

<table>
<thead>
<tr>
<th>Phase Number</th>
<th>Phase Name</th>
<th>Phase Type</th>
<th>Start Date</th>
<th>End Date</th>
<th>Num Days Week</th>
<th>Num Days</th>
<th>Phase Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site Preparation</td>
<td>Site Preparation</td>
<td>4/2/2018</td>
<td>4/27/2018</td>
<td>5</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Grading</td>
<td>Grading</td>
<td>4/28/2018</td>
<td>10/26/2018</td>
<td>5</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Paving</td>
<td>Paving</td>
<td>10/27/2018</td>
<td>11/9/2018</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
## OffRoad Equipment

<table>
<thead>
<tr>
<th>Phase Name</th>
<th>Offroad Equipment Type</th>
<th>Amount</th>
<th>Usage Hours</th>
<th>Horse Power</th>
<th>Load Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paving</td>
<td>Cement and Mortar Mixers</td>
<td>4</td>
<td>6.00</td>
<td>9</td>
<td>0.56</td>
</tr>
<tr>
<td>Grading</td>
<td>Concrete/Industrial Saws</td>
<td>1</td>
<td>8.00</td>
<td>81</td>
<td>0.73</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>Graders</td>
<td>1</td>
<td>8.00</td>
<td>187</td>
<td>0.41</td>
</tr>
<tr>
<td>Paving</td>
<td>Tractors/Loaders/Backhoes</td>
<td>1</td>
<td>7.00</td>
<td>97</td>
<td>0.37</td>
</tr>
<tr>
<td>Architectural Coating</td>
<td>Bore/Drill Rigs</td>
<td></td>
<td></td>
<td>221</td>
<td>0.50</td>
</tr>
<tr>
<td>Architectural Coating</td>
<td>Excavators</td>
<td></td>
<td></td>
<td>158</td>
<td>0.38</td>
</tr>
<tr>
<td>Architectural Coating</td>
<td>Graders</td>
<td></td>
<td></td>
<td>187</td>
<td>0.41</td>
</tr>
<tr>
<td>Paving</td>
<td>Pavers</td>
<td></td>
<td></td>
<td>130</td>
<td>0.42</td>
</tr>
<tr>
<td>Paving</td>
<td>Rollers</td>
<td>1</td>
<td>7.00</td>
<td>80</td>
<td>0.38</td>
</tr>
<tr>
<td>Architectural Coating</td>
<td>Pavers</td>
<td></td>
<td></td>
<td>130</td>
<td>0.42</td>
</tr>
<tr>
<td>Grading</td>
<td>Rubber Tired Dozers</td>
<td>1</td>
<td>1.00</td>
<td>247</td>
<td>0.40</td>
</tr>
<tr>
<td>Grading</td>
<td>Tractors/Loaders/Backhoes</td>
<td>2</td>
<td>6.00</td>
<td>97</td>
<td>0.37</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>Tractors/Loaders/Backhoes</td>
<td>1</td>
<td>8.00</td>
<td>97</td>
<td>0.37</td>
</tr>
</tbody>
</table>

### Projects

**OffRoad Equipment**

- **Paving**
  - Cement and Mortar Mixers: 4 units, 6.00 hours, 9 horse power, 0.56 load factor
  - Concrete/Industrial Saws: 1 unit, 8.00 hours, 81 horse power, 0.73 load factor

- **Grading**
  - Graders: 1 unit, 8.00 hours, 187 horse power, 0.41 load factor

- **Site Preparation**
  - Tractors/Loaders/Backhoes: 1 unit, 7.00 hours, 97 horse power, 0.37 load factor

- **Paving**
  - Bore/Drill Rigs: 221 units, 0.50 load factor
  - Excavators: 158 units, 0.38 load factor
  - Graders: 187 units, 0.41 load factor
  - Pavers: 130 units, 0.42 load factor
  - Rollers: 1 unit, 80 units, 0.38 load factor

- **Grading**
  - Rubber Tired Dozers: 1 unit, 247 units, 0.40 load factor
  - Tractors/Loaders/Backhoes: 2 units, 6.00 hours, 97 horse power, 0.37 load factor

- **Site Preparation**
  - Tractors/Loaders/Backhoes: 1 unit, 8.00 hours, 97 horse power, 0.37 load factor
### 3.1 Mitigation Measures Construction

### 3.2 Site Preparation - 2018

**Unmitigated Construction On-Site**

<table>
<thead>
<tr>
<th>Phase Name</th>
<th>Offroad Equipment Count</th>
<th>Worker Trip Number</th>
<th>Vendor Trip Number</th>
<th>Hauling Trip Number</th>
<th>Worker Trip Length</th>
<th>Vendor Trip Length</th>
<th>Hauling Trip Length</th>
<th>Worker Vehicle Class</th>
<th>Vendor Vehicle Class</th>
<th>Hauling Vehicle Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading</td>
<td></td>
<td>4</td>
<td>10.00</td>
<td>0.00</td>
<td>188.00</td>
<td>10.80</td>
<td>6.60</td>
<td>20.00</td>
<td>LD_Mix</td>
<td>HDT_Mix</td>
</tr>
<tr>
<td>Paving</td>
<td></td>
<td>7</td>
<td>18.00</td>
<td>0.00</td>
<td>0.00</td>
<td>10.80</td>
<td>6.60</td>
<td>20.00</td>
<td>LD_Mix</td>
<td>HDT_Mix</td>
</tr>
<tr>
<td>Site Preparation</td>
<td></td>
<td>2</td>
<td>5.00</td>
<td>0.00</td>
<td>0.00</td>
<td>10.80</td>
<td>6.60</td>
<td>20.00</td>
<td>LD_Mix</td>
<td>HDT_Mix</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fugitive Dust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.6000e-004</td>
<td>0.0000</td>
<td>1.6000e-004</td>
<td>2.0000e-005</td>
<td>0.0000</td>
<td>2.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Off-Road</td>
<td>7.8600e-003</td>
<td>0.0976</td>
<td>0.0425</td>
<td>1.0000e-004</td>
<td>4.1800e-003</td>
<td>4.1800e-003</td>
<td>3.8500e-003</td>
<td>3.8500e-003</td>
<td>0.0000</td>
<td>8.9150</td>
<td>8.9150</td>
<td>2.7800e-003</td>
<td>0.0000</td>
<td>8.9644</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7.8600e-003</td>
<td>0.0976</td>
<td>0.0425</td>
<td>1.0000e-004</td>
<td>4.1800e-003</td>
<td>4.3400e-003</td>
<td>3.8500e-003</td>
<td>3.8700e-003</td>
<td>0.0000</td>
<td>8.9150</td>
<td>8.9150</td>
<td>2.7800e-003</td>
<td>0.0000</td>
<td>8.9644</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 3.2 Site Preparation - 2018

### Unmitigated Construction Off-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Worker</td>
<td>1.6000e-004</td>
<td>1.2000e-004</td>
<td>1.2000e-003</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>1.6000e-004</td>
<td>1.2000e-004</td>
<td>1.2000e-003</td>
<td>0.0000</td>
<td>3.9000e-004</td>
<td>0.0000</td>
<td>4.0000e-004</td>
<td>1.0000e-004</td>
<td>0.0000</td>
<td>1.1000e-004</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.3496</td>
</tr>
</tbody>
</table>

### Mitigated Construction On-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fugitive Dust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.6000e-004</td>
<td>0.0000</td>
<td>1.6000e-004</td>
<td>2.0000e-005</td>
<td>0.0000</td>
<td>2.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
</tr>
<tr>
<td>Off-Road</td>
<td>7.8600e-003</td>
<td>0.0976</td>
<td>0.0425</td>
<td>1.0000e-004</td>
<td>4.1800e-003</td>
<td>4.1800e-003</td>
<td>3.8500e-003</td>
<td>3.8500e-003</td>
<td>0.0000</td>
<td>8.9150</td>
<td>8.9150</td>
<td>2.7800e-003</td>
<td>0.0000</td>
<td>8.9844</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7.8600e-003</td>
<td>0.0976</td>
<td>0.0425</td>
<td>1.6000e-004</td>
<td>4.1800e-003</td>
<td>4.3400e-003</td>
<td>2.0000e-005</td>
<td>3.8500e-003</td>
<td>3.8700e-003</td>
<td>0.0000</td>
<td>8.9150</td>
<td>8.9150</td>
<td>2.7800e-003</td>
<td>0.0000</td>
<td>8.9844</td>
<td></td>
</tr>
</tbody>
</table>
### 3.2 Site Preparation - 2018

#### Mitigated Construction Off-Site

| Category          | ROG | NOx | CO  | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|-------------------|-----|-----|-----|-----|---------------|--------------|------------|---------------|--------------|------------|-----------|----------|----------|-----------|-----|-----|------|
| Hauling           | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000       | 0.0000       | 0.0000     | 0.0000         | 0.0000       | 0.0000     | 0.0000   | 0.0000   | 0.0000   | 0.0000 | 0.0000 | 0.0000 |
| Vendor            | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000       | 0.0000       | 0.0000     | 0.0000         | 0.0000       | 0.0000     | 0.0000   | 0.0000   | 0.0000   | 0.0000 | 0.0000 | 0.0000 |
| Worker            | 1.6000e-004 | 1.2000e-004 | 1.2000e-003 | 0.0000 | 3.9000e-004 | 0.0000       | 4.0000e-004 | 1.0000e-004 | 1.1000e-004 | 0.0000     | 0.0000   | 0.0000   | 0.0000   | 0.0000 | 0.3494 | 0.3494 |
| **Total**         | 1.6000e-004 | 1.2000e-004 | 1.2000e-003 | 0.0000 | 3.9000e-004 | 0.0000       | 4.0000e-004 | 1.0000e-004 | 1.1000e-004 | 0.0000     | 0.0000   | 0.0000   | 0.0000   | 0.0000 | 0.3494 | 0.3494 |

### 3.3 Grading - 2018

#### Unmitigated Construction On-Site

| Category          | ROG    | NOx    | CO    | SO2    | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4   | N2O   | CO2e  |
|-------------------|--------|--------|-------|--------|---------------|--------------|------------|---------------|--------------|------------|-----------|----------|-----------|-----------|-------|-------|-------|
| Fugitive Dust     | 0.0492 | 0.0000 | 0.0000 | 0.0492 | 0.0269       | 0.0000       | 0.0000     | 0.0269         | 0.0000       | 0.0000     | 0.0000   | 0.0000   | 0.0000   | 0.0000 | 0.0000 | 0.0000 |
| Off-Road          | 0.0692 | 0.6129 | 0.5055 | 7.8000e-004 | 0.0405 | 0.0405 | 0.0386 | 0.0386 | 0.0000 | 68.9531 | 68.9531 | 0.0133 | 0.0000 | 69.2854 |
| **Total**         | 0.0692 | 0.6129 | 0.5055 | 7.8000e-004 | 0.0492 | 0.0405 | 0.0897 | 0.0386 | 0.0656 | 0.0000 | 68.9531 | 68.9531 | 0.0133 | 0.0000 | 69.2854 |
### 3.3 Grading - 2018

#### Unmitigated Construction Off-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>1.0000e-003</td>
<td>0.0347</td>
<td>0.0126</td>
<td>8.0000e-005</td>
<td>1.5700e-003</td>
<td>1.4000e-004</td>
<td>1.7200e-003</td>
<td>4.3000e-004</td>
<td>1.4000e-004</td>
<td>5.7000e-004</td>
<td>0.0000</td>
<td>8.0797</td>
<td>8.0797</td>
<td>9.6000e-004</td>
<td>0.0000</td>
<td>8.1037</td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Worker</td>
<td>2.1200e-003</td>
<td>0.0156</td>
<td>0.0003</td>
<td>0.0005</td>
<td>0.0390</td>
<td>0.0005</td>
<td>0.0390</td>
<td>0.0390</td>
<td>0.0005</td>
<td>0.0390</td>
<td>0.0005</td>
<td>4.5421</td>
<td>4.5421</td>
<td>1.1000e-004</td>
<td>0.0000</td>
<td>4.5448</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3.1200e-003</td>
<td>0.0362</td>
<td>0.0282</td>
<td>1.3000e-004</td>
<td>6.6900e-003</td>
<td>1.7000e-004</td>
<td>6.8700e-003</td>
<td>1.7900e-003</td>
<td>1.7000e-004</td>
<td>1.9600e-003</td>
<td>0.0000</td>
<td>12.6218</td>
<td>12.6218</td>
<td>1.0700e-003</td>
<td>0.0000</td>
<td>12.6485</td>
</tr>
</tbody>
</table>

#### Mitigated Construction On-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fugitive Dust</td>
<td>0.0492</td>
<td>0.0000</td>
<td>0.0492</td>
<td>0.0269</td>
<td>0.0000</td>
<td>0.0269</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Off-Road</td>
<td>0.0692</td>
<td>0.6129</td>
<td>0.5055</td>
<td>7.8000e-004</td>
<td>0.0405</td>
<td>0.0405</td>
<td>0.0386</td>
<td>0.0386</td>
<td>0.0000</td>
<td>68.9530</td>
<td>68.9530</td>
<td>0.0133</td>
<td>0.0000</td>
<td>69.2853</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.0692</td>
<td>0.6129</td>
<td>0.5055</td>
<td>7.8000e-004</td>
<td>0.0492</td>
<td>0.0405</td>
<td>0.0897</td>
<td>0.0386</td>
<td>0.0656</td>
<td>0.0000</td>
<td>68.9530</td>
<td>68.9530</td>
<td>0.0133</td>
<td>0.0000</td>
<td>69.2853</td>
<td></td>
</tr>
</tbody>
</table>
### 3.3 Grading - 2018

**Mitigated Construction Off-Site**

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>1.0000e-003</td>
<td>0.0347</td>
<td>0.0126</td>
<td>8.0000e-005</td>
<td>1.5700e-003</td>
<td>1.4000e-004</td>
<td>1.7200e-003</td>
<td>4.3000e-004</td>
<td>1.4000e-004</td>
<td>5.7000e-004</td>
<td>0.0000</td>
<td>8.0797</td>
<td>8.0797</td>
<td>9.6000e-004</td>
<td>0.0000</td>
<td>8.1037</td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Worker</td>
<td>2.1200e-003</td>
<td>0.0156</td>
<td>0.0305</td>
<td>6.0000e-005</td>
<td>3.0000e-003</td>
<td>5.0000e-003</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>4.5421</td>
<td>4.5421</td>
<td>1.1000e-002</td>
<td>0.0000</td>
<td>4.5448</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3.1200e-003</td>
<td>0.0362</td>
<td>0.0282</td>
<td>1.3000e-004</td>
<td>6.6900e-003</td>
<td>1.7000e-004</td>
<td>1.7900e-003</td>
<td>1.7000e-004</td>
<td>1.9600e-003</td>
<td>0.0000</td>
<td>12.6218</td>
<td>12.6218</td>
<td>1.0700e-003</td>
<td>0.0000</td>
<td>12.6485</td>
<td></td>
</tr>
</tbody>
</table>

### 3.4 Paving - 2018

**Unmitigated Construction On-Site**

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-Road</td>
<td>4.6000e-003</td>
<td>0.0437</td>
<td>0.0361</td>
<td>6.0000e-005</td>
<td>2.5500e-003</td>
<td>2.5500e-003</td>
<td>2.3700e-003</td>
<td>2.3700e-003</td>
<td>2.3700e-003</td>
<td>0.0000</td>
<td>4.8541</td>
<td>4.8541</td>
<td>1.3700e-003</td>
<td>0.0000</td>
<td>4.8883</td>
<td></td>
</tr>
<tr>
<td>Paving</td>
<td>3.9000e-004</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4.9900e-003</td>
<td>0.0437</td>
<td>0.0361</td>
<td>6.0000e-005</td>
<td>2.5500e-003</td>
<td>2.5500e-003</td>
<td>2.3700e-003</td>
<td>2.3700e-003</td>
<td>2.3700e-003</td>
<td>0.0000</td>
<td>4.8541</td>
<td>4.8541</td>
<td>1.3700e-003</td>
<td>0.0000</td>
<td>4.8883</td>
<td></td>
</tr>
</tbody>
</table>
### 3.4 Paving - 2018

**Unmitigated Construction Off-Site**

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>tons/yr</td>
<td>MT/yr</td>
<td></td>
<td>tons/yr</td>
<td>MT/yr</td>
<td></td>
<td>tons/yr</td>
<td>tons/yr</td>
<td>tons/yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hauling</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker</td>
<td>2.9000e-004</td>
<td>2.1000e-004</td>
<td>2.1600e-003</td>
<td>1.0000e-005</td>
<td>7.1000e-004</td>
<td>0.0000</td>
<td>7.1000e-004</td>
<td>1.9000e-004</td>
<td>0.0000</td>
<td>1.9000e-004</td>
<td>0.0000</td>
<td>0.6289</td>
<td>0.6293</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2.9000e-004</td>
<td>2.1000e-004</td>
<td>2.1600e-003</td>
<td>1.0000e-005</td>
<td>7.1000e-004</td>
<td>0.0000</td>
<td>7.1000e-004</td>
<td>1.9000e-004</td>
<td>0.0000</td>
<td>1.9000e-004</td>
<td>0.0000</td>
<td>0.6289</td>
<td>0.6293</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Mitigated Construction On-Site**

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>tons/yr</td>
<td>MT/yr</td>
<td></td>
<td>tons/yr</td>
<td>MT/yr</td>
<td></td>
<td>tons/yr</td>
<td>tons/yr</td>
<td>tons/yr</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-Road</td>
<td>4.6000e-003</td>
<td>0.0437</td>
<td>0.0361</td>
<td>6.0000e-005</td>
<td>2.5500e-003</td>
<td>2.5500e-003</td>
<td>2.3700e-003</td>
<td>2.3700e-003</td>
<td>0.0000</td>
<td>4.8541</td>
<td>4.8541</td>
<td>1.3700e-003</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paving</td>
<td>3.9000e-004</td>
<td>0.0437</td>
<td>0.0361</td>
<td>6.0000e-005</td>
<td>2.5500e-003</td>
<td>2.5500e-003</td>
<td>2.3700e-003</td>
<td>2.3700e-003</td>
<td>0.0000</td>
<td>4.8541</td>
<td>4.8541</td>
<td>1.3700e-003</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.9900e-003</td>
<td>0.0437</td>
<td>0.0361</td>
<td>6.0000e-005</td>
<td>2.5500e-003</td>
<td>2.5500e-003</td>
<td>2.3700e-003</td>
<td>2.3700e-003</td>
<td>0.0000</td>
<td>4.8541</td>
<td>4.8541</td>
<td>1.3700e-003</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.4 Paving - 2018

Mitigated Construction Off-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Worker</td>
<td>2.9000e-004</td>
<td>2.1000e-004</td>
<td>2.1600e-003</td>
<td>1.0000e-005</td>
<td>7.1000e-004</td>
<td>7.1000e-004</td>
<td>0.0000</td>
<td>1.9000e-004</td>
<td>1.9000e-004</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.6289</td>
<td>0.6289</td>
<td>0.6293</td>
</tr>
<tr>
<td>Total</td>
<td>2.9000e-004</td>
<td>2.1000e-004</td>
<td>2.1600e-003</td>
<td>1.0000e-005</td>
<td>7.1000e-004</td>
<td>7.1000e-004</td>
<td>0.0000</td>
<td>1.9000e-004</td>
<td>1.9000e-004</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.6289</td>
<td>0.6289</td>
<td>0.6293</td>
</tr>
</tbody>
</table>

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile
### 4.2 Trip Summary Information

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Average Daily Trip Rate</th>
<th>Unmitigated</th>
<th>Mitigated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weekday</td>
<td>Saturday</td>
<td>Sunday</td>
</tr>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### 4.3 Trip Type Information

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Miles</th>
<th>Trip %</th>
<th>Trip Purpose %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H-W or C-W</td>
<td>H-S or C-C</td>
<td>H-O or C-NW</td>
</tr>
<tr>
<td>Other Asphalt Surfaces</td>
<td>14.70</td>
<td>6.60</td>
<td>6.60</td>
</tr>
</tbody>
</table>

### 4.4 Fleet Mix

<table>
<thead>
<tr>
<th>Land Use</th>
<th>LDA</th>
<th>LDT1</th>
<th>LDT2</th>
<th>MDV</th>
<th>LHD1</th>
<th>LHD2</th>
<th>MHD</th>
<th>HHD</th>
<th>OBUS</th>
<th>UBUS</th>
<th>MCY</th>
<th>SBUS</th>
<th>MH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0.498968</td>
<td>0.049513</td>
<td>0.248277</td>
<td>0.134909</td>
<td>0.018184</td>
<td>0.006326</td>
<td>0.020670</td>
<td>0.006254</td>
<td>0.003828</td>
<td>0.003354</td>
<td>0.008577</td>
<td>0.000418</td>
<td>0.000722</td>
</tr>
</tbody>
</table>

### 5.0 Energy Detail

Historical Energy Use: N
5.1 Mitigation Measures Energy

| Category                    | ROG  | NOx | CO  | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|-----------------------------|------|-----|-----|-----|----------------|--------------|------------|----------------|--------------|------------|----------|-----------|-----------|---------|-----|-----|------|
| Electricity Mitigated       | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Electricity Unmitigated     | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| NaturalGas Mitigated        | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| NaturalGas Unmitigated      | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

5.2 Energy by Land Use - NaturalGas

Unmitigated

| Land Use              | NaturalGas Use | ROG  | NOx  | CO  | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|-----------------------|----------------|------|------|-----|-----|----------------|--------------|------------|----------------|--------------|------------|----------|-----------|-----------|---------|-----|-----|------|
| Other Asphalt Surfaces| 0              | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Total                 |                | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
5.2 Energy by Land Use - NaturalGas

**Mitigated**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>NaturalGas Use</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Total</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

5.3 Energy by Land Use - Electricity

**Unmitigated**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Electricity Use</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>Total</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>
5.3 Energy by Land Use - Electricity

Mitigated

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Electricity Use</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0 kWh/yr</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

6.0 Area Detail

6.1 Mitigation Measures Area

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigated</td>
<td>1.1200e-003</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>1.0000e-005</td>
<td>1.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>1.0000e-005</td>
</tr>
<tr>
<td>Unmitigated</td>
<td>1.1200e-003</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>1.0000e-005</td>
<td>1.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>1.0000e-005</td>
</tr>
</tbody>
</table>
### 6.2 Area by SubCategory

#### Unmitigated

<table>
<thead>
<tr>
<th>SubCategory</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural Coating</td>
<td>2.7000e-004</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>8.4000e-004</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Landscaping</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>1.1100e-003</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

#### Mitigated

<table>
<thead>
<tr>
<th>SubCategory</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural Coating</td>
<td>2.7000e-004</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Consumer Products</td>
<td>8.4000e-004</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Landscaping</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>1.1100e-003</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

### 7.0 Water Detail
### 7.1 Mitigation Measures Water

<table>
<thead>
<tr>
<th>Category</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigated</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Unmitigated</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

### 7.2 Water by Land Use

**Unmitigated**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Indoor/Outdoor Use</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0 / 0</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
### 7.2 Water by Land Use

**Mitigated**

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Indoor/Outdoor Use</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0 / 0</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>0.0000</strong></td>
<td><strong>0.0000</strong></td>
<td><strong>0.0000</strong></td>
<td><strong>0.0000</strong></td>
</tr>
</tbody>
</table>

### 8.0 Waste Detail

### 8.1 Mitigation Measures Waste

**Category/Year**

<table>
<thead>
<tr>
<th></th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MT/yr</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitigated</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Unmitigated</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
### 8.2 Waste by Land Use

#### Unmitigated

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Waste Disposed</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

#### Mitigated

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Waste Disposed</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

### 9.0 Operational Offroad

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number</th>
<th>Hours/Day</th>
<th>Days/Year</th>
<th>Horse Power</th>
<th>Load Factor</th>
<th>Fuel Type</th>
</tr>
</thead>
</table>
### 10.0 Stationary Equipment

#### Fire Pumps and Emergency Generators

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number</th>
<th>Hours/Day</th>
<th>Hours/Year</th>
<th>Horse Power</th>
<th>Load Factor</th>
<th>Fuel Type</th>
</tr>
</thead>
</table>

#### Boilers

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number</th>
<th>Heat Input/Day</th>
<th>Heat Input/Year</th>
<th>Boiler Rating</th>
<th>Fuel Type</th>
</tr>
</thead>
</table>

#### User Defined Equipment

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number</th>
</tr>
</thead>
</table>

#### 11.0 Vegetation
1.0 Project Characteristics

1.1 Land Usage

<table>
<thead>
<tr>
<th>Land Uses</th>
<th>Size</th>
<th>Metric</th>
<th>Lot Acreage</th>
<th>Floor Surface Area</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0.30</td>
<td>Acre</td>
<td>0.30</td>
<td>13,068.00</td>
<td>0</td>
</tr>
</tbody>
</table>

1.2 Other Project Characteristics

- **Urbanization**: Rural
- **Climate Zone**: 5
- **Wind Speed (m/s)**: 2.2
- **Precipitation Freq (Days)**: 70
- **Operational Year**: 2019

- **Utility Company**: Pacific Gas & Electric Company

- **CO2 Intensity (lb/MWhr)**: 641.35
- **CH4 Intensity (lb/MWhr)**: 0.029
- **N2O Intensity (lb/MWhr)**: 0.006

1.3 User Entered Comments & Non-Default Data

- **Project Characteristics** -
- **Land Use** -
- **Construction Phase**: Assume 6 months of construction
- **Off-road Equipment**: A drill rig will be used.
- **Grading**: 0.3 acres graded
<table>
<thead>
<tr>
<th>Table Name</th>
<th>Column Name</th>
<th>Default Value</th>
<th>New Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>tblConstructionPhase</td>
<td>NumDays</td>
<td>2.00</td>
<td>130.00</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>NumDays</td>
<td>5.00</td>
<td>10.00</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>NumDays</td>
<td>1.00</td>
<td>20.00</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>PhaseEndDate</td>
<td>4/4/2018</td>
<td>10/26/2018</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>PhaseEndDate</td>
<td>4/11/2018</td>
<td>11/9/2018</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>PhaseEndDate</td>
<td>4/2/2018</td>
<td>4/27/2018</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>PhaseStartDate</td>
<td>4/3/2018</td>
<td>4/28/2018</td>
</tr>
<tr>
<td>tblConstructionPhase</td>
<td>PhaseStartDate</td>
<td>4/5/2018</td>
<td>10/27/2018</td>
</tr>
<tr>
<td>tblGrading</td>
<td>AcresOfGrading</td>
<td>10.00</td>
<td>0.30</td>
</tr>
<tr>
<td>tblGrading</td>
<td>MaterialImported</td>
<td>0.00</td>
<td>1,500.00</td>
</tr>
<tr>
<td>tblOffRoadEquipment</td>
<td>OffRoadEquipmentType</td>
<td>Bore/Drill Rigs</td>
<td>Excavators</td>
</tr>
<tr>
<td>tblOffRoadEquipment</td>
<td>OffRoadEquipmentType</td>
<td>Excavators</td>
<td>Graders</td>
</tr>
<tr>
<td>tblOffRoadEquipment</td>
<td>OffRoadEquipmentType</td>
<td>Graders</td>
<td>Pavers</td>
</tr>
<tr>
<td>tblProjectCharacteristics</td>
<td>OperationalYear</td>
<td>2018</td>
<td>2019</td>
</tr>
<tr>
<td>tblProjectCharacteristics</td>
<td>UrbanizationLevel</td>
<td>Urban</td>
<td>Rural</td>
</tr>
</tbody>
</table>

2.0 Emissions Summary
# 2.1 Overall Construction (Maximum Daily Emission)

## Unmitigated Construction

<table>
<thead>
<tr>
<th>Year</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>1.1165</td>
<td>9.9926</td>
<td>8.2217</td>
<td>0.0140</td>
<td>0.8638</td>
<td>0.6255</td>
<td>1.4893</td>
<td>0.4429</td>
<td>0.5969</td>
<td>1.0398</td>
<td>0.0000</td>
<td>1.382287</td>
<td>1.382287</td>
<td>0.3068</td>
<td>0.0000</td>
<td>1.388379</td>
</tr>
<tr>
<td>Maximum</td>
<td>1.1165</td>
<td>9.9926</td>
<td>8.2217</td>
<td>0.0140</td>
<td>0.8638</td>
<td>0.6255</td>
<td>1.4893</td>
<td>0.4429</td>
<td>0.5969</td>
<td>1.0398</td>
<td>0.0000</td>
<td>1.382287</td>
<td>1.382287</td>
<td>0.3068</td>
<td>0.0000</td>
<td>1.388379</td>
</tr>
</tbody>
</table>

## Mitigated Construction

<table>
<thead>
<tr>
<th>Year</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>1.1165</td>
<td>9.9926</td>
<td>8.2217</td>
<td>0.0140</td>
<td>0.8638</td>
<td>0.6255</td>
<td>1.4893</td>
<td>0.4429</td>
<td>0.5969</td>
<td>1.0398</td>
<td>0.0000</td>
<td>1.382287</td>
<td>1.382287</td>
<td>0.3068</td>
<td>0.0000</td>
<td>1.388379</td>
</tr>
<tr>
<td>Maximum</td>
<td>1.1165</td>
<td>9.9926</td>
<td>8.2217</td>
<td>0.0140</td>
<td>0.8638</td>
<td>0.6255</td>
<td>1.4893</td>
<td>0.4429</td>
<td>0.5969</td>
<td>1.0398</td>
<td>0.0000</td>
<td>1.382287</td>
<td>1.382287</td>
<td>0.3068</td>
<td>0.0000</td>
<td>1.388379</td>
</tr>
</tbody>
</table>

## Percent Reduction

<table>
<thead>
<tr>
<th>Percent Reduction</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
### 2.2 Overall Operational

#### Unmitigated Operational

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>6.1200e-003</td>
<td>0.0000</td>
<td>3.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td>7.0000e-005</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Mobile</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>6.1200e-003</td>
<td>0.0000</td>
<td>3.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td>7.0000e-005</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Mitigated Operational

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>6.1200e-003</td>
<td>0.0000</td>
<td>3.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td>7.0000e-005</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Mobile</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>6.1200e-003</td>
<td>0.0000</td>
<td>3.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td>7.0000e-005</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.0 Construction Detail

#### Construction Phase

<table>
<thead>
<tr>
<th>Phase Number</th>
<th>Phase Name</th>
<th>Phase Type</th>
<th>Start Date</th>
<th>End Date</th>
<th>Num Days</th>
<th>Num Days</th>
<th>Phase Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site Preparation</td>
<td>Site Preparation</td>
<td>4/2/2018</td>
<td>4/27/2018</td>
<td>5</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Grading</td>
<td>Grading</td>
<td>4/28/2018</td>
<td>10/26/2018</td>
<td>5</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Paving</td>
<td>Paving</td>
<td>10/27/2018</td>
<td>11/9/2018</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

- Acres of Grading (Site Preparation Phase): 0.3
- Acres of Grading (Grading Phase): 0.3
- Acres of Paving: 0.3

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

**OffRoad Equipment**
### Mitigation Measures Construction

<table>
<thead>
<tr>
<th>Phase Name</th>
<th>Offroad Equipment Type</th>
<th>Amount</th>
<th>Usage Hours</th>
<th>Horse Power</th>
<th>Load Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paving</td>
<td>Cement and Mortar Mixers</td>
<td>4</td>
<td>6.00</td>
<td>9</td>
<td>0.56</td>
</tr>
<tr>
<td>Grading</td>
<td>Concrete/Industrial Saws</td>
<td>1</td>
<td>8.00</td>
<td>81</td>
<td>0.73</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>Graders</td>
<td>1</td>
<td>8.00</td>
<td>187</td>
<td>0.41</td>
</tr>
<tr>
<td>Paving</td>
<td>Tractors/Loaders/Backhoes</td>
<td>1</td>
<td>7.00</td>
<td>97</td>
<td>0.37</td>
</tr>
<tr>
<td>Architectural Coating</td>
<td>Bore/Drill Rigs</td>
<td></td>
<td></td>
<td>221</td>
<td>0.50</td>
</tr>
<tr>
<td>Architectural Coating</td>
<td>Excavators</td>
<td></td>
<td></td>
<td>158</td>
<td>0.36</td>
</tr>
<tr>
<td>Architectural Coating</td>
<td>Graders</td>
<td></td>
<td></td>
<td>187</td>
<td>0.41</td>
</tr>
<tr>
<td>Paving</td>
<td>Pavers</td>
<td>1</td>
<td>7.00</td>
<td>130</td>
<td>0.42</td>
</tr>
<tr>
<td>Architectural Coating</td>
<td>Rollers</td>
<td>1</td>
<td>7.00</td>
<td>80</td>
<td>0.38</td>
</tr>
<tr>
<td>Grading</td>
<td>Rubber Tired Dozers</td>
<td>1</td>
<td>1.00</td>
<td>247</td>
<td>0.40</td>
</tr>
<tr>
<td>Grading</td>
<td>Tractors/Loaders/Backhoes</td>
<td>2</td>
<td>6.00</td>
<td>97</td>
<td>0.37</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>Tractors/Loaders/Backhoes</td>
<td>1</td>
<td>8.00</td>
<td>97</td>
<td>0.37</td>
</tr>
</tbody>
</table>

### Trips and VMT

<table>
<thead>
<tr>
<th>Phase Name</th>
<th>Offroad Equipment Count</th>
<th>Worker Trip Number</th>
<th>Vendor Trip Number</th>
<th>Hauling Trip Number</th>
<th>Worker Trip Length</th>
<th>Vendor Trip Length</th>
<th>Hauling Trip Length</th>
<th>Worker Vehicle Class</th>
<th>Vendor Vehicle Class</th>
<th>Hauling Vehicle Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grading</td>
<td>4</td>
<td>10.00</td>
<td>0.00</td>
<td>188.00</td>
<td>10.80</td>
<td>6.60</td>
<td>20.00</td>
<td>LD_Mix</td>
<td>HDT_Mix</td>
<td>HHDT</td>
</tr>
<tr>
<td>Paving</td>
<td>7</td>
<td>18.00</td>
<td>0.00</td>
<td>0.00</td>
<td>10.80</td>
<td>6.60</td>
<td>20.00</td>
<td>LD_Mix</td>
<td>HDT_Mix</td>
<td>HHDT</td>
</tr>
<tr>
<td>Site Preparation</td>
<td>2</td>
<td>5.00</td>
<td>0.00</td>
<td>0.00</td>
<td>10.80</td>
<td>6.60</td>
<td>20.00</td>
<td>LD_Mix</td>
<td>HDT_Mix</td>
<td>HHDT</td>
</tr>
</tbody>
</table>

### 3.1 Mitigation Measures Construction
### 3.2 Site Preparation - 2018

#### Unmitigated Construction On-Site

| Category         | ROG | NOx | CO  | SO2 | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|------------------|-----|-----|-----|-----|---------------|--------------|------------|---------------|--------------|------------|----------|----------|-----------|--------|-----|-----|------|
| Fugitive Dust    |     |     |     |     | 0.0159        | 0.0000       | 0.0159     | 1.7200e-003   | 0.0000       | 1.7200e-003 | 0.0000   | 0.0000   | 0.0000   | 0.0000 |
| Off-Road         | 0.7858 | 9.7572 | 4.2514 | 9.7600e-003 | 0.4180       | 0.4180       | 0.3846     | 0.3863         | 982.7113    | 982.7113 | 0.3059   | 0.0000   | 0.0000   | 990.3596 |
| Total            | 0.7858 | 9.7572 | 4.2514 | 9.7600e-003 | 0.0159       | 0.4180       | 0.4339     | 1.7200e-003   | 0.3846       | 0.3863     | 982.7113 | 982.7113 | 0.3059   | 990.3596 |

#### Unmitigated Construction Off-Site

| Category | ROG  | NOx  | CO   | SO2  | Fugitive PM10 | Exhaust PM10 | PM10 Total | Fugitive PM2.5 | Exhaust PM2.5 | PM2.5 Total | Bio- CO2 | NBio- CO2 | Total CO2 | CH4 | N2O | CO2e |
|----------|------|------|------|------|---------------|--------------|------------|---------------|--------------|------------|----------|----------|-----------|--------|-----|-----|------|
| Hauling  | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000       | 0.0000       | 0.0000     | 0.0000         | 0.0000       | 0.0000     | 0.0000   | 0.0000   | 0.0000   | 0.0000 |
| Vendor   | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000       | 0.0000       | 0.0000     | 0.0000         | 0.0000       | 0.0000     | 0.0000   | 0.0000   | 0.0000   | 0.0000 |
| Worker   | 0.0183 | 0.0129 | 0.1240 | 3.8000e-004 | 0.0411       | 2.5000e-004  | 0.0413     | 0.0109         | 2.3000e-004  | 0.0111     | 38.3681  | 38.3681  | 9.1000e-004 | 38.3909 |
| Total    | 0.0183 | 0.0129 | 0.1240 | 3.8000e-004 | 0.0411       | 2.5000e-004  | 0.0413     | 0.0109         | 2.3000e-004  | 0.0111     | 38.3681  | 38.3681  | 9.1000e-004 | 38.3909 |
### 3.2 Site Preparation - 2018

#### Mitigated Construction On-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fugitive Dust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0159</td>
<td>0.0000</td>
<td>0.0159</td>
<td>1.7200e-003</td>
<td>0.0000</td>
<td>1.7200e-003</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
</tr>
<tr>
<td>Off-Road</td>
<td>0.7858</td>
<td>9.7572</td>
<td>4.2514</td>
<td>9.7600e-003</td>
<td>0.4180</td>
<td>0.4180</td>
<td>0.3846</td>
<td>0.3846</td>
<td>0.0000</td>
<td>982.7113</td>
<td>982.7113</td>
<td>0.3059</td>
<td>990.3596</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.7858</td>
<td>9.7572</td>
<td>4.2514</td>
<td>9.7600e-003</td>
<td>0.0159</td>
<td>0.4180</td>
<td>0.4339</td>
<td>1.7200e-003</td>
<td>0.3846</td>
<td>1.7200e-003</td>
<td>0.0000</td>
<td>982.7113</td>
<td>982.7113</td>
<td>0.3059</td>
<td>990.3596</td>
<td></td>
</tr>
</tbody>
</table>

#### Mitigated Construction Off-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
</tr>
<tr>
<td>Worker</td>
<td>0.0183</td>
<td>0.0129</td>
<td>0.1240</td>
<td>3.8000e-004</td>
<td>0.0411</td>
<td>2.5000e-004</td>
<td>0.0413</td>
<td>0.0109</td>
<td>2.3000e-004</td>
<td>0.0111</td>
<td>38.3681</td>
<td>38.3681</td>
<td>9.1000e-004</td>
<td>38.3909</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.0183</td>
<td>0.0129</td>
<td>0.1240</td>
<td>3.8000e-004</td>
<td>0.0411</td>
<td>2.5000e-004</td>
<td>0.0413</td>
<td>0.0109</td>
<td>2.3000e-004</td>
<td>0.0111</td>
<td>38.3681</td>
<td>38.3681</td>
<td>9.1000e-004</td>
<td>38.3909</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.3 Grading - 2018

#### Unmitigated Construction On-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fugitive Dust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.7565</td>
<td>0.0000</td>
<td>0.7565</td>
<td>0.4142</td>
<td>0.0000</td>
<td>0.4142</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-Road</td>
<td>1.0643</td>
<td>9.4295</td>
<td>7.7762</td>
<td>0.0120</td>
<td>0.6228</td>
<td>0.6228</td>
<td>0.5943</td>
<td>0.5943</td>
<td>1.169350</td>
<td>2</td>
<td>1.169350</td>
<td>2</td>
<td>0.2254</td>
<td>1,174.985</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1.0643</td>
<td>9.4295</td>
<td>7.7762</td>
<td>0.0120</td>
<td>0.7565</td>
<td>0.6228</td>
<td>1.3793</td>
<td>0.4142</td>
<td>0.5943</td>
<td>1.0085</td>
<td>1.169350</td>
<td>2</td>
<td>0.2254</td>
<td>1,174.985</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Unmitigated Construction Off-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>0.0156</td>
<td>0.5373</td>
<td>0.1974</td>
<td>1.2200e-003</td>
<td>0.0251</td>
<td>2.2300e-003</td>
<td>0.0273</td>
<td>6.8700e-003</td>
<td>2.1300e-003</td>
<td>9.0000e-003</td>
<td>136.2016</td>
<td>136.2016</td>
<td>0.0164</td>
<td>136.6116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker</td>
<td>0.0366</td>
<td>0.0258</td>
<td>0.2481</td>
<td>7.7000e-004</td>
<td>0.0822</td>
<td>5.1000e-004</td>
<td>0.0827</td>
<td>0.0218</td>
<td>4.7000e-004</td>
<td>0.0223</td>
<td>76.7361</td>
<td>76.7361</td>
<td>1.8300e-003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.0522</td>
<td>0.5631</td>
<td>0.4455</td>
<td>1.9900e-003</td>
<td>0.1073</td>
<td>2.7400e-003</td>
<td>0.1100</td>
<td>0.0287</td>
<td>2.6000e-003</td>
<td>0.0313</td>
<td>212.9377</td>
<td>212.9377</td>
<td>0.0182</td>
<td>213.3935</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.3 Grading - 2018

Mitigated Construction On-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fugitive Dust</td>
<td>0.7565</td>
<td>0.0000</td>
<td>0.7565</td>
<td>0.0000</td>
<td>0.4142</td>
<td>0.0000</td>
<td>0.4142</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-Road</td>
<td>1.0643</td>
<td>9.4295</td>
<td>7.7762</td>
<td>0.0120</td>
<td>0.6228</td>
<td>0.6228</td>
<td>0.5943</td>
<td>0.5943</td>
<td>0.0000</td>
<td>1.169350</td>
<td>2</td>
<td>1.169350</td>
<td>2</td>
<td>0.2254</td>
<td>1,174.985</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1.0643</td>
<td>9.4295</td>
<td>7.7762</td>
<td>0.0120</td>
<td>0.7565</td>
<td>0.6228</td>
<td>1.3793</td>
<td>0.5943</td>
<td>1.0085</td>
<td>0.0000</td>
<td>1.169350</td>
<td>2</td>
<td>0.2254</td>
<td>1,174.985</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Mitigated Construction Off-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>0.0156</td>
<td>0.5373</td>
<td>0.1974</td>
<td>1.22000e-003</td>
<td>0.0251</td>
<td>2.23000e-003</td>
<td>0.0273</td>
<td>6.87000e-003</td>
<td>2.13000e-003</td>
<td>9.00000e-003</td>
<td>136.2016</td>
<td>136.2016</td>
<td>0.0164</td>
<td>136.6116</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker</td>
<td>0.0366</td>
<td>0.0258</td>
<td>0.2481</td>
<td>7.70000e-004</td>
<td>0.0822</td>
<td>5.10000e-004</td>
<td>0.0827</td>
<td>0.0218</td>
<td>4.70000e-004</td>
<td>0.0223</td>
<td>76.7361</td>
<td>76.7361</td>
<td>1.83000e-003</td>
<td>76.7818</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.0522</td>
<td>0.5631</td>
<td>0.4455</td>
<td>1.99000e-003</td>
<td>0.1073</td>
<td>2.74000e-003</td>
<td>0.1100</td>
<td>0.0287</td>
<td>2.60000e-003</td>
<td>0.0313</td>
<td>212.9377</td>
<td>212.9377</td>
<td>0.0182</td>
<td>213.3935</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.4 Paving - 2018

Unmitigated Construction On-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-Road</td>
<td>0.9202</td>
<td>8.7447</td>
<td>7.2240</td>
<td>0.0113</td>
<td>0.5109</td>
<td>0.4735</td>
<td>0.5109</td>
<td>0.4735</td>
<td>0.5109</td>
<td>0.4735</td>
<td>1.070137</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paving</td>
<td>0.0786</td>
<td></td>
<td></td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.9988</td>
<td>8.7447</td>
<td>7.2240</td>
<td>0.0113</td>
<td>0.5109</td>
<td>0.4735</td>
<td>0.5109</td>
<td>0.4735</td>
<td>0.5109</td>
<td>0.4735</td>
<td>1.070137</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unmitigated Construction Off-Site

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker</td>
<td>0.0658</td>
<td>0.0464</td>
<td>0.4466</td>
<td>1.3900e-003</td>
<td>0.1479</td>
<td>9.1000e-004</td>
<td>0.1488</td>
<td>0.0392</td>
<td>8.4000e-004</td>
<td>0.0401</td>
<td>138.1250</td>
<td>138.1250</td>
<td>3.2900e-003</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>0.0658</td>
<td>0.0464</td>
<td>0.4466</td>
<td>1.3900e-003</td>
<td>0.1479</td>
<td>9.1000e-004</td>
<td>0.1488</td>
<td>0.0392</td>
<td>8.4000e-004</td>
<td>0.0401</td>
<td>138.1250</td>
<td>138.1250</td>
<td>3.2900e-003</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.4 Paving - 2018

**Mitigated Construction On-Site**

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off-Road</td>
<td>0.9202</td>
<td>8.7447</td>
<td>7.2240</td>
<td>0.0113</td>
<td>0.5109</td>
<td>0.5109</td>
<td>0.4735</td>
<td>0.4735</td>
<td></td>
<td></td>
<td>0.0000</td>
<td>1,070.137</td>
<td>2</td>
<td>1,070.137</td>
<td>0.3017</td>
<td>1,077.679</td>
</tr>
<tr>
<td>Paving</td>
<td>0.0786</td>
<td></td>
<td></td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.9988</td>
<td>8.7447</td>
<td>7.2240</td>
<td>0.0113</td>
<td>0.5109</td>
<td>0.5109</td>
<td>0.4735</td>
<td>0.4735</td>
<td></td>
<td></td>
<td>0.0000</td>
<td>1,070.137</td>
<td>2</td>
<td>1,070.137</td>
<td>0.3017</td>
<td>1,077.679</td>
</tr>
</tbody>
</table>

**Mitigated Construction Off-Site**

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hauling</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
</tr>
<tr>
<td>Vendor</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td>0.0000</td>
</tr>
<tr>
<td>Worker</td>
<td>0.0658</td>
<td>0.0464</td>
<td>0.4466</td>
<td>1.3900e-003</td>
<td>0.1479</td>
<td>9.1000e-004</td>
<td>0.1488</td>
<td>0.0392</td>
<td>8.4000e-004</td>
<td>0.0401</td>
<td>138.1250</td>
<td>138.1250</td>
<td>3.2900e-003</td>
<td>138.2073</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>0.0658</td>
<td>0.0464</td>
<td>0.4466</td>
<td>1.3900e-003</td>
<td>0.1479</td>
<td>9.1000e-004</td>
<td>0.1488</td>
<td>0.0392</td>
<td>8.4000e-004</td>
<td>0.0401</td>
<td>138.1250</td>
<td>138.1250</td>
<td>3.2900e-003</td>
<td>138.2073</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4.0 Operational Detail - Mobile
4.1 Mitigation Measures Mobile

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio-CO2</th>
<th>NBio-CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigated</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Unmitigated</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

4.2 Trip Summary Information

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Average Daily Trip Rate</th>
<th>Unmitigated</th>
<th>Mitigated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weekday</td>
<td>Saturday</td>
<td>Sunday</td>
</tr>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

4.3 Trip Type Information

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Miles</th>
<th>Trip %</th>
<th>Trip Purpose %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H-W or C-W</td>
<td>H-S or C-C</td>
<td>H-O or C-NW</td>
</tr>
<tr>
<td>Other Asphalt Surfaces</td>
<td>14.70</td>
<td>6.60</td>
<td>6.60</td>
</tr>
</tbody>
</table>

4.4 Fleet Mix

<table>
<thead>
<tr>
<th>Land Use</th>
<th>LDA</th>
<th>LDT1</th>
<th>LDT2</th>
<th>MDV</th>
<th>LHD1</th>
<th>LHD2</th>
<th>MHD</th>
<th>HHD</th>
<th>OBUS</th>
<th>UBUS</th>
<th>MCY</th>
<th>SBUS</th>
<th>MH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0.498968</td>
<td>0.049513</td>
<td>0.248277</td>
<td>0.134909</td>
<td>0.018184</td>
<td>0.006326</td>
<td>0.020670</td>
<td>0.006254</td>
<td>0.003828</td>
<td>0.003354</td>
<td>0.008577</td>
<td>0.000418</td>
<td>0.000722</td>
</tr>
</tbody>
</table>
5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

<table>
<thead>
<tr>
<th>Category</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaturalGas</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>NaturalGas</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
5.2 Energy by Land Use - Natural Gas

### Unmitigated

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Natural Gas Use</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

### Mitigated

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Natural Gas Use</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Asphalt Surfaces</td>
<td>0</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

6.0 Area Detail

6.1 Mitigation Measures Area
### Category

<table>
<thead>
<tr>
<th>SubCategory</th>
<th>lb/day</th>
<th>lb/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmitigated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 6.2 Area by SubCategory

##### Unmitigated

<table>
<thead>
<tr>
<th>SubCategory</th>
<th>lb/day</th>
<th>lb/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural Coating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscaping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.2 Area by SubCategory

Mitigated

<table>
<thead>
<tr>
<th>SubCategory</th>
<th>ROG</th>
<th>NOx</th>
<th>CO</th>
<th>SO2</th>
<th>Fugitive PM10</th>
<th>Exhaust PM10</th>
<th>PM10 Total</th>
<th>Fugitive PM2.5</th>
<th>Exhaust PM2.5</th>
<th>PM2.5 Total</th>
<th>Bio- CO2</th>
<th>NBio- CO2</th>
<th>Total CO2</th>
<th>CH4</th>
<th>N2O</th>
<th>CO2e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architectural Coating</td>
<td>1.4900e-003</td>
<td></td>
<td></td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer Products</td>
<td>4.6300e-003</td>
<td></td>
<td></td>
<td></td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landscaping</td>
<td>0.0000</td>
<td>0.0000</td>
<td>3.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td>7.0000e-005</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6.1200e-003</td>
<td>0.0000</td>
<td>3.0000e-005</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td>7.0000e-005</td>
<td>0.0000</td>
<td>7.0000e-005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number</th>
<th>Hours/Day</th>
<th>Days/Year</th>
<th>Horse Power</th>
<th>Load Factor</th>
<th>Fuel Type</th>
</tr>
</thead>
</table>

10.0 Stationary Equipment

Fire Pumps and Emergency Generators
11.0 Vegetation

---

### Boilers

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number</th>
<th>Heat Input/Day</th>
<th>Heat Input/Year</th>
<th>Boiler Rating</th>
<th>Fuel Type</th>
</tr>
</thead>
</table>

### User Defined Equipment

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Number</th>
</tr>
</thead>
</table>

---
Appendix B

Biological Resources Assessment
County of San Mateo Parks Department
Complete the Gap Trail Planning Project

Biological Resources Assessment

January 2017

rincon

Environmental Scientists Planners Engineers
BIOLOGICAL RESOURCES ASSESSMENT

COMPLETE THE GAP TRAIL PLANNING PROJECT
SAN MATEO COUNTY, CALIFORNIA

Prepared for:
County of San Mateo Parks Department
455 County Center, Fourth Floor
Redwood City, California 94063-1665

Bellecci and Associates
7041 Koll Center Parkway, Suite 132
Pleasanton, California 94566

Prepared by:
Rincon Consultants, Inc.
449 15th Street, Suite 303
Oakland, California 94612

January 2017
# TABLE OF CONTENTS

## TABLE OF CONTENTS

- Executive Summary .................................................................................................................. i
- 1.0 Introduction .......................................................................................................................... 1
  - 1.1 Project Location .................................................................................................................. 2
  - 1.2 Project Description ............................................................................................................. 2
- 2.0 Methodology .......................................................................................................................... 5
  - 2.1 Regulatory Overview ......................................................................................................... 5
    - 2.1.1 Environmental Statutes ............................................................................................... 5
  - 2.2 Literature Review ............................................................................................................... 5
  - 2.3 Field Reconnaissance Survey ............................................................................................. 6
- 3.0 Existing Conditions ............................................................................................................. 8
  - 3.1 Physical Characteristics .................................................................................................... 8
    - 3.1.1 Watershed and Drainages .......................................................................................... 8
    - 3.1.2 Soils ........................................................................................................................... 8
  - 3.2 Vegetation and Habitats .................................................................................................... 10
  - 3.3 General Wildlife ............................................................................................................... 10
- 4.0 Sensitive Biological Resources ......................................................................................... 11
  - 4.1 Special Status Species ...................................................................................................... 11
    - 4.1.1 Special Status Plant Species ....................................................................................... 13
    - 4.1.2 Special Status Wildlife Species .................................................................................. 13
  - 4.2 Sensitive Plant Communities ............................................................................................ 15
  - 4.3 Jurisdictional Waters and Wetlands .................................................................................. 15
  - 4.4 Wildlife Movement .......................................................................................................... 15
  - 4.5 Resources Protected By Local Policies and Ordinances .................................................. 16
    - 4.5.1 San Mateo County General Plan 1986 ....................................................................... 16
    - 4.5.2 San Mateo County Heritage Tree Ordinance ............................................................... 17
    - 4.5.3 San Mateo County Significant Tree Ordinance .......................................................... 18
- 5.0 Limitations, Assumptions, and Use Reliance .................................................................... 19
- 6.0 References .......................................................................................................................... 20
- 7.0 List of Preparers .................................................................................................................. 22
Figures
Figure 1 - Regional Location ................................................................. 3
Figure 2 – Biological Study Area ........................................................... 4
Figure 3 – Sensitive Resources within the Biological Study Area .................. 9
Figure 4 – Sensitive Species, Natural Communities, and Designated Critical Habitats.......... 12

Appendices
Appendix A. Regulatory Guidance
Appendix B. Special Status Species Evaluation Tables
Appendix C. Floral and Faunal Compendium
Appendix D. Site Photographs
EXECUTIVE SUMMARY

The project site is located along the Lower Crystal Springs Reservoir in San Mateo County, California; west of Interstate 280 from the community of Highlands-Baywood Park. The approximate center of the project site occurs at latitude 37°31'37.31"N and longitude 122°21'40.17"W (WGS-84 datum).

The Complete the Gap Trail Project will be part of the 17.5-mile long Crystal Springs Regional Trail system that connects the City of San Bruno to the Town of Woodside along the eastern side of the San Francisco Watershed reservoirs. The project will consist of a Class I bikeway on the western shoulder of Skyline Boulevard with a 10-foot wide paved/gravel trail. The trail will be bordered by a barrier on the east side and a chain-link fence on the west.

Vegetation in the Biological Study Area consists entirely of coast live oak woodland (*Quercus agrifolia* Woodland Alliance). Developed/disturbed areas in the form of Skyline Boulevard and the road shoulders are the only other land use type in the Biological Study Area. No named streams or jurisdictional wetlands or waters occur within the Biological Study Area.

Twenty-two special status plant species were evaluated and six may occur in the Biological Study Area based on the presence of suitable habitat. Franciscan onion (*Allium peninsulare* var. *franciscanum*), San Mateo woolly sunflower (*Eriophyllum latilobum*), Hillsborough chocolate lily (*Fritillaria biflora* var. *ineziana*), Crystal Springs lessingia (*Lessingia arachnoidea*), bent-flowered fiddleneck (*Amsinckia lunaris*), and white-rayed pentachaeta (*Pentachaeta bellidiflora*) could all occur in the coast live oak woodland within the Biological Study Area.

Twenty-one special status animal species were evaluated; six may occur in the Biological Study Area based on the presence of suitable habitat and San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) middens were observed during the reconnaissance survey. California giant salamander (*Dicamptodon ensatus*), California red-legged frog (*Rana draytonii*), western pond turtle (*Emys marmorata*), San Francisco garter snake (*Thamnophis sirtalis tetrataenia*), saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*), and pallid bat (*Antrozous pallidus*) all have the potential to utilize the coast live oak woodland within the Biological Study Area. In addition, vegetation within the Biological Study Area offers potential nesting habitat for bird species that are protected under the federal Migratory Bird Treaty Act and California Fish and Game Code.
1.0 INTRODUCTION

Rincon Consultants, Inc. (Rincon) prepared this Biological Resources Assessment (BRA) to document the existing conditions at the Complete the Gap Trail Planning Project (Project) site. The approximate 5.4-acre project site is located in the Highlands-Baywood Park area of San Mateo County, California (Figure 1). This BRA focuses on biological resources on the 5.4-acre project site. This BRA is prepared with the intent of serving as the basis for suitable analysis of potential impacts to biological resources pursuant to the California Environmental Quality Act (CEQA) environmental review process.

1.1 PROJECT LOCATION

The proposed Project is located along the Lower Crystal Springs Reservoir in San Mateo County, California; west of Interstate 280 (I-280) from the community of Highlands-Baywood Park. The Project is being proposed by the County of San Mateo. The approximate center of the project site occurs at latitude 37°31’37.31”N and longitude 122°21’40.17”W (WGS-84 datum) and is depicted on the San Mateo, California United States Geological Survey (USGS) 7.5-minute topographic quadrangle.

The Biological Study Area (BSA) analyzed in this BRA includes the entire project site and all of the project components as outlined in the project description plus a 50-foot buffer. The BSA for the proposed Project is presented in Figure 2.

1.2 PROJECT DESCRIPTION

The Project will be part of the 17.5-mile Crystal Springs Regional Trail (CSRT) system that connects the City of San Bruno to the Town of Woodside along the eastern side of the San Francisco Watershed reservoirs. The CSRT serves a variety of users including hikers, joggers, equestrians, and cyclists. Most of the CSRT has been completed; this Project consists of an 800-foot segment that connects the Crystal Springs Dam Trail to the Crystal Springs Regional South of Dam Trail.

The Project will consist of a Class I bikeway on the western shoulder of Skyline Boulevard with a 10-foot wide paved/gravel trail. The trail will be bordered by a barrier on the east side and a chain-link fence on the west side.
Figure 1 - Regional Location
Figure 2 – Biological Study Area
2.0 METHODOLOGY

2.1 REGULATORY OVERVIEW

Regulated or sensitive resources studied and analyzed herein include special status plant and wildlife species, nesting birds and raptors, sensitive plant communities, jurisdictional waters and wetlands, wildlife movement, and locally protected resources, such as protected trees.

2.1.1 Environmental Statutes

For the purpose of this report, potential impacts to biological resources were analyzed based on the following laws, ordinances, regulations, and statutes (LORSs):

- California Environmental Quality Act (CEQA)
- Federal Endangered Species Act (FESA)
- California Endangered Species Act (CESA)
- Federal Clean Water Act (CWA)
- California Fish and Game Code (CFGC)
- Migratory Bird Treaty Act (MBTA)
- The Bald and Golden Eagle Protection Act
- Porter-Cologne Water Quality Control Act
- San Mateo County General Plan 1986
- San Mateo County Regulation of the Removal and Trimming of Heritage Trees on Public and Private Property (Ordinance 2727, April 5, 1977)
- San Mateo County Significant Tree Ordinance, 2010 (Part Three of Division VIII of the San Mateo County Ordinance Code).

See Appendix A for a discussion of some of these LORSs.

2.2 LITERATURE REVIEW

The following existing reports and lists were reviewed for relevant project information:

- *Crystal Springs Regional Trail South of Dam Project Biotic Assessment* (TRA Environmental Services 2012)
- *Endangered Species Formal Consultation on the Proposed Crystal Springs Dam Bridge Replacement, San Mateo County, California* (USFWS 1999)
- *Crystal Springs Dam Bridge Replacement Project, Initial Study with Proposed Mitigated Negative Declaration* (ENTRIX 2009)
- *Amendment to the Biological Opinion on the Effects of the Proposed Crystal Springs Dam Bridge Replacement, San Mateo County* (Service File No. 1-1-98-F-145) (USFWS 2009)
- Complete the Gap Trail Project website (County of San Mateo Parks Department 2016)

Queries of the United States Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System (IPaC) (USFWS 2016), California Department of Fish and Wildlife
(CDFW) California Natural Diversity Database (CNDDB) (CDFW 2017), and the California Native Plant Society (CNPS) Online Inventory of Rare, Threatened and Endangered Plants of California (CNPS 2017) were conducted to obtain comprehensive information regarding state and federally listed species as well as other special status species and sensitive plant communities considered to have potential to occur or known to occur within the San Mateo, California USGS 7.5-minute topographic quadrangle and/or surrounding eight quadrangles (San Francisco South, Hunters Point, San Mateo, Woodside, Montara Mountain, Redwood Point, Palo Alto, and Half Moon Bay). The results of these scientific database queries were compiled into a table that is presented as Appendix B. (Note that for CNDDB mapping purposes, a one mile search radius was used).

In addition, the following resources were reviewed for information about the BSA:

- Google Earth (2016) aerial photographs of the BSA and vicinity
- San Mateo, California USGS 7.5-minute topographic quadrangle
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Web Soil Survey (2017)
- USFWS IPaC list of federally listed species with potential to occur within the BSA and vicinity (2016)
- USFWS Critical Habitat Portal (2017)
- CDFW (2017) CNDDB list of species status species documented within the San Mateo, California USGS 7.5-minute topographic quadrangle and surrounding eight quadrangles
- CDFW (2017) CNDDB map of state and federally listed species that have been previously documented within a 1-mi (1.6-km) radius of the BSA
- CNPS/California Rare Plant Rank (CRPR) list of sensitive plant species with potential to occur within the San Mateo, California USGS 7.5-minute topographic quadrangle and surrounding eight quadrangles (2017).

### 2.3 FIELD RECONNAISSANCE SURVEY

A field reconnaissance survey was conducted to document the existing site conditions and to evaluate the potential for presence of sensitive biological resources, including sensitive plant and animal species, sensitive plant communities, potentially jurisdictional waters of the United States and State of California including wetlands, and habitat for federally and state protected nesting birds.

The field reconnaissance survey was conducted by Rincon Senior Biologist, Eric Schaad, on January 4, 2017. Weather conditions during the survey included temperatures of approximately 53 degrees Fahrenheit, with winds from zero to three miles per hour, and fog with 100 percent cloud cover and a slight drizzle throughout the survey. Mr. Schaad surveyed the entire BSA on foot, where terrain would allow, and recorded all biological resources encountered in the BSA.

An inventory of all plant and animal species observed was compiled (Appendix C) and an evaluation of potentially jurisdictional aquatic features was also conducted during the survey. During the survey, an inventory of all coast live oak (*Quercus agrifolia*) trees was also conducted to document the location and number of oak trees within the BSA. Plant species

Wildlife identification and nomenclature followed standard reference texts including, the American Ornithologists’ Union (AUO) Check-list of North and Middle American Birds, 7th edition and the 57th supplement (AUO, 2016), Field Guide to Western Reptiles and Amphibians (Stebbins 2003), and Mammals of North America (Bowers et al. 2004). The habitat requirements for each regionally occurring special status species were assessed and compared to the type and quality of the habitats observed within the BSA during the field survey. Several sensitive species were eliminated from consideration as potentially occurring in the BSA due to a lack of suitable habitat, lack of suitable soils/substrate, and/or known regional distribution. The relative density of fossorial mammal burrows and soil characteristics throughout the BSA were also noted. Locations of woodrat middens were recorded using a Trimble Global Positioning System unit with sub-meter accuracy.
3.0 EXISTING CONDITIONS

This section summarizes the results of the field reconnaissance survey and incorporates information about the environmental setting. Discussions regarding the general environmental setting, vegetation communities present, plants and animals observed, and potential constraints due to the presence of special status species are presented below. A complete list of all the plant and animal species observed in the BSA during the 2017 field reconnaissance survey is presented as Appendix C and representative photographs of the BSA are provided in Appendix D. Figure 3 depicts the locations of all sensitive biological resources documented during the survey.

3.1 PHYSICAL CHARACTERISTICS

The BSA is located in San Mateo County along the eastern border of the Lower Crystal Springs Reservoir near the community of Highlands-Baywood Park. The climate is moderate and typifies a Mediterranean coastal climate throughout the year. The majority of rainfall occurs during the winter months and the summers are cool. This part of San Mateo County has a mean annual air temperature range of 48 to 70 degrees Fahrenheit and mean annual precipitation of 20 inches (NOAA 2017).

Elevations in the BSA range from approximately 300 to 400 feet above mean sea level. Skyline Boulevard runs north-south through the BSA and crosses over the Crystal Springs Dam directly north of the BSA. The Lower Crystal Springs Reservoir borders the BSA to the west. Approximately 315 feet east, I-280 runs parallel in a north-south direction to the BSA. Skyline Boulevard continues to the southeast and the Crystal Springs Regional Trail system continues to the southwest.

The BSA is within the San Francisco Bay (SnFrB) geographic sub-region of California. The SnFrB sub-region is a component of the larger Central Western California geographic region, which occurs within the even larger California Floristic Province (Baldwin et al. 2012).

3.1.1 Watershed and Drainages

The BSA is in the San Francisco Bay watershed (Hydrologic Unit Code 18050004) and adjacent to Lower Crystal Springs Reservoir. There are no named streams within the BSA.

3.1.2 Soils

The NRCS Web Soil Survey of San Mateo County, Eastern Part, and San Francisco County, California delineates two soil map units within the BSA: Obispo clay, 15 to 30 percent slopes and Los Gatos loam, 30 to 75 percent slopes, Major Land Resource Area (MLRA) 15 (USDA, 2017). Most of the BSA consists of Obispo clay, 15 to 30 percent slopes. The northern portion of the BSA, abutting the Crystal Springs Dam, is mapped as Los Gatos loam, 30 to 75 percent slopes, MLRA 15. These soil map units are not designated as hydric soils in coastal San Mateo County (USDA, 2017). Soils in the BSA are not volcanic, or highly saline or alkaline. Descriptions of each soil map unit are presented below.
Figure 3 – Sensitive Resources within the Biological Study Area
Obispo clay, 15 to 30 percent slopes

Obispo clay, 15 to 30 percent slopes is a well-drained soil that occurs on hillslopes. The parent material for Obispo clay is residuum weathered from serpentine. A typical soil profile for Obispo clay consists of clay in the upper 12 inches and unweathered bedrock from 12 to 16 inches.

Los Gatos loam, 30 to 75 percent slopes, MLRA 15

Los Gatos loam, 30 to 75 percent slopes, MLRA 15 is a well-drained soil that occurs on hillslopes and mountain slopes. The parent material is residuum weathered from sedimentary rock. A typical soil profile for Los Gatos loam is slightly decomposed plant material in the uppermost inch, loam from 1 to 8 inches, gravelly loam from 8 to 18 inches, very gravelly clay loam from 18 to 26 inches, and bedrock from 26 to 36 inches.

3.2 VEGETATION AND HABITATS

One vegetation community and one land cover type were detected in the BSA: coast live oak woodland (*Quercus agrifolia* Woodland Alliance) and disturbed/developed. Vegetation was classified and mapped during the January 4, 2017 reconnaissance survey. The floristic composition of these communities as described below is limited to one site visit during the winter; therefore, the descriptions underrepresent the diversity and abundance of native plant taxa.

Coast Live Oak woodland (*Quercus agrifolia* Woodland Alliance)

Coast live oak woodland is the only vegetation community in the BSA. Vegetation in the BSA is characterized by an open to continuous canopy of coast live oak with California bay (*Umbellularia californica*) and pacific madrone (*Arbutus menziesii*) throughout. Seventy coast live oak trees were recorded within the BSA with diameter at breast height (dbh) ranging from 7 inches to 29.25 inches. Shrubs in the BSA were mostly toyon (*Heteromeles arbutifolia*) and western poison oak (*Toxicodendron diversilobum*). The understory is comprised of various forb species that were unable to be identified due to the timing of the reconnaissance survey.

Disturbed /Developed

Skyline Boulevard runs north-south through the center of the BSA. At the southern end of the BSA a small segment of the existing CSRT connects to Skyline Boulevard. A single tubular steel pole is present in the BSA just south of the Crystal Springs Dam to the west of Skyline Boulevard.

3.3 GENERAL WILDLIFE

Wildlife activity was generally low during the reconnaissance survey. See Appendix C for a full list of species observed within the BSA. A number of bird species such as red-tailed hawk (*Buteo jamaicensis*), western scrub jay (*Aphelocoma californica*), and northern flicker (*Colaptes auratus*) were detected within the BSA. San Francisco dusky footed woodrat (*Neotoma fuscipes annectens*) middens were observed throughout the BSA. No bird nests were detected within the BSA.
4.0 SENSITIVE BIOLOGICAL RESOURCES

Local, state, and federal agencies regulate special status species and require an assessment of their presence or potential presence to be conducted on site prior to the approval of any proposed development on a property. This section discusses sensitive biological resources observed in the BSA, and evaluates the potential for the BSA to support other sensitive biological resources. Assessments for the potential occurrence of special status species are based upon known ranges, habitat preferences for the species, species occurrence records from the CNDDB, and species occurrence records from other sites in the vicinity of the BSA. The potential for each special status species to occur in the BSA was evaluated according to the following criteria:

No Potential. Habitat on and adjacent to the BSA is clearly unsuitable for the species requirements (foraging, breeding, cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

Low Potential. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the BSA is unsuitable or of very poor quality. The species is not likely to be found in the BSA.

Moderate Potential. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the BSA is unsuitable. The species has a moderate probability of being found in the BSA.

High Potential. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the BSA is highly suitable. The species has a high probability of being found in the BSA.

Present. Species is observed in the BSA or has been recorded (e.g., CNDDB, other reports) on the site recently (within the last 5 years).

The evaluation of potential to occur for each species identified in the records search is presented in Appendix D.

4.1 SPECIAL STATUS SPECIES

Rincon staff evaluated 43 special status species for their potential to occur in the BSA: 22 plant species, and 21 animal species (Appendix D). The BSA potentially supports suitable habitat for seven special status animal species and six special status plant species. Known occurrences of special status plants, wildlife, sensitive natural communities, and critical habitats within one mile of the BSA are illustrated on Figure 4.
Figure 4 – Sensitive Species, Natural Communities, and Designated Critical Habitats

1 - Bay checkerspot butterfly
2 - California red-legged frog
3 - Edgewood blind harvestman
4 - western pond turtle
5 - arcuate bush-hen
6 - bent-flowered fiddleneck
7 - Crystal Springs fountain thistle
8 - Crystal Springs lessingia
9 - fragrant fritillary
10 - Franciscan onion
11 - Hillsborough chocolate lily
12 - Marin western fritillary
13 - San Francisco colt’s foot
14 - San Francisco owl’s clover
15 - San Mateo thorn-mint
16 - San Mateo woolly sunflower
17 - short-leaved evans
18 - western leafy wood
19 - white-rayed pentachasma
20 - Serpentine Bunchgrass
4.1.1 Special Status Plant Species

Based on the database and literature review of records from the nine-quadrangle query and the USFWS IPaC list of federally listed species, 22 special status plant species are known to occur, or have the potential to occur within 10 miles of the BSA (Appendix D). Of these 22 special status plant species, none are known to currently occur within the BSA. Six species have a low or moderate potential to occur in the BSA based on the presence of a suitable vegetation community and other suitable habitat parameters. Special status plants that are associated with volcanic substrates, clay soils, or highly saline or alkaline soils are not expected to be present in the BSA because the BSA lacks these specific substrates and soil types. Botanical surveys that targeted specific special status plants were not conducted.

The following four special status plant species have a moderate potential to occur in coast live oak woodland in the BSA:

- Franciscan onion (*Allium peninsulare* var. *franciscanum*) – California Rare Plant Rank (CRPR) 1B.2
- San Mateo woolly sunflower (*Eriophyllum latilobum*) – federally and state Endangered; CRPR 1B.1
- Hillsborough chocolate lily (*Fritillaria biflora* var. *ineziana*) – CRPR 1B.1
- Crystal Springs lessingia (*Lessingia arachnoidea*) – CRPR 1B.2

The following two special status plant species have a low potential to occur in coast live oak woodland in the BSA:

- bent-flowered fiddleneck (*Amsinckia lunaris*) – CRPR 1B.2
- white-rayed pentachaeta (*Pentachaeta bellidiflora*) – federally and state Endangered; CRPR 1B.1

Each of the above species has been recorded within one mile of the BSA and could potentially be found in the coast live oak woodland on site. Targeted botanical surveys would need to be conducted during the appropriate blooming periods to definitively determine the presence or absence of these species.

4.1.2 Special Status Wildlife Species

One special status animal species, San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*) was detected during the reconnaissance field surveys. Another twenty special status animal species were identified within five miles of the project site or included in the USFWS IPaC list of federally listed species, three of which have been documented within one mile of the BSA (Figure 4). Six special status animal species were determined to have a low or moderate potential to occur in the BSA and one was documented to be present in the BSA.

The following species was present in the BSA during the reconnaissance survey:
• San Francisco dusky-footed woodrat – state Species of Special Concern: Twenty-nine woodrat middens are present in the BSA. The coast live oak woodland in the BSA provides moderate canopy and understory that woodrats prefer.

The following three species were determined to have a moderate potential to occur in the BSA:

• California red-legged frog (Rana draytonii) – federally threatened and state Species of Special Concern: California red-legged frog (CRLF) has been documented near the BSA. The entire BSA is within designated Critical Habitat for CRLF (Figure 4). The BSA lacks suitable aquatic/breeding habitat for CRLF, but it potentially provides suitable non-breeding habitat within the coast live oak woodland. This habitat type within the project area is marginally suitable for frog movement since the proposed trail alignment is not located between the reservoir and other suitable aquatic habitat and is therefore not within a primary movement corridor for the CRLF. All life history stages of the CRLF are most likely to be encountered in and around breeding sites, which include coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, and ponded and backwater portions of streams, as well as artificial impoundments such as stock ponds, irrigation ponds, and siltation ponds. Eggs are typically deposited in permanent pools, attached to emergent vegetation. The CNDDB record in close proximity to the BSA was recorded in 2007. Observations of adults, tadpoles, and egg masses were made in 2001, 2006, and 2007 (Figure 4). The observation includes the Crystal Springs Dam, just north of the BSA. There are multiple other CNDDB records of CRLF within the Lower Crystal Springs Reservoir and within one mile of the BSA. The BSA lacks suitable breeding habitat for CRLF; however, the coast live oak woodland in the BSA could provide suitable upland habitat to shelter, forage, and avoid predators.

• Pallid bat (Antrozous pallidus) – state Species of Special Concern: Pallid bats have been documented within the nine-quad search area surrounding the BSA. This species roosting habitat includes cliff and rocky outcrops, which are not found in the BSA; however, pallid bats could also potentially roost in hollow trees in the BSA. The BSA occurs adjacent to the Lower Crystal Springs Reservoir, which provides foraging habitat for pallid bat.

• California giant salamander (Dicamptodon ensatus) – state Species of Special Concern: California giant salamanders have been documented within the nine-quad search area surrounding the BSA. This species inhabits wet coastal forests surrounding various water sources. The coast live oak woodland in the BSA would potentially provide suitable habitat. This species was documented more than one mile from the BSA in the vicinity of San Mateo Creek in 1997.

The following three species were determined to have a low potential to occur in the BSA:

• Western pond turtle (Emys marmorata) – state Species of Special Concern: Western pond turtles have been documented within one mile of the BSA. The BSA is immediately adjacent to the Lower Crystal Springs Reservoir, which provides suitable aquatic habitat. However, the BSA does not have beaches or grassy open fields for basking.
Several CNDDB records of adult western pond turtles exist in the Lower Crystal Springs Reservoir from 2006.

- San Francisco garter snake (*Thamnophis sirtalis tetrataenia*) – federally and state endangered; Fully protected: San Francisco garter snake was included in the USFWS IPaC list and has been documented within the nine-quad search area surrounding the BSA. The BSA does not provide suitable aquatic habitat for this species; however, it may use the coast live oak woodland on site to overwinter. There are no CNDDB records of San Francisco garter snake within five miles of the BSA.

- Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) – state Species of Special Concern: Saltmarsh common yellowthroat has been documented within the nine-quad search area surrounding the BSA. This species is found in freshwater and saltwater marshes with emergent vegetation and willows for nesting. The BSA does not provide suitable marsh habitat; however, this species could forage in the coast live oak woodland in the BSA. There are no CNDDB records of saltmarsh common yellowthroat within one mile of the BSA.

In addition, native vegetation is present in and surrounding the BSA that may provide suitable habitat for nesting birds. Several species of birds common to the area that typically nest in the vegetation found within the BSA, such as western scrub jay (*Aphelocoma californica*) and northern flicker (*Colaptes auratus*) were detected during the reconnaissance survey. Although no raptor nests were detected during the survey, any of the larger trees within the BSA and adjacent to the BSA could be utilized by raptors for nesting.

### 4.2 SENSITIVE PLANT COMMUNITIES

No sensitive plant communities are present in the BSA. One sensitive plant community, serpentine bunchgrass, occurs within one mile of the BSA. This community is listed as a sensitive natural community in the CDFW *List of Vegetation Alliances and Associations* (CDFW 2010). According to the California Department of Fish and Wildlife’s Vegetation Program, Alliances with State ranks of S1-S3 are considered to be imperiled, and thus, potentially of special concern. Serpentine bunchgrass is listed as S2.2.

### 4.3 JURISDICTIONAL WATERS AND WETLANDS

There are no areas present in the BSA that would qualify as waters of the United States and/or State of California under the jurisdictions of the United States Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), or CDFW.

### 4.4 WILDLIFE MOVEMENT

Wildlife movement corridors, or habitat linkages, are generally defined as connections between habitat patches that allow for physical and genetic exchange between otherwise isolated animal populations. Such linkages may serve a local purpose, such as providing a linkage between foraging and denning areas, or they may be regional in nature. Some habitat linkages may serve
as migration corridors, wherein animals periodically move away from an area and then subsequently return. Others may be important as dispersal corridors for young animals. A group of habitat linkages in an area can form a wildlife corridor network.

The habitats within the link do not necessarily need to be the same as the habitats that are being linked. Rather, the link merely needs to contain sufficient cover and forage to allow temporary inhabitation by ground-dwelling species. Typically habitat linkages are contiguous strips of natural areas, though dense plantings of landscape vegetation can be used by certain disturbance-tolerant species. Depending upon the species using a corridor, specific physical resources (such as rock outcroppings, vernal pools, or oak trees) may need to be located within the habitat link at certain intervals to allow slower-moving species to traverse the link. For highly mobile or aerial species, habitat linkages may be discontinuous patches of suitable resources spaced sufficiently close together to permit travel along a route in a short period of time. Wildlife movement corridors can be both large and small scale. The project site is not located between two well-defined habitat regions and as such is unlikely to serve as an important wildlife corridor; however, it located in a comparatively undeveloped area of natural habitat that runs along the eastern border of the Upper and Lower Crystal Springs Reservoirs. The project site is also already partially developed and it is unlikely that the proposed project would significantly alter wildlife movement through the area.

4.5 RESOURCES PROTECTED BY LOCAL POLICIES AND ORDINANCES

4.5.1 San Mateo County General Plan 1986

The San Mateo County General Plan (1986) goals and objectives that protect biological resources include the following:

- Promote the conservation, enhancement, protection, maintenance, and managed use of the County’s vegetative, water, fish and wildlife resources.
- Protect sensitive habitats from reduction in size or degradation of the conditions necessary for their maintenance.
- Protect the availability and encourage the productive use of the county’s economically valuable vegetative, water, fish, and wildlife resources in a manner that minimizes adverse environmental impacts.

General Plan policies that protect biological resources include the following:

- Policy 1.20: Consider areas designated as sensitive habitat as a priority resource requiring protection.
- Policy 1.21: Consider Vegetative, Water, Fish, and Wildlife Resources that are economically valuable as a priority resource to be enhanced, utilized, managed, and maintained for the needs of present and future generations.
- Policy 1.22: Regulate development to protect vegetative, water, fish, and wildlife resources.
Complete the Gap Trail Planning Project  
Biological Resources Assessment

- Policy 1.23: Regulate location, density, and design of development to protect vegetative, water, fish, and wildlife resources.
- Policy 1.24: Ensure that development will: minimize the removal of vegetative resources and/or protect vegetation that enhances microclimate, stabilizes slopes, or reduces surface water runoff, erosion, or sedimentation; and/or protect historic and scenic trees.
- Policy 1.25: Ensure that development will maintain adequate stream flows and water quality for vegetative, fish, and wildlife habitats.
- Policy 1.26: Ensure that development will minimize the disruption of fish and wildlife and their habitats.
- Policy 1.27: Regulate land uses and development activities within and adjacent to sensitive habitats in order to protect rare, endangered and unique plants and animals from reduction of the range or degradation of their environment and protect and maintain the biological productivity of important plant and animal habitats.
- Policy 1.28: Establish necessary buffer zones adjacent to sensitive habitats.

4.5.2 San Mateo County Heritage Tree Ordinance

The San Mateo County Regulation of the Removal and Trimming of Heritage Trees on Public and Private Property (Ordinance 2727, April 5, 1977) protects the removal of heritage trees (San Mateo County 1977). A tree permit is required from the San Mateo County Planning Department for the removal of a heritage tree. Heritage trees include the following trees:

- Any tree or grove of trees so designated after Board inspection, advertised public hearing and resolution by the Board of Supervisors.
- Bigleaf maple (*Acer macrophyllum*) of more than 36 inches in diameter at breast height (dbh) west of Skyline Boulevard or 28 inches east of Skyline Boulevard.
- Madrone (*Arbutus menziesii*) with a single stem or multiple stems touching each other 4 1/2 feet above the ground of more than 48 inches in DBH, or clumps visibly connected above ground with a basal area greater than 20 square feet measured 4 1/2 feet above average ground level.
- Golden chinquapin (*Chrysolepis chrysophylla*) of more than 20 inches in dbh
- All Santa Cruz cypress (*Cupressus abramsiana*).
- Oregon ash (*Fraxinus latifolia*) of more than 12 inches in dbh
- Tan Oak (*Lithocarpus densiflorus*) of more than 48 inches in dbh
- Douglas fir (*Pseudotsuga menziesii*) of more than 60 inches in DBH east of Skyline Boulevard and north of Highway 92.
- Coast live oak (*Quercus agrifolia*) of more than 48 inches in dbh
- Canyon live oak (*Quercus chrysolepis*) of more than 40 inches in dbh
- All Oregon white oak (*Quercus garryana*)
- Black oak (*Quercus kellogii*) of more than 32 inches in dbh
- Interior live oak (*Quercus wislizenii*) of more than 40 inches in dbh
- Valley oak (*Quercus lobata*) of more than 48 inches in dbh
- Blue oak (*Quercus douglasii*) of more than 30 inches in dbh
- California bay (*Umbellularia californica*) with a single stem or multiple stems touching each other 4 1/2 feet above the ground of more than 48 inches in dbh, or clumps visibly
connected above ground with a basal area of 20 square feet measured 4 1/2 feet above average ground level.

- California nutmeg (*Torreya californica*) of more than 30 inches in dbh
- Redwood (*Sequoia sempervirens*) of more than 84 inches in dbh west of Skyline Boulevard or 72 inches DBH east of Skyline Boulevard.

### 4.5.3 San Mateo County Significant Tree Ordinance

The San Mateo County *Significant Tree Ordinance* requires a permit for the removal of any native or non-native tree with a circumference of 38 inches (12.1 inches in diameter) as measured at breast height or immediately below the lowest branch, whichever is lower, and having the inherent capacity of naturally producing one main axis continuing to grow more vigorously than the lateral axes (San Mateo County 2010). A permit is also required for the removal of part of a community of trees, which is defined as a group of trees of any size that are ecologically or aesthetically related to each other such that loss of several of them would cause a significant ecological, aesthetic, or environmental impact in the immediate area.
5.0 LIMITATIONS, ASSUMPTIONS, AND USE RELIANCE

This Biological Resources Assessment has been performed in accordance with professionally accepted biological investigation practices conducted at this time and in this geographic area. The biological investigation is limited by the scope of work performed. In addition, general biological (or protocol) surveys do not guarantee that the organisms are not present and will not be discovered in the future within the site. In particular, mobile wildlife species could occupy the site on a transient basis, or re-establish populations in the future. Our field study was based on current industry practices, which change over time and may not be applicable in the future. No other guarantees or warranties, expressed or implied, are provided. The findings and opinions conveyed in this report are based on findings derived from site reconnaissance, jurisdictional areas, review of CNDDB RareFind5, and specified historical and literature sources. Standard data sources relied upon during the completion of this report, such as the CNDDB, may vary with regard to accuracy and completeness. In particular, the CNDDB is compiled from research and observations reported to CDFW that may or may not have been the result of comprehensive or site-specific field surveys. Although Rincon believes the data sources are reasonably reliable, Rincon cannot and does not guarantee the authenticity or reliability of the data sources it has used. Additionally, pursuant to our contract, the data sources reviewed included only those that are practically reviewable without the need for extraordinary research and analysis.
6.0 REFERENCES


Google Earth. 2016. Available at: http://earth.google.com/


San Mateo County Parks Department. 2016. Complete the Gap Trail Project website. Available at: http://parks.smcgov.org/complete-gap-trail-project


United States Fish and Wildlife Service. 2009. Amendment to the Biological Opinion on the Effects of the Proposed Crystal Springs Dam Bridge Replacement, San Mateo County (Service File No. 1-1-98-F-145)


7.0 LIST OF PREPARERS

RINCON CONSULTANTS, INC.

Field Survey:
  o Eric Schaad, Senior Biologist

Primary Author:
  o Amy Leigh Trost, Associate Biologist

Technical Review:
  o Colby J. Boggs, MS, Principal/Senior Ecologist
  o Eric Schaad, Senior Biologist

Graphics:
  o Doug Carreiro, GIS Analyst
REGULATORY SETTING

Special-status habitats are vegetation types, associations, or sub-associations that support concentrations of special-status plant or wildlife species, are of relatively limited distribution, or are of particular value to wildlife.

Listed species are those taxa that are formally listed as endangered or threatened by the federal government (e.g. U.S. Fish and Wildlife Service [USFWS]), pursuant to the Federal Endangered Species Act (FESA) or as endangered, threatened, or rare (for plants only) by the State of California (i.e. California Fish and Game Commission), pursuant to the California Endangered Species Act or the California Native Plant Protection Act. Some species are considered rare (but not formally listed) by resource agencies, organizations with biological interests/expertise (e.g. Audubon Society, CNPS, The Wildlife Society), and the scientific community.

The following is a brief summary of the regulatory context under which biological resources are managed at the federal, state, and local levels. A number of federal and state statutes provide a regulatory structure that guides the protection of biological resources. Agencies with the responsibility for protection of biological resources within the project site include:

- U.S. Army Corps of Engineers (wetlands and other waters of the United States);
- Regional Water Quality Control Board (waters of the State);
- U.S. Fish and Wildlife Service (federally listed species and migratory birds);
- California Department Fish and Wildlife (riparian areas and other waters of the State, state-listed species);

U.S. Army Corps of Engineers. Under Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers (USACE) has authority to regulate activities that could discharge fill of material or otherwise adversely modify wetlands or other “waters of the United States.” Perennial and intermittent creeks are considered waters of the United States if they are hydrologically connected to other jurisdictional waters. The USACE also implements the federal policy embodied in Executive Order 11990, which is intended to result in no net loss of wetland value or acres. In achieving the goals of the Clean Water Act, the USACE seeks to avoid adverse impacts and offset unavoidable adverse impacts on existing aquatic resources. Any fill or adverse modification of wetlands that are hydrologically connected to jurisdictional waters would require a permit from the USACE prior to the start of work. Typically, when a project involves impacts to waters of the United States, the goal of no net loss of wetland acres or values is met through compensatory mitigation involving creation or enhancement of similar habitats.

Regional Water Quality Control Board. The State Water Resources Control Board (SWRCB) and the local Central Coast Regional Water Quality Control Board (RWQCB) have jurisdiction over “waters of the State,” pursuant to the Porter-Cologne Water Quality Control Act, which are defined as any surface water or groundwater, including saline waters, within the boundaries of the State. The SWRCB has issued general Waste Discharge Requirements (WDRs) regarding discharges to “isolated” waters of the State (Water Quality Order No. 2004-0004-DWQ, Statewide General Waste Discharge Requirements for Dredged or Fill Discharges to Waters Deemed by the U.S. Army Corps of Engineers to be Outside of Federal Jurisdiction). The
Central Coast RWQCB enforces actions under this general order for isolated waters not subject to federal jurisdiction, and is also responsible for the issuance of water quality certifications pursuant to Section 401 of the Clean Water Act for waters subject to federal jurisdiction.

**United States Fish and Wildlife Service and National Marine Fisheries Service.** The USFWS implements the Migratory Bird Treaty Act (16 United States Code [USC] Section 703-711) and the Bald and Golden Eagle Protection Act (16 USC Section 668). The USFWS and National Marine Fisheries Service (NMFS) share responsibility for implementing the Federal Endangered Species Act (FESA) (16 USC § 153 et seq.). The USFWS generally implements the FESA for terrestrial and freshwater species, while the NMFS implements the FESA for marine and anadromous species. Projects that would result in “take” of any federally listed threatened or endangered species are required to obtain permits from the USFWS or NMFS through either Section 7 (interagency consultation with a federal nexus) or Section 10 (Habitat Conservation Plan) of FESA, depending on the involvement by the federal government in permitting and/or funding of the project. The permitting process is used to determine if a project would jeopardize the continued existence of a listed species and what measures would be required to avoid jeopardizing the species. “Take” under federal definition means to harass, harm (which includes habitat modification), pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Proposed or candidate species do not have the full protection of FESA; however, the USFWS and NMFS advise project applicants that they could be elevated to listed status at any time.

**California Department of Fish and Wildlife.** The California Department of Fish and Wildlife (CDFW) derives its authority from the Fish and Game Code of California. The California Endangered Species Act (CESA) (Fish and Game Code Section 2050 et. seq.) prohibits take of state listed threatened, endangered or fully protected species. Take under CESA is restricted to direct mortality of a listed species and does not prohibit indirect harm by way of habitat modification. The CDFW also prohibits take for species designated as Fully Protected under the Code.

California Fish and Game Code sections 3503, 3503.5, and 3511 describe unlawful take, possession, or destruction of birds, nests, and eggs. Fully protected birds (Section 3511) may not be taken or possessed except under specific permit. Section 3503.5 of the Code protects all birds-of-prey and their eggs and nests against take, possession, or destruction of nests or eggs.

Species of Special Concern (SSC) is a category used by the CDFW for those species that are considered to be indicators of regional habitat changes or are considered to be potential future protected species. Species of Special Concern do not have any special legal status except that which may be afforded by the Fish and Game Code as noted above. The SSC category is intended by the CDFW for use as a management tool to include these species into special consideration when decisions are made concerning the development of natural lands. The CDFW also has authority to administer the Native Plant Protection Act (NPPA) (Fish and Game Code Section 1900 et seq.). The NPPA requires the CDFW to establish criteria for determining if a species, subspecies, or variety of native plant is endangered or rare. Under Section 1913(c) of the NPPA, the owner of land where a rare or endangered native plant is growing is required to notify the department at least 10 days in advance of changing the land use to allow for salvage of plant.
Perennial and intermittent streams and associated riparian vegetation, when present, also fall under the jurisdiction of the CDFW. Section 1600 et seq. of the Fish and Game Code (Lake and Streambed Alteration Agreements) gives the CDFW regulatory authority over work within the stream zone (which could extend to the 100-year flood plain) consisting of, but not limited to, the diversion or obstruction of the natural flow or changes in the channel, bed, or bank of any river, stream or lake.

**County of San Mateo.** The proposed project is partially located within the County of San Mateo and is subject to the policies set forth in the County of San Mateo General Plan. The San Mateo county General Plan includes the following goals designed to protect vegetative, water, fish and wildlife resources:

1.1 **Conserve, Enhance, Protect, Maintain and Manage Vegetative, Water, Fish and Wildlife Resources**

Promote the conservation, enhancement, protection, maintenance and managed use of the County’s Vegetative, Water, Fish and Wildlife Resources.

1.2 **Protect Sensitive Habitats**

Protect sensitive habitats from reduction in size or degradation of the conditions necessary for their maintenance.

1.3 **Protection and Productive Use of Economically Valuable Vegetative, Water, Fish and Wildlife Resources**

Protect the availability and encourage the productive use of the County’s economically valuable vegetative, water, fish and wildlife resources in a manner which minimizes adverse environmental impacts.

1.4 **Access to Vegetative, Water, Fish and Wildlife Resources**

Protect and promote existing rights of public access to vegetative, water, fish and wildlife resources for purposes of study and recreation consistent with the need to protect public rights, rights of private property owners and protection and preservation of such resources.

The General Plan also designates sensitive habitats and includes general policies, regulation of development, resource protections, and other procedures/policies to achieve the general plan goals.
Appendix B

Special Status Species Evaluation Tables
<table>
<thead>
<tr>
<th>Scientific Name Common Name</th>
<th>Status</th>
<th>Habitat Requirements</th>
<th>Potential to Occur in Project Area</th>
<th>Habitat Suitability/Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Plants</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Acanthomintha duttonii</em> San Mateo thorn-mint</td>
<td>FE/CE</td>
<td>Chaparral, valley and foothill grassland. Uncommon serpentine vertisol clays; in relatively open areas. 50-300 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td><em>Allium peninsulare var. franciscanum</em> Franciscan onion</td>
<td>None/None G5T1 / S1 1B.2</td>
<td>Cismontane woodland, valley and foothill grassland. Clay soils; often on serpentine; sometimes on volcanics. Dry hillsides. 5-350 m.</td>
<td>Moderate Potential</td>
<td>The coast live oak woodland in the BSA may provide suitable habitat for this species. Records of this species occur within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Amsinckia lunaris</em> bent-flowered fiddleneck</td>
<td>None/None G2G3 / S2S3 1B.2</td>
<td>Cismontane woodland, valley and foothill grassland, coastal bluff scrub. 3-795 m.</td>
<td>Low Potential</td>
<td>The coast live oak woodland in the BSA provides marginally suitable habitat for this species. Records of this species occur within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Arctostaphylos montaraensis</em> Montara manzanita</td>
<td>None/None G1 / S1 1B.2</td>
<td>Chaparral, coastal scrub. Slopes and ridges. 270-460 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td><em>Arctostaphylos regismontana</em> Kings Mountain manzanita</td>
<td>None/None G2 / S2 1B.2</td>
<td>Broadleaved upland forest, chaparral, north coast coniferous forest. Granitic or sandstone outcrops. 240-705 m.</td>
<td>No potential</td>
<td>Suitable soils for this species do not occur in the BSA. This species has not been documented within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Astragalus pycnostachyus var. pycnostachyus</em> coastal marsh milk-vetch</td>
<td>None/None G2T2 / S2 1B.2</td>
<td>Coastal dunes, marshes and swamps, coastal scrub. Mesic sites in dunes or along streams or coastal salt marshes. 0-155 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td>Scientific Name Common Name</td>
<td>Status</td>
<td>Habitat Requirements</td>
<td>Potential to Occur in Project Area</td>
<td>Habitat Suitability/Observations</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------</td>
<td>----------------------</td>
<td>-----------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td><em>Cirsium fontinale var. fontinale</em> Crystal Springs fountain thistle</td>
<td>FE/CE G2T1 / S1 1B.1</td>
<td>Valley and foothill grassland, chaparral, cismontane woodland, meadows and seeps. Serpentine seeps and grassland. 45-185 m.</td>
<td>No Potential</td>
<td>No seeps or grasslands occur within the BSA. Records of this species occur within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Collinsia multicolor</em> San Francisco collinsia</td>
<td>None/None G2 / S2 1B.2</td>
<td>Closed-cone coniferous forest, coastal scrub. On decomposed shale (mudstone) mixed with humus; sometimes on serpentine. 30-250 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td><em>Eriophyllum latilobum</em> San Mateo woolly sunflower</td>
<td>FE/CE G1 / S1 1B.1</td>
<td>Cismontane woodland, coastal scrub, lower montane coniferous forest. Often on roadcuts; found on and off of serpentine. 30-610 m.</td>
<td>Moderate Potential</td>
<td>The coast live oak woodland in the BSA may provide suitable habitat for this species. Records of this species occur within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Fritillaria biflora var. ineziana</em> Hillsborough chocolate lily</td>
<td>None/None G3G4T1 / S1 1B.1</td>
<td>Cismontane woodland, valley and foothill grassland. Probably only on serpentine; most recent site is in serpentine grassland. 90-160 m.</td>
<td>Moderate Potential</td>
<td>The coast live oak woodland in the BSA may provide suitable habitat for this species. Records of this species occur within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Fritillaria liliacea</em> fragrant fritillary</td>
<td>None/None G2 / S2 1B.2</td>
<td>Coastal scrub, valley and foothill grassland, coastal prairie, cismontane woodland. Often on serpentine; various soils reported though usually on clay, in grassland. 3-400 m.</td>
<td>No Potential</td>
<td>Suitable habitat does not occur in the BSA. Records of this species occur within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Hesperevax sparsiflora var. brevifolia</em> short-leaved evax</td>
<td>None/None G4T3 / S2 1B.2</td>
<td>Coastal bluff scrub, coastal dunes, coastal prairie. Sandy bluffs and flats. 0-215 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Status</td>
<td>Habitat Requirements</td>
<td>Potential to Occur in Project Area</td>
<td>Habitat Suitability/Observations</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------</td>
<td>----------------------</td>
<td>-----------------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Hesperolinon congestum</td>
<td>FT/CT G1 / S1 1B.1</td>
<td>Chaparral, valley and foothill grassland. In serpentine barrens and in serpentine grassland and chaparral. 60-370 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td>Horkelia cuneata var. sericea</td>
<td>None/None G4T? / S1? 1B.1</td>
<td>Closed-cone coniferous forest, coastal scrub, coastal dunes, chaparral. Old dunes, coastal sandhills; openings. 5-215 m.</td>
<td>No potential</td>
<td>Suitable soils for this species do not occur within the BSA. This species has not been documented within one mile of the BSA.</td>
</tr>
<tr>
<td>Lessingia arachnoidea</td>
<td>None/None G2 / S2 1B.2</td>
<td>Coastal sage scrub, valley and foothill grassland, cismontane woodland. Grassy slopes on serpentine; sometimes on roadsides. 90-200 m.</td>
<td>Moderate potential</td>
<td>The coast live oak woodland in the BSA may provide suitable habitat for this species. Records of this species occur within one mile of the BSA.</td>
</tr>
<tr>
<td>Malacothamnus arcuatus</td>
<td>None/None G2Q / S2 1B.2</td>
<td>Chaparral, cismontane woodland. Gravelly alluvium. 1-735 m.</td>
<td>No Potential</td>
<td>Suitable soils for this species do not occur in the BSA. Records of this species occur within one mile of the BSA.</td>
</tr>
<tr>
<td>Monolopia gracilens</td>
<td>None/None G3 / S3 1B.2</td>
<td>Chaparral, valley and foothill grassland, cismontane woodland, broadleaved upland forest, north coast coniferous forest. Grassy sites, in openings; sandy to rocky soils. Often seen on serpentine after burns but may have only weak affinity to serpentine. 100-1200 m.</td>
<td>No Potential</td>
<td>Suitable grassy sites do not occur in the BSA. This species has not been documented within one mile of the BSA.</td>
</tr>
<tr>
<td>Pentachaeta bellidiflora</td>
<td>FE/CE G1 / S1 1B.1</td>
<td>Valley and foothill grassland, cismontane woodland. Open dry rocky slopes and grassy areas, often on soils derived from serpentine bedrock. 35-610 m.</td>
<td>Low Potential</td>
<td>The coast live oak woodland in the BSA provides marginally suitable habitat for this species.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Status</td>
<td>Habitat Requirements</td>
<td>Potential to Occur in Project Area</td>
<td>Habitat Suitability/Observations</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------------</td>
<td>----------------------------------------------------------</td>
<td>------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td><strong>Plagiobothrys chorisianus var. chorisianus</strong> Choris’ popcornflower</td>
<td>None/None</td>
<td>Chaparral, coastal scrub, coastal prairie. Mesic sites. 15-160 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td><strong>Polemonium carneum</strong> Oregon polemonium</td>
<td>None/None</td>
<td>Coastal prairie, coastal scrub, lower montane coniferous forest. 0-1830 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td><strong>Silene verecunda ssp. verecunda</strong> San Francisco campion</td>
<td>None/None</td>
<td>Coastal scrub, valley and foothill grassland, coastal bluff scrub, chaparral, coastal prairie. Often on mudstone or shale; one site on serpentine. 30-645 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td><strong>Triphysaria floribunda</strong> San Francisco owl’s-clover</td>
<td>None/None</td>
<td>Coastal prairie, coastal scrub, valley and foothill grassland. On serpentine and non-serpentine substrate (such as at Pt. Reyes). 1-150 m.</td>
<td>No potential</td>
<td>Suitable habitat does not occur in the BSA.</td>
</tr>
<tr>
<td><strong>Fish</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hypomesus transpacificus</strong> delta smelt</td>
<td>Threatened/ Endangered</td>
<td>Occurs in the Sacramento-San Joaquin Delta. Seasonally found in Suisun Bay, Carquinez Strait &amp; San Pablo Bay. Seldom found at salinities &gt; 10 ppt. Most often at salinities &lt; 2ppt.</td>
<td>No potential</td>
<td>The BSA does not include aquatic habitat.</td>
</tr>
<tr>
<td><strong>Oncorhynchus mykiss irideus</strong> steelhead - central California coast DPS</td>
<td>Threatened/ None</td>
<td>From Russian River, south to Soquel Creek &amp; to, but not including, Pajaro River. Also San Francisco &amp; San Pablo Bay basins.</td>
<td>No potential</td>
<td>The BSA does not include aquatic habitat.</td>
</tr>
<tr>
<td>Scientific Name</td>
<td>Common Name</td>
<td>Status</td>
<td>Habitat Requirements</td>
<td>Potential to Occur in Project Area</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------------------</td>
<td>--------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td><em>Spirinchus thaleichthys</em></td>
<td>longfin smelt</td>
<td>Candidate/ Threatened G5 / S1 SSC</td>
<td>Euryhaline, nektonic &amp; anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15-30 ppt, but can be found in completely freshwater to almost pure seawater.</td>
<td>No potential</td>
</tr>
<tr>
<td><strong>Insects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Euphydryas editha bayensis</em></td>
<td>Bay checkerspot butterfly</td>
<td>Threatened/ None G5T1 / S1</td>
<td>Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay. Plantago erecta is the primary host plant; Orthocarpus densiflorus &amp; <em>O. purpurascens</em> are the secondary host plants.</td>
<td>No potential</td>
</tr>
<tr>
<td><em>Plebejus icarioides missionensis</em></td>
<td>Mission blue butterfly</td>
<td>Endangered/ None G5T1 / S1</td>
<td>Inhabits grasslands of the San Francisco peninsula. Three larval host plants: Lupinus albifrons, <em>L. variicolor</em>, and <em>L. formosus</em>, of which <em>L. albifrons</em> is favored.</td>
<td>No potential</td>
</tr>
<tr>
<td><em>Speyeria zerene myrtleae</em></td>
<td>Myrtle's silverspot butterfly</td>
<td>Endangered/ None G5T1 / S1</td>
<td>Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County. Larval foodplant thought to be <em>Viola adunca</em>.</td>
<td>No potential</td>
</tr>
<tr>
<td><em>Callophrys mossii bayensis</em></td>
<td>San Bruno elfin butterfly</td>
<td>Endangered/ None G4T1 / S1</td>
<td>Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County. Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is <em>Sedum spathulifolium</em>.</td>
<td>No potential</td>
</tr>
</tbody>
</table>
## Complete the Gap Trail Planning Project
### Biological Resources Assessment

<table>
<thead>
<tr>
<th>Scientific Name Common Name</th>
<th>Status</th>
<th>Habitat Requirements</th>
<th>Potential to Occur in Project Area</th>
<th>Habitat Suitability/Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amphibians</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Dicamptodon ensatus</em></td>
<td>None/None</td>
<td>Known from wet coastal forests near streams and seeps from Mendocino Co. south to Monterey Co. and east to Napa Co. Aquatic larvae found in cold, clear streams, occasionally in lakes and ponds. Adults known from wet forests under rocks and logs near streams and lakes.</td>
<td>Moderate Potential</td>
<td>The BSA is adjacent to the Lower Crystal Springs Reservoir and could provide suitable habitat for adults. This species has not been documented within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Rana draytonii</em> California red-legged frog</td>
<td>Threatened/None</td>
<td>Lowlands &amp; foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. must have access to estivation habitat.</td>
<td>Moderate Potential</td>
<td>This species was documented in the immediate vicinity of the Crystal Springs Dam in 2007. Critical habitat for this species occurs in the BSA.</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Emys marmorata</em> western pond turtle</td>
<td>None/None</td>
<td>A thoroughly aquatic turtle of ponds, marshes, rivers, streams &amp; irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation. Need basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 km from water for egg-laying.</td>
<td>Low Potential</td>
<td>No suitable aquatic or upland habitat is present in the BSA; however, the BSA does occur adjacent to the Lower Crystal Springs Reservoir where this species has been observed.</td>
</tr>
<tr>
<td><em>Thamnophis sirtalis tetrataenia</em> San Francisco gartersnake</td>
<td>Endangered/Endangered</td>
<td>Vicinity of freshwater marshes, ponds and slow-moving streams in San Mateo County &amp; extreme northern Santa Cruz County. Prefers dense cover and water depths of at least one foot. Upland areas near water are also very</td>
<td>Low Potential</td>
<td>No suitable aquatic habitat is present in the BSA; however, the site is adjacent to aquatic habitat and this species could use the BSAs upland habitat. This</td>
</tr>
</tbody>
</table>
## Scientific Name

**Common Name**

**Status**

**Habitat Requirements**

**Potential to Occur in Project Area**

**Habitat Suitability/Observations**

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Status</th>
<th>Habitat Requirements</th>
<th>Potential to Occur in Project Area</th>
<th>Habitat Suitability/Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athene cunicularia</td>
<td>burrowing owl</td>
<td>None/None</td>
<td>Open, dry annual or perennial grasslands, deserts &amp; scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.</td>
<td>No potential</td>
<td>The BSA does not provide suitable burrowing habitat or foraging habitat.</td>
</tr>
<tr>
<td>Brachyramphus marmoratus</td>
<td>marbled murrelet</td>
<td>Threatened/Endangered</td>
<td>Feeds near-shore; nests inland along coast from Eureka to Oregon border &amp; from Half Moon Bay to Santa Cruz. Nests in old-growth redwood-dominated forests, up to six miles inland, often in Douglas-fir.</td>
<td>No potential</td>
<td>The BSA does not include suitable old growth coniferous forests for nesting.</td>
</tr>
<tr>
<td>Charadrius alexandrinus nivosus</td>
<td>western snowy plover</td>
<td>Threatened/None</td>
<td>Sandy beaches, salt pond levees &amp; shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.</td>
<td>No potential</td>
<td>The BSA does not include suitable beaches or gravel banks for nesting.</td>
</tr>
<tr>
<td>Geothlypis trichas sinuosa</td>
<td>saltmarsh common yellowthroat</td>
<td>None/None</td>
<td>Resident of the San Francisco Bay region, in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.</td>
<td>Low Potential</td>
<td>The BSA does not include fresh or saltwater marshes; however, this species could forage in the coast live oak woodland in the BSA. This species has not been documented within one mile of the BSA.</td>
</tr>
</tbody>
</table>
### Biological Resources Assessment

#### Complete the Gap Trail Planning Project

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Status</th>
<th>Habitat Requirements</th>
<th>Potential to Occur in Project Area</th>
<th>Habitat Suitability/Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Laterallus jamaicensis</em></td>
<td>California black rail</td>
<td>None/Threatened</td>
<td>Inhabits freshwater marshes, wet meadows &amp; shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year &amp; dense vegetation for nesting habitat.</td>
<td>No potential</td>
<td>No marshes or other suitable habitat types occur in or adjacent to the BSA. This species has not been documented within one mile of the BSA.</td>
</tr>
<tr>
<td><em>Melospiza melodia</em></td>
<td>Alameda song sparrow</td>
<td>None/None</td>
<td>Resident of salt marshes bordering south arm of San Francisco Bay. Inhabits Salicornia marshes; nests low in Grindelia bushes (high enough to escape high tides) and in Salicornia.</td>
<td>No potential</td>
<td>No salt marshes occur within or adjacent to the BSA.</td>
</tr>
<tr>
<td><em>Rallus obsoletus</em></td>
<td>Ridgway’s rail</td>
<td>Endangered/Endangered</td>
<td>Salt-water &amp; brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed, but feeds away from cover on invertebrates from mud-bottomed sloughs.</td>
<td>No potential</td>
<td>No salt water habitats occur within or adjacent to the BSA. This species has not been documented within one mile of the BSA.</td>
</tr>
</tbody>
</table>

#### Mammals

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Status</th>
<th>Habitat Requirements</th>
<th>Potential to Occur in Project Area</th>
<th>Habitat Suitability/Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Antrozous pallidus</em></td>
<td>Pallid bat</td>
<td>None/None</td>
<td>Deserts, grasslands, shrublands, woodlands &amp; forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.</td>
<td>Moderate Potential</td>
<td>Suitable rocky outcrops or cliffs for roosting do not occur in the BSA; however, this species could potentially utilize hollow trees.</td>
</tr>
<tr>
<td><em>Neotoma fuscipes</em></td>
<td>San Francisco dusky-footed woodrat</td>
<td>None/None</td>
<td>Forest habitats of moderate canopy &amp; moderate to dense understory. May prefer chaparral &amp; redwood habitats. Constructs nests of shredded grass,</td>
<td>Present</td>
<td>Woodrat middens are present in the BSA.</td>
</tr>
<tr>
<td>Scientific Name Common Name</td>
<td>Status</td>
<td>Habitat Requirements</td>
<td>Potential to Occur in Project Area</td>
<td>Habitat Suitability/Observations</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------</td>
<td>----------------------</td>
<td>-----------------------------------</td>
<td>--------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reithrodontomys raviventris salt-marsh harvest mouse</td>
<td>Endangered/Endangered G1G2 / S1S2 FP</td>
<td>leaves &amp; other material. May be limited by availability of nest-building materials.</td>
<td>No potential</td>
<td>No saline wetlands or marsh habitats in or adjacent to the BSA. This species has not been documented within one mile of the BSA.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C. Plant and Animal Species Observed
Within the Biological Study Area During Reconnaissance Survey.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Status¹</th>
<th>Origin (Native or Introduced)²</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLANTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trees</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arbutus menziesii</td>
<td>Pacific madrone</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td>Pinus ponderosa</td>
<td>ponderosa pine</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td>Quercus agrifolia</td>
<td>coast live oak</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td>Umbellularia californica</td>
<td>California bay</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td><strong>Shrubs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heteromeles arbutifolia</td>
<td>toyon</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td>Toxicodendron diversilobum</td>
<td>western poison oak</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td><strong>Lichens</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usnea sp.</td>
<td>lichen</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td><strong>WILDLIFE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Invertebrates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ariolimax columbiaus</td>
<td>banana slub</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aphelocoma californica</td>
<td>western scrub jay</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td>Buteo jamaicensis</td>
<td>red-tailed hawk</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td>Colaptes auratus</td>
<td>northern flicker</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td>Larus sp.</td>
<td>gull</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td>Vireo sp.</td>
<td>vireo</td>
<td></td>
<td>Native</td>
</tr>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neotoma sp.</td>
<td>woodrats</td>
<td></td>
<td>Native</td>
</tr>
</tbody>
</table>

¹CRPR – California Rare Plant Rank, defined in California Native Plant Society Online Inventory and CDFW California Natural Diversity Database. Ranks are also fully listed and defined in Appendix D.
²Cal-IPC – California Invasive Plant Council
Photograph 1. South end of the project site, facing north.

Photograph 2. Crystal Springs Dam Bridge under construction at the north end of the project site, facing north.
Photograph 3. Large coast live oak in the BSA.

Photograph 4. Coast live oak woodland in the BSA.
Photograph 5. Woodrat midden at base of coast live oak within the BSA.
Appendix C

Cultural Resources Study
County of San Mateo, Complete the Gap Trail Planning Project

Cultural Resources Study Technical Report

prepared for
County of San Mateo Parks Department
455 County Center, Fourth Floor
Redwood City, California 94063-1665

prepared by
Rincon Consultants, Inc.
449 15th Street, Suite 303
Oakland, California 94612

January 2017
Please cite this report as follows:

Brudvik, Kyle and Steven Treffers

Management Summary

Purpose and Scope: Rincon Consultants, Inc. (Rincon) was retained by the San Mateo County Parks Department to perform a cultural resources study for the Complete the Gap Trail Planning Project (Project) in San Mateo County, California. This study included a cultural resources records search, Native American scoping, archival research, and a cultural resources field survey and evaluation. The project site includes approximately 5.4 acres centered along Skyline Boulevard/State Route 35, immediately west to the Lower Crystal Springs Reservoir in unincorporated San Mateo County. All activities were conducted in accordance with the requirements of the California Environmental Quality Act (CEQA) and applicable local regulations.

Dates of Investigation: Staff at the Northwest Information Center (NWIC), located at Sonoma State University, conducted a California Historical Resources Information System (CHRIS) records search in December 2016. The results of a search of the Sacred Lands Files from the Native American Heritage Commission (NAHC) were received on December 20, 2016. Letters were sent to identified Native American groups and individuals on December 21, 2016. An intensive-level cultural resources survey of the project site was conducted an intensive cultural resources pedestrian survey of the project area on January 4, 2017.

Summary of Findings: Background research identified 19 previous studies within a 0.5-mile radius of the project site. Of these, one included portions of the project site. Background research further identified five previously recorded built environment resources. None of these are on the project site; all are located immediately adjacent to the north. The resources include the Lower Crystal Springs Dam (LCSD) and four properties that are associated with the LCSD’s development and subsequent operation. The LCSD has been previously determined eligible, with concurrence from the State Historic Preservation Officer (SHPO), for listing in the National Register of Historic Places (NRHP) and is listed in the California Register of Historical Resources (CRHR) under Criteria A/1 and C/3. The remaining four properties were determined ineligible for NRHP and CRHR. Background research failed to identify any archaeological resources within the direct project site or a 0.5-mile radius.

As a result of the intensive-level survey, one built environment resource, a segment of Skyline Boulevard/State Route 35, was recorded on California Department of Parks and Recreation (DPR) 523 series forms. Originally developed as a private road in support of the construction of the adjacent LCSD and later incorporated into the California state highway system, the park was evaluated for historic significance and recommended ineligible for listing in the NRHP or CRHR; it is therefore not considered a historical resource for the purposes of CEQA.

Recommendations: No historical, archaeological or tribal cultural resources were identified within the project site, and thus the Project would result in no impact to cultural and tribal cultural resources. Rincon does not recommend further cultural resources work for the proposed Project at this time. Nevertheless, the following measures should be implemented to reduce potential impacts to unanticipated archaeological and tribal cultural resources: cease all construction work in the event that unanticipated buried cultural deposits are encountered and contact a qualified archaeologist; follow
Native American consultation procedures if a previously unidentified cultural resource is determined to be of Native American origin by the qualified archaeologist; and contact the San Mateo County Coroner if human remains are discovered.
# Table of Contents

Management Summary........................................................................................................1

1 Introduction .......................................................................................................................1

   1.1 Project Description......................................................................................................1

2 Regulatory Setting .............................................................................................................4

   2.1 Federal .......................................................................................................................4

   2.2 State ..........................................................................................................................5

   2.3 Local ..........................................................................................................................6

3 Cultural Setting ................................................................................................................9

   3.1 Prehistory ..................................................................................................................9

      3.1.1 Early Holocene (8,000-3,500 B.C.) .................................................................9

      3.1.2 Early Period (3,500-600 B.C.) ......................................................................9

      3.1.3 Lower Middle Period (500 B.C.-A.D. 430) ..................................................10

      3.1.4 Upper Middle Period (A.D. 430-1050) .........................................................10

      3.1.5 Late Period (A.D. 1050-Contact) ..................................................................10

   3.2 Ethnographic Background .........................................................................................10

   3.3 History ......................................................................................................................12

      3.3.1 Spanish Period (1769-1822) .......................................................................12

      3.3.2 Mexican Period (1822-1848) .......................................................................12

      3.3.3 American Period (1848-Present) ..................................................................13

      3.3.4 Crystal Springs Reservoir ..............................................................................13

   3.4 Environmental Setting ..............................................................................................14

4 Background Research .....................................................................................................15

   4.1 Records Search .........................................................................................................15

      4.1.1 Previous Cultural Resources Studies .............................................................15

      4.1.2 Previously Recorded Cultural Resources .....................................................17

   4.2 Native American Scoping .........................................................................................19

5 Methods ..........................................................................................................................21

   5.1 Field Survey .............................................................................................................21

   5.2 Archival Research ....................................................................................................21

6 Findings ...........................................................................................................................22

   6.1 Archaeological Resources .......................................................................................22

   6.2 Built Environment/Historical Resources ...............................................................22

      6.2.1 Skyline Boulevard/State Route 35 .................................................................22

7 Conclusions ....................................................................................................................28

   7.1 Project Impacts Assessment ......................................................................................28
List of Figures
Figure 1 Project vicinity ................................................................. 2
Figure 2 Project Location ................................................................. 3
Figure 3 Southern terminus of Skyline Boulevard/State Route 35 segment, facing south .......... 23
Figure 4 Northern terminus of Skyline Boulevard/State Route 35 segment, facing north .......... 23
Figure 5 Construction staging on Skyline Boulevard/State Route 35 segment, facing south .......... 24
Figure 6 Circa 1891 photograph of the original wood LCSD bridge (Source: San Francisco Public Library) ................................................................. 25
Figure 7 Circa 1924 photograph of the replacement concrete LCSD bridge (Source: Caltrans Digital Collections) ................................................................. 26

List of Tables
Table 1 Previous Cultural Resource Studies within 0.5-miles of the Project Site .......................... 15
Table 2 Previously Recorded Resources within 0.5-miles of the Project Site .......................... 18

Appendices
Appendix A: Records Search Summary
Appendix B: Native American Scoping Documentation
Appendix C: Resource Records
1 Introduction

Rincon Consultants, Inc. (Rincon) was retained by Bellecci Associates and the San Mateo County Parks Department to perform a cultural resources study for the Complete the Gap Trail Planning Project (Project) in the Highlands-Baywood Park area of San Mateo County, California. This study included a cultural resources records search, Native American scoping, archival research, and a cultural resources field survey and evaluation. All activities were conducted in accordance with the requirements of the California Environmental Quality Act (CEQA) and all applicable local regulations.

1.1 Project Description

The Complete the Gap Trail Project (Project) will be part of the 17.5-mile Crystal Springs Regional Trail (CSRT) system that connects the City of San Bruno to the Town of Woodside along the eastern side of the San Francisco Watershed reservoirs. The project site is located along the Lower Crystal Springs Reservoir in San Mateo County, California; west of Interstate (I) 280 from the community of Highlands-Baywood Park (Figures 1 and 2). The CSRT serves a variety of users, including hikers, joggers, equestrians, and cyclists. Most of the CSRT has been completed; this project consists of an 800 foot segment which connects the Crystal Springs Dam Trail to the Crystal Springs Regional South of Dam Trail.

The project would consist of a Class I bikeway on the western shoulder of Skyline Boulevard with a 10 foot wide paved/gravel trail. The trail would be bordered by a barrier on the east side and a chain-link fence on the west.
Figure 1 Project vicinity

Imagery provided by National Geographic Society, ESRI and its licensors © 2016. San Mateo Quadrangle. T05S R05W S01. The topographic representation depicted in this map may not portray all of the features currently found in the vicinity today and/or features depicted in this map may have changed since the original topographic map was assembled.
Figure 2 Project Location
2 Regulatory Setting

This section discusses applicable federal, state, and local laws, ordinances, regulations, and standards governing cultural resources, which must be adhered to before and during implementation of the proposed Project.

2.1 Federal

The proposed Project does not have a federal nexus; therefore, compliance with reference to the NHPA and other federal laws is provided here for informational purposes only. Projects that involve federal funding or permitting (i.e., have a federal nexus) must comply with the provisions of the National Historic Preservation Act of 1966 (NHPA), as amended (16 United States Code [U.S.C.] 470f). Cultural resources are considered during federal undertakings chiefly under Section 106 of the NHPA through one of its implementing regulations, 36 Code of Federal Regulations (CFR) 800 (Protection of Historic Properties), as well as the National Environmental Policy Act (NEPA). Properties of traditional religious and cultural importance to Native Americans are considered under Section 101(d)(6)(A) of the NHPA. Other relevant federal laws include the Archaeological Data Preservation Act of 1974, American Indian Religious Freedom Act of 1978, Archaeological Resources Protection Act of 1979, and Native American Graves Protection and Repatriation Act of 1989.

The National Register of Historic Places was established by the NHPA of 1966 as “an authoritative guide to be used by Federal, State, and local governments, private groups and citizens to identify the Nation’s cultural resources and to indicate what properties should be considered for protection from destruction or impairment” (CFR 36 CFR 60.2). The NRHP recognizes properties that are significant at the national, state, and local levels. To be eligible for listing in the NRHP, a resource must be significant in American history, architecture, archaeology, engineering, or culture. Districts, sites, buildings, structures, and objects of potential significance must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. A property is eligible for the NRHP if it:

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

In addition to meeting these criteria, a property must retain historic integrity, which is defined in National Register Bulletin 15 as the “ability of a property to convey its significance” (National Park Service 1990). In order to assess integrity, the National Park Service recognizes seven aspects or qualities that, considered together, define historic integrity. To retain integrity, a property must possess several, if
not all, of these seven qualities, which are defined in the following manner in National Register Bulletin 15:

1. Location – the place where the historic property was constructed or the place where the historic event occurred
2. Design – the combination of elements that create the form, plan, space, structure, and style of a property
3. Setting – the physical environment of a historic property
4. Materials - the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property
5. Workmanship – the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory
6. Feeling – a property’s expression of the aesthetic or historic sense of a particular period of time
7. Association – the direct link between an important historic event or person and a historic property

2.2 State

As the lead agency for the proposed Project, the San Mateo County Parks Department must comply with the provisions of the California Environmental Quality Act (CEQA), which requires a lead agency to determine whether a project may have a significant effect on historical resources (Public Resources Code [PRC], Section 21084.1). A historical resource is a resource listed, or determined to be eligible for listing, in the California Register of Historical Resources (CRHR); a resource included in a local register of historical resources; or an object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant (State CEQA Guidelines, Section 15064.5[a][1-3]).

A resource shall be considered historically significant if it:

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

In addition, if a project can be demonstrated to cause damage to a unique archaeological resource, the lead agency may require reasonable efforts to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that resources cannot be left undisturbed, mitigation measures are required (PRC, Section 21083.2[a], [b], and [c]).

PRC, Section 21083.2(g) defines a unique archaeological resource as an artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information;
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type; or
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

As of July 1, 2015, California Assembly Bill 52 of 2014 (AB 52) was enacted and expands CEQA by defining a new resource category, “tribal cultural resources.” Assembly Bill 52 establishes that “A project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment” (PRC Section 21084.2). It further states that the lead agency shall establish measures to avoid impacts that would alter the significant characteristics of a tribal cultural resource, when feasible (PRC Section 21084.3). PRC Section 21074 (a)(1)(A) and (B) defines tribal cultural resources as “sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe” and meets either of the following criteria:

- Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or
- A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

AB 52 also establishes a formal consultation process for California tribes regarding those resources. The consultation process must be completed before a CEQA document can be certified. AB 52 requires that lead agencies “begin consultation with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project.” Native American tribes to be included in the process are those that have requested notice of projects proposed within the jurisdiction of the lead agency.

### 2.3 Local

Although the County of San Mateo does not have a historic preservation ordinance with criteria for local designation, the General Plan, which was adopted in 1986, is implemented through the following goals and policies for historical and archaeological resources (County of San Mateo 1986, Chapter 5):

#### Goals and Objectives

5.1 Historic Resource Protection. Protect historic resources for their historic, cultural, social and educational values and the enjoyment of future generations.

5.2 Rehabilitation of Historic Structures. Encourage the rehabilitation, preservation and use of historically significant structures.

5.3 Protection of Archaeological/Paleontological Sites. Protect archaeological/paleontological sites from destruction in order to preserve and interpret them for future scientific research, and public educational programs.
5.4 Historical Resources Inventory. Encourage the development of inventories of historical resources which have national, State and Countywide significance.

5.5 Planning and Historic Preservation. Integrate historical preservation into the planning process of the County.

5.6 Increase Public Awareness. Develop increased public awareness of the County’s heritage to foster widespread support and understanding for the need to preserve historical resources.

General Policies

5.10 Educational Programs. Encourage cooperative educational programs by educational and historic groups.

5.11 Recognition of Historic Resources. A) Identify high priority resources in the comprehensive inventory and apply for their designation as State Point of Historic Interest, State Historical Landmark, or inclusion in the National Register of Historic Places. B) Establish historic districts for areas which include concentrations of historic resources found in the comprehensive inventory.

5.12 Rehabilitation of Historic Structures. Encourage the rehabilitation and recycling of historic structures.

5.13 Use of Innovative Techniques. Encourage the use of innovative techniques such as density transfer, facade easements, etc., to protect historic structures.

5.14 Registration of Significant Archaeological/Paleontological Sites. Recommend State and/or national register status for significant archaeological/paleontological sites.

Regulation of Development

Protection of Historical Resources

5.15 Character of New Development. A) Encourage the preservation and protection of historic resources, districts and landmarks on sites which are proposed for new development. B) Ensure that new development in historic districts is compatible in bulk, height, material and design with that of the historic character and qualities of the district. C) Encourage the use of the Secretary of the Interior’s guidelines and standards for rehabilitation of historic structures by: (1) those undertaking the rehabilitation of historic structures, and (2) those responsible for the architectural review and permit approval.

5.16 Demolition of Resources. Discourage the demolition of any designated historic district or landmark.

5.17 Designation of Historic Resources. Establish criteria and procedures for the designation of County landmarks and districts. Include a provision requiring approval to alter, demolish or relocate designated landmarks or districts.

5.18 Development of County Historic Sites. Develop County-owned historic sites in park and recreation areas in accordance with the performance criteria and development standards contained in Appendix D of this Chapter.
5.19 Economic Use. A) Encourage compatible and adaptive residential, commercial or public uses of historic structures as a means for their protection. B) Permit commercial uses such as crafts, stores, bookshops and art shops if they preserve and enhance the resource.

Protection of Archaeological/Paleontological Resources

5.20 Site Survey. Determine if sites proposed for new development contain archaeological/paleontological resources. Prior to approval of development for these sites, require that a mitigation plan, adequate to protect the resource and prepared by a qualified professional, be reviewed and implemented as a part of the project.

5.21 Site Treatment. A) Encourage the protection and preservation of archaeological sites. B) Temporarily suspend construction work when archaeological/paleontological sites are discovered. Establish procedures which allow for the timely investigation and/or excavation of such sites by qualified professionals as may be appropriate. C) Cooperate with institutions of higher learning and interested organizations to record, preserve, and excavate sites.
3 Cultural Setting

3.1 Prehistory

During the twentieth century, many archaeologists developed chronological sequences to explain prehistoric cultural changes within all or portions of northern California (Jones and Klar 2007; Moratto 1984). The Project lies within the San Francisco Bay Area archaeological region (Milliken et al. 2007; Moratto 1984). Following Milliken et al. (2007), the prehistoric cultural chronology for the San Francisco Bay Area can be generally divided into five periods: the Early Holocene (8,000-3,500 B.C.), Early (3,500-500 B.C.), Lower Middle (500 B.C.-A.D. 430), the Upper Middle (A.D. 430-1050), and the Late Period (A.D. 1050-Contact).

Early Paleoindian groups likely lived in the area prior to 8,000 B.C., however, no evidence for that period has been discovered in the area to date (Milliken et al. 2007). Because sea level was much lower prior to 8,000 B.C., it is likely that any such sites may now be underwater. For this reason, the terminal Pleistocene to earliest Holocene Period (ca. 11,700-8,000 B.C.) is not discussed here.

The earliest intensive study of the archaeology of the San Francisco Bay Area began with Nels C. Nelson of the University of California, Berkeley, between 1906 and 1908. He documented over 425 shell mounds along the shores of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties. Nelson was the first to identify the Bay Area as a discrete archaeological region (Moratto 1984; Nelson 1909).

3.1.1 Early Holocene (8,000-3,500 B.C.)

The Early Holocene Period in the San Francisco Bay Area is characterized by a mobile forager pattern and the presence of millingslabs, handstones, and a variety of leaf-shaped projectile points, though evidence for this period is limited. It is likely that Holocene alluvial deposits buried many prehistoric sites in the area (Moratto 1984; Ragir 1972). Sites such as CA-CCO-696 and CA-CCO-637 in Contra Costa County are two of just a few sites dating to this period. The earliest evidence for the Early Holocene Period comes from CA-CCO-696 at Los Vaqueros Reservoir (Milliken et al. 2007).

3.1.2 Early Period (3,500-600 B.C.)

The Early Period saw increased sedentism from the Early Holocene as indicated by new ground stone technologies (introduction of the mortar and pestle), an increase in regional trade, and the earliest cut-bead horizon. The first documentation of the mortar and pestle, dating to 3,800 B.C., comes from CA-CCO-637 in the Los Vaqueros Reservoir area. By 1,500 B.C., mortars and pestles had almost completely replaced millingslabs and handstones. A shift to a sedentary or semi-sedentary lifestyle is marked by the prevalence of mortars and pestles, ornamental grave associations, and shell mounds. The earliest cut beads are represented by rectangular Haliotis (abalone) and Olivella (snail) beads from several sites, including CA-CCO-637, CA-SCL-832 in Sunnyvale, and CA-ALA-307 in Berkeley (Milliken et al. 2007).
advent of the mortar and pestle indicates a greater reliance on processing nuts such as acorns. Faunal evidence from various sites indicates a diverse diet based on mussel and other shellfish, marine mammals, terrestrial mammals, and birds (D’Oro 2009).

3.1.3 Lower Middle Period (500 B.C.-A.D. 430)
The Lower Middle Period saw numerous changes from the previous period. Rectangular shell beads, common during the Early Period, disappear completely and are replaced by split-beveled and saucer *Olivella* beads. *Haliotis* ornaments, bone tools, bone ornaments, and basketry awls indicating coiled basketry manufacture appeared. Mortars and pestles continued to be the dominant grinding tools (Milliken et al. 2007). Evidence for the Lower Middle Period in the Bay Area comes from sites such as the Emeryville shell mound (CA-ALA-309) and Ellis Landing (CA-CCO-295). CA-ALA-309 is one of the largest shell mounds in the Bay Area and contains multiple cultural sequences. The lower levels of the site, dating to the Middle Period, contain flexed burials with bone implements, chert bifaces, charmstones, and oyster shells (Moratto 1984).

3.1.4 Upper Middle Period (A.D. 430-1050)
Around A.D. 430, *Olivella* saucer bead trade networks established during earlier periods collapsed and over half of known sites occupied during the Lower Middle Period were abandoned. *Olivella* saucer beads were replaced with *Olivella* saddle beads. New items appear at sites, including elaborate, decorative blades, fishtail charmstones, new *Haliotis* ornament forms, and mica ornaments. Sea otter bones became more frequent than in earlier periods (Milliken et al. 2007). Analysis of CA-ALA-309 indicates a shift from oysters to clams. Subsistence analysis at various sites dating to this period indicate a diverse diet that included various species of fish, mammal species, bird species, shellfish, and plant resources that varied by location within the Bay Area (Hylkema 2002).

3.1.5 Late Period (A.D. 1050-Contact)
The Late Period saw an increase in social complexity, indicated by differences in burials, and an increased level of sedentism relative to preceding periods. Small, finely worked projectile points associated with bow and arrow technology appear around A.D. 1250. *Olivella* shell beads disappeared and were replaced with clamshell disk beads. The toggle harpoon, hopper mortar, and magnesite tube beads also appeared during this period (Milliken et al. 2007). This period saw an increase in the intensity of resource exploitation, correlative with population increases (Moratto 1984). Many of the well-known sites of earlier periods, such as the Emeryville shell mound (CA-ALA-309) and the West Berkeley site (CA-ALA-307) were abandoned, possibly due to fluctuating climates and droughts that occurred throughout the Late Period (Lightfoot and Luby 2002).

3.2 Ethnographic Background
The project site is situated within a region historically occupied by the Costanoan (also known as the Ohlone) (Kroeber 1925). The term Costanoan is a linguistic designation for populations that spoke one of eight Costanoan languages. These languages are part of the Utian language family which is a member of the Penutian linguistic stock. Linguistic research has grouped these languages into four branches: 1) the Karkin branch located in Carquinez Strait area; 2) the Northern Costanoan branch which consists of the
Chochen, Ramaytush, Tamyen, and Awaswas languages; 3) the Soledad (Cholon) branch; and 4) the Southern Costanoan branch, consisting of the Rumsen and Mutsun languages (Mithun 2001:535).

The Costanoan were organized into numerous tribelets. Each tribelet’s territory contained a main village and smaller satellite villages. The villages were typically situated along a river or stream for easy access to water (Levy 1978:487). The tribelets functioned as political units that were structured by similarities in language and ethnicity, each holding claim to a designated portion of territory. Milliken (1995:229) was able to conduct a detailed examination of mission records, marriage patterns, and dialect variation seen in personal names and delineated 43 separate political entities (tribelets) in the San Francisco Bay, Santa Cruz, and inland area, with another six or so tribelets in the south Monterey Bay and Carmel Valley region. In general, Costanoan territory extended between the Carquinez Strait and San Pablo Bay on the north, southward along the coast beyond Monterey Bay to Carmel Valley, and inland to the coast range (Levy 1978:485). Neighboring groups included the Coast Miwok to the north, the Miwok and Northern Valley Yokuts to the east, and the Salinan and Esselen to the south.

Costanoan groups came into contact with European culture at the beginning of Spain’s land exploration and settlement of Alta California in A.D. 1769. During the late 1700’s and early 1800’s, traditional lifeways were drastically altered when the Spanish placed their capital at Monterey, built forts at Monterey and San Francisco, and established seven Franciscan missions to convert native peoples to Christianity and the European way of life. During this time, large-scale epidemics swept through the mission population and remaining Costanoan villages (Milliken 1995). It is estimated that the combined Costanoan population decreased from a pre-contact total of 10,000 down to 2,000 by the end of the mission period in 1834 (Levy 1978:486). During the mission period, the dwindling Costanoan population also intermarried with other interior tribes at the missions, mixing their cultural identities.

During the late 1800s, several multi-ethnic Native American communities began to appear in Costanoan territory. The best known of these were located in Pleasanton, Monterey, and San Juan Bautista. However, even these groups continued to shrink as young people married into other groups and moved away. Estimates of the total remaining population of people with recognizable Costanoan descent were fewer than 300 in 1973 (Levy 1978:487).

Descendants of the Costanoan united in 1971 to form a corporate entity known as the Ohlone Indian Tribe. This entity was successful in obtaining title to the Ohlone Indian Cemetery where their ancestors who died at Mission San José are buried (Levy 1978:487). Since that time, other descendants of Costanoan tribelets, notably the Rumsen and Mutsun groups, have organized political and cultural heritage organizations that are active locally and statewide. All are concerned with revitalizing aspects of their culture, learning the language through notes collected by anthropologist John Harrington, and preserving the natural resources that played a vital role in traditional culture.

In addition, some Costanoan groups (namely the Amah-Mutsun Band of Mission Indians, Costanoan Band of Carmel Mission Indians, Costanoan Rumsen Carmel Tribe, the Indian Canyon Mutsun Band of Costanoan, and the Muwekma Ohlone Tribe) are seeking federal recognition of their tribe, petitioning the Bureau of Indian Affairs with reconstructed tribal histories and genealogies.
3.3 History

The Post-European contact history for California is generally divided into three periods: the Spanish Period (1769–1822), the Mexican Period (1822–1848), and the American Period (1848–present).

3.3.1 Spanish Period (1769-1822)

Juan Rodriguez Cabrillo in 1542 led the first European expedition to observe what was known by the Spanish as Alta (upper) California. For more than 200 years, Cabrillo and other Spanish, Portuguese, British, and Russian explorers sailed the Alta California coast and made limited inland expeditions, but they did not establish permanent settlements (Bean 1968; Rolle 2003). In 1769, Gaspar de Portolá and Franciscan Father Junipero Serra established the first Spanish settlement in Alta California at Mission San Diego de Alcalá. This was the first of 21 missions erected by the Spanish between 1769 and 1823. In addition to the missions four presidios and three pueblos (towns) were established throughout the state (State Lands Commission 1982). During his expedition, de Portola traveled to Sweeney Ridge in present day Pacifica (San Mateo County) and was the first European to identify San Francisco Bay. Following this discovery, San Pedro Valley Mission Outpost (1786-1793) of Mission Dolores was constructed in Pacifica.

During this period, Spain also deeded ranchos to prominent citizens and soldiers, though very few in comparison to the subsequent Mexican Period. To manage and expand their herds of cattle on these large ranchos, colonists enlisted the labor of the surrounding Native American population, often forcibly (Engelhardt 1927a; Reséndez 2016). The missions were responsible for administrating to the local Indians as well as converting the population to Christianity (Engelhardt 1927b). The influx of European settlers brought the local Native American population in contact with European diseases which they had no immunity against, resulting in a catastrophic reduction in native populations throughout the state (McCawley 1996).

3.3.2 Mexican Period (1822-1848)

The Mexican Period commenced when news of the success of the Mexican Revolution (1810-1821) against the Spanish crown reached California in 1822. This period saw the privatization of mission lands in California with the passage of the Secularization Act of 1833. This Act enabled Mexican governors in California to distribute mission lands to individuals in the form of land grants. Successive Mexican governors made more than 700 land grants between 1833 and 1846, putting most of the state’s lands into private ownership for the first time (Shumway 2006). About 22 land grants (ranchos) were located in San Mateo County. The project site is located on the Rancho Cañada de Raymundo land grant originally given to Raymundo in 1840 and then to John Coppinger in 1841 (Hoffman 1862).

The Mexican Period ended in early January 1848, following several decisive battles against the United States. On January 10, leaders of the Pueblo of Los Angeles surrendered peacefully after Mexican General Jose Maria Flores withdrew his forces. Shortly thereafter, newly appointed Mexican Military Commander of California Andrés Pico surrendered all of Alta California to US Army Lieutenant Colonel John C. Fremont in the Treaty of Cahuenga.
3.3.3 American Period (1848-Present)

The American Period officially began with the signing of the Treaty of Guadalupe Hidalgo in 1848, in which the United States agreed to pay Mexico $15 million for the conquered territory, which included California, Nevada, Utah, and parts of Colorado, Arizona, New Mexico, and Wyoming. Settlement of southern California continued to increase during the early American Period. Many ranchos in the county were sold or otherwise acquired by Americans, and most were subdivided into agricultural parcels or towns.

The discovery of gold in northern California in 1848 led to the California Gold Rush (Guinn 1977; Workman 1935:26) and California’s population grew exponentially. During this time, San Francisco became California’s first true city, growing from a population of 812 to 25,000 in only a few years (Rolle 2003). By 1853, the population of California exceeded 300,000. Thousands of settlers and immigrants continued to pour into the state, particularly after the completion of the transcontinental railroad in 1869. By the 1880s, the railroads had established networks throughout northern California, resulting in fast and affordable shipment of goods, as well as a means to transport new residents to the booming region (Dumke 1944).

3.3.4 Crystal Springs Reservoir

The San Mateo County area was mainly agricultural in the first half of the 19th century until the Gold Rush brought an influx of newcomers to Northern California starting in 1848. Subsequently, roads were created, and industries such as logging, whaling and dairy farms developed. San Mateo County was established in 1856 (Harris and Zogg 2010). The area came to be known for the lavish country homes of San Francisco’s elite as early as the mid-1800s and continued into the first three decades of the 20th century. A railroad between the cities of San Francisco and San Jose was completed in 1864, and in 1870, the railroad was absorbed into the larger Southern Pacific Railroad system. The advancements in transportation furthered the development of large estates and land subdivision (ESA and Orion 2009).

The communities on the Peninsula grew steadily but slowly at first. However, after the 1906 earthquake, thousands of people moved to San Mateo County, with the towns of San Mateo and Burlingame being major beneficiaries of this growth (ESA and Orion 2009; Wickert 1990). Hillsborough was generally established as a country club community in the late 19th century and maintained itself as an enclave of well-to-do residents in the early decades of the 20th century, with grander homes than the suburbs of Burlingame and San Mateo. By the 1920s and 1930s, the emphasis in development changed to more moderate homes, rather than extravagant estates. A growing affluent middle class and a post-war building boom were partly responsible for the breakup of many large estates for land subdivision in the 1940s and 1950s, continuing into the 1970s (Wickert 1990).

The growing population of San Francisco and other Peninsula communities, as well as the industrialization of San Francisco in the 19th century, created a large demand for water, advancing the need to develop the infrastructure for a regional water system. Two water companies, the San Francisco Water Works and the Spring Valley Water Company, were organized in San Francisco in 1857 and 1858, respectively. The early sources of water were local springs and creeks, which proved inadequate for the growing city. In 1864 the Spring Valley Water Company built a dam to impound the water of Pilarcitos Creek and brought the water to San Francisco through a system of flumes and pipes. The two
aforementioned water companies merged in 1865, becoming a single company that would monopolize the water system of San Francisco for approximately the following fifty years (Shoup 1989).

During the mid-1870s, the water company decided that the entire Crystal Springs Valley needed to be utilized to develop water storage facilities. The Crystal Springs area was still rural at the time, and the Upper Crystal Springs Dam, an earthen dam, was constructed between 1875 and 1877. The second dam in the valley, the Lower Crystal Springs Dam soon followed. Its construction began in 1886 and it was completed in 1890. The dam is significant due to the fact that its builder, Hermann Schussler, a German- and Swiss-trained engineer, pioneered construction techniques which later came into more general usage. These included the washing of the sand and aggregates used in the cement, the precise measurement of each raw material which made up the concrete, the placing of the mixed concrete within 15 minutes, the hand ramming of the concrete, water curing, and the intricate arrangement of the concrete in large interlocking blocks (Shoup 1989).

After the completion of the Hetch Hetchy Reservoir, the City of San Francisco acquired Spring Valley Water Company’s watershed lands in 1930. Thereafter, the water system was administered by the recently-formed San Francisco Water Department (Demouth 2008; Shoup 1989). As part of the San Francisco Peninsula Watershed, much of the lands immediately surrounding the Crystal Springs Reservoir remained an open space, eventually becoming an important local recreational resource for the communities of the Peninsula. With the development of State Route 92 and Interstate 280 the area also became a major transportation corridor, as nearby Hillsborough and the surrounding cities continued to grow into the decades after World War II.

### 3.4 Environmental Setting

The project site is located on the east side of Crystal Springs Reservoir (Figure 2) in an area dominated by a coast live oak woodland community of oak, bay, madrone, poison oak, and dusky footed wood rat. The reservoir itself fills a geographic low created by the trace of the San Andreas Fault, which separates two distinct geomorphic assemblages (fault-bounded packages of unique stratigraphy): the Pacifica Assemblage (to the west) and the Woodside Assemblage (to the east) (Brabb and Pampeyan 1983; Brabb et al. 1998; Graymer et al. 2006). The project area is within the Woodside Assemblage, an assortment of Jurassic to Cretaceous sedimentary and metamorphic units underlain largely by Pliocene to Recent sediments (Brabb et al. 1998). The project site is on the west-facing slope of Plugas Ridge, a local outcropping of greenish-gray to bluish-green sheared serpentine (Brabb et al. 1998; Graymer et al. 2006).
4 Background Research

4.1 Records Search

Rincon requested a review of the California Historical Resources Information System (CHRIS) at the Northwest Information Center (NWIC) to identify previously conducted cultural resources work within the project site and a 0.5-mile radius around it, as well as previously recorded cultural resources within or near the project site. The CHRIS search included a review of the National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), the California Points of Historical Interest list, the California Historical Landmarks list, the Archaeological Determinations of Eligibility list, and the California State Historic Resources Inventory list. Rincon received the results of the records search on December 20, 2016.

4.1.1 Previous Cultural Resources Studies

The NWIC identified 19 previous studies within a 0.5-mile radius of the project site. One of these included a portion of the project site (S-027930; Table 1).

Table 1 Previous Cultural Resource Studies within 0.5-miles of the Project Site

<table>
<thead>
<tr>
<th>Report Number</th>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Relationship to Project Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-006425</td>
<td>David Chavez</td>
<td>1983</td>
<td>Citywide Archaeological Investigations, City of San Mateo, California</td>
<td>Outside</td>
</tr>
<tr>
<td>S-010740</td>
<td>Laurence H. Shoup</td>
<td>1989</td>
<td>Historic Property Survey Report for Lower Crystal Springs Dam and Skyline Boulevard Highway Bridge (#35C 004 3), San Mateo County, California</td>
<td>Outside</td>
</tr>
<tr>
<td>Report Number</td>
<td>Author</td>
<td>Year</td>
<td>Title</td>
<td>Relationship to Project Site</td>
</tr>
<tr>
<td>---------------</td>
<td>--------</td>
<td>------</td>
<td>-------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>S-036313a</td>
<td>Randy S. Wiberg</td>
<td>2009</td>
<td>Technical Report, Extended Archaeological Survey, Crystal Springs Pipeline No. 2, Segments 2 and 3 Between Sites 8 and 9, City of San Mateo and Town of Hillsborough</td>
<td>Outside</td>
</tr>
<tr>
<td>S-037015</td>
<td>Kimberly Demuth</td>
<td>2008</td>
<td>Historical Resources Evaluation Report, Crystal Springs Dam Bridge Replacement Project</td>
<td>Outside</td>
</tr>
<tr>
<td>S-037241</td>
<td>Benjamin J. Harris, Maureen Zogg, and Christopher Caputo</td>
<td>2010</td>
<td>Historic Property Survey Report, proposed replacement of Metal Beam Guardrails (MBGR) at various locations in San Mateo County, California, 04-SMA-VarVar, EA 04-0A8721</td>
<td>Outside</td>
</tr>
<tr>
<td>S-037241a</td>
<td>U.S. Coast Guard</td>
<td>1996</td>
<td>Request for Determination of Eligibility for Inclusion in the National Register of Historic Places, Southern Pacific Railroad Dumbarton Cutoff, Southern Pacific Railroad Dumbarton Bridge, Southern Pacific Railroad Newark Slough Bridge, Alameda and San Mateo Counties, California</td>
<td>Outside</td>
</tr>
<tr>
<td>S-037241b</td>
<td>Benjamin J. Harris and Maureen Zogg</td>
<td>2010</td>
<td>Archaeological Survey Report for the Proposed Metalbeam Guardrail Upgrade Project at Various Locations across San Mateo County, California, 04-SMA-VarVar, EA 04-0A8721</td>
<td>Outside</td>
</tr>
<tr>
<td>Report Number</td>
<td>Author</td>
<td>Year</td>
<td>Title</td>
<td>Relationship to Project Site</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------</td>
<td>------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>S-037241c</td>
<td>Benjamin J. Harris</td>
<td>2010</td>
<td>Environmentally Sensitive Area (ESA) and Archaeological Monitoring Area (AMA) Action Plan for Two Locations Along State Route 1, San Mateo County, California, 04-SMA-01, PM 0.7 and 1.2, EA 04-OA8721; for the Proposed Metalbeam Guardrail Project at Various Locations Across San Mateo County, California, 04-SMA-VarVar, EA 04-OA8721</td>
<td>Outside</td>
</tr>
<tr>
<td>S-037241d</td>
<td>Benjamin J. Harris and Maureen Zogg</td>
<td>2010</td>
<td>Extended Phase I Testing at CA-SMA-97 for the Proposed Metalbeam Guardrail 1-5 Upgrade Project, San Mateo County, California, 04-SMA-01, PM 1.20, EA: 04-OA8721</td>
<td>Outside</td>
</tr>
<tr>
<td>S-037260</td>
<td>Benjamin J. Harris and Maureen Zogg</td>
<td>2010</td>
<td>Archaeological Survey Report for the Proposed Metalbeam Guardrail Upgrade Project at Various Locations across San Mateo County, California, 04-SMA-VarVar, EA 04-OA8721</td>
<td>Outside</td>
</tr>
<tr>
<td>S-037889</td>
<td>Brad Brewster</td>
<td>2010</td>
<td>Historic American Engineering Record Lower Crystal Springs Dam</td>
<td>Outside</td>
</tr>
<tr>
<td>S-038139</td>
<td>ICF Jones and Stokes</td>
<td>2009</td>
<td>Final Crystal Springs/San Andreas Transmission Upgrade Project, Archaeological Survey and Architectural Inventory and Evaluation Report for Section 106 Compliance</td>
<td>Outside</td>
</tr>
<tr>
<td>S-038343</td>
<td>Randy Wiberg</td>
<td>2011</td>
<td>Lower Crystal Springs Dam Improvements Project: Historic Flume Structure Identified in Discharge Pools 1 and 2</td>
<td>Outside</td>
</tr>
<tr>
<td>S-038916</td>
<td>Randy Wiberg</td>
<td>2011</td>
<td>Lower Crystal Springs Dam Improvements Project: Historic Flume Structure Identified in Discharge Pools 1 and 2 (letter report)</td>
<td>Outside</td>
</tr>
<tr>
<td>S-046397</td>
<td>Tim Spillane</td>
<td>2014</td>
<td>Archaeological Overview and Assessment: Indigenous Sites of the GGNRA, 2014</td>
<td>Outside</td>
</tr>
</tbody>
</table>

Source: Northwest Information Center 2016

Report S-027930 describes a cultural resources assessment of alternative routes for PG&E’s Jefferson-Martin 230 kV Transmission Line Project (Brown et al. 2003). A field survey was completed between May 6 and 8, 2003, using mostly vehicle-survey, as the transmission line route was proposed within existing roadways. No archaeological resources were found within the boundaries of the current project site.

### 4.1.2 Previously Recorded Cultural Resources

The NWIC records search additionally identified 5 previously recorded cultural resources, none of which are on the project site (Table 2).
The Lower Crystal Springs Dam (LCSD) (41-001376) and its associated resources have been recorded and evaluated for historical significance during various previous assessments, most recently in 2008 as part of the LCSD Bridge Replacement Project (Demuth 2008). Constructed between 1886 and 1890, the LCSD is significant for its direct associations with the historical development of water storage and conveyance for the rapidly growing San Francisco area. The LCSD has been previously determined eligible, with concurrence from the State Historic Preservation Officer, for listing in the NRHP and is listed in the CRHR under Criteria A/1 and C/3. In addition, the structure is a California Point of Historical Interest and has been recognized as a California Historic Civil Engineering Landmark by the American Society of Engineers (Demouth 2008:5).

A number of additional resources associated with the LCSD were also recorded and evaluated for individual and collective historical significance as part of the potential LCSD Historic District (41-002277). These include the LCSD Bridge (41-001375), the Crystal Springs Pump Station (41-002274), Outlet Towers Nos. 1 and 2 (41-002275), the Vista Point Scenic Area (41-002276), and the LCSD Water Conveyance System (41-002279).

### Table 2 Previously Recorded Resources within 0.5-miles of the Project Site

<table>
<thead>
<tr>
<th>Primary Number</th>
<th>Trinomial</th>
<th>Resource Type</th>
<th>Description</th>
<th>Recorder(s) and Year(s)</th>
<th>NRHP/CRHR Status*</th>
<th>Relationship to APE</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-41-001375</td>
<td>N/A</td>
<td>Historic-era structure</td>
<td>Lower Crystal Springs Bridge</td>
<td>Harvey 2008</td>
<td>2S2</td>
<td>Outside</td>
</tr>
<tr>
<td>P-41-001376</td>
<td>N/A</td>
<td>Historic-era structure</td>
<td>Lower Crystal Springs Dam</td>
<td>Harvey 2008</td>
<td>6Y</td>
<td>Outside</td>
</tr>
<tr>
<td>P-41-002274</td>
<td>N/A</td>
<td>Historic-era structure</td>
<td>Crystal Springs Pumping Station</td>
<td>Harvey 2008</td>
<td>6Y</td>
<td>Outside</td>
</tr>
<tr>
<td>P-41-002275</td>
<td>N/A</td>
<td>Historic-era structure</td>
<td>Lower Crystal Springs Dam Outlet Towers Nos. 1 and 2</td>
<td>Harvey 2008</td>
<td>6Y</td>
<td>Outside</td>
</tr>
<tr>
<td>P-41-002276</td>
<td>N/A</td>
<td>Historic-era structure</td>
<td>Vista Point Scenic Area</td>
<td>Harvey 2008</td>
<td>6Y</td>
<td>Outside</td>
</tr>
<tr>
<td>P-41-002277</td>
<td>N/A</td>
<td>Historic-era district</td>
<td>Lower Crystal Springs Dam Historic District</td>
<td>Harvey 2008</td>
<td>6Y</td>
<td>Outside</td>
</tr>
</tbody>
</table>

* Source: Northwest Information Center 2016
* 2S2 – Individual property determined eligible for NRHP by consensus through Section 106 process. Listed in CRHR.
* 6Y – Determined ineligible for NRHP by consensus through Section 106 process – Not evaluated for CRHR or Local Listing.
Located atop the LCSD, the LCSD Bridge was built in 1923-1924 and previously determined ineligible for the CRHR and ineligible for the NRHP with SHPO concurrence on two separate occasions, in 1989 and 1997. The bridge was also found ineligible as a contributor to any existing or potential historic districts.

The Crystal Springs Pump Station, built in 1913 with additions in 1933, was recommended ineligible for the NRHP by L.H. Shoup in 1996/1997; however, this recommendation was never submitted to the SHPO and the FHWA never formally completed a determination of eligibility (Demouth 2008). In 2008, the pump station was recommended eligible for the NRHP for its association with the expansion of water capacity by the Spring Valley Water Company, for its intact and distinctive Classical-Revival architectural style, and for its association with noted Bay area architect Willis Polk. In 2009, ICF Jones and Stokes recommended the Crystal Springs Pump Station Pump as ineligible for the NRHP and CRHR, due to lack of historical and architectural significance.

The Lower Crystal Springs Dam Outlet Towers Nos. 1 and 2, respectively constructed in 1891 and 1931-1932, were evaluated in 2008 by David Harvey for Entrix Inc., who recommended both towers ineligible for the NRHP due to a loss of integrity and the appearance of having been externally modified. They also were found not to be contributors to the LCSD historic district (Demouth 2008). In 2009, ICF Jones and Stokes found the Crystal Springs Outlet Structure No. 1 to be a contributing feature to the LCSD because it was planned, designed and constructed as part of a singular effort to create functioning reservoir facilities for urban water supply. Outlet Structure No. 1 was found eligible for the NRHP for innovative design and engineering. The Crystal Springs Outlet Structure No. 2 was found eligible for the CRHR under criterion 3 (ICF Jones and Stokes 2009).

The Vista Point Scenic Area, developed in 1923 and modified in 1929, was evaluated by David Harvey for Entrix Inc. in 2008 and found ineligible for the NRHP. While associated with the development of Skyline Boulevard as a scenic roadway in the 1920s, its design, materials and workmanship have been degraded through inappropriate repairs and site changes. The Vista Point Scenic Area is not directly associated with the historic development of the LCSD and its associated water conveyance facilities.

The LCSD Water Conveyance System, an enclosed wooden structure likely built in the late 19th century, was evaluated in 2011 by Wiberg and Psota for Holman and Associates, and found eligible for the CRHR under criterion 4 for its potential to yield information important in history.

The LCSD Historic District was recorded and evaluated by David Harvey for Entrix in 2008. The district, as a whole, was determined ineligible for the NRHP and the CRHR, due to a lack of historical associations of the properties, a lack of connection to the development of water distribution capacity in the San Francisco region, a lack of cohesion among resources, and a larger number of non-contributing resources in the district.

### 4.2 Native American Scoping

Rincon contacted the Native American Heritage Commission (NAHC) to request a Sacred Lands File (SLF) search of the project site and a 0.5-mile buffer surrounding it. The purpose of the SLF search is to identify lands or resources important to Native Americans, and to assess the potential for project-related development to impact tribal cultural resources. The NAHC responded on December 20, 2016, stating that the SLF search was returned with negative results. However, the NAHC noted that the absence of
specific site information in the SLF does not negate the possibility of important cultural resources existing within the project area. The NAHC also provided a list of Native American individuals and tribal organizations that may have knowledge of cultural resources in the area. Letters were sent via email to the five Native American individuals identified by the NAHC on December 21, 2016 (Appendix B).

Irenne Zwierlein, Chairperson of the Amah Mutsun Tribal Band of Mission San Juan Bautista responded on December 22, 2016 stating that the area is sensitive and suggesting Rincon contact Mark Hylkema, the Santa Cruz District Archaeologist and Tribal Liaison for California State Parks, for further consultation. Rincon contacted Mr. Hylkema on January 5, 2017 in compliance with Chairperson Zwierlein’s request. Mr. Hylkema responded on January 9, 2017 stating that he is aware of two archaeological near the project site, but not within it, and offering to forward along his MA thesis and notes. Rincon responded in the affirmative.

At the time of completion of this report, no additional responses were received.
5   Methods

5.1   Field Survey

Rincon Archaeologist Kyle Brudvik, M.A., Registered Professional Archaeologist (RPA) conducted an intensive cultural resources field survey of the project site on January 4, 2017. The field survey consisted of walking as much of the shoulder of Route 35 and accessible off-shoulder, tree-covered slopes (east and west of the road) as possible to examine all areas of exposed ground surface for artifacts (e.g., flaked stone tools, tool-making debris, stone milling tools, ceramics, fire-affected rock [FAR]), soil discoloration that might indicate the presence of a cultural midden, soil depressions, and features indicative of the former presence of structures or buildings (e.g., standing exterior walls, postholes, foundations) or historic debris (e.g., metal, glass, ceramics). Ground disturbances such as burrows, cut banks, drainages, and wood rat nests were visually inspected. The field survey also included a visual inspection of any built environment features, including the roadway and adjacent LCSD. Mr. Brudvik documented the fieldwork using field notes and digital photographs. Copies of the field notes and digital photographs from both surveys are on file with Rincon’s Oakland office.

5.2   Archival Research

Archival research was completed between December 2016 and January 2017. Research methodology focused on the review of a variety of primary and secondary source materials relating to the history and development of the property. Sources included, but were not limited to, historical maps, aerial photographs, and written histories of the area. The following repositories, publications, and individuals were contacted to identify known historical land uses and the locations of research materials pertinent to the project site:

- Mark Hylkema, Santa Cruz District Archaeologist and Tribal Liaison for California State Parks
- Noah Stewart, Senior Environmental Planner, Caltrans District 4
- Historic aerial photographs from the U.C. Santa Cruz Digital Collections
- Historic United States Geological Survey topographic maps
- San Francisco Historical Photograph Collection, San Francisco Public Library
- Caltrans Digital Collections
- Online Archive of California
- Calisphere, University of California
- Digital Public Library of America
- Other sources as noted in the references list
6 Findings

6.1 Archaeological Resources

The project site is within a roadway situated within a relatively undeveloped area, west of a major highway (280; Figure 2). At the time of the survey the project site was largely covered by staged equipment and plastic-covered sediment piles, presumably excavated from the nearby dam construction project (Figures 4 and 5). As a result, visibility was variable, nearing 0 percent in paved areas with patches of low visibility (approximately 2 percent) in grassy and under-canopy areas interspersed with areas of moderately good visibility (approximately 25 percent) in areas with little vegetation or patchy dirt cover, for example in some places along the road shoulder. No evidence of prehistoric or historic archaeological materials was identified during the pedestrian survey.

6.2 Built Environment/Historical Resources

As a result of the intensive-level architectural survey, one built environment resource, Skyline Boulevard/State Route 35, was recorded on California Department of Parks and Recreation (DPR) 523 Series forms and evaluated for listing in the NRHP and CRHR. Described in greater detail below, this linear resource is a segment of a larger two-lane road that runs approximately 54 miles from Highway 17 in Santa Clara Count to State Route 1 in San Francisco. The complete set of DPR 523 Series forms for Skyline Boulevard/State Route 35 can be found in Appendix C of this report. One utility tower was also identified in the northwest section of the project site. However, review of historic aerial photographs confirms that the tower was constructed after 2000; therefore, it was not recorded or evaluated for significance as a result.

6.2.1 Skyline Boulevard/State Route 35

The recorded segment of Skyline Boulevard/State Route 35 is a two-lane road that is located in unincorporated San Mateo County. Following a general northwest-southeast alignment, it is situated along a tree-covered hillside that slopes downward from Interstate 280 to the east to the Lower Crystal Springs Reservoir to the west (Figure 3). The segment begins at the Lower Crystal Springs Dam to the north and extends approximately 850 feet to the south, where it intersects a paved bike path that extends to the southwest. Approximately 25 feet wide, the graded roadbed is paved in asphalt-concrete and features a short paved shoulder that is bordered by gravel on either side. Road markings include painted shoulder lines and a centerline consisting of Bott dots, as well as adjacent mile markers, speed limit, and signage on metal poles. Portions of the roadway have cracked and been repaired with tar and the northern end of the segment is currently disjoined from the Lower Crystal Springs Dam due to an ongoing bridge replacement project (Figure 4). A full condition assessment could not be completed however, as the roadway was largely covered by construction equipment at the time of the field survey (Figure 5).
Figure 3 Southern terminus of Skyline Boulevard/State Route 35 segment, facing south

Figure 4 Northern terminus of Skyline Boulevard/State Route 35 segment, facing north
6.2.1.1 Skyline Boulevard/State Route 35 History

The subject segment of Skyline Boulevard/State Route 35 appears to have been initially developed by the Spring Valley Water Company in the late 19th century as a private service road for the LCSD. A historic map from 1896 identifies the road extending south from the LCSD and following a slightly more rounded alignment than the present-day segment (U.S. Geological Survey 1896). The differing alignment is further supported by a circa 1891 photograph, which depicts the original wood dam bridge (constructed in 1891) connected to the adjacent roadway further to the west than its current location (Figure 6).
By the early 1920s, the original wood bridge was in poor condition and in need of replacement. The bridge was overseen by the California Highway Commission by this time and a request for proposals to complete the project was released in the summer of 1923 (Shoup 1989:11). Construction of the new bridge was not only spurred by the need to replace the original wood structure, but also by the development of Skyline Boulevard, which was planned to cross over the LCSD. As discussed in 2008:

Planning began for Skyline Boulevard began in 1919 with the route of the scenic highway between San Francisco and the Los Gatos-Santa Cruz highway to the south in the Santa Cruz mountains. The boosters for the scenic highway envisioned the road as a means to generate economic development of vast amounts of San Mateo County real estate and as a boon to tourism with the increased leisure use of the automobile after World War I. Unfortunately the northern section of the highway never reached its full potential. For a long time it was graveled but not paved, making for unpleasant driving conditions for weekend tourists. The highway was originally to be routed over the mountain range west of Crystal Springs Reservoir. But the Spring Valley Water Company, fearful of the potential fire danger in mountain watershed, persuaded the state and county to locate it along the foothills east of the reservoir and across the Lower Crystal Springs Dam (Demouth 2008).

Completed in early 1924, the multi-span curved concrete bridge was supported on multi-column bents and built directly atop the LCSD. As seen in a circa 1924 photograph and as discussed in previous
documentation of the adjacent LCSD (Demouth 2008), the subject segment of Skyline Boulevard/State Route 35 was originally topped with crushed stone (Figure 7). The alignment appears to be consistent with the present-day road, indicating it was most likely realigned as part of the bridge construction and the road’s incorporation into Skyline Boulevard.

**Figure 7 Circa 1924 photograph of the replacement concrete LCSD bridge (Source: Caltrans Digital Collections)**

Progress on Skyline Boulevard lagged after 1925 as the California Highway Commission, running short on funds, diverted resources to other highway projects (Schwind and the Skyline Historical Society 2014). Development continued of the highway continued through the 1930s as the project received intermittent funding from bonds and support from federal programs. Originally designated State Route 55, it was subsequently renumbered State Route 5 and ultimately State Route 35 following a statewide renumbering of highways in the early 1960s (California Division of Highways 1964:12).

In the years since its development, Skyline Boulevard/State Route 35 has been bifurcated in certain areas as a result of construction of the adjacent Interstate 280 and surrounding suburban residential development. In addition to its realignment in the early 1920s, alterations to the subject segment include its paving with asphalt at an unknown date, partial widening, the addition of adjacent modern roadway signage, and most recently its disconnection from the 1923-24 bridge, which at the time of the survey was demolished and in the process of being replaced.
6.2.1.2 Skyline Boulevard/State Route 35 Evaluation

Coordination with staff at Caltrans District 4 and the NWIC failed to identify any previous documentation that included a historic resource evaluation of Skyline Boulevard/State Route 35. Caltrans previously completed extensive historic resources documentation in support of the adjacent LCSD Bridge Replacement Project, which included recordation and evaluation of the LCSD and its associated infrastructure (Shoup 1989; Demouth 2008). Although the development of Skyline Boulevard/State Route 35 is discussed within this documentation, the historic-era road is not individually recorded or evaluated, and coordination with Caltrans staff confirmed that roads are not typically recorded unless there is evidence they may be historically significant (Stewart 2017). Two resources recorded as part of the LCSD Bridge Replacement Project, the LCSD Bridge (P-41-003175) and the Vista Point (P-41-00276), are associated not only with the development of the LCSD, but also with Skyline Boulevard/State Route 35. Both of these resources were found ineligible for listing in the NRHP or CRHR due to a lack of significant associations.

In considering the individual significance of the subject segment, it is a portion of a larger two-lane highway that was originally constructed in the late 19th century as a private road for the LCSD before being incorporated into the California state highway system in the early 1920s. Due to a lack of integrity, however, it does not appear eligible for NRHP or CRHR listing for any potential significant associations with events (Criterion A/1), or its embodiment of distinctive architectural or engineering characteristics (Criterion C/3). Although the subject segment may have been developed to support construction of the LCSD, it has substantially altered since this time through its realignment and resurfacing, and demolition of the original, adjacent wood bridge. The road therefore does not possess sufficient integrity of location, design, materials, workmanship, feeling, or association from this period to convey any potential significant associations with the early development of the LCSD.

Similarly, any potential significance the subject segment has for its association with or as a representation of 1920s-era highway design in California cannot be conveyed due to a lack of integrity. The original road surface consisted of gravel, which has since been replaced with asphalt concrete, and historic photographs indicate the roadbed was partially widened, resulting in a loss of integrity of materials and workmanship. Further, the subject segment was developed in conjunction with the adjacent 1923-24 LCSD Bridge, which was recently demolished, negatively affecting the segment’s integrity of feeling, association, and setting.

Archival research also does not indicate that the subject segment is associated with any significant individuals (Criterion B/2) or that it has the potential to yield important information (Criterion D/4).
Conclusions

7.1 Project Impacts Assessment

CEQA (Section 21084.1) requires that a lead agency determine whether a project may have a significant effect on cultural resources. Impacts to significant cultural resources that affect the characteristics of the resource that qualify it for the CRHR or adversely alter the significance of a resource listed on or eligible for the CRHR are considered a significant effect on the environment.

If it can be demonstrated that a project will cause damage to a unique archaeological resource, the lead agency may require reasonable efforts be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. To the extent that they cannot be left undisturbed, mitigation measures are required (Section 21083.2[a], [b], and [c]).

In terms of historical resources, these impacts could result from “physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired” (CEQA Guidelines, Section 15064.5 [b][1], 2000). Material impairment is defined as demolition or alteration “in an adverse manner [of] those characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for inclusion in, the California Register.” (CEQA Guidelines Section 15064.5[b][2][A]).

The potential for the proposed project to result in impacts to cultural resources is based on the CEQA thresholds of significance outlined in Appendix G of the State CEQA Guidelines. They are as follows:

- Would the project cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5?
- Would the project cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines Section 15064.5?
- Would the project disturb any human remains, including those interred outside of formal cemeteries?
- Does the project site contain known historic structures or sites?
- Is the project site in or near an area containing known archaeological resources or containing features (drainage course, spring, knoll, rock outcroppings, or oak trees) that indicate potential archaeological sensitivity?

Significance thresholds for impacts to tribal cultural resources are also included in Appendix G of the State CEQA Guidelines and are as follows:

- Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:
  a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

7.1.1 Archaeological and Tribal Cultural Resources

The approximately 800-foot project alignment has been previously developed and the site contains roadway-related infrastructure, such as pavement. It is likely that surface soils have been scattered across the surface of the site during initial construction and grading of the area, and that the proposed project improvements are unlikely to occur at soil depths below those which have been previously disturbed, negating the usefulness of subsurface archaeological testing. No archaeological resources of Native American origin or tribal cultural resources have been identified as a result of the cultural resources records search, Native American scoping, local historic group consultation, or cultural resources survey.

7.1.2 Built Environment/Historical Resources

The segment of Skyline Boulevard/State Route 35 that is located within the project site is recommended not eligible for listing in the NRHP or CRHR and, therefore, is not considered a historical resource for the purposes of CEQA. Background research and the field survey also failed to identify any other historical resources on the project site. Although one historical resource, the LCSD, is located immediately adjacent to the project site to the north, the project would not result in material impairment of this resource. The LCSD is significant as an architecturally innovative engineering prototype for future large water storage dams. Features that convey this significance are primarily the curved, wall structure constructed of interlocking, irregular-shaped concrete blocks and the four spillway bays (Demuth 2008:11). The 1920s-era bridge that sat atop the dam, and that connected to the recorded segment Skyline Boulevard/State Route 35, was previously determined neither eligible nor a contributing element to the LCSD and was demolished and in the process of being replaced at the time of the current survey. The minimal alteration of the adjacent roadway through the addition of a bike lane would not negatively impact any of the character-defining features of the LCSD or result in its material impairment. As a result, the project would not result in a significant adverse impact on the environment as defined in CEQA Guidelines Section 15064.5.

7.2 Recommendations

No historical, archaeological or tribal cultural resources were identified within the project site, and thus the Project would result in no impact to cultural and tribal cultural resources. Rincon does not recommend further cultural resources work for the proposed Project at this time. Rincon recommends implementation of the following measures to reduce potential impacts to unanticipated archaeological and tribal cultural resources, including human remains. Impacts to archaeological and tribal cultural resources would be less than significant with adherence to these mitigation measures.
7.2.1 Unanticipated Discovery of Cultural Resources

If cultural resources are encountered during ground-disturbing activities, work in the immediate area should be halted and an archaeologist meeting the Secretary of the Interior’s Professional Qualifications Standards for archaeology (NPS 1983) (hereafter qualified archaeologist) should be contacted immediately to evaluate the find. If necessary, the evaluation may require preparation of a treatment plan and archaeological testing for CRHR eligibility. If the discovery proves to be significant under CEQA and cannot be avoided by the Project, additional work such as data recovery excavation may be warranted to mitigate any significant impacts to historical resources.

7.2.2 Unanticipated Discovery of Tribal Cultural Resources

In the event that a previously unidentified cultural resource is determined to be of Native American origin, the qualified archaeologist will consult with San Mateo County Parks to begin or continue Native American consultation procedures. If a discovery is determined to be a tribal cultural resource and thus significant under CEQA (after consultation with San Mateo County Parks), the resource should be avoided, if feasible. If avoidance is not feasible, a mitigation plan should be prepared and implemented in accordance with state guidelines and in consultation with Native American groups.

7.2.3 Unanticipated Discovery of Human Remains

The discovery of human remains is always a possibility during ground disturbing activities; if human remains are found, State of California Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. In the event of an unanticipated discovery of human remains, the County Coroner must be notified immediately. If the human remains are determined to be prehistoric, the coroner will notify the Native American Heritage Commission, which will determine and notify a most likely descendant (MLD). The MLD shall complete the inspection of the site within 48 hours of notification and may recommend scientific removal and nondestructive analysis of human remains and items associated with Native American burials.
8 References

Assembly Bill No. 52


Bean, Walton


Brabb, E.E. and E.H. Pampeyan


Brabb, E.E., R.W. Graymer, and D.L. Jones


California Division of Highways


Demouth, Kimberly

2008   Historical Resources Report for the Crystal Springs Dam Bridge Replacement Project. Prepared for San Mateo County.

Dumke, Glenn S.


D’Oro, Stella

2009   Native California Prehistory and Climate in the San Francisco Bay Area. Master’s Thesis, San Jose State University.

Engelhardt, Zephyrin, O.F.M.

1927a   San Fernando Rey, the Mission of the Valley. Franciscan Herald Press, Chicago.


ESA and Orion


Guinn, J.M.


Harris, Benjamin J. and Maureen Zogg


Hoffman, Ogden

1862 Reports of Land Cases Determined in the United States District Court for the Northern District of California, Numa Hubert, San Francisco.

Hylkema, Mark G.


Jones, Terry L. and Kathryn Klar


Kroeber, Alfred J.


Levy, R.


Lightfoot, Kent G., and Edward M. Luby

McCawley, William


Milliken, R.


Mithun, Marianne


Moratto, Michael


Nelson, Nels C.


Ragir, Sonia


Reséndez, Andrés


Rolle, Andrew


Schwind, Janet and the Skyline Historical Society

2014 The South Skyline Story. South Skyline Association, La Honda, California.
Shoup, Laurence H.


Shumway, Burgess McK.


U.S. Geological Survey

1896  San Mateo [map], 1:62,500, Topographic Quadrangle Map. Reston, VA.

Wickert, Linda


Workman, Boyle

Appendix A

Records Search Results Summary
<table>
<thead>
<tr>
<th>Report No.</th>
<th>Other IDs</th>
<th>Year</th>
<th>Author(s)</th>
<th>Title</th>
<th>Affiliation</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-006425</td>
<td>1983</td>
<td>David Chavez</td>
<td>Citywide Archaeological Investigations, City of San Mateo, California</td>
<td>Archaeological/Historical Consultants</td>
<td>41-001375, 41-001376</td>
<td></td>
</tr>
<tr>
<td>S-010740</td>
<td>1989</td>
<td>Laurence H. Shoup</td>
<td>Historic Property Survey Report for Lower Crystal Springs Dam and Skyline Boulevard Highway Bridge (#35C 004 3), San Mateo County, California</td>
<td>Archaeological/Historical Consultants</td>
<td>41-001375, 41-001376</td>
<td></td>
</tr>
<tr>
<td>Report No.</td>
<td>Other IDs</td>
<td>Year</td>
<td>Author(s)</td>
<td>Title</td>
<td>Affiliation</td>
<td>Resources</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>------</td>
<td>-----------</td>
<td>-------</td>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Report No.</td>
<td>Other IDs</td>
<td>Year</td>
<td>Author(s)</td>
<td>Title</td>
<td>Affiliation</td>
<td>Resources</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>------</td>
<td>-----------</td>
<td>-------</td>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>S-036313a</td>
<td></td>
<td>2009</td>
<td>Rancy S. Wiberg</td>
<td>Technical Report, Extended Archaeological Survey, Crystal Springs Pipeline No. 2, Segments 2 and 3 Between Sites 8 and 9, City of San Mateo and Town of Hillsborough</td>
<td>Holman &amp; Associates</td>
<td></td>
</tr>
<tr>
<td>S-037015</td>
<td></td>
<td>2008</td>
<td>Kimberly Demuth</td>
<td>Historical Resources Evaluation Report, Crystal Springs Dam Bridge Replacement Project</td>
<td>Entrix, Inc.</td>
<td>41-001375</td>
</tr>
<tr>
<td>S-037241</td>
<td>Agency Nbr - FHWA100414A; Caltrans - EA 0A8721</td>
<td>2010</td>
<td>Benjamin J. Harris, Maureen Zogg, and Christopher Caputo</td>
<td>Historic Property Survey Report, proposed replacement of Metal Beam Guardrails (MBGR) at various locations in San Mateo County, California, 04-SMA-VarVar, EA 04-0A8721</td>
<td>Caltrans, District 4</td>
<td>01-001783, 41-000100, 41-000233, 41-000255, 41-002167</td>
</tr>
<tr>
<td>S-037241a</td>
<td></td>
<td>1996</td>
<td></td>
<td>Request for Determination of Eligibility for Inclusion in the National Register of Historic Places, Southern Pacific Railroad Dumbarton Cutoff, Southern Pacific Railroad Dumbarton Bridge, Southern Pacific Railroad Newark Slough Bridge, Alameda and San Mateo Counties, California</td>
<td>U.S. Coast Guard</td>
<td></td>
</tr>
<tr>
<td>S-037241b</td>
<td></td>
<td>2010</td>
<td>Benjamin J. Harris and Maureen Zogg</td>
<td>Archaeological Survey Report for the Proposed Metalbeam Guardrail Upgrade Project at Various Locations across San Mateo County, California, 04-SMA-VarVar, EA 04-0A8721</td>
<td>Caltrans</td>
<td></td>
</tr>
<tr>
<td>S-037241c</td>
<td></td>
<td>2010</td>
<td>Benjamin J. Harris</td>
<td>Environmentally Sensitive Area (ESA) and Archaeological Monitoring Area (AMA) Action Plan for Two Locations Along State Route 1, San Mateo County, California, 04-SMA-01, PM 0.7 and 1.2, EA 04-0A8721; for the Proposed Metalbeam Guardrail Project at Various Locations Across San Mateo County, California, 04-SMA-VarVar, EA 04-0A8721</td>
<td>Caltrans</td>
<td></td>
</tr>
<tr>
<td>S-037241d</td>
<td></td>
<td>2010</td>
<td>Benjamin J. Harris and Maureen Zogg</td>
<td>Extended Phase I Testing at CA-SMA-97 for the Proposed Metalbeam Guardrail 1-5 Upgrade Project, San Mateo County, California, 04-SMA-01, PM 1.20, EA: 04-0A8721</td>
<td>Caltrans</td>
<td></td>
</tr>
<tr>
<td>Report No.</td>
<td>Other IDs</td>
<td>Year</td>
<td>Author(s)</td>
<td>Title</td>
<td>Affiliation</td>
<td>Resources</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>------</td>
<td>-----------</td>
<td>-------</td>
<td>-------------</td>
<td>-----------</td>
</tr>
<tr>
<td>S-037260</td>
<td>Caltrans - EA 04-0A8721</td>
<td>2010</td>
<td>Benjamin J. Harris and Maureen Zogg</td>
<td>Archaeological Survey Report for the Proposed Metalbeam Guardrail Upgrade Project at Various Locations across San Mateo County, California, 04-SMA-VarVar, EA 04-0A8721</td>
<td>Caltrans, District 4</td>
<td>41-000100, 41-000233, 41-000255, 41-002917</td>
</tr>
<tr>
<td>S-037889</td>
<td>2010</td>
<td>Brad Brewster</td>
<td>Historic American Engineering Record Lower Crystal Springs Dam</td>
<td>Enviornmental Science Associates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-038139</td>
<td>Other - COE100429A</td>
<td>2009</td>
<td>ICF Jones &amp; Stokes</td>
<td>Final Crystal Springs/San Andreas Transmission Upgrade Project, Archaeological Survey and Architectural Inventory and Evaluation Report for Section 106 Compliance</td>
<td>ICF Jones &amp; Stokes</td>
<td></td>
</tr>
<tr>
<td>S-038343</td>
<td>2011</td>
<td>Randy Wiberg</td>
<td>Lower Crystal Springs Dam Improvements Project: Historic Flume Structure Identified in Discharge Pools 1 and 2</td>
<td>Holman &amp; Associates</td>
<td>41-002279</td>
<td></td>
</tr>
</tbody>
</table>
## Resource List

<table>
<thead>
<tr>
<th>Primary No.</th>
<th>Trinomial</th>
<th>Other IDs</th>
<th>Type</th>
<th>Age</th>
<th>Attribute codes</th>
<th>Recorded by</th>
<th>Reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-41-001375</td>
<td>Resource Name - Lower Crystal Springs Bridge 35C-43; Other - Skyline Blvd Bridge; Other - Lower Crystal Springs Dam and Bridge; OHP PRN - FHWA 970421A; OHP PRN - DOE 41-97-0003-0000; OHP Property Number - 068327</td>
<td>Structure, Element of district</td>
<td>Historic</td>
<td>HP19 (Bridge)</td>
<td>1996 (Laurence H. Shoup, Archaeological/Historical Consultants); 1998 (Clarence Ceasar); 2008 (David Harvey, ENTRIX, Inc.)</td>
<td>S-010740, S-021879, S-037015</td>
<td></td>
</tr>
<tr>
<td>P-41-001376</td>
<td>Resource Name - Lower Crystal Springs Dam; OHP PRN - DOE 41-89-0002-0000; OHP PRN - FHWA 890822B; Other - SPHI-SMA-003; OHP Property Number - 068328</td>
<td>Structure, Element of district</td>
<td>Historic</td>
<td>HP19 (Bridge); HP21 (Dam)</td>
<td>1996 (Laurence Shoup, Archaeological/Historical Consultants); 2008 (David Harvey, ENTRIX, Inc.)</td>
<td>S-010740, S-021879, S-027930</td>
<td></td>
</tr>
<tr>
<td>P-41-002274</td>
<td>Resource Name - Crystal Springs Pumping Station; Caltrans - LCSD #3</td>
<td>Building, Element of district</td>
<td>Historic</td>
<td>HP09 (Public utility building)</td>
<td>2008 (David Harvey, ENTRIX, Inc.)</td>
<td>S-010740, S-021879, S-027930</td>
<td></td>
</tr>
<tr>
<td>P-41-002277</td>
<td>Resource Name - Lower Crystal Springs Dam Historic District; Caltrans - LCSD HD</td>
<td>District</td>
<td>Historic</td>
<td>HP19 (Bridge); HP21 (Dam); HP22 (Lake/river/reservoir); HP29 (Landscape architecture)</td>
<td>2008 (David Harvey, ENTRIX, Inc.)</td>
<td>S-010740, S-021879, S-027930</td>
<td></td>
</tr>
<tr>
<td>P-41-002279</td>
<td>CA-SMA-000395H Resource Name - Lower Crystal Springs Dam Water Conveyance System</td>
<td>Site, Element of district</td>
<td>Historic</td>
<td>AH06 (Water conveyance system)</td>
<td>2011 (R. Wibert, S. Psota, Holman &amp; Associates)</td>
<td>S-038343</td>
<td></td>
</tr>
</tbody>
</table>
December 20, 2016

Kyle Brudvik
Rincon Consultants

Sent by: kbrudvik@rinconconsultants.com

RE: Complete the Gap Trail Planning Project, San Mateo

Dear Mr. Brudvik,

Attached is a list of tribes that have cultural and traditional affiliation to the area of potential project effect (APE) referenced above. I suggest you contact all of those listed, if they cannot supply information, they might recommend others with specific knowledge. The list should provide a starting place to locate areas of potential adverse impact within the APE. By contacting all those on the list, your organization will be better able to respond to claims of failure to consult, as may be required under particular state statutes. If a response has not been received within two weeks of notification, the Native American Heritage Commission (NAHC) requests that you follow-up with a telephone call to ensure that the project information has been received.

The NAHC also recommends that project proponents conduct a record search of the NAHC Sacred Lands File (SLF) at the appropriate regional archaeological Information Center of the California Historic Resources Information System (CHRIS) (http://ohp.parks.ca.gov/?page_id=1068) to determine if any tribal cultural resources are located within the area(s) affected by the proposed action. The SFL, established under Public Resources Code section 5094, are sites submitted for listing to the NAHC by California Native American tribes. The SFL, established under Public Resources Code section 5094, are sites submitted for listing to the NAHC by California Native American tribes. A record search of the SLF was completed for the APE referenced above with negative results. Please note records maintained by the NAHC and CHRIS is not exhaustive, and a negative response to these searches does not preclude the existence of tribal cultural resources. A tribe may be the only source of information regarding the existence of tribal cultural resources.

If you receive notification of change of addresses and phone numbers from any of these tribes, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact via email: frank.lienert@nahc.ca.gov

Sincerely,

Frank Lienert
Associate Governmental Program Analyst
Native American Contacts

December 20, 2016

Coastanoan Rumsen Carmel Tribe
Tony Cerda, Chairperson
244 E. 1st Street
Pomona, CA 91766
rumsen@aol.com
(909) 524-8041 Cell
(909) 629-6081

Amah Mutsun Tribal Band of Mission San Juan Bautista
Irene Zwierlein, Chairperson
789 Canada Road
Woodside, CA 94062
amahmutsuntribal@gmail.com
(650) 400-4806 Cell
(650) 332-1526 Fax

Muwekma Ohlone Indian Tribe of the SF Bay Area
Rosemary Cambra, Chairperson
P.O. Box 360791
Milpitas, CA 95036
muwekma@muwekma.org
(408) 314-1898
(510) 581-5194

The Ohlone Indian Tribe
Andrew Galvan
P.O. Box 3152
Fremont, CA 94539
chochenyo@AOL.com
(510) 882-0527 Cell
(510) 687-9393 Fax

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayers, Chairperson
P.O. Box 28
Hollister, CA 95024
ams@indiancanyon.org
(831) 637-4238

This list is current only as of the date of this document and is based on the information available to the Commission on the date it was produced.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 6097.94 of the Public Resource Section 5097.98 of the Public Resources Code

This list is only applicable for contacting local Native Americans with regard to cultural resources assessments for Complete the Gap Trail Planning Project, San Mateo
December 21, 2016

Amah Mutsun Tribal Band of
Mission San Juan Bautista
Irenne Zwierlein, Chairperson
789 Canada Road
Woodside, CA 94602

Sent via email to: amahmutsuntribal@gmail.com

RE: Cultural Resources Study for the Complete the Gap Trail Planning Project, San Mateo County, California

Dear Chairperson Zwierlein:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the proposed Complete the Gap Trail Planning Project (project) in San Mateo County, California. The project will be part of an eventual 17.5-mile CSRT system that stretches from the City of San Bruno to the Town of Woodside along the eastern side of the San Francisco Watershed reservoirs. The current project completes an approximately 800’-long gap to connect the Crystal Springs Dam Trail to the Crystal Springs Regional South of Dam Trail, located at the southernmost part of Sawyer Camp Trail of the Crystal Springs Regional Trail in the San Francisco Peninsula Watershed (see attached map). The Crystal Springs Dam Bridge will be completed by Fall 2017. The current project is the remaining segment to provide contiguous trail from San Bruno Avenue to Highway 92 and is subject to the California Environmental Quality Act (CEQA).

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project site. The results stated that a search of the SLF was completed with “negative results” and recommended that we consult with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project.

If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or kbrudvik@rinconconsultants.com or at 510-671-0176. Thank you for your assistance.
Sincerely,

Kyle Brudvik, MA, RPA
Paleontologist/Geoarchaeologist/Archaeologist

Enclosure: Project Location Map
December 21, 2016

Costanoan Rumsen Carmel Tribe
Tony Cerda, Chairperson
244 E. 1st Street
Pomona, CA 91766

Sent via email to: rumsen@aol.com

RE: Cultural Resources Study for the Complete the Gap Trail Planning Project, San Mateo County, California

Dear Chairperson Cerda:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the proposed Complete the Gap Trail Planning Project (project) in San Mateo County, California. The project will be part of an eventual 17.5-mile CSRT system that stretches from the City of San Bruno to the Town of Woodside along the eastern side of the San Francisco Watershed reservoirs. The current project completes an approximately 800’-long gap to connect the Crystal Springs Dam Trail to the Crystal Springs Regional South of Dam Trail, located at the southernmost part of Sawyer Camp Trail of the Crystal Springs Regional Trail in the San Francisco Peninsula Watershed (see attached map). The Crystal Springs Dam Bridge will be completed by Fall 2017. The current project is the remaining segment to provide contiguous trail from San Bruno Avenue to Highway 92 and is subject to the California Environmental Quality Act (CEQA).

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project site. The results stated that a search of the SLF was completed with “negative results” and recommended that we consult with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project.

If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or kbrudvik@rinconconsultants.com or at 510-671-0176. Thank you for your assistance.
Sincerely,

Kyle Brudvik, MA, RPA
Paleontologist/Geoarchaeologist/Archaeologist

Enclosure: Project Location Map
December 21, 2016

Indian Canyon Mutsun Band of Costanoan
Ann Marie Sayers, Chairperson
PO Box 28
Hollister, CA 95024

Sent via email to: ams@indiancanyon.org

RE: Cultural Resources Study for the Complete the Gap Trail Planning Project, San Mateo County, California

Dear Chairperson Sayers:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the proposed Complete the Gap Trail Planning Project (project) in San Mateo County, California. The project will be part of an eventual 17.5-mile CSRT system that stretches from the City of San Bruno to the Town of Woodside along the eastern side of the San Francisco Watershed reservoirs. The current project completes an approximately 800’-long gap to connect the Crystal Springs Dam Trail to the Crystal Springs Regional South of Dam Trail, located at the southernmost part of Sawyer Camp Trail of the Crystal Springs Regional Trail in the San Francisco Peninsula Watershed (see attached map). The Crystal Springs Dam Bridge will be completed by Fall 2017. The current project is the remaining segment to provide contiguous trail from San Bruno Avenue to Highway 92 and is subject to the California Environmental Quality Act (CEQA).

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project site. The results stated that a search of the SLF was completed with “negative results” and recommended that we consult with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project.

If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or kbrudvik@rinconconsultants.com or at 510-671-0176. Thank you for your assistance.
Sincerely,

Kyle Brudvik, MA, RPA
Paleontologist/Geoarchaeologist/Archaeologist

Enclosure: Project Location Map
December 21, 2016

Muwekma Ohlone Indian Tribe of the
San Francisco Bay Area
Rosemary Cambra, Chairperson
PO Box 360791
Milpitas, CA 95036

Sent via email to: muwekma@muwekma.org

RE: Cultural Resources Study for the Complete the Gap Trail Planning Project, San Mateo County, California

Dear Chairperson Cambra:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the proposed Complete the Gap Trail Planning Project (project) in San Mateo County, California. The project will be part of an eventual 17.5-mile CSRT system that stretches from the City of San Bruno to the Town of Woodside along the eastern side of the San Francisco Watershed reservoirs. The current project completes an approximately 800'-long gap to connect the Crystal Springs Dam Trail to the Crystal Springs Regional South of Dam Trail, located at the southernmost part of Sawyer Camp Trail of the Crystal Springs Regional Trail in the San Francisco Peninsula Watershed (see attached map). The Crystal Springs Dam Bridge will be completed by Fall 2017. The current project is the remaining segment to provide contiguous trail from San Bruno Avenue to Highway 92 and is subject to the California Environmental Quality Act (CEQA).

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project site. The results stated that a search of the SLF was completed with “negative results” and recommended that we consult with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project.

If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or kbrudvik@rinconconsultants.com or at 510-671-0176. Thank you for your assistance.
Sincerely,

Kyle Brudvik, MA, RPA  
Paleontologist/Geoarchaeologist/Archaeologist

Enclosure: Project Location Map
December 21, 2016

The Ohlone Indian Tribe
Andrew Galvan
PO Box 3152
Fremont, CA 94539

Sent via email to: chochenyo@aol.com

RE: Cultural Resources Study for the Complete the Gap Trail Planning Project, San Mateo County, California

Dear Mr. Galvan:

Rincon Consultants, Inc. (Rincon) has been retained to conduct a cultural resources study for the proposed Complete the Gap Trail Planning Project (project) in San Mateo County, California. The project will be part of an eventual 17.5-mile CSRT system that stretches from the City of San Bruno to the Town of Woodside along the eastern side of the San Francisco Watershed reservoirs. The current project completes an approximately 800’-long gap to connect the Crystal Springs Dam Trail to the Crystal Springs Regional South of Dam Trail, located at the southernmost part of Sawyer Camp Trail of the Crystal Springs Regional Trail in the San Francisco Peninsula Watershed (see attached map). The Crystal Springs Dam Bridge will be completed by Fall 2017. The current project is the remaining segment to provide contiguous trail from San Bruno Avenue to Highway 92 and is subject to the California Environmental Quality Act (CEQA).

As part of the process of identifying cultural resources issues for this project, Rincon contacted the Native American Heritage Commission and requested a Sacred Lands File (SLF) search and a list of Native American tribal organizations and individuals who may have knowledge of sensitive cultural resources in or near the project site. The results stated that a search of the SLF was completed with “negative results” and recommended that we consult with you directly regarding your knowledge of the presence of cultural resources that may be impacted by this project.

If you have knowledge of cultural resources that may exist within or near the project area, please contact me in writing at the above address or kbrudvik@rinconconsultants.com or at 510-671-0176. Thank you for your assistance.
Sincerely,

Kyle Brudvik, MA, RPA
Paleontologist/Geoarchaeologist/Archaeologist

Enclosure: Project Location Map
Appendix C

Resource Records
Resource Name or #: Skyline Boulevard/State Route 35

P1. Other Identifier:

*P2. Location:  ☐ Not for Publication  ☑ Unrestricted
□ a. County: Santa Barbara
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
□ b. USGS 7.5' Quad: San Mateo Date: T 5S; R 5W; ¼ of ¼ of Sec ; M.D.  B.M.
□ c. Address: Skyline Boulevard City: Unincorporated San Mateo County Zip:
□ d. UTM: Zone: ; mE/ mN (G.P.S.)
□ e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation:

From the southern point of the Lower Crystal Springs Dam, the recorded segment extends approximately 850 feet to the south.

*P3a. Description: (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
The recorded segment of Skyline Boulevard/State Route 35 is a two-lane road that is located in unincorporated San Mateo County. Following a general northwest-southeast alignment, it is situated along a tree-covered hillside that slopes downstream from Interstate 280 to the east to the Lower Crystal Springs Reservoir to the west. The segment begins at the Lower Crystal Springs Dam (LCSD) to the north and extends approximately 850 feet to the south, where it intersects a paved bike path that extends to the southwest. Approximately 25 feet wide, the graded roadbed is paved with asphalt-concrete and features a short paved shoulder that is bordered by gravel on either side. Road markings include painted shoulder lines and a centerline consisting of Bott dots, as well as adjacent mile markers, speed limit, and other signage on metal poles. Portions of the roadway have cracked and been repaired with tar and the northern end of the segment is currently disjoined from the LCSD due to an ongoing bridge replacement project. A full condition assessment could not be completed however, as the roadway was largely covered by construction equipment at the time of the field survey.

*P3b. Resource Attributes: (List attributes and codes) HP37. Highway/trail

*P4. Resources Present:  □ Building  □ Structure  □ Object  □ Site  □ District  □ Element of District  □ Other (Isolates, etc.)

P5b. Description of Photo: (View, date, accession #)
Southern terminus of Skyline Boulevard/State Route 35 segment, facing south, January 4, 2017.

*P6. Date Constructed/Age and Sources: □ Historic  □ Prehistoric  □ Both
Main building, 1926; additional buildings 1954-1955 and 1990s.

*P7. Owner and Address: Unknown

*P8. Recorded by: (Name, affiliation, and address)
Steven Treffers
Rincon Consultants, Inc.
180 N. Ashwood
Ventura, CA 93003

*P9. Date Recorded: January 4, 2017

*P10. Survey Type: (Describe)
Intensive

*P11. Report Citation: (Cite survey report and other sources, or enter “none.”)
County of San Mateo, Complete the Gap Trail Planning Project: Cultural Resources Study (Rincon Consultants 2017).

*Attachments: □ NONE  □ Location Map  □ Sketch Map  □ Continuation Sheet  □ Building, Structure, and Object Record
□ Archaeological Record  □ District Record  □ Linear Feature Record  □ Milling Station Record  □ Rock Art Record
□ Artifact Record  □ Photograph Record  □ Other (List): DPR 523A (1/95)
*Resource Name or #: Skyline Boulevard/State Route 35

*Map Name: USGS 7.5-minute Quadrangle, San Mateo

*Scale: 1:24,000  *Date of Map: 1993

Subject Segment

0 1,000 2,000 Feet

DPR 523J (1/95)

*Required Information
L1. Historic and/or Common Name: Skyline Boulevard

L2a. Portion Described: □ Entire Resource  ■ Segment  □ Point Observation  □ Designation:
   b. Location of point or segment: (Provide UTM coordinates, decimal degrees, legal description, and any other useful locational data. Show the area that has been field inspected on a Location Map.)

The subject segment begins at the southern point of the Lower Crystal Springs Dam (LCSD) in unincorporated San Mateo County and extends approximately 350 feet to the south.

L3. Description: (Describe construction details, materials, and artifacts found at this segment/point. Provide plans/sections as appropriate.)

The subject property is a segment of a two‐lane road that is paved in non‐original asphalt that is cracking in areas and patched with tar. It features a centerline consisting of Bott dots and painted shoulder lines, and is bordered by a short gravel shoulder on either side. With the exception of metal signage, no additional features, artifacts, and/or archaeological sites/deposits appear to be associated with the segment.

L4. Dimensions: (In feet for historic features and meters for prehistoric features)
   a. Top Width ± 25 feet
   b. Bottom Width ± 25 feet
   c. Height or Depth ±6 inches
   d. Length of Segment ±850 feet

L5. Associated Resources:

The subject segment was realigned in 1923‐24 as part of the development of a no longer extant bridge atop the LCSD.

L6. Setting: (Describe natural features, landscape characteristics, slope, etc., as appropriate.)

Following a general northwest‐southeast alignment, it is situated along a tree‐covered hillside that slopes downward from Interstate 280 to the east to the Lower Crystal Springs Reservoir to the west. It follows a general northwest‐southeast alignment that slopes slightly to the south.

L7. Integrity Considerations: Originally constructed circa 1891, the subject segment was realigned to its current alignment in 1923‐24. It was originally topped with crushed stone, but has since been widened and paved with asphalt. In addition, the LCSD bridge it was initially connected to was recently demolished.

L8a. Photograph, Map or Drawing

L8b. Description of Photo, Map, or Drawing  (View, scale, etc.)  
Northern terminus of Skyline Boulevard/State Route 35 segment, facing north, January 4, 2017

L9. Remarks:

L10. Form Prepared by: (Name, affiliation, and address)
Steven Treffers
Rinccon Consultants, Inc.
180 N. Ashwood
Ventura, CA 93003

L11. Date: January 20, 2017
B1. Historic Name: Skyline Highway; Skyline Boulevard
B2. Common Name: Skyline Boulevard; State Route 35
B3. Original Use: Private road
B4. Present Use: State highway

*B5. Architectural Style: N/A

*B6. Construction History: (Construction date, alterations, and date of alterations)
Initially constructed circa 1891 to support development of the Lower Crystal Springs Dam (LCSD); realigned to current alignment in 1923-24 as part of its incorporation into the California State Highway System and construction of the adjacent LCSD

*B7. Moved? ☐ No ☐ Yes ☐ Unknown Date: ☐ Original Location:

*B8. Related Features:

B9a. Architect: Unknown
b. Builder: Unknown

*B10. Significance: Theme: Engineering and technological history
Area: San Mateo County
Period of Significance: ca. 1891; 1923-24
Property Type: Road/Highway
Applicable Criteria: N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The subject segment of Skyline Boulevard/State Route 35 appears to have been initially developed by the Spring Valley Water Company in the late 19th century as a private service road for the LCSD. A historic map from 1896 identifies the road extending south from the LCSD and following a slightly more rounded alignment than the present-day segment (U.S. Geological Survey 1896). The differing alignment is further supported by a circa 1891 photograph, which depicts the original wood dam bridge (constructed in 1891) connected to the adjacent roadway further to the west than its current location (Snodgrass 1891).

By the early 1920s, the original wood bridge was in poor condition and in need of replacement. The bridge was overseen by the California Highway Commission by this time and a request for proposals was released in the summer of 1923 (Shoup 1989:11) to complete the project. Construction of the new bridge was not only spurred by the need to replace the original wood structure, but also by the development of Skyline Boulevard, which was planned to cross over the LCSD. As discussed in 2008:

Planning began for Skyline Boulevard began in 1919 with the route of the scenic highway between San Francisco and the Los Gatos-Santa Cruz highway to the south in the Santa Cruz mountains. The boosters for the scenic highway envisioned the road as a means to generate economic development of vast amounts of San Mateo County real estate and as a boon to tourism with the increased leisure use of the automobile after World War I. Unfortunately the northern section of the highway never reached its full potential. For a long time it was graveled but not paved, making for unpleasant driving conditions for weekend tourists. The highway was originally to be routed over the mountain range west of Crystal Springs Reservoir. But the Spring Valley Water Company, fearful of the potential fire danger in mountain watersheds, persuaded the state and county to locate it along the foothills east of the reservoir and across the Lower Crystal Springs Dam (Demouth 2008).

See continuation sheet, p. 5.

B11. Additional Resource Attributes: (List attributes and codes)

*B12. References:


See continuation sheet, p. 5.

B13. Remarks:

*B14. Evaluator: Steven Treffers; Rincon Consultants, Inc.
Date of Evaluation: January 20, 2017

(This space reserved for official comments.)
B10. Significance, continued:

Completed in early 1924, the multi-span curved concrete bridge was supported on multi-column bents and built directly atop the LCSD. As seen in a circa 1924 photograph and as discussed in previous documentation (Demouth 2008) the subject segment of Skyline Boulevard/State Route 35 was originally topped with crushed stone. The alignment appears to be consistent with the present-day road, indicating that it was most likely realigned as part of the bridge construction and the road’s incorporation into Skyline Boulevard.

Progress on Skyline Boulevard lagged after 1925 as the California Highway Commission, running short on funds, diverted resources to other highway projects (Schwind and the Skyline Historical Society 2014). Development continued of the highway through the 1930s as the project received intermittent funding from bonds and support from federal programs. Originally designated State Route 55, it was subsequently renumbered State Route 5 and ultimately State Route 35 following a statewide renumbering of highways in the early 1960s (California Division of Highways 1964:12).

In the years since its development, Skyline Boulevard/State Route 35 has been bifurcated in certain areas as a result of the construction of the adjacent Interstate 280 and surrounding suburban residential development. In addition to its realignment in the early 1920s, alterations to the subject segment include its paving with asphalt at an unknown date, partial widening, the addition of adjacent modern roadway signage, and most recently its disconnection from the 1923-24 bridge, which at the time of the survey was demolished and in the process of being replaced.

Coordination with staff at Caltrans District 4 and the NWIC failed to identify any previous documentation that included a historic resource evaluation of Skyline Boulevard/State Route 35. Caltrans previously completed extensive historic resources documentation in support of the adjacent LCSD Bridge Replacement Project, which included recordation and evaluation of the LCSD and its associated infrastructure (Shoup 1989; Demouth 2008). Although the development of Skyline Boulevard/State Route 35 is discussed within this documentation, the historic-era road is not individually recorded or evaluated, and coordination with Caltrans staff confirmed that roads are not typically recorded unless there is evidence they may be historically significant (Stewart 2017). Two resources recorded as part of the LCSD Bridge Replacement Project, the LCSD Bridge (P-41-003175) and the Vista Point (P-41-00276), are associated not only with the development of the LCSD, but also with Skyline Boulevard/State Route 35. Both of these resources were found ineligible for listing in the NRHP or CRHR due to a lack of significant associations.

In considering the individual significance of the subject segment, it is a portion of a larger two-lane highway that was originally constructed in the late 19th century as a private road for the LCSD before being incorporated into the California state highway system in the early 1920s. Due to a lack of integrity however, it does not appear eligible for listing in the National Register of Historic Places or California Register of Historical Resources for any potential significant associations with events (Criterion A/1), or its embodiment of distinctive architectural or engineering characteristics (Criterion C/3). Although the subject segment may have been developed to support the construction of the LCSD, it has substantially altered since this time through its realignment and resurfacing, and the demolition of the original, adjacent wood bridge. The road therefore does not possess sufficient integrity of location, design, materials, workmanship, feeling, or association from this period to convey any potential significant associations with the early development of the LCSD.

Similarly, any potential significance the subject segment has for its association with or as a representation of 1920s-era highway design in California is unable to be conveyed due to a lack of integrity. The original road surface consisted of gravel, which has since been replaced with asphalt concrete, and historic photographs indicate the roadbed was partially widened, resulting in a loss of integrity of materials and workmanship. Further, the subject segment was developed in conjunction with the adjacent 1923-24 LCSD Bridge, which was recently demolished, negatively affecting the segment’s integrity of feeling, association, and setting. Archival research also does not indicate that the subject segment is associated with any significant individuals (Criterion B/2) or has the potential to yield important information (Criterion D/4).

B12. References, continued:


Snodgrass, Ken. Lower Crystal Springs [photograph]. On file in the San Francisco Historical Photograph Collection, San Francisco Public Library. 1891.

Stewart, Noah (Branch Chief, Built Resources/Architectural History, Caltrans District 4). Personal communication with Steven Treffers [via email]. January 18, 2017.

Appendix D

Geotechnical Investigation
August 29, 2017
Project 3700

Bellecci & Associates
2290 Diamond Blvd. Suite 100
Concord, CA 94520

Attention: Mr. Daniel Leary, P.E.

Subject: Geotechnical Investigation
          Crystal Springs Complete the Gap Bike Trail
          San Mateo County, California

Dear Mr. Leary:

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation for proposed Complete the Gap (CTG) bike trail on Skyline Blvd. adjacent to Crystal Springs reservoir in San Mateo County, California. The site is shown on Figure 1, Vicinity Map and Figures 2A and 2B, Site Plan.¹

2.0 PROJECT DESCRIPTION

The project will consist of constructing a paved bike trail along the western edge of Skyline Blvd. starting at the southern end of Lower Crystal Springs Dam and extending 800 feet south to connect to an existing bike trail segment. The construction of the bike trail will require widening of the existing roadway shoulder area in some locations by placing fill, and may necessitate that retaining walls or structures be constructed in a few areas. The location and height of the retaining structures will depend on the bike trail width and alignment alternative selected by the San Mateo County from the options presented by your firm. We understand that 6-foot wide and 8-foot wide trail sections are being considered, as well as alternative alignments that require trees to be either removed or preserved. The proposed preliminary design has the trail separated from the roadway by a concrete curb and gutter and a fence. A chain link fence is also proposed along the west edge of the trail.

Currently, the northern approximately 400 feet of the roadway and shoulder are being used to support the ongoing construction of a roadway bridge deck on the dam. As part of this project, the elevation of the Skyline Blvd. roadway and shoulder will be raised about 7 to 8 feet at the south abutment of the dam (and north end of the bike trail) and will taper to match existing grade at a point roughly 250 feet south of the abutment. The

¹ Site plan, stationing, and elevations mentioned in this report are based on Trail Improvement Plan, Sheet-3, Complete the Gap Trail Project, San Mateo County, California (30% Submittal), prepared by Bellecci & Associates, Inc., dated March 2017.
bike trail will be constructed to match these new roadway grades. A portion of the new fill was in place at the time of our fieldwork. We understand that this new fill and roadway section will be constructed prior to the construction of the CTG bike trail and that the new roadway will have minimal shoulder width and will not be wide enough to accommodate a bike trail. The replacement of a portion of the storm drain underlying the bike trail alignment is also currently in progress and has disrupted some of the fill previously placed by the bridge deck contractor. We understand that this disrupted fill will be restored after the completion of the storm drain project. Additional fill will also need to be placed as part of the bike trail project, to reestablish a wider shoulder to accommodate the bike trail.

3.0 PURPOSE AND SCOPE OF WORK

The purpose of our geotechnical investigation was to evaluate the subsurface conditions and provide geotechnical engineering recommendations for the design and construction of the bike trail. In accordance with our proposal dated August 23, 2016, we completed the following scope of work:

1. Reviewed available geotechnical and geologic information pertinent to the site, including previous geotechnical and geologic studies for the site and vicinity.

2. Performed a site reconnaissance to observe existing conditions within and adjacent to the study area.

3. Explored subsurface conditions by drilling and sampling nine exploratory test borings to depths between 10.0 and 31.3 feet below the ground surface within the approximately 800-foot long shoulder area.

4. Performed geotechnical laboratory testing to evaluate pertinent engineering and index properties of the earth materials.

5. Performed engineering analyses of the acquired data to identify and evaluate the most-appropriate retaining and/or stabilization measures to support the proposed bike trail. Developed geotechnical engineering recommendations for retaining wall design, pavement design, site grading and fill construction, and site drainage.

6. Prepared this report summarizing our findings, conclusions, and geotechnical design recommendations for the proposed bike trail.

As outlined in our proposal, we also completed supplemental tasks to assist in the preparation of design documents as follows:
1. Provided consultation and meeting attendance to assist design team in evaluating alternatives and developing the design.

2. Provided retaining wall design calculations and design sketches for soldier pile for incorporation into plan sheets prepared by your firm.

The above scope of work did not include the investigation or evaluation for the presence of hazardous materials on the site, or in the soil and groundwater beneath the site.

4.0 SITE CONDITIONS

4.1 General

The area proposed for the bike trail comprises the outer and western edge of the Skyline Blvd. roadway embankment and consists primarily of a soil and gravel shoulder of varying width (6 feet to 25 feet). At the roadway shoulder edge, the embankment slopes downhill to the west and has varying slope inclinations between about 1.3H:1V and 3.0H:1V (horizontal to vertical). Depending on the alignment alternative that is selected, the bike trail area may also encompass a small portion of the embankment upper slope and existing vegetation. The upper portion of the embankment slope has vegetation typically consisting of brush and ground cover. There are also mature trees in a few areas on the upper embankment slope, which could require trimming or removal, depending on the selected alignment.

The roadway appears to have been constructed by cut and fill with the inner northbound lane and a portion of the outer southbound lane generally supported on cut, and the remainder of the outer lane and shoulder supported on fill, except where the roadway and shoulder cross two east-west trending drainages which have been filled. Culverts were installed in these drainages to convey runoff beneath the road from areas upslope of the embankment to areas downslope of the embankment. The culverts are approximately at stations 169+20 and 173+25, and have concrete headwalls at the upstream ends.

Within the bike trail segment, the roadway and shoulder are at about a 6.5% grade. In general, the shoulder has a slight swale and outer berm roughly parallel to the roadway that directs roadway runoff along the shoulder to existing drain inlets at the roadway edge. These inlets are connected to a storm drain that is under the roadway shoulder and which consists of a 48-inch reinforced concrete pipe (RCP) upstream of 170+90, and a recently installed 48-inch HDPE plastic corrugated pipe downstream of 170+90 that replaced a deteriorated 36-inch corrugated metal pipe. The culvert and proposed bike trail alignments coincide. Our limited observations as of August 25, 2017 indicate that
the 48-inch HDPE culvert was installed in a 6-foot wide trench and that bedding and backfill placement were in progress. In several places lean concrete slurry bedding was placed to about 4 inches above the pipe and compacted soil backfill was placed above the pipe bedding. At this time, no information on inspections or testing results has been furnished. From our limited observations and conversations with the contractor, the pipe cover depth appears to be at least 27 inches below existing grade at the drain inlet at 170+90, and increases slightly going northward, except between about 168+50 and 169+75 where it is about 18 inches, according to the pipeline foreman. Beyond 169+75 the pipe cover increases with proximity to the bridge abutment. The 6-foot wide backfilled trench underlies a portion of the bike trail width, creates a non-uniform subgrade support condition, and will require limited over-excavation of the new and existing subgrade underlying the bike trail alignment.

The site features are shown on Figures 2A and 2B.

5.0 GEOLOGIC AND SUBSURFACE CONDITIONS

5.1 Geologic Conditions

The project site is located within the Coast Ranges Geomorphic province of California, a region characterized by northwest-trending mountains, intervening valleys, and northwest-trending faults. The site is located on the west-facing slope adjacent to the Crystal Springs Reservoir shoreline and is in a valley formed by the San Andreas fault, which underlies the reservoir. The site is mapped\(^2\) as underlain by the Franciscan Complex of Cretaceous to Jurassic age consisting of sheared rock described as containing predominately greywacke, siltstone, and shale, among other rocks. Based on our observation of test boring samples, a variable thickness of poorly lithified clayey sandstone was sporadically encountered above sheared rock.

5.2 Faulting and Seismicity

The project is located in the seismically active San Francisco Bay area, which is dominated by the active San Andreas fault and related active faults such as the San Gregorio-Seal Cove, Hayward, and Calaveras. The San Andreas fault is located about 1000 feet southwest of the project site. Consequently, the site is about 200 feet outside of and not within the State of California Earthquake Fault Zone designated for the San Andreas fault. The San Gregorio-Seal Cove is located approximately 7.6 miles southwest of the project site. The Hayward fault is located 18 miles northeast of the site. The Calaveras fault is located 27 miles northeast of the project site.

Numerous large earthquakes have occurred in this region in the past and some have previously caused strong ground shaking at the site. The largest and most notable was the San Francisco earthquake of April 18, 1906 (Richter magnitude 7.9) with epicenter about 12 miles to the north. The most recent large earthquakes to occur in the region include the October 17, 1989 Loma Prieta earthquake (Richter magnitude 6.9), the 1984 Morgan Hill earthquake (Richter magnitude 6.2), the 1979 Coyote Lake earthquake (Richter magnitude 5.9), and the 1957 Daly City earthquake (Richter magnitude 5.3).

5.3 Subsurface Investigation

Our subsurface investigation consisted of drilling exploratory test borings, performing field penetration tests, retrieving drive samples from the borings, and completing laboratory testing of selected samples. Nine test borings, FG-1 through FG-9, were drilled in the roadway shoulder as close as practical to the embankment slope crest on June 29, 2017 to depths between about 10 feet and 31 feet below the ground surface. The locations of the borings are shown on Figure 2. A description of our subsurface methodology and the test boring logs are included in Appendix A.

The samples obtained from the exploratory borings were examined in the laboratory to confirm field classifications and to select representative samples for testing. Laboratory tests determined moisture content, dry density, unconfined compressive strength, consolidated-undrained direct shear strength, and corrosivity of soil and rock materials. Laboratory test results are summarized on the test boring logs and data sheets in Appendix A.

5.4 Subsurface Conditions

The exploratory test borings encountered a varying thickness of artificial fill ranging between about 2 feet and 21 feet thick. The fill was underlain by colluvial and residual soil in some instances, and by bedrock in other instances. Accounting for the distance of the boring from the embankment edge, it appears that that with two exceptions, the embankment edge is generally underlain by 5 feet to 10 feet of fill, which is then underlain by weathered bedrock. The exceptions are where the test borings were drilled at the two drainage crossings and a deeper fill profile was encountered. Boring FG-4 was drilled near the drainage (culvert) crossing at 169+20 and boring FG-9 was drilled near the drainage (culvert) crossing at 173+25. Boring FG-4 encountered approximately 21.5 feet of fill, which was underlain by 2 feet of colluvial soil followed by weathered bedrock. Boring FG-9 encountered approximately 8.5 feet of fill underlain by 13 feet of colluvial soil followed by weathered bedrock.
The fill materials encountered in the borings typically consisted of medium dense silty fine grained sand with gravel. Colluvial and residual soil encountered in the borings consisted of medium dense clayey sand and sandy silt with gravel. Weathered bedrock encountered in the borings typically consisted of very severely to severely weathered clayey sandstone/conglomerate and very severely to severely weathered sheared rock, previously mapped as belonging to the Franciscan Complex.

The clayey sandstone/conglomerate was encountered in most of borings except FG-7 and FG-9. The clayey sandstone was typically poorly lithified, fine grained, and with severely weathered gravels, except for a zone at 15 feet in FG-5, where slightly weathered, very hard sandstone was encountered.

The sheared rock was encountered in most of the borings except FG-1, FG-2, and FG-5, which were drilled to relatively shallow depths between 10 feet and 15 feet. The sheared rock typically has indistinct lithology and structure and in many instances we identified it as possibly shale. The sheared rock was encountered below the clayey sandstone in FG-3, FG-4, FG-6, and FG-8.

Groundwater was encountered in only FG-7 at a depth of 18 feet during drilling.

It should be noted that we interpret the poorly lithified clayey sandstone/conglomerate to possibly be a small isolated remnant of the Santa Clara formation, which has other nearby remnants, and not Franciscan greywacke that is usually well lithified within the Franciscan Complex.

Our interpretations of subsurface conditions are shown on Figures 3 through 8, Subsurface Sections.

### 5.5 Corrosion Potential Test Results

Tests to assess corrosion potential of the on-site soil were performed on samples from the test borings. The results are presented in Appendix A and summarized in the table below.

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>Material Type</th>
<th>Minimum Resistivity (ohm-cm)</th>
<th>pH</th>
<th>Sulfate (ppm)</th>
<th>Chloride (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FG3 @ 4.0’-6.5’</td>
<td>Silty Sand (SM/SC) Fill</td>
<td>4,020</td>
<td>6.81</td>
<td>8.2</td>
<td>5.6</td>
</tr>
<tr>
<td>FG3 @ 10.5’-11.0’</td>
<td>Clayey Sandstone</td>
<td>3,480</td>
<td>6.51</td>
<td>6.4</td>
<td>4.9</td>
</tr>
<tr>
<td>FG8 @ 20.5’-21.0’</td>
<td>Sheared Rock</td>
<td>2,950</td>
<td>5.58</td>
<td>2.9</td>
<td>4.8</td>
</tr>
</tbody>
</table>
Commonly used corrosion guidelines\(^3\) for buried metals are presented as follows:

<table>
<thead>
<tr>
<th>Resistivity (ohm-cm)</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 500</td>
<td>Very Corrosive</td>
</tr>
<tr>
<td>500 – 1,000</td>
<td>Corrosive</td>
</tr>
<tr>
<td>1,000 - 5,000</td>
<td>Moderately Corrosive</td>
</tr>
<tr>
<td>5,000 - 10,000</td>
<td>Slightly Corrosive</td>
</tr>
<tr>
<td>Over 10,000</td>
<td>Non-corrosive</td>
</tr>
</tbody>
</table>

On the basis of the resistivity and pH test results, the samples can be characterized as moderately corrosive to metals.

Soil with high sulfate concentrations can cause degradation of concrete. Based on guidelines published by the Portland Cement Association\(^4\) and the American Concrete Institute (ACI)\(^5\), there is negligible attack on concrete by soil containing less than 1,000 mg/kg (ppm) of sulfate and moderate attack (Class 1) for soil containing between 1,000 ppm-2,000 ppm of sulfate. Based on the sulfate test results, the samples can be characterized as not corrosive to concrete.

Based on the guidelines issued by Caltrans\(^6\), chloride concentrations in soil of over 500 ppm are considered corrosive to exposed metal and reinforcing steel in concrete. If only considering chlorides, the samples would be characterized as non-corrosive; however, as previously mentioned, the samples are considered moderately corrosive to exposed metals on the basis of minimum resistivity and pH. These samples can also be characterized as exposure class C1 by ACI guidelines.

### 6.0 CONCLUSIONS AND ANALYSES

#### 6.1 General

Based on this investigation, we conclude that, from a geotechnical engineering standpoint, the proposed CTG bike trail can be constructed as planned, provided that the discussions herein are considered, and the recommendations presented in this report are incorporated into the project plans and specifications.

---

\(^3\) Corrosion Manual, Pacific Gas and Electric Co., 1970
\(^5\) Building Code Requirements for Structural Concrete and Commentary (ACI 318-08), Table 4.2.1, 2008
\(^6\) California Department of Transportation (Caltrans), Corrosion Guidelines, 2003.
6.2 Retaining Wall Type

We conclude that the most appropriate and cost-effective retaining wall system for the project is a steel soldier pile and timber lagging wall. Other retaining systems such as a geogrid-reinforced segmental block wall and cast-in-place concrete walls were considered but not selected because of issues that included the limited equipment access, steep slope, inadequate shallow foundation support, construction impact on existing vegetation, and cost.

6.3 Fill and Subgrade Reinforcement

We conclude that the bike trail will be underlain by variable subgrade conditions that include isolated areas of loose existing fill, differential thickness of new fill over existing fill, recent storm drain trench backfill underlying only a portion of the trail, and proximity of the trail to the outer fill slope. Consequently, we conclude that over-excavation and geogrid reinforcement of the trail subgrade are required.

6.4 Seismic Hazards

The primary seismic hazard affecting the site is strong seismic ground shaking during a large earthquake, most notably on the nearby San Andreas fault. Based on probabilistic methods\(^7\), a peak horizontal ground acceleration of 1.03g (103\% gravity) was estimated to have a 2\% probability of being exceeded in 50 years. We conclude that the project can be designed to accommodate strong ground shaking by using the current California Building Code.

Liquefaction\(^8\), a secondary seismic hazard, is estimated to have an extremely low potential to occur at the project site because groundwater is within the weathered rock zone and because the cohesionless fill and colluvial soils are unsaturated and have a low potential to become saturated.

The potential for seismically-induced compaction of soil materials and resulting ground settlement at the site is judged to be relatively low because the site is generally underlain by a limited thickness of medium dense sandy soil and bedrock.


\(^8\) Soil liquefaction is a phenomenon where loose, saturated, cohesionless soil experiences a temporary reduction of strength during strong cyclic loading such as that produced by earthquake shaking. Soils most susceptible to liquefaction are loose, clean, saturated, uniformly-graded, fine-grained sand and cohesionless silt.
Based on published maps, the potential for earthquake-induced instability to occur on the slopes adjacent to, or affecting, the proposed bike trail is estimated to be low to moderate because of the steep slope inclination and the intense level of ground shaking expected during a large earthquake on the nearby San Andreas fault. Slope stability analyses were performed for an area near 169+00 where the embankment slope is steepest, the embankment fill is deepest, and the shoulder is narrow.

The results of the analyses confirm that the slope may experience shallow surface failures (FS=0.91) during intense ground shaking; however, these analyses also indicate that the slope has an adequate degree of stability against deeper failures (FS=1.11). In addition, the analyses indicate that the slope with the proposed bike trail retaining wall has an adequate degree of stability (FS=1.21) against deeper failures. While the potential for shallow surface failures may exist, we conclude that this hazard is primarily in the areas of deepest fill and steepest slopes, namely at the deeper drainage areas such as 169+20 and 173+25. With proper foundation design for the proposed retaining walls, we conclude that the bike trail can be isolated from this hazard.

The potential for ground failure from fault rupture on the project site is estimated to be relatively low because there are no known traces of the San Andreas or other active faults that cross the project site.

7.0 RECOMMENDATIONS

7.1 Site Preparation and Grading

7.1.1 General - Prior to any clearing, minor grading, or drilling, the existing underground utilities and underground improvements should be located (by calling Dig Alert-Dial 811) and checked for any conflicts with proposed excavation activities. Buried high voltage lines and storm drains are known to be among the buried improvements within the bike trail alignment.

The bike trail alignment should be stripped of vegetation and organic material, and debris and the resulting material removed from the site. Where loose soil, soft soil, deleterious materials, or voids are encountered or result from tree removal, they should be excavated to expose firm soil prior to placement of engineered fill. Engineered fill should be placed and graded to conform to adjacent slopes. We estimate that the site excavation can be accomplished using conventional excavation equipment.

---

The area underlying the bike trail and any fill placed for the bike trail should be over-excavated to a depth of 18 inches below final grade, or below existing grade, whichever is lower. The lateral limits of over-excavation should extend 2 feet beyond the bike trail pavement edge to any planned fill slope edges. The base of the over-excavated areas shall be in firm material and approved by the project geotechnical engineer. It is possible that over-excavation could conflict with the existing storm drain in some areas and may require a shallower depth of over-excavation. This will be determined from conditions exposed at the time of excavation.

The base of the over-excavated areas should be scarified to a depth of 6 inches, moisture conditioned to about 2 percent over optimum moisture content, and compacted to 95 percent of the maximum dry density as determined by the ASTM test method D1557. Over-excavated areas should be backfilled to design grade using non-expansive engineered fill with geogrid reinforcement.

**7.1.2 Engineered Fill** - On-site excavated material derived from the site appears to be generally suitable for use as engineered fill. Site excavated material and imported non-expansive materials which are used as engineered fill should not contain debris, rocks and clods larger than 4 inches in greatest dimension, or more than 2 percent by dry weight of organic material. Additionally, the material should have no more than 30 percent material passing the No. 200 sieve, have a plasticity index of no more than 12, and have a minimum R-value of 40.

Material for engineered fill should be moisture conditioned, or allowed to dry, to about 2 percent above optimum moisture content, spread in horizontal lifts not exceeding 8 inches in loose thickness, and compacted with an approved mechanical compactor to at least 95 percent relative compaction as determined by the ASTM test method D1557. Fill shall not be placed on existing slopes steeper than 2H:1V. Where fill is placed on existing slopes with inclinations of 2H:1V or flatter, a minimum 3-foot deep by 8-foot wide keyway shall be excavated to support the new fill. Minimum 18-inch wide benches shall be excavated into the existing embankment as fill is being constructed to achieve finish grade. Permanent fill slopes should be constructed no steeper than 2H:1V.

Prior to fill placement, the contractor should submit samples of proposed fill materials and the type of compaction equipment for approval by the engineer. The choice of lightweight compaction equipment is important where compaction will occur over the storm drain.

**7.1.3 Geogrid Reinforcement** - Geogrid reinforcement should be placed at the base of the over-excavation for the bike trail and at vertical intervals not exceeding 12 inches such that at least two layers of geogrid underlie the bike trail. The geogrid should extend
the entire width of the over-excavation, a minimum of 10 feet, and should extend to the face of fill slopes. The geogrid reinforcement should have a biaxial minimum long term design strength\(^{10}\) of 850 pounds per foot.

### 7.2 Soldier Pile and Lagging Retaining Wall

Soldier piles should consist of wide flange steel beams placed in drilled holes with concrete backfill. Design details for the soldier pile wall are presented in Appendix C of this report and are based on the following criteria:

- **Minimum Pile Length:** The minimum pile length should be determined by using an overturning factor of safety (FS) of 1.5 for static loads plus traffic surcharge and a factor of safety of 1.3 for static loads plus seismic surcharge. In addition, the pile length should also conform to embedment requirements in California Building Code section 1807.3.2.1 (pole formula).

- **Minimum Diameter of Drilled Hole:** 2 feet.

- **Maximum Spacing:** 8 feet, center to center

- **Lateral Earth Pressure:** 40 pounds per cubic foot (pcf), equivalent fluid pressure applied to the exposed wall height plus 4 feet below the exposed wall height (4-foot thick zone of loose soil potentially prone to creep or seismically-induced shallow failure).

- **Traffic Surcharge Pressure:** 100 pounds per square foot (psf) applied as a uniform lateral pressure to a depth of 5 feet below the top of the retaining wall.

- **Seismic Surcharge Pressure:** 160 psf applied as a uniform lateral pressure to the exposed wall height plus 4 feet below the exposed wall height. Seismic and traffic loads are not concurrent.

- **Minimum Timber Lagging Requirements:** 6X6 No. 1 Douglas fir pressure-treated with AZCA for long-term design life. All installed lagging shall have treated ends. Lagging should be installed with 1/2-inch gaps using durable (non-degradable) spacers. Lagging should extend 24 inches below adjacent down hill final grade.

---

• Passive Resistance: 300 pcf equivalent fluid pressure applied over 3 pile diameters, starting at 4 feet below the wall or retained material height.

• Corrosion Requirements: Additional sacrificial steel thickness of 0.11 inch to be added to flanges when determining minimum pile section.

Retaining wall areas should be excavated to create a bench at the approximate bottom of wall (bottom of lagging) elevation such that the excavation extends a minimum of 18 inches behind the soldier beams. Installation of the piles should follow Caltrans standard specifications, latest edition. Pile shafts should be free of standing water and cleared of all loose debris prior to pouring of concrete. It is anticipated that groundwater may collect in some pile shafts. The water should be pumped out or the concrete should be placed by the tremie method with the concrete displacing the water from the bottom up. If casing is required to maintain excavation stability, the casings shall be removed during placement of the concrete so that the concrete will cure in contact with native soil. Uncased shafts that encounter groundwater should be poured the same day that they are drilled. All drilled shafts should be inspected and approved by the project geotechnical engineer prior to the placement of steel piles.

Resistant zones of hard rock may be encountered during drilling within the weathered bedrock at the site. The contractor should be prepared to drill in hard rock and occasionally core through these resistant zones.

7.3 Wall Backfill and Drainage

Retaining wall backfill should consist of engineered fill as described above. A drain should be installed behind the retaining wall and should consist of a minimum 12-inch wide zone of Caltrans Class 2 permeable material or clean 1/2 to ¾-inch drain rock that is completely enveloped by geotextile filter fabric such as Mirafi 140N, or approved equivalent. The filter fabric is needed to prevent migration of fine backfill material through the 1/2 inch gaps that allow drainage between wood lagging. The drain should extend the entire wall height except for the upper foot, which should consist of engineered fill separated from the lagging by additional filter fabric.

The drainage material should be compacted using vibratory compactors to 90 percent relative compaction, or to the satisfaction of the engineer. Where the lagging will be buried, a 4-inch diameter schedule 40, perforated, PVC pipe should be placed at the low point in the backfill. The perforated drain pipe should be connected to a non-perforated discharge pipe, and should drain by gravity to an appropriate area.
7.4 Construction Considerations

Soldier pile layout should avoid conflicts with underground improvements including the culverts at 169+20 and 173+25 and the existing storm drain underlying the road shoulder.

Over-excavation for the bike trail may encounter the existing storm drain. The depth to the storm drain should be determined by potholing or other methods prior to excavation so that over-excavation recommendations can be modified if necessary.

The soldier piles will be installed on a steep slope with difficult access. The equipment to be used should be intended for limited access work. While the construction means and methods will be left to the contractor to select, the County should be clear in the plans and specifications regarding the amount and limits of disturbance and excavation it is willing to tolerate in order to construct the bike trail. It may be possible to work around some the existing mature trees, provided that their branches can be trimmed to accommodate the drill rig mast.

7.5 Erosion Control

Exposed soil areas where the ground surface has been disturbed, or vegetation has been disturbed or removed should be seeded using a native seed mix approved by the County and fertilized. As much as practical, an erosion control mat and/or erosion resistant materials approved by the engineer should be placed on these areas after seeding is completed.

7.6 Pavement Design

Existing shoulder materials consisting of silty sand with gravel can be reused as engineered fill; however, this material only composes a portion of the fill material required. Because import fill will be required and the source of the import fill has not been identified, the composition of the final bike trail pavement subgrade is yet to be determined. Consequently, we recommend that import fill have a minimum R-value of 40 corresponding to Caltrans requirements for Class 3 aggregate subbase. The calculation of the minimum recommended flexible pavement section using the Caltrans Highway Design Method and a traffic index of 5.0 yields a minimum flexible pavement section of 3.0 inches of asphalt concrete (AC) over 4.0 inches of Caltrans Class 2 aggregate base (CL2AB). Recent County standards for bike trails require a minimum pavement section of 3 inches of AC over 4 inches to 6 inches of CL2AB aggregate base.

---

11 Alta Transportation Consulting, 2000, San Mateo County Comprehensive Bicycle Route Plan, Table 9-Class I Bicycle Path Specifications, prepared for City/County Association of Governments.
Therefore, we recommend that the CTG bike trail pavement section consist of 3 inches of AC over 6 inches of CL2AB.

The subgrade underlying pavement areas should be prepared according to the recommendations provided in the Site Grading section. Aggregate base materials should be compacted to a minimum of 95 percent of the maximum dry density within two percent of the optimum moisture content as determined by ASTM D1557.

7.7 Plan Review and Construction Observation

We should review the project plans and specifications to verify that the intent of our recommendations is incorporated in these documents.

The project contractors should review and reference this report prior to construction. Any questions or discrepancies in this report or between this report and the project plans should be brought to the attention of our office prior to beginning construction activities related to the item in question.

If conditions different from those described in this report are encountered during construction, our office should be notified in a timely manner so that the conditions can be evaluated and report recommendations can be modified, if necessary, to address the change in conditions.

During construction, our office should observe during over-excavation, soldier pile layout and installation, and placement and compaction of engineered fill. Our office should be notified at least 48 hours in advance of construction activities requiring inspections.

8.0 LIMITATIONS

In performing our engineering services on this project, we have employed generally accepted principles and practices of the geotechnical engineering profession in the San Francisco Bay area at this time. This warranty is in lieu of all other warranties, either expressed or implied.

The conclusions and recommendations contained in this report are based on site observations and limited background and subsurface information. It is possible that changes in site conditions, subsurface conditions different from those encountered in the test borings, or additional information that could come to light in the future could alter the conclusions and recommendations in this report.
August 29, 2017
3700
Geotechnical Investigation
Crystal Springs Complete the Gap Bike Trail
San Mateo County, California

Please call if you have any questions regarding this report.

Sincerely,

Raymond L. Fisher, P.E., G.E.
Geotechnical Engineer #2188

Attachments:  Figure 1, Vicinity Map
               Figures 2A and 2B, Site Plan
               Figures 3 through 8, Subsurface Sections
               Appendix A - Subsurface Investigation
               Appendix B - Slope Stability Analyses
               Appendix C - Retaining Wall Design Details

Distribution:  Addressee (digital)
Key:
FG1  Test Boring Location
SD   Existing 48" Storm Drain
PG&SE HV  Existing Underground High Voltage Line

Notes:
1. The base used for this site plan is an untitled, undated topographic survey prepared by Bellecci & Associates.
2. Test boring locations are approximate.
3. Bike trail and retaining wall locations are approximate and subject to change.
4. Underground utility and underground improvement locations are approximate and not all utilities and improvements are shown. All underground utilities and improvements should be identified and accurately located prior to final design and construction. This includes but is not limited to calling 811, Dig Alert/USA North.

SCALE 1"=30'

Fisher Geotechnical
Civil and Geotechnical Engineering

COMPLETE THE GAP BIKE TRAIL
SAN MATEO COUNTY, CALIFORNIA
PROJECT NO. 3700  DATE AUGUST 2017  FIGURE 2A
Key:
FG1  Test Boring Location
SD   Existing 48" Storm Drain
PG&E HV  Existing Underground High Voltage Line

Notes:
1. The base used for this site plan is an untitled, undated topographic survey prepared by Bellecci & Associates.
2. Test boring locations are approximate.
3. Bike trail and retaining wall locations are approximate and subject to change.
4. Underground utility and underground improvement locations are approximate and not all utilities and improvements are shown. All underground utilities and improvements should be identified and accurately located prior to final design and construction. This includes but is not limited to calling 811, Dig Alert/USA North.
Key:
FG1  Test Boring
EG   Existing Grade
FG   Final Grade

Notes:
2. All subsurface features or utilities not shown.
3. Preliminary trail geometry shown.

SUBSURFACE SECTION 167+00
SCALE 1"=20'

Fisher Geotechnical
Civil and Geotechnical Engineering

COMPLETE THE GAP BIKE TRAIL
SAN MATEO COUNTY, CALIFORNIA
PROJECT NO. 3700
DATE AUGUST 2017
FIGURE 3
SUBSURFACE SECTION 167+75
SCALE 1"=20'

See Figure 3 for Key and Notes.
See Figure 3 for Key and Notes.

SUBSURFACE SECTIONS 169+25 AND 169+50
SCALE 1"=20'

Fisher Geotechnical
Civil and Geotechnical Engineering

COMPLETE THE GAP BIKE TRAIL
SAN MATEO COUNTY, CALIFORNIA

PROJECT NO. 3700
DATE AUGUST 2017
FIGURE 6
See Figure 3 for Key and Notes.

SUBSURFACE SECTIONS 171+00 AND 172+50
SCALE 1"=20'

Fisher Geotechnical
Civil and Geotechnical Engineering

COMPLETE THE GAP BIKE TRAIL
SAN MATEO COUNTY, CALIFORNIA

PROJECT NO. 3700
DATE AUGUST 2017
FIGURE 7
See Figure 3 for Key and Notes.

SUBSURFACE SECTIONS 173+00 AND 173+25
SCALE 1"=20'

Fisher Geotechnical
Civil and Geotechnical Engineering

COMPLETE THE GAP BIKE TRAIL
SAN MATEO COUNTY, CALIFORNIA

PROJECT NO. 3700
DATE AUGUST 2017
FIGURE 8
APPENDIX A - SUBSURFACE INVESTIGATION

Our subsurface exploration program consisting of nine test borings was carried out by Britton Exploration of Los Gatos, California on June 29, 2017. Test borings FG-1 through FG-9 were drilled using a CME 45 track-mounted drilling rig with 6.0-inch diameter solid-stem augers. The test borings were drilled to depths of between 10.0 feet and 31.3 feet below the ground surface.

The materials encountered in the test borings were continuously logged in the field by a registered geotechnical engineer. The materials are described in accordance with the Unified Soil Classification System (ASTM D-2487). The locations of the test borings are shown on Figures 2A and 2B. The test boring logs are included in this appendix. A key for classification of the soil and laboratory test results is also included. The boring logs and related information show our interpretation of subsurface conditions on the date and at the locations indicated and it is not implied that they are representative of subsurface conditions at other locations or other times.

Material samples were obtained from the test borings at various depths. The samples were obtained using: 1) a 3.0-inch outside diameter (O.D.), 2.5-inch inside diameter (I.D.) Modified California split-spoon sampler fitted with a series of 6-inch long, thin-wall brass liners, and 2) a 2.0-inch O.D., 1.375-inch I.D. Standard Penetration Test (SPT) split spoon sampler. Representative samples were taken to the laboratory for evaluation and selected testing. Laboratory test results are summarized on the boring logs and are included in this appendix.

The split-spoon samplers were driven into the soil and rock materials at selected depths in the test borings by dropping a 140-pound hammer by rope and cathead methods through a 30-inch free fall for both the truck-mounted drill rig and the portable drill rigs. The penetration resistance was obtained by counting the number of blows of the hammer required to drive the sampler, in 6-inch intervals, a total distance of 18 inches. The blow counts recorded on the boring logs represent the number of blows required to drive the sampler the last 12 inches or until refusal at less than 12 inches. Refusal is typically considered 50 or more blows to drive the sampler 6 inches or less.

The test borings were drilled and backfilled with Portland cement grout under the permitting of the San Mateo County Environmental Health Department (permit 17-1103). In the pavement area at boring FG-6, the top 6 inches of the boring was plugged with asphalt concrete cold patch.
**Laboratory Tests**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample</th>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-73 mc</td>
<td>Silty Sand w/Gravel (SM), dk yel brn (10yr4/6), loose, slightly moist, fine grained, gravel to 1&quot;, FILL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>73-50/6&quot; mc</td>
<td>Clayey Sandstone, yel brn and v dk gry brn (10yr5/4,5/8,3/2), severely to moderately weathered, weak, soft matrix with hard zones, w/weathered gravel, BEDROCK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50/6&quot; mc</td>
<td>at 10', lt yel brn and yel brn (10yr6/4,5/6), severely weathered, weak, soft, with gry clay seams</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50/2&quot; mc</td>
<td>at 15’, yel brn, dk yel brn, w/gry (10yr5/4,4/4,5/1), moderately weathered, strong, hard</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boring terminated at 15.2 feet.
No ground water encountered.
Boring backfilled w/Portland cement grout.
San Mateo County EHD permit #17-1103.

---

**Note:**


---

**Figure FG-1**

**Equipment:** CME 45 Track Rig  
**Elevation:** 306+/- ft (elevation datum)
**Drilling Date:** 6/29/17
Equipment: CME 45 Track Rig
Elevation: 313+/-. ft (elevation datum)
Drilling Date: 6/29/17

Laboratory Tests

Pocket Penetrometer (TSF) Moisture Content (%) Dry Density (pcf) Blows/Feet (field) Sampler Type* Sample Depth (ft)

SM Silty Sand w/Gravel (SM), lt yel brn (10yr6/4), medium dense, slightly moist, fine grained, gravel to 1", FILL

ROCK Sandstone, lt yel brn, yel brn, and dk yel brn (2.5y6/3) (10yr5/8,4/4), moderately weathered w/severely weathered fine grained (fg) matrix, weak, soft, w/moderately hard subangular clasts, FeO staining, BEDROCK

Unconf=3,652psf @ 5.2% 5.2 138 76 mc

Unconf=5,486psf @ 1.7% 6.4 137 50/5" mc

50/5.5" mc

Boring terminated at 10.0 feet.
No ground water encountered.
Boring backfilled w/Portland cement grout.
San Mateo County EHD permit #17-1103.


*st=Std. Penetration Test *mc=Modified California /2.5"ID *ca=Calif./2.0"ID *st=Shelby tube *cb=core barrel *b=bulk
6” Solid Stem Auger
140 lb. Auto-Trip Hammer

Equipment: CME 45 Track Rig
Elevation: 316+/- ft (elevation datum¹)
Drilling Date: 6/29/17

Laboratory Tests

<table>
<thead>
<tr>
<th>Pocket Penetrometer (TSF)</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Blows/Foot (field)</th>
<th>Sampler Type*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10.4</td>
<td>120</td>
<td>19 mc</td>
<td></td>
</tr>
</tbody>
</table>

Direct Shear at 4.0’
\( \phi_p = 44.0^\circ, C_p = 0 \text{ psf} \)
\( \phi_u = 42.1^\circ, C_u = 0 \text{ psf} \)
CU saturated
Corrosion test at 4.5’-6.0’
(see data sheet)

Corrosion test at 10.5’-11.0’
(see data sheet)
Unconf=6,906psf @ 2.6%
4.5+ 10.3 118 21 mc

Silty Sand w/Gravel (SM), yel brn
(10yr5/4,5/8), medium dense, moist, fine grained, w/weathered sandstone gravel to 1”.
FILL

at 3’, dk yel brn (10yr3/6)

at 5’, dk yel brn w/yel brn (10yr4/6,5/8), w/variously colored gravel to 1”

Clayey Sandstone, yel brn, dk yel brn, and dk gry brn (10yr4/4,6/4,2), very severely to severely weathered, weak, soft, w/moderately weathered clasts of variable lithology, BEDROCK

at 15’, yel brn w/gry (10yr5/4,5/8,6/1), very severely weathered, clayey matrix


*ps=Std. Penetration Test *mc=Modified California /2.5”ID *ca=Calif./2.0”ID *st=Shelby tube *cb=core barrel *b=bulk
### BORING FG-3 Cont'd

<table>
<thead>
<tr>
<th>Sample</th>
<th>Boring Terminated at 20.5 feet.</th>
<th>No ground water encountered.</th>
<th>Boring backfilled w/Portland cement grout.</th>
<th>San Mateo County EHD permit #17-1103.</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Sheared Shale, v dk gry (10yr3/1), severely weathered w/moderately weathered zones, weak, soft with hard zones, w/FeO and Mn staining on joints.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

### Laboratory Tests

<table>
<thead>
<tr>
<th>Pocket Penetrometer (TSF)</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Blows/Feet (field)</th>
<th>Sampler Type*</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.3</td>
<td>123</td>
<td>50/6&quot; mc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---


---

* spt=Std. Penetration Test   * mc=Modified California /2.5"ID   * ca=Calif./2.0"ID   * st=Shelby tube   * cb=core barrel   * b=bulk
**Geotechnical Invest.**

**Crystal Springs CTG Bike Trail,**

**San Mateo County, CA**

---

**6" Solid Stem Auger**

140 lb. Auto-Trip Hammer

---

**Equipment:** CME 45 Track Rig

**Elevation:** 319+/- ft (elevation datum)

**Drilling Date:** 6/29/17

---

### Laboratory Tests

<table>
<thead>
<tr>
<th>Sample</th>
<th>Pocket Penetrometer (TSF)</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Blows/Foot (field)</th>
<th>Sampler Type*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconf=1,916psf @ 5.6%</td>
<td>15.9</td>
<td>116</td>
<td>15 mc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unconf=7,923psf @ 10.1%</td>
<td>4.5</td>
<td>15.9</td>
<td>118</td>
<td>32 mc</td>
<td></td>
</tr>
<tr>
<td>(Blowcount: 50 for last 5&quot;)</td>
<td>7.9</td>
<td>132</td>
<td>67/11&quot; mc</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**BORING FG-4 Cont'd**

- **Sandy Lean Clay (CL) Cont'd,** brn, blk, 
  - volc brn, red brn (10yr4/3,2/1)(2.5y5/3)(5yr4/4), 
  - very stiff, moist, completely weathered gravel 
    - to 1", blk clay at bottom of sample, FILL
- **Clayey Sand (SC/CL),** v dk gry and blk 
  - (2.5y3/1,2.5/1), medium dense, very moist, 
  - trace subangular gravel to 3/8", COLLUVIUM
- **Clayey Sandstone,** dk yel brn w/gry 
  - (10yr4/6,5/1), completely weathered, weak, 
    - soft, weathered to residual soil w/visible 
      - structure, fine grained, BEDROCK
- **Sheared Rock (Shale?),** v dk gry and blk 
  - (5y3/1,2.5/1), severely to moderately 
    - weathered, very strong, hard, sheared/altered
  - Boring terminated at 30.9 feet.
  - No ground water encountered.
  - Boring backfilled w/Portland cement grout.
  - San Mateo County EHD permit #17-1103.

---

1 Datum: Trail Improvement Plan, Sheet 3, 
Complete the Gap Trail Project, San Mateo 
County, California (30% Submittal), prepared by 

---

* st=Std. Penetration Test  * mc=Modified California /2.5"ID  * ca=Calif./2.0"ID  * st=Shelby tube  * cb=core barrel  * b=bulk
6" Solid Stem Auger
140 lb. Auto-Trip Hammer

Equipment: CME 45 Track Rig
Elevation: 324+/- ft (elevation datum)
Drilling Date: 6/29/17

Laboratory Tests

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample</th>
<th>Dry Density (pcf)</th>
<th>Blows/Foot (field)</th>
<th>Moisture Content (%)</th>
<th>Pockenthometer (TSF)</th>
<th>Sampler Type*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>BORING FG-5</td>
<td>8.3</td>
<td>113</td>
<td>15 mc</td>
<td>Silty Sand w/Gravel (SM), lt yel brn, bm, yel brn (10yr5/8,4/3,3/4), loose to medium dense, slightly moist, fine grained, gravel to 2&quot;, FILL</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Unconf=1,548psf @ 1.4%</td>
<td>10.4</td>
<td>121</td>
<td>21 mc</td>
<td>Clayey Sandstone, lt yel brn, bm and yel brn (10yr6/4,4/3,5/8), very severely to completely weathered, weak, soft matrix with severely weathered gravel to 2&quot;, BEDROCK</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Unconf=8,846psf @ 2.7%</td>
<td>50/2&quot; mc</td>
<td>50/0&quot; mc</td>
<td>at 10’, dk bm and dk yel brn (10yr3/3,3/4), slightly weathered, hard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>at 10’ to 15,’ difficult drilling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>at 15’, refusal - no sample recovery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boring terminated at 15.0 feet.
No ground water encountered.
Boring backfilled w/Portland cement grout.
San Mateo County EHD permit #17-1103.


---

Fisher Geotechnical
Civil and Geotechnical Engineering

Geotechnical Invest.
Crystal Springs CTG Bike Trail,
San Mateo County, CA

Figure FG-5
**BORING FG-6**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Depth (ft)</th>
<th>Blows/Foot (field)</th>
<th>Dry Density (pcf)</th>
<th>Moisture Content (%)</th>
<th>Sampler Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>126</td>
<td>51 mc</td>
<td>8.7</td>
<td><strong>AC</strong></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>122</td>
<td>60 mc</td>
<td>10.9</td>
<td><strong>SM</strong></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>126</td>
<td>20 mc</td>
<td>10.9</td>
<td><strong>ROCK</strong></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **AC**: Asphalt Concrete Pavement, 5"
- **SM**: Silty Sand w/Gravel (SM), yel brn (10yr5/8), medium dense, moist, RESIDUAL SOIL
- **ROCK**: Clayey Sandstone, dk gry brn, dk brn, and dk yel brn (10yr4/2,3/3,4/6), very severely weathered, weak, soft, w/severely and moderately weathered clasts of variable lithology, BEDROCK
- **ROCK**: Sheared Rock (Shale?), v dk gry brn w/yel brn (10yr3/2,5/4), severely weathered, weak, soft, w/moderately weathered zones, w/wt mineralization (non-reactive to HCL), rock is altered and sheared, lithology is not obvious
- **ROCK**: at 9', blk and v dk gry (5y2.5/1,3/1), very severely weathered, very soft, very moist

Boring terminated at 10.5 feet.
No ground water encountered.
Boring backfilled with Portland cement grout.
San Mateo County EHD permit #17-1103.

---

**Laboratory Tests**

<table>
<thead>
<tr>
<th>BORING FG-6</th>
<th>Pocket Penetrometer (TSF)</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Blows/Foot (field)</th>
<th>Sample Type*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---


---

**Figure FG-6**

6" Solid Stem Auger
140 lb. Auto-Trip Hammer

**Equipment:** CME 45 Track Rig
**Elevation:** 332 +/- ft (elevation datum)
**Drilling Date:** 6/29/17
### Laboratory Tests

<table>
<thead>
<tr>
<th>Sample</th>
<th>Unconf=5,492psf @ 2.7%</th>
<th>Unconf=7,411psf @ 2.5%</th>
<th>Unconf=4,412psf @ 4.1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampler Type</td>
<td>SM</td>
<td>SC</td>
<td>ROCK</td>
</tr>
<tr>
<td>Depth (ft)</td>
<td>0</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Soil Type</td>
<td>Silty Sand w/Gravel (SM), dk brn mottled w/yel bm (10yr3/3,5/8), medium dense, moist, fine grained, w/gravel to 1&quot;, FILL</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clayey Sand w/Gravel (SC/GC), dk gry bm, dk bm, dk yel bm (10y4/2,3/3,4/6), medium dense, moist, severely weathered gravel of variable lithology to 1.5&quot;, chaotic appearance, FILL?/RESIDUAL SOIL?</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sheared Rock (Shale?), dk gry, blk, and yel bm (2.5y4/1) (5y2.5/1) (10y3/6), very severely weathered, weak, soft, w/zones of moderately weathered and hard rock, FeO staining at partings, BEDROCK at 10', severely weathered, indistinct lithology and structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>at 15', v dk gry and v dk gry bm (2.5y3/1,3/2) very severely to severely weathered</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>groundwater encountered at 18'</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---


---

Fisher Geotechnical
Civil and Geotechnical Engineering

Geotechnical Invest.
Crystal Springs CTG Bike Trail,
San Mateo County, CA

Figure FG-7a
6" Solid Stem Auger  
140 lb. Auto-Trip Hammer

Equipment: CME 45 Track Rig  
Elevation: 342 +/- ft (elevation datum)
Drilling Date: 6/29/17

Laboratory Tests

<table>
<thead>
<tr>
<th>Pocket Penetrometer (TSF)</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Blows/Foot (field)</th>
<th>Sampler Type*</th>
<th>Depth (ft)</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BORING FG-7 Cont'd

- Sheared Rock (Shale?) (cont'd), blk (2.5y2.5/1), very severely weathered, weak, soft w/moderately hard zones, w/wt mineralization (HCL-), indistinct lithology and structure
- at 25', dk gry and blk (N4/, N2.5/) severely weathered, weak, soft
- Boring terminated at 26.5 feet.
- Ground water encountered at 18.0 feet.
- Boring backfilled w/Portland cement grout.
- San Mateo County EHD permit #17-1103.

Unconf=5,202psf @ 2.3%


*spt=Std. Penetration Test  *mc=Modified California /2.5"ID  *ca=Calif./2.0"ID  *st=Shelby tube  *cb=core barrel  *b=bulk


Fisher Geotechnical
Civil and Geotechnical Engineering
### Laboratory Tests

<table>
<thead>
<tr>
<th>Sample</th>
<th>Depth (ft)</th>
<th>Sampler Type*</th>
<th>Blows/Foot (field)</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Elevation: 344+/- ft (elevation datum 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BORING FG-8</td>
<td>0</td>
<td>BORING</td>
<td>13</td>
<td>7.5</td>
<td>122</td>
<td>Unconf=3,431psf @ 1.4%</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>BORING</td>
<td>13</td>
<td>12.4</td>
<td>120</td>
<td>Unconf=6,950psf @ 2.7%</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>BORING</td>
<td>21</td>
<td>12.1</td>
<td>124</td>
<td>Unconf=5,246psf @ 2.9%</td>
</tr>
</tbody>
</table>


---

**Figure FG-8a**

6" Solid Stem Auger
140 lb. Auto-Trip Hammer

Equipment: CME 45 Track Rig
Drilling Date: 6/29/17

---

Fisher Geotechnical
Civil and Geotechnical Engineering

Geotechnical Invest.
Crystal Springs CTG Bike Trail,
San Mateo County, CA
### Lab Tests

<table>
<thead>
<tr>
<th>Test Description</th>
<th>Depth (ft)</th>
<th>Sample Type</th>
<th>Blows/Foot (field)</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion test at 20.5'-21.0'</td>
<td>4.5</td>
<td></td>
<td></td>
<td>4.5+</td>
<td>13.3</td>
</tr>
<tr>
<td>Unconf=5,202psf @ 3.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>122</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>37 mc</td>
</tr>
</tbody>
</table>

**BORING FG-8 Cont'd**

- Sheared Rock (cont'd), dk brn, dk yel brn, v dk gry brn (10yr3/3,4/6,3/2), very severely to completely weathered, weak, soft w/mod.
- Distinct lithology and structure
- Boring terminated at 21.5 feet.
- No ground water encountered.
- Boring backfilled w/Portland cement grout.
- San Mateo County EHD permit #17-1103.

---


---

* scl=Std. Penetration Test  * mc=Modified California /2.5"ID  * ca=Calif./2.0"ID  * st=Shelby tube  * cb=core barrel  * b=bulk

---

Fisher Geotechnical
Civil and Geotechnical Engineering

Geotechnical Invest.
Crystal Springs CTG Bike Trail,
San Mateo County, CA

Figure FG-8b
6" Solid Stem Auger
140 lb. Auto-Trip Hammer

Equipment: CME 45 Track Rig
Elevation: 346+/- ft (elevation datum¹)
Drilling Date: 6/29/17

Laboratory Tests

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>BORING FG-9</td>
</tr>
<tr>
<td>5</td>
<td>GF</td>
</tr>
<tr>
<td>10</td>
<td>SM</td>
</tr>
<tr>
<td>15</td>
<td>SC</td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Pocket Penetrometer (TSF)
Moisture Content (%)
Dry Density (pcf)
Blows/Foot (field)
Sampler Type*

GM  Silty Gravel (GM), v dk olv gry (5y3/1), FILL
SM  Silty Sand w/Gravel (SM), lt yel brn (10yr6/4), loose, slightly moist, fine grained, w/sandstone gravel to 1", FILL
SM  Sandy Silt w/Gravel (ML), v dk gry brn w/yel brn (10yr3/2,5/8), very stiff, moist, w/very severely to completely weathered gravel to 1.5", COLLUVIUM
SC  Clayey Sand (SC), v dk gry brn (10yr3/2), medium dense, moist to very moist, fine grained sand, w/subangular to subround gravel to 3/8", uniform color, COLLUVIUM

Unconf=1,151psf @ 0.7%
6.0 116 8 mc
Unconf=4,029psf @ 1.7%
4.5+ 12.0 114 18 mc
Unconf=2,366psf @ 6.7%
4.5+ 2.0 15.0 116 14 mc


*st=Std. Penetration Test *mc=Modified California /2.5"ID *ca=Calif./2.0"ID *st=Shelby tube *cb=core barrel *b=bulk

Figure FG-9a
### BORING FG-9 Cont’d

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Clayey Sand (SC) (cont’d), v dk gry brn (10yr3/2), medium dense, moist to very moist, fine grained sand, w/sub-angular to sub-round gravel to 3/8&quot;, uniform color, COLLUVIUM</td>
</tr>
<tr>
<td>25</td>
<td>Sheared Rock (Shale?), brn, gry, blk (10yr4/3,5/1,2/1), severely weathered matrix, weak, soft, w/moderately weathered zones, sheared/ altered zones w/wt mineralization (HCL-), indistinct lithology and structure, BEDROCK at 25’, v dk gry and dk olv gry (5y3/1,3/2,4/2), very intensely fractured</td>
</tr>
<tr>
<td>30</td>
<td>at 30’, blk (2.5y2.5/1), w/polished surfaces, very thinly foliated (from weathering)</td>
</tr>
<tr>
<td>35</td>
<td>Boring terminated at 31.3 feet. No ground water encountered. Boring backfilled w/Portland cement grout. San Mateo County EHD permit #17-1103.</td>
</tr>
</tbody>
</table>

---


---

* Equipment: CME 45 Track Rig  
* Elevation: 346+/- ft (elevation datum 1)  
* Drilling Date: 6/29/17

---

6” Solid Stem Auger  
140 lb. Auto-Trip Hammer  

---

Laboratory Tests

<table>
<thead>
<tr>
<th>Pocket Penetrometer (TSF)</th>
<th>Moisture Content (%)</th>
<th>Dry Density (pcf)</th>
<th>Blows/Foot (field)</th>
<th>Sampler Type*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unconf=3,884psf @ 3.0%</td>
<td>12.8</td>
<td>124</td>
<td>34 mc</td>
<td></td>
</tr>
<tr>
<td>Unconf=5,537psf @ 3.6%</td>
<td>5.7</td>
<td>143</td>
<td>73/10” mc</td>
<td></td>
</tr>
</tbody>
</table>

---

* spp=Std. Penetration Test  
* mc=Modified California /2.5”ID  
* caf=Calif./2.0”ID  
* st=Shelby tube  
* cb=core barrel  
* b=bulk

---


---

**Figure FG-9b**
### Sample Location:

<table>
<thead>
<tr>
<th>Water Content (%)</th>
<th>10.5</th>
<th>11.0</th>
<th>10.1</th>
<th>9.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry Unit Weight (pcf)</td>
<td>117.2</td>
<td>120.7</td>
<td>119.3</td>
<td>122.0</td>
</tr>
<tr>
<td>Saturation (%)</td>
<td>65.0</td>
<td>75.3</td>
<td>66.4</td>
<td>69.7</td>
</tr>
<tr>
<td>Void Ratio</td>
<td>0.44</td>
<td>0.40</td>
<td>0.41</td>
<td>0.38</td>
</tr>
</tbody>
</table>

**Notes:**

1. Results somewhat variable based on differing material composition along sample shear planes.
2. Ultimate Stress taken as low point of first decrease in shear stress.

### Direct Shear Test

**ASTM D 3080 Modified**

<table>
<thead>
<tr>
<th>Normal Stress (psf)</th>
<th>1075</th>
<th>2035</th>
<th>2554</th>
<th>3032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure Stress (psf)</td>
<td>1052</td>
<td>1402</td>
<td>2615</td>
<td>3175</td>
</tr>
<tr>
<td>Displacement (in.)</td>
<td>0.17</td>
<td>0.2</td>
<td>0.12</td>
<td>0.4</td>
</tr>
<tr>
<td>Ultimate Stress (psf)</td>
<td>902</td>
<td>1391</td>
<td>2198</td>
<td>3149</td>
</tr>
<tr>
<td>Displacement (in.)</td>
<td>0.32</td>
<td>0.24</td>
<td>0.39</td>
<td>0.43</td>
</tr>
<tr>
<td>Sample Diameter (in.)</td>
<td>2.42</td>
<td>2.42</td>
<td>2.42</td>
<td>2.42</td>
</tr>
</tbody>
</table>

**Sample Description:** Silty Sand w/Gravel (SM), Yel Brn, 10yr5/4,5/8, w/completely weathered sandstone gravel to 1", Fill

**Notes:**

1. Consolidated Undrained
2. 2-hour min. inundation and load
3. G=2.70 assumed
4. Final density, void ratio, and saturation are approximate based on test method limitations.
### Sample Data

#### Sample Description:
- **Sample No.**
- **Location:** FG3/T5 @ 16.0’
- **Description:** Mottled Dark Yellow Brown and Yellow Brown Severely Weathered

#### Initial Data
- **Water Content (%):** 13.4, 13.6, 12.8
- **Dry Unit Weight (pcf):** 118.1, 118.4, 119.5
- **Saturation (%):** 84.7, 87.1, 84.2
- **Void Ratio:** 0.43, 0.42, 0.41
- **Height (in.):** 1.2000, 1.2000, 1.2000

#### At Test Data
- **Water Content (%):** 22.3, 20.7, 18.9
- **Dry Unit Weight (pcf):** 118.1, 119.4, 123.1
- **Saturation (%):** 100.0, 100.0, 100.0
- **Void Ratio:** 0.43, 0.41, 0.37
- **Height (in.):** 1.2000, 1.2000, 1.2000
- **Normal Stress (psf):** 1075, 2035, 3032
- **Peak Failure Stress (psf):** 2360, 3121, 3558
- **Displacement (in.):** 0.15, 0.18, 0.18
- **Ultimate Failure Stress (psf):** 1047, 1670, 2932
- **Displacement (in.):** 0.45, 0.43, 0.30
- **Sample Diameter (in.):** 2.42, 2.42, 2.42

#### Notes:
- Consolidated Undrained
- 2-hour min. inundation and load
- G=2.70 assumed, strain rate 0.029”/min.
- At-test density, void ratio, and saturation are approximate based on test method limitations

### Direct Shear Test
- **ASTM D 3080 Modified**
To: Raymond Fisher  
Fisher Engineering  
345 Alameda Ave.  
Half Moon Bay, CA  94019

From: Gene Oliphant, Ph.D.  
General Manager
Randy Horney  
Lab Manager

The reported analysis was requested for the following location:
Location: 3700 CTG BIKE TRAIL  
Site ID: FG-3@4.5-6.0 FT.

Thank you for your business.

* For future reference to this analysis please use SUN # 75056-156666.

-----------------------------------
EVALUATION FOR SOIL CORROSION

Soil pH  6.81

Minimum Resistivity  4.02 ohm-cm (x1000)

Chloride  5.6 ppm  0.00056 %

Sulfate  8.2 ppm  0.00082 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422
To: Raymond Fisher  
Fisher Engineering  
345 Alameda Ave.  
Half Moon Bay, CA 94019

From: Gene Oliphant, Ph.D. \ Randy Horney/\  
General Manager \ Lab Manager \n
The reported analysis was requested for the following location:
Location: 3700 CTG BIKE TRAIL Site ID: FG-3@10.5-11.0.
Thank you for your business.

* For future reference to this analysis please use SUN # 75056-156667.

-------------------------------------------
EVALUATION FOR SOIL CORROSION

Soil pH 6.51

Minimum Resistivity 3.48 ohm-cm (x1000)

Chloride 4.9 ppm 00.00049%

Sulfate 6.4 ppm 00.00064%

METHODS
pH and Min. Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422
To: Raymond Fisher  
Fisher Engineering  
345 Alameda Ave.  
Half Moon Bay, CA 94019

From: Gene Oliphant, Ph.D. \ Randy Horney  
General Manager \ Lab Manager

The reported analysis was requested for the following location:  
Location: 3700 CTG BIKE TRAIL  Site ID: FG-8@20-5-21.0.  
Thank you for your business.

* For future reference to this analysis please use SUN # 75056-156668.

-----------------------------------------------
EVALUATION FOR SOIL CORROSION

Soil pH  5.58

Minimum Resistivity  2.95 ohm-cm (x1000)

Chloride  4.8 ppm  00.00048 %

Sulfate  2.9 ppm  00.00029 %

METHODS
pH and Min. Resistivity CA DOT Test #643  
Sulfate CA DOT Test #417, Chloride CA DOT Test #422
APPENDIX B - SLOPE STABILITY ANALYSES

Four limit-equilibrium slope stability total-stress analyses were performed using the computer program PCSTAB5M to evaluate the degree of stability and the most probable geometry of potential failure surfaces under static and seismic conditions for the existing slope and for the slope with the new retaining wall sections. From our review of the bike trail cross sections from your firm and our test boring logs, we concluded that the most critical slope area is at 169+00, where there is the fill is deepest and where the existing slope inclination is about 1:3H:1V. This slope was used in our analyses. A seismic slope stability (pseudo-static) coefficient of 0.2g was used to model intense ground shaking in our seismic slope stability analyses.

Our first analyses evaluated the existing slope under seismic conditions. Using our test boring and laboratory test data, an undrained peak shear strength envelope defined by $\phi=42^\circ$, $c=0$ psf was used for the fill. An undrained peak shear strength envelope defined by $\phi=0^\circ$, $c=900$ psf was used for colluvial soil. An undrained peak shear strength envelope defined by $\phi=31^\circ$, $c=1500$ psf was used for the severely weathered bedrock that underlies the colluvial soil. The analyses considered both shallow and deep failure circles at various initiation and termination points on the slope and behind the slope crest. The results of this analysis indicate that the slope has surface instability (FS=0.91) during the maximum earthquake; however, the slope appears to have an adequate degree of stability (FS=1.11) against deeper failures.

Our second analyses evaluated the existing slope with the proposed retaining wall under seismic conditions and using the same undrained, peak shear strength parameters. The analysis also incorporated a tieback force of 2,400 lbs. per foot of wall width to artificially model a restraint to active wall pressure. The results of this analysis indicate that the slope appears to have an adequate degree of stability (FS=1.21) against failure under seismic conditions.

Our third analyses evaluated the existing slope under static conditions. An undrained ultimate shear strength envelope defined by $\phi=42^\circ$, $c=0$ psf was used for the fill. An undrained shear strength envelope defined by $\phi=20^\circ$, $c=0$ psf was used for colluvial soil. An undrained ultimate shear strength envelope defined by $\phi=42^\circ$, $c=0$ psf was used for the severely weathered bedrock that underlies the colluvial soil. The analyses considered both shallow and deep failure circles at various points on the slope and behind the slope crest. The results of this analysis indicate that the slope appears to be stable by a reasonable margin under static conditions, but appears to have a degree of stability (FS=1.33) slightly lower than the accepted standard of FS=1.50 against failure under static conditions.

---

12 Caltrans Bridge Design Specifications, August 2004, Section 5.2.2.3
Our fourth analyses evaluated the existing slope with the proposed retaining wall under static conditions and using the same undrained, peak shear strength parameters. The analysis also incorporated a tieback force of 2,400 pounds per foot of wall width to artificially model a restraint to active wall pressure. The analyses considered both shallow and deep failure circles at various points on the slope and behind the slope crest. The results of this analysis indicate that the slope appears to be stable by a reasonable margin under static conditions, but appears to have a degree of stability (FS=1.39) slightly lower than the accepted standard of FS=1.50 against failure under static conditions.

A ground water surface was included in each of the analyses above and was conservatively assumed to be above the native colluvial soil, although no groundwater was encountered in test boring FG-4 drilled near 169+00. Summary plots of the stability analyses are included in this appendix.
CTG Bike Trail - Orig. Grade - Seismic Profile FG4, undrained strength, K=0.2g
Ten Most Critical. C:CTG1.PLT By: rlf 08-22-17 5:18pm

<table>
<thead>
<tr>
<th>#</th>
<th>FS No.</th>
<th>Soil (pcf)</th>
<th>Tot(Ht) (pcf)</th>
<th>Sat(Ht) (pcf)</th>
<th>C (psf)</th>
<th>Phi (deg)</th>
<th>Ru Param</th>
<th>Pore Press Surf #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.91</td>
<td>130</td>
<td>130</td>
<td>0</td>
<td>42</td>
<td>0</td>
<td>0</td>
<td>W1</td>
</tr>
<tr>
<td>2</td>
<td>0.99</td>
<td>120</td>
<td>120</td>
<td>900</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>W1</td>
</tr>
<tr>
<td>3</td>
<td>1.11</td>
<td>130</td>
<td>130</td>
<td>1500</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>W1</td>
</tr>
</tbody>
</table>

Elev. (ft)

90 100 110 120 130 140 150 160 170 180 190 200
PCSTABL5M FSmin = 0.91 X-Axis (ft)
CTG Bike Trail - Orig. Grade - Seismic Profile FG4, undrained strength, K=0.2g
All surfaces evaluated. C:CTG1.PLT  By: rlf  08-22-17  5:18pm
### Soil Properties

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>130</td>
<td>130</td>
<td>0</td>
<td>42</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>W1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>120</td>
<td>120</td>
<td>900</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>W1</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>130</td>
<td>130</td>
<td>1500</td>
<td>31</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>W1</td>
</tr>
</tbody>
</table>

### Graphical Representation

- **Elevation (ft)**: The elevation is marked in feet, ranging from 280 to 350.
- **X-Axis (ft)**: The x-axis represents the distance in feet, ranging from 90 to 200.
- **Label**: The graph is labeled with PCSTABL5M FSmin=1.21 X-Axis (ft).

The diagram illustrates the relationship between elevation and distance, highlighting critical points labeled with numbers from 1 to 10.
CTG Bike Trail - Orig. Grade - Static Profile FG4, undrained ultimate strength
All surfaces evaluated. C:CTG4.PLT By: rlf 08-23-17 9:35pm
CTG Bike Trail- New Ret. Wall-Static Profile FG4, undrained ultimate strength
All surfaces evaluated. C:CTG3.PLT By: rlf 08-23-17 9:41pm
APPENDIX C - RETAINING WALL DESIGN DETAILS
See Figure C-2 for Retaining Wall Data Table and Notes
### Retaining Wall Data Table and Notes

<table>
<thead>
<tr>
<th>Wall Height Above Existing Grade (ft)</th>
<th>Wall Design Height (W/4' Deep Loose/Creep zone) (ft)</th>
<th>Minimum Beam Size* ASTM A992</th>
<th>Flange Width (in)</th>
<th>Minimum Beam Length (ft)</th>
<th>Beam Spacing (ft)</th>
<th>Wood Lagging Height (ft)</th>
<th>Final Grade Depth Below Top of Wall-Front Face (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>W8x35</td>
<td>8</td>
<td>14</td>
<td>6</td>
<td>5</td>
<td>0 to 3</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>W10x54</td>
<td>10</td>
<td>18</td>
<td>6</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>W10x60</td>
<td>10</td>
<td>22</td>
<td>6</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
<td>W12x79</td>
<td>12</td>
<td>25</td>
<td>6</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>13</td>
<td>W12x96</td>
<td>12</td>
<td>30</td>
<td>6</td>
<td>13</td>
<td>11</td>
</tr>
</tbody>
</table>

*Note: For uniformity, the use of one or two beam sizes for a wall that tapers in height is more practical than using multiple beam sizes. Minimum beam size includes additional sacrificial thickness for corrosion protection.

#### Notes:

1. Subsurface obstructions such as rocks, tree roots, and debris may be encountered during excavation or drilling for pile installation. Obstructions shall be cored through or removed with minimal disturbance to adjacent ground as approved by the engineer. Hard bedrock zones may also be encountered.

2. The contractor shall provide proper configuration and/or shoring of excavations in accordance with occupational safety laws. In addition to occupational safety requirements, excavation method shall ensure preservation of adjacent underground utilities.

3. Prior to placing the first course of wood lagging, tops of soldier pile concrete backfill shall be adjusted to the specified elevation by removing concrete between beam flanges to create a uniform level footing for the lagging. (The contractor may elect to block-out the area between flanges to the specified elevation prior to placing concrete backfill.) Wood lagging shall be installed level and plumb. ½” thick spacers shall be installed between lagging courses. Spacers shall have a nominal dimension of 4”x6” and shall be pressure treated wood or an approved alternative durable material.

4. All earth fill, graded surfaces, and any other areas disturbed by the contractor’s operations shall be hydro-seeded as directed by the engineer.
Appendix E

Noise Calculations
## Construction Noise and Vibration Estimates:

### Equipment Approximate VdB

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Approximate VdB</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D 25 ft</td>
</tr>
<tr>
<td>Bulldozer (large)</td>
<td>87</td>
</tr>
<tr>
<td>Bulldozer (small)</td>
<td>58</td>
</tr>
<tr>
<td>Caisson drill</td>
<td>87</td>
</tr>
<tr>
<td>Loaded Trucks</td>
<td>86</td>
</tr>
</tbody>
</table>

**Formula**

\[
Lv(D) = Lv(25 \text{ ft}) - 30 \log \left( \frac{D}{25} \right)
\]

### Equipment Approximate dBA

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Approximate dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D 50 ft</td>
</tr>
<tr>
<td>Bulldozers</td>
<td>85</td>
</tr>
<tr>
<td>Paver</td>
<td>89</td>
</tr>
<tr>
<td>Truck</td>
<td>88</td>
</tr>
</tbody>
</table>

**Formula**

\[
Leq(equip) = E.L. + 10 \log(U.F.) - 20 \log(D/50) - 10G \log(D/50)
\]

- **UF**: 0.5 \text{ --- conservative}
- **G**: 0 \text{ --- I'm assuming hard ground at } G = 0