Clean Watersheds for a Clean Bay (CW4CB) Task 5 Individual Retrofit Pilot Project Report

Nevin Avenue Improvement Project

Richmond, California

Prepared for Contra Costa Clean Water Program

Prepared by Geosyntec consultants

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1. INTRODUCTION AND BACKGROUND

The Bay Area Stormwater Management Agencies Association (BASMAA) Clean Watersheds for a Clean Bay (CW4CB) project evaluated a variety of potential control options to reduce mass loadings of polychlorinated biphenyls (PCBs) and mercury in urban stormwater runoff to San Francisco Bay.

The primary objective of CW4CB Task 5 was to select and implement representative urban stormwater treatment retrofit projects. This objective coincided with Municipal Regional Stormwater NPDES Permit (MRP, Order R2-2009-0074) Provision C.12.e, which required the MRP Permittees to identify and conduct on-site pilot treatment projects in ten locations during the MRP term and to document the knowledge and experience gained to provide a basis for determining the scope of implementation of treatment retrofits in subsequent permit terms.

This report focuses on the CW4CB component of the Nevin Avenue Improvement Project that was constructed in Richmond, California. This report includes descriptions of the project location, treatment measures, planning and design process, construction process and schedule, cost summary, monitoring plan, water quality data, and challenges and lessons learned.

The stormwater program representatives that oversaw the design and installation of this project was Lynn Scarpa, the former Environmental Manager for the City of Richmond Stormwater Program, and Joanne Le, the current Environmental Manager for the City.

2. PROJECT LOCATION

The Nevin Avenue Improvement Project is a streetscape project along eight blocks of Nevin Avenue, between 19th Street and 27th Street in the City of Richmond (see Figure 1). The project extends between the Richmond BART Station and Richmond City Hall. The project is located in a mixed civic, residential, and commercial area. Light industrial and historical old industrial land uses are within close proximity to Nevin Avenue Improvement Project. The area is largely residential in the lower blocks (19th through 23rd Streets) and is adjacent to the Richmond BART Station. From 23rd to 25th Streets, the land use is largely commercial, and from 25th to 27th Streets, the City Hall buildings are the dominant land use (civic), with some commercial buildings interspersed.

3. TREATMENT CONTROL MEASURE

The project includes stormwater treatment measures integrated into the streetscape. Streetscape features include standard street trees and curb extensions to make the street more bicyclist and pedestrian friendly. The City’s base contract for the project included rain garden (bioretention) curb extensions as the primary stormwater treatment measure. Additional treatment measures added by CW4CB Task 5 included permeable pavers with subterranean drainage (i.e., Silva Cells) and porous asphalt concrete pavement.
Two bioretention curb extension areas totaling 4,200 square feet were installed at 25th Street and Nevin Avenue. Per the BKF design drawings dated January 9, 2012, the rain gardens were constructed with curb cuts and 21 inches of a loamy sand bioretention mix underlain by 12 inches of Class 2 permeable aggregate (see Appendix A). An underdrain is located at the bottom of the permeable aggregate layer (BKF, 2012).

Additionally, 2,500 square feet of Silva Cells with subterranean drainage were installed beneath permeable pavers between 24th Street and 25th Street. Silva Cells are a modular suspended pavement system that use soil to support tree growth and provide stormwater treatment (see Appendix B). Porous asphalt concrete pavement was installed from 23rd to 24th along Nevin Avenue. The drainage to the treatment measures is largely street drainage with possible drainage from adjacent parcels.

4. CONSTRUCTION PROCESS

The 100% design of the CW4CB Task 5 component of the Nevin Avenue Improvement Project was completed in April 2013. The project went out to bid from December 9, 2014 to January 21, 2015. The Successor Agency Board approved the construction contractor on April 7, 2015. Construction of the project began on August 31, 2015 and construction was completed in July 2016.

5. COST SUMMARY

The Nevin Avenue Improvement Project was originated by the City of Richmond Redevelopment Agency. The overall project included grants from several agencies including the Federal Highway Administration (FHA). The CW4CB grant added funding for the CW4CB Task 5 stormwater treatment control measures. The FHA funds are processed through Caltrans and thus an Authorization to Proceed was required from Caltrans before the project could go out to bid. The Authorization to Proceed was delayed but finally issued to the City on September 16, 2014.

Table 1 shows the cost summary for the CW4CB Task 5 component of the Nevin Avenue Improvement project.

<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Description</th>
<th>Individual Cost ($)</th>
<th>Total Cost ($)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Total</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Completed as part of the larger Nevin Avenue Improvement Project.</td>
</tr>
<tr>
<td>Construction</td>
<td>Management</td>
<td>Unknown</td>
<td>444,698</td>
<td>Current estimate using bid estimates.</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>Unknown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>O&amp;M</td>
<td>Annual</td>
<td>5,000</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>Total Cost</td>
<td>Total</td>
<td>444,698</td>
<td>444,698</td>
<td>The total estimated cost does not include the annual O&amp;M costs.</td>
</tr>
</tbody>
</table>
The current estimate of $444,698 uses the construction bid estimates. However, this methodology understates the true costs of these stormwater improvements, since it does not account for the amount spent on new underground stormwater conveyances needed in order to install these elements. When those are factored in, the cost approaches 1 million (Chad Smalley, City of Richmond, Personal Communication, 2016).

6. MONITORING DATA

A detailed monitoring plan for each CW4CB retrofit pilot projects was developed by Brian Currier of the Cal State University Sacramento Office of Water Programs and Geosyntec Consultants, with guidance and review from the CW4CB Project Management Team (PMT) and Technical Advisory Committee (TAC) (BASMAA, 2013a, b). All monitoring was conducted in accordance with the methods and procedures set forth in the CW4CB Quality Assurance Project Plan (QAPP) and the CW4CB Task 5 Sampling and Analysis Plans (SAPs) (BASMAA 2012, 2013c). Water quality and flow monitoring reports and laboratory quality assurance (QA) summary reports prepared by the CW4CB monitoring contractor are available as appendices to the CW4CB Final Project Report (BASMAA, in preparation).

One pre-construction storm event on April 4, 2013, was monitored as part of a screening-level effort to determine existing water quality. Samples were collected at three sampling locations (see see Table 2) and analyzed for mercury, suspended sediment concentration, PCBs, total suspended solids (TSS) and turbidity. Monitoring results and summary statistics are provided in Table 3 and PCB homolog profiles are shown in Figure 2.

Construction was completed in July 2016, therefore no monitoring was performed during the 2015/2016 wet season. No post-implementation monitoring data has been collected nor is planned to be collected at this time.

Monitoring additional pre-construction storm events was considered, but was rejected because monitoring a few additional storms would not have greatly improved the existing water quality assessment compared to the benefit of reallocating the monitoring resources to collect additional post-construction data at other CW4CB Task 5 pilot projects. It was determined that the resources should be expended on projects within Contra Costa County and therefore the monitoring events were reallocated to the PG&E Substation Project at 1st and Cutting.

Table 2. Summary of Pre-Construction Monitoring Locations

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Site Description</th>
<th>Sample Date</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAR-01</td>
<td>South side of Nevin Ave, east of 24th</td>
<td>4/4/13</td>
<td>37.93663</td>
<td>-122.34596</td>
</tr>
<tr>
<td>PAR-02</td>
<td>North side of Nevin Ave, east of 24th</td>
<td>4/4/13</td>
<td>37.93693</td>
<td>-122.34590</td>
</tr>
<tr>
<td>PAR-03</td>
<td>South side of Nevin Ave, west of 24th</td>
<td>4/4/13</td>
<td>37.93670</td>
<td>-122.34643</td>
</tr>
<tr>
<td>Analyte</td>
<td>Size Fraction</td>
<td>PAR-01</td>
<td>PAR-02</td>
<td>PAR-03</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>---------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Particle Size Distribution (mg/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;2000 µm</td>
<td>1.19 J</td>
<td>1.37 J</td>
<td>&lt;0.75</td>
<td>&lt;0.75</td>
</tr>
<tr>
<td>1 to &lt;25 µm</td>
<td>2.71 J</td>
<td>1.39 J</td>
<td>2.86</td>
<td>1.39</td>
</tr>
<tr>
<td>25 to 63 µm</td>
<td>3.56 J</td>
<td>5.33 J</td>
<td>2.86</td>
<td>2.86</td>
</tr>
<tr>
<td>500 to &lt;2000 µm</td>
<td>0.98 J</td>
<td>1.45 J</td>
<td>&lt;0.75</td>
<td>&lt;0.75</td>
</tr>
<tr>
<td>63 to &lt; 500 µm</td>
<td>1.84 J</td>
<td>2.34 J</td>
<td>&lt;0.75</td>
<td>&lt;0.75</td>
</tr>
<tr>
<td><strong>Suspended Sediment Concentration (mg/L)</strong></td>
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<tr>
<td>Total</td>
<td>10.28 J</td>
<td>11.88 J</td>
<td>6.05</td>
<td>6.05</td>
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<tr>
<td>&lt;25 µm</td>
<td>2.71 J</td>
<td>1.39 J</td>
<td>2.86</td>
<td>1.39</td>
</tr>
<tr>
<td><strong>Total Suspended Solids (mg/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>6.9 J</td>
<td>5.4 J</td>
<td>--</td>
<td>5.4 J</td>
</tr>
<tr>
<td>&lt;25 µm</td>
<td>1.5 J</td>
<td>2.2 J</td>
<td>--</td>
<td>1.5 J</td>
</tr>
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<td><strong>Total Suspended Solids and Salts (mg/L)</strong></td>
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<tr>
<td>&lt;1 µm</td>
<td>29.32 J</td>
<td>18.12 J</td>
<td>20.51</td>
<td>18.12</td>
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<td><strong>Volatile Suspended Solids (mg/L)</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.27 J</td>
<td>2.27 J</td>
<td>--</td>
<td>2.27 J</td>
</tr>
<tr>
<td>&lt;25 µm</td>
<td>0.67 J</td>
<td>0.3 J</td>
<td>--</td>
<td>0.3 J</td>
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<td><strong>Settleable Solids (mL/L)</strong></td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>&lt;0.05 J</td>
<td>&lt;0.05 J</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>&lt;25 µm</td>
<td>&lt;0.05 J</td>
<td>&lt;0.05 J</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
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<tr>
<td><strong>Turbidity (NTU)</strong></td>
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<tr>
<td>Total</td>
<td>5.72 J</td>
<td>7.07 J</td>
<td>9.22</td>
<td>5.72</td>
</tr>
<tr>
<td><strong>Mercury (ng/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>11.6 J</td>
<td>12 J</td>
<td>8.05</td>
<td>8.05</td>
</tr>
<tr>
<td><strong>Total Dichlorobiphenyls (pg/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17.4 J</td>
<td>18 J</td>
<td>23 J</td>
<td>17.4 J</td>
</tr>
<tr>
<td>&lt;25 µm</td>
<td>23.1 J</td>
<td>20.6 J</td>
<td>14.5 J</td>
<td>14.5 J</td>
</tr>
<tr>
<td><strong>Total Trichlorobiphenyls (pg/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>66.05 J</td>
<td>89.55 J</td>
<td>59.3 J</td>
<td>59.3 J</td>
</tr>
<tr>
<td>&lt;25 µm</td>
<td>65.1 J</td>
<td>71.1 J</td>
<td>42.7 J</td>
<td>42.7 J</td>
</tr>
<tr>
<td><strong>Total Tetrachlorobiphenyls (pg/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>223 J</td>
<td>434.5 J</td>
<td>246 J</td>
<td>223 J</td>
</tr>
<tr>
<td>&lt;25 µm</td>
<td>118 J</td>
<td>242 J</td>
<td>209 J</td>
<td>118 J</td>
</tr>
<tr>
<td><strong>Total Pentachlorobiphenyls (pg/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>360.5 J</td>
<td>1091.5 J</td>
<td>439 J</td>
<td>360.5 J</td>
</tr>
<tr>
<td><strong>Total Hexachlorobiphenyls (pg/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>265.5 J</td>
<td>636.5 J</td>
<td>282 J</td>
<td>265.5 J</td>
</tr>
<tr>
<td>&lt;25 µm</td>
<td>122 J</td>
<td>272 J</td>
<td>179 J</td>
<td>122 J</td>
</tr>
<tr>
<td><strong>Total Heptachlorobiphenyls (pg/L)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>180 J</td>
<td>317 J</td>
<td>62.1 J</td>
<td>62.1 J</td>
</tr>
<tr>
<td>&lt;25 µm</td>
<td>13.5 J</td>
<td>41.3 J</td>
<td>30.4 J</td>
<td>13.5 J</td>
</tr>
<tr>
<td>Analyte</td>
<td>Size Fraction</td>
<td>PAR-01</td>
<td>PAR-02</td>
<td>PAR-03</td>
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<tr>
<td>Total Octachlorobiphenyls (pg/L)</td>
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<td>&lt;12.5</td>
<td>&lt;12.5</td>
<td>&lt;18.1</td>
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<tr>
<td></td>
<td>&lt;25 µm</td>
<td>&lt;8.63</td>
<td>&lt;16.5</td>
<td>&lt;7.77</td>
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<tr>
<td>Total PCBs (pg/L)</td>
<td></td>
<td>1021.5 J</td>
<td>2431.5 J</td>
<td>1081 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>496 J</td>
<td>1110 J</td>
<td>746 J</td>
</tr>
<tr>
<td>PCB 008 (pg/L)</td>
<td></td>
<td>17.4 J</td>
<td>18 J</td>
<td>23 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>23.1 J</td>
<td>20.6 J</td>
<td>14.5 J</td>
</tr>
<tr>
<td>PCB 018/30 (pg/L)</td>
<td></td>
<td>32.95 J</td>
<td>28.15 J</td>
<td>34.5 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>28.7 J</td>
<td>26.3 J</td>
<td>21.3 J</td>
</tr>
<tr>
<td>PCB 020/28 (pg/L)</td>
<td></td>
<td>38.6 J</td>
<td>29.85 J</td>
<td>22.9 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>18.1 J</td>
<td>21.8 J</td>
<td>21.4 J</td>
</tr>
<tr>
<td>PCB 021/33 (pg/L)</td>
<td></td>
<td>&lt;9.81 J</td>
<td>&lt;8.24 J</td>
<td>&lt;12.8 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>&lt;8.25 J</td>
<td>&lt;13.6 J</td>
<td>&lt;8.25 J</td>
</tr>
<tr>
<td>PCB 031 (pg/L)</td>
<td></td>
<td>27.2 J</td>
<td>31.7 J</td>
<td>26.7 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>18.2 J</td>
<td>23.1 J</td>
<td>&lt;9.05</td>
</tr>
<tr>
<td>PCB 044/47/65 (pg/L)</td>
<td></td>
<td>62.5 J</td>
<td>107.8 J</td>
<td>95.35 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>49.7 J</td>
<td>65.6 J</td>
<td>76.2 J</td>
</tr>
<tr>
<td>PCB 049/69 (pg/L)</td>
<td></td>
<td>20.8 J</td>
<td>44.9 J</td>
<td>&lt;15.25</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>&lt;11 J</td>
<td>18.1 J</td>
<td>18.7 J</td>
</tr>
<tr>
<td>PCB 052 (pg/L)</td>
<td></td>
<td>64 J</td>
<td>121.4 J</td>
<td>83.85 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>44.3 J</td>
<td>74.4 J</td>
<td>61.4 J</td>
</tr>
<tr>
<td>PCB 056 (pg/L)</td>
<td></td>
<td>&lt;15.8</td>
<td>33.2 J</td>
<td>&lt;15.95</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>&lt;13.8</td>
<td>&lt;9.85</td>
<td>&lt;7.96</td>
</tr>
<tr>
<td>PCB 060 (pg/L)</td>
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<td>&lt;15.1</td>
<td>17.1 J</td>
<td>&lt;15.25</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>&lt;13.2</td>
<td>&lt;9.4</td>
<td>&lt;7.46</td>
</tr>
<tr>
<td>PCB 061/70/74/76 (pg/L)</td>
<td></td>
<td>52.8 J</td>
<td>122.4 J</td>
<td>53.35 J</td>
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<td></td>
<td>&lt;25 µm</td>
<td>23.8 J</td>
<td>66 J</td>
<td>37.5 J</td>
</tr>
<tr>
<td>Analyte</td>
<td>Size Fraction</td>
<td>PAR-01</td>
<td>PAR-02</td>
<td>PAR-03</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>--------</td>
</tr>
<tr>
<td>PCB 066 (pg/L)</td>
<td>Total</td>
<td>23.2 J</td>
<td>70.6 J</td>
<td>27.3 J</td>
</tr>
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<td></td>
<td>&lt;25 µm</td>
<td>&lt;10.4</td>
<td>17.6 J</td>
<td>14.8 J</td>
</tr>
<tr>
<td>PCB 083/99 (pg/L)</td>
<td>Total</td>
<td>49 J</td>
<td>97.35 J</td>
<td>48 J</td>
</tr>
<tr>
<td></td>
<td>&lt;25 µm</td>
<td>&lt;11.9</td>
<td>38.6 J</td>
<td>23.1 J</td>
</tr>
<tr>
<td>PCB 086/87/97/109/119/125 (pg/L)</td>
<td>Total</td>
<td>97 J</td>
<td>156.45 J</td>
<td>63.9 J</td>
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<td>&lt;25 µm</td>
<td>29.3 J</td>
<td>61.9 J</td>
<td>40.3 J</td>
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<td>PCB 090/101/113 (pg/L)</td>
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<td>195.25 J</td>
<td>89.6 J</td>
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<td></td>
<td>&lt;25 µm</td>
<td>33.1 J</td>
<td>85.2 J</td>
<td>58.3 J</td>
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<td>31.6 J</td>
<td>81.4 J</td>
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<td>PCB 105 (pg/L)</td>
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<td>&lt;25 µm</td>
<td>&lt;10.2</td>
<td>33.2 J</td>
<td>13.7 J</td>
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<td>PCB 110/115 (pg/L)</td>
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<td>72.2 J</td>
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<td>93.5 J</td>
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<tr>
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<td>&lt;25 µm</td>
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<td>52.5 J</td>
<td>187.15 J</td>
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<td>&lt;25 µm</td>
<td>25.4 J</td>
<td>65.8 J</td>
<td>34.4 J</td>
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<td>PCB 128/166 (pg/L)</td>
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<td>&lt;7.53</td>
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<td>PCB 129/138/163 (pg/L)</td>
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<td>178.7 J</td>
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<td>34 J</td>
<td>66.4 J</td>
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<td>75.05 J</td>
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<td>32.6 J</td>
<td>67 J</td>
<td>34.6 J</td>
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<td>PAR-02</td>
<td>PAR-03</td>
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<td>---------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
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<td>54.4 J</td>
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<td>&lt;11.6</td>
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<td>PCB 177 (pg/L)</td>
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<td>&lt;28</td>
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<td>&lt;25 µm</td>
<td>&lt;14.7</td>
<td>&lt;25.9</td>
<td>&lt;12.5</td>
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<td>26.2 J</td>
<td>20.1 J</td>
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<td>&lt;25 µm</td>
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<td>&lt;25 µm</td>
<td>&lt;9.54</td>
<td>15.1 J</td>
<td>10.3 J</td>
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<td>&lt;25 µm</td>
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<tr>
<td>PCB 195 (pg/L)</td>
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<td>&lt;18</td>
<td>&lt;18.3</td>
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<td>&lt;25 µm</td>
<td>&lt;12.7</td>
<td>&lt;24.2</td>
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<tr>
<td>PCB 201 (pg/L)</td>
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<td>&lt;18.1</td>
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<td>&lt;25 µm</td>
<td>&lt;8.63</td>
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<td>PCB 203 (pg/L)</td>
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<td>&lt;14.35</td>
<td>&lt;14.3</td>
<td>&lt;20.7</td>
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<tr>
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<td>&lt;25 µm</td>
<td>&lt;9.88</td>
<td>&lt;18.9</td>
<td>&lt;8.35</td>
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</tbody>
</table>
7. PROJECT OUTCOMES AND LESSONS LEARNED

There were challenges related to the Federal aid process as administered by Caltrans, which delayed the start of construction. The volume of documentation, time required for Caltrans review, and changing requirements all contributed to the delay of the issuance of the “Authorization to Proceed” by Caltrans. Aside from that, challenges were encountered during construction that also delayed progress, principally relating to utility conflicts with the new storm drain line. A good portion of this issue was due to inaccurate utility records (Chad Smalley, City of Richmond, Personal Communication, 2016).
8. REFERENCES


California Department of Transportation, 2014. Authorization to Proceed Letter from Nam Nguyen to Chad Smalley entitled, 04-CC-0-Richmond, CML-5137(039), Nevin Ave BART St – 19th St – 27th Bike and Pedestrian Improvement. 16 September.

Smalley, Chad, 2016. City of Richmond, Personal Communication, 1 March.
FIGURES
Project Location

Legend
- Nevin Avenue Improvement Project
- CW4CB Project
- Rain Gardens
- Pervious Pavement
- Subterranean Stormwater System with Permeable Paver
- Existing Drainage Inlet
- New Storm Drain
- Existing Storm Drain Pipe

Flow Direction

Legend

Nevin Avenue Improvement Project
CW4CB Project
Rain Gardens
Pervious Pavement
Subterranean Stormwater System with Permeable Paver
Existing Drainage Inlet
New Storm Drain
Existing Storm Drain Pipe
Flow Direction

0 125 250 Feet

0 125 250 Feet

CW4CB Task 5
Nevin Avenue Improvement Project Map
Richmond, CA

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

P:\GIS\CCWP\Project\Task 5\NevinAve.mxd

Figure 1

WW2061
July 2016
Nevin Avenue Improvement Project PCB Homolog Profiles

Oakland, CA

Figure WW2061

July 2016

Percent Composition

- Total Octachlorobiphenyls
- Total Heptachlorobiphenyls
- Total Hexachlorobiphenyls
- Total Pentachlorobiphenyls
- Total Tetrachlorobiphenyls
- Total Trichlorobiphenyls
- Total Dichlorobiphenyls
APPENDIX A:
Nevin Avenue Improvement Project -
100% Design Plans for the
CW4CB Task 5 Component
STORM WATER MANAGEMENT PLAN
NEVIN AVENUE (STA 46+30 TO 46+50)

STORM WATER MANAGEMENT PLAN
NEVIN AVENUE (STA 46+50 TO 49+75)
STORM WATER MANAGEMENT PLAN
NEVIN AVENUE (STA 49+75 TO 52+35)

STORM WATER MANAGEMENT PLAN
NEVIN AVENUE (STA 52+35 TO 57+25)

COUNTY OF CONTRA COSTA ENGINEERS DEPARTMENT OF PUBLIC WORKS

STORM WATER MANAGEMENT EXHIBIT
NORTH

322 HARBOUR WAY, STE 23
RICHMOND, CA 94801
PH: (510) 529-0336

ENGINEERS / SURVEYORS / PLANNERS

C.3 FEATURES

- Rain Garden Area
- Stormwater System (Pervious Paving)
- Pervious Paving

RAIN GARDEN AREA

STORM WATER MANAGEMENT BETWEEN 19TH AND 27TH
APPENDIX B: Silva Cells Standard Details
SILVA CELLS FOR TREES - MODIFIED - DETAIL INDEX

To be used in conjunction with standard Silva Cell details.

Silva Cell Construction Depths

Breakout Zone Details
A Breakout Zone is an application where Silva Cells are used to bridge the area between the soil in the tree opening and available, lightly compacted soil nearby (but not adjacent), allowing tree roots access to larger soil quantities with minimal use of the Silva Cell.

- Breakout Zone
- Breakout Zone - Concrete 2.1
- Breakout Zone - Pavers 2.1

Bridging Slab Details
Bridging Slabs are used when gaps larger than 3" (75mm) between Silva Cells cannot be avoided. These details may be referenced for gaps around lightpole or other footings, as well as other site features that may prohibit standard Silva Cell layout.

- Bridge-Concrete
- Bridge-Pavers
- Bridge-Asphalt
- Minor Gap Bridging

Footing Details
- Footing
- Footing with Bridging Slab

Green Wall Details
- Green Wall-Concrete
- Green Wall-Pavers

Parking Bay (Lay-by) Details
- Parking Bay 3.1
- Parking Bay 3.2

Tree Grate Detail

Geotextile Wrap

Inspection Riser
This detail shall be used in conjunction with Silva Cells for Trees Details and Specifications.

The above information contained in this standard detail is not to scale.

The standard detail is provided for general education and informational purposes only and does not constitute an endorsement, approval or recommendation of any kind. The actual suitability and applicability of this information for a given use depends upon a wide variety of considerations, including specific project specifications, over which DeepRoot® has no information or control. This standard detail should NOT be used as a basis for volume calculations that are site specific and vary greatly depending on cell and deck spacing, soil conditions and soil compaction. All DeepRoot® Silva Cell products are sold with the understanding that the purchaser, either individually or in consultation with purchaser's design professionals, has independently determined the suitability of each product for the application for which it is purchased. Except as expressly provided, DeepRoot® disclaims all warranties, express or implied, and strongly encourages the reader to consult with a construction/design professional and/or engineer before applying any of this information to a specific use or purpose.

NOTES:
1. Installation to be completed in accordance with manufacturer's specifications.
2. Do not scale drawings.

Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
A Break-Out zone is an application where Silva Cells are used to bridge the area between the soil in the tree opening and a nearby, lightly compacted soil, allowing tree roots access to larger soil quantities with minimal use of the Silva Cell. For example, Silva Cells can be used to provide a tunnel for root growth from the tree opening, underneath a sidewalk, and into an open planting area beyond.

This detail shall be used in conjunction with Silva Cells for Trees Details and Specifications.

The standard detail is provided for general education and informational purposes only and does not constitute an endorsement, approval or recommendation of any kind. The actual suitability and applicability of this information for a given use depends upon a wide variety of considerations, including specific project specifications, over which DeepRoot® has no information or control. This standard detail should NOT be used as a basis for volume calculations that are site specific and vary greatly depending on cell and deck spacing, soil conditions and soil compaction. All DeepRoot® Silva Cell products are sold with the understanding that the purchaser, either individually or in consultation with purchaser's design professionals, has independently determined the suitability of each product for the application for which it is purchased. Except as expressly provided, DeepRoot® disclaims all warranties, express or implied, and strongly encourages the reader to consult with a construction/design professional and/or engineer before applying any of this information to a specific use or purpose.
1. Installation to be completed in accordance with manufacturer’s specifications.
2. Do not scale drawings.

Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
Concrete curb, sized per project specifications, positioned over Cell posts. Pavers to be permanently adhered to concrete.

Pavers per project specifications

300mm aggregate base course

Geotextile, 450mm minimum overlap past excavation

75mm compost between Silva Cell deck and planting soil, or 25mm air space

Geogrid. ‘J’ 150mm minimum below backfill at base.

Overlap 300mm minimum at top of Cells.

Backfill, installed in 200mm max. lifts (2 lifts per cell), compacted to 95%

5mm x 350mm zip ties, attaching Geogrid to Silva Cells at each level and at Cell deck

Angle of repose, varies per project specifications

Anchor each Silva Cell to ground with (4) 250mm spike, <10mm dia., see Cell base for spike hole

Silva Cell base slope to max. 5%

Geotextile on compacted subgrade.

Planting soil per Silva Cell specifications, installed in 200mm lifts (2 lifts per cell)

100mm aggregate sub base, compacted to 95% or by 3 passes with plate compactor, whichever is greater. Connect to storm drain for positive drainage

Subgrade below geotextile and aggregate base course, compacted to 95% or by 3 passes with plate compactor, whichever is greater

NOTES:
1. Installation to be completed in accordance with manufacturer’s specifications.
2. Do not scale drawings.
3. Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
Notes:

- This detail shows concrete bridging slab in a restricted condition.
- Concrete slab to extend 48" beyond gap over cell decks; concrete slab to overlap a minimum of 24" across a minimum of 4 cell posts where conditions restrict slab extension.
- Concrete to be poured directly on 2 layers of geotextile.

Concrete Shall Be:
1. Type 3 cement with maximum 1.5" (38 mm) aggregate
2. Air-entrained to 6% ±1.0%
3. F' c = 4,500 psi
4. 4" (100 mm) maximum slump
5. Placed within 1.5 hours of mixing
6. Cured in conformance with latest ASTM C171 designation and continue at least 7 days

Reinforcing Steel Shall Be:
1. Epoxy coated
2. Fy = 60,000 psi
3. Lap splice length in conformance with ACI Code
4. 2" clear concrete cover at the base of the slab
Notes:
- This detail shows concrete bridging slab in a restricted condition.
- Concrete slab to extend 48" beyond gap over cell decks. In restricted conditions, concrete slab to overlap a minimum of 24" beyond gap, across a minimum of 4 cell posts.
- Concrete to be poured directly on 2 layers of geotextile.

Concrete Shall Be:
1. Type 3 cement with maximum 1.5" (38 mm) aggregate
2. Air-entrained to 6% ±1.0%
3. F' c = 4,500 psi
4. 4" (100 mm) maximum slump
5. Placed within 1.5 hours of mixing
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Reinforcing Steel Shall Be:
1. Epoxy coated
2. Fy = 60,000 psi
3. Lap splice length in conformance with ACI Code
4. 2" clear concrete cover at the base of the slab

Notes:
- Installation to be completed in accordance with manufacturer's specifications.
- Do not scale drawings.
- Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
Notes:
- Concrete slab to extend 48" beyond gap over cell decks.
  In restricted conditions, concrete slab to overlap a minimum of 24" beyond gap, across a minimum of 4 cell posts.
- Concrete to be poured directly on 2 layers of geotextile.

Concrete Shall Be:
1. Type 3 cement with maximum 1.5" (38 mm) aggregate
2. Air-entrained to 6% ±1.0%
3. $f'c = 4,500$ psi
4. 4" (100 mm) maximum slump
5. Placed within 1.5 hours of mixing
6. Cured in conformance with latest ASTM C171 designation and continue at least 7 days

Reinforcing Steel Shall Be:
1. Epoxy coated
2. $Fy = 60,000$ psi
3. Lap splice length in conformance with ACI Code
4. 2" clear concrete cover at the base of the slab

Geotextile, bottom layer: 450 mm minimum overlap past excavation, and top layer: 450 mm minimum overlap past concrete bridging slab

Existing or proposed utility/conduit, aggregate base and pipe cover per project specifications

NOTES:
1. Installation to be completed in accordance with manufacturer's specifications.
2. Do not scale drawings.
Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
Minor Gap Bridging detail is to be used in conjunction with other Silva Cell standard details. Detail will vary per project specifications.

If 2.4m dimension cannot be achieved due to Silva Cell layout, the remaining geogrid dimension can be wrapped up into aggregate subbase.

Geogrid over gaps shall be BX 1500 biaxial geogrid by Tensar or SF20 biaxial geogrid by Synteen. Other products must be approved by Engineer.

NOTES:
1. Installation to be completed in accordance with manufacturer's specifications.
2. Do not scale drawings.
Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
Pavers per project specifications
- 300 mm aggregate base course
- Geotextile, bottom layer: 450 mm minimum overlap at excavation, and top layer: 450 mm minimum overlap past gap.

NOTES:
1. Installation to be completed in accordance with manufacturer's specifications.
2. Do not scale drawings.
Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
**NOTES:**

Footing with Bridging Slab details to be used when gaps larger than 3" are necessary between the footing and adjacent Silva Cell system. Gaps up to 24" can be accommodated with this detail. Concrete slab at footing to extend a minimum of 24" beyond gap, across a minimum of 4 cell posts. Concrete to be poured directly on 2 layers of geotextile.

1. Concrete span varies- up to 12" without rebar, 12" - 24" include #6 rebar
2. Installation to be completed in accordance with manufacturer’s specifications.
3. Footing and gap bridging to be designed and verified based on project conditions.
4. Do not scale drawings.
5. Disclaimer: Conditions that vary from drawings shall be evaluated by a qualified Engineer and appropriate adjustments made.

**Concrete Shall Be:**

- Type 3 cement with maximum 1.5" (38 mm) aggregate
- Air-entrained to 6% ±1.0%
- $f'c = 4,500$ psi
- 4" (100 mm) minimum slump
- Placed within 1.5 hours of mixing
- Cured in conformance with latest ASTM C171 designation and continue at least 7 days

**Reinforcing Steel Shall Be:**

- Epoxy coated
- $f_y = 60,000$ psi
- Lap splice length in conformance with ACI Code
- 2" clear concrete cover at the base of the slab

**Silva Cells for Trees - Modified**

- Deep Root Urban Solutions
- The Kestrel Design Group
- 7101 Ohms Lane
- Minneapolis, MN 55439
- 952-928-9600
- fax 952-224-9860
- www.kestreldesigngroup.com

- Deep Root Partners L.P.
- 530 Washington Street
- San Francisco, California 94111
- Ph. 415 781-9700
- www.deeproot.com

- Urban Trees and Soils
- 915 Creek Drive
- Annapolis, Maryland 21403
- 410 263-4838
- www.urbansoils.com

- Project No.: 07337
- Drawn by: MDB
- Checked by: DR
- Date: 12/1/2010
- Revisions: Modified 2010 Release

- Copyright © 2010 Deep Root Partners, L.P.
Curb and street per project specifications
Concrete paving per project specifications
300mm aggregate base course
Concrete curb, sized per project specifications. Align curb with Cell posts.
Geotextile, 450mm minimum overlap past excavation
75mm compost between Silva Cell deck and planting soil
Geogrid. 'J' 150mm minimum below backfill at base.
Overlap 300mm minimum at top of Cells.
Backfill, installed in 200mm max. lifts (2 lifts per cell), compacted to 95% or by 3 passes with plate compactor, whichever is greater.
DeepRoot UB18-2 Root barrier
5mm x 350mm zip ties, attaching Geogrid to Silva Cells at each level and at Cell deck
Anchor each Silva Cell to ground with (4)
250mm spike,<10mm dia., see Cell base for spike hole
Silva Cell base slope to match cross-slope or flow-line slope, whichever is greater, to max. 5%
Geotextile on compacted subgrade. NOTE that geotextile is not required if determined by qualified professional. See specifications.
Planting soil per Silva Cell specifications, installed in 200mm lifts (2 lifts per cell)
100mm aggregate sub base, compacted to 95% or by 3 passes with plate compactor, whichever is greater. Connect to storm drain for positive drainage
Subgrade below geotextile and aggregate base course, compacted to 95% or by 3 passes with plate compactor, whichever is greater
NOTES:
1. Installation to be completed in accordance with manufacturer’s specifications.
2. Do not scale drawings.
Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
Curb and street per project specifications

Concrete curb, sized per project specifications. Align curb with Cell posts. Pavers to be permanently adhered to concrete.

Geotextile, 450mm minimum overlap past excavation

75mm compost between Silva Cell deck and planting soil

Geogrid. 'J' 150mm minimum below backfill at base. Overlap 300mm minimum at top of Cells.

Overlap 300mm minimum at top of Cells.

Backfill, installed in 200mm max. lifts (2 lifts per cell), compacted to 95% or by 3 passes with plate compactor, whichever is greater.

Screw Cell decks to frames (for each) after snapping in place Geogrid. 'J' 150mm minimum below backfill at base. Overlap 300mm minimum at top of Cells.

5mm x 350mm zip ties, attaching Geogrid to Silva Cells at each level and at Cell deck

Backfill, installed in 200mm max. lifts (2 lifts per cell), compacted to 95% or by 3 passes with plate compactor, whichever is greater.

Anchor each Silva Cell to ground with (4) 250mm spike, <10mm dia., see Cell base for spike hole

Silva Cell base slope to match cross-slope or flow-line slope, whichever is greater, to max. 5%

Geotextile on compacted subgrade. NOTE that geotextile is not required if determined by qualified professional. See specifications.

Planting soil per Silva Cell specifications, installed in 200mm lifts (2 lifts per cell)

100mm aggregate sub base, compacted to 95% or by 3 passes with plate compactor, whichever is greater. Connect to storm drain for positive drainage

Subgrade below geotextile and aggregate base course, compacted to 95% or by 3 passes with plate compactor, whichever is greater

NOTES:
1. Installation to be completed in accordance with manufacturer’s specifications.
2. Do not scale drawings.
Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
Screw Cell decks to frames after snapping in place (typ.)

100mm aggregate sub base, compacted to 95% or by 3 passes with plate compactor, whichever is greater. Connect to storm drain for positive drainage

Silva Cell base slope to max. 5%

Subgrade below geotextile and aggregate base course, compacted to 95% or by 3 passes with plate compactor, whichever is greater

Planting soil per Silva Cell specifications, installed in 200mm lifts (2 lifts per cell)

Geogrid. 'J' 150mm minimum below backfill at base. Overlap 300mm minimum at top of Cells.

Backfill, installed in 200mm max. lifts (2 lifts per cell), compacted to 95% or by 3 passes with plate compactor, whichever is greater

5mm x 350mm zip ties, attaching Geogrid to Silva Cells at each level and at Cell deck

Anchor each Silva Cell to ground with (4) 250mm spike, <10mm dia., see Cell base for spike hole

100mm concrete, turn down to deck around tree opening. Position curb over Cell posts.

100mm aggregate base course

75mm compost between Silva Cell deck and planting soil, or 25mm air space

Geotextile, 450mm minimum overlap past excavation

Tree trunk, size varies

150mm min. aggregate base course. Additional aggregate may be necessary in order to accommodate level excavation.

450mm Geotextile on compacted subgrade. NOTE that geotextile is not required if determined by qualified professional. See specifications.

DeepRoot UB18-2 Root barrier

Concrete curb, sized per project specifications, positioned over Cell posts.

Asphalt, asphalt binder, and curb per project specifications

300mm min. aggregate base course. Additional aggregate may be necessary in order to accommodate level excavation.

450mm Ribbon curb, or similar to separate drive lane from parking bay. Per project specifications.

150mm min. aggregate base course. Additional aggregate may be necessary in order to accommodate level excavation.

Angle of repose, varies per project specifications

Planting soil, tamped to max. 85% compaction below root package

150mm mulch above tree pit

Provide inspection riser

Key Plan

NOTES:

1. Installation to be completed in accordance with manufacturer's specifications.
2. Do not scale drawings.

Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.

Parking Bay 3.1

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Parking bay details to be used ONLY for dedicated parking. NOT APPLICABLE for through traffic lanes.

Concrete curb, sized per project specifications, positioned over Cell posts.

Asphalt, asphalt binder, and curb per project specifications

Ribbon curb, or similar to separate drive lane from parking bay. Per project specifications.

100mm aggregate sub base, compacted to 95% or by 3 passes with plate compactor, whichever is greater. Connect to storm drain for positive drainage

Silva Cell base slope to max. 5%

Subgrade below geotextile and aggregate base course, compacted to 95% or by 3 passes with plate compactor, whichever is greater

Geotextile, 450mm minimum overlap past excavation

5mm x 350mm zip ties, attaching Geogrid to Silva Cells at each level and at Cell deck

Anchor each Silva Cell to ground with (4) 250mm spike, <10mm dia., see Cell base for spike hole

Screw Cell deck to frames after snapping in place (typ.)

Geogrid. 'J' 150mm minimum below backfill at base. Overlap 300mm minimum at top of Cells.

5mm x 350mm zip ties, attaching Geogrid to Silva Cells at each level and at Cell deck

Backfill, installed in 200mm max. lifts (2 lifts per cell), compacted to 95% or by 3 passes with plate compactor, whichever is greater

Anchor each Silva Cell to ground with (4) 250mm spike, <10mm dia., see Cell base for spike hole

Geotextile on compacted subgrade. NOTE that geotextile is not required if determined by qualified professional. See specifications.

Planting soil per Silva Cell specifications, installed in 200mm lifts (2 lifts per cell)

-100mm aggregate sub base, compacted to 95% or by 3 passes with plate compactor, whichever is greater. Connect to storm drain for positive drainage

NOTES:
1. Installation to be completed in accordance with manufacturer's specifications.
2. Do not scale drawings.

Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
100mm concrete, turn down to deck around tree opening. Position curb over Cell posts.

Tree grate assembly with concrete anchor bolt, per project specifications.

Tree trunk, size varies
25mm-50mm mulch above tree root ball
Curb and street per project specifications

Tree grate assembly with concrete anchor, per project specifications
Root barrier
100mm concrete, turn down to deck around tree opening. Position curb over Cell posts.

Tree trunk, size varies
25mm-50mm mulch above tree root ball
Curb and street per project specifications

Tree grate assembly with concrete anchor bolt, per project specifications
Root barrier
Pavers, per project specifications. Concrete curb positioned over Cell posts.

Tree Grate details are to be used in conjunction with other Silva Cell standard details. Detail will vary per project and manufacturer specifications.

NOTES:
1. Installation to be completed in accordance with manufacturer's specifications.
2. Do not scale drawings.

Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
Geotextile Wrap detail is to be used in conjunction with other Silva Cell standard details. Detail will vary per project and manufacturer specifications.

Geotextile Wrap at Top of Silva Cell Stack,
600mm total width, placed above Geogrid.
300mm of geotextile placed on top of Silva Cell stack, 300mm placed on side of Silva Cell stack.

NOTES:
1. Installation to be completed in accordance with manufacturer’s specifications.
2. Do not scale drawings.
Disclaimer: Conditions that vary from drawings must be evaluated by a qualified Engineer and appropriate adjustments made.
**Inspection Riser for Drainage:** Vertical, perforated pipe installed at tree openings to allow access for visual inspection of water levels at base of Silva Cell system. Designers to determine frequency of risers, one riser for every three trees is recommended.

**Inspection Riser for Soil:** Vertical pipe installed within pavement section to allow access for visual inspection of soils within Silva Cell system. Designers to determine frequency of risers based on soil inspection goals. One riser for every two trees is recommended.

Inspection Riser details are to be used in conjunction with other Silva Cell standard details. Detail will vary per project and manufacturer specifications.