Preliminary Drainage Study

Portion of Parcel 1, Parcel Map No. 18252
7991-93 Prospect Place
La Jolla, California 92037

Prepared for:
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**Introduction**

This project involves the removal of one of the existing cottages and the construction of a basement below the remaining cottage and construction of a new single family residence at the rear of the site. The existing historic cottage will be raised while basement construction is completed and will be lowered to be supported by the new basement, once it is completed. Additional improvements include a driveway with vegetated swale, vegetated planters and landscaping fronting the site.

The attached drainage area maps are from a topographic survey by Christensen Engineering & Surveying dated May 22, 2015 and revised April 11, 2016. Prior to development some runoff flows from the site northerly to the adjacent property, with the majority of the site runoff flowing onto Prospect Place. Following construction all onsite runoff will be conveyed onto Prospect Place. Since there is a slight increase in total site imperviousness (3,325 sf (60.3%) prior to construction and 3,695 sf (67.0%) following construction), a slight increase in runoff (0.02 cfs) is expected to leave the site (0.40 cfs - 0.38 cfs). No runoff will flow over the neighboring property following construction. So, there will be a slight but insignificant increase in runoff from the site. There will be no adverse effect on public storm drain system from this small increase in total runoff.

The runoff is conveyed to the City of San Diego storm drain system located in Prospect Place and then conveyed to the Pacific Ocean.

Since the project flows in a hardened conveyance system to an exempt water body it is exempt from hydromodification requirements. Calculations for site pollutant treatment is included below for a Filterra Biofiltration unit.

The Rational Method was used to calculate the anticipated flow for the 100-year storm return frequency event using the method outlined in the City of San Diego Drainage Design Manual.

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RCE 54021  
Exp. 12-31-17  

JN A2015-24


**Calculations**

1. **Intensity Calculation**
   (From the City of San Diego Design Manual, Page 86)

   \[ T_c = Time \text{ of concentration} \]

   \[ = 1.8(1.1-C)\text{Dist.}^{1/2} \]
   \[ (S^{1/3}) \]

   Since the slope over the area with the greatest elevation change (122'-118') is (4'/70') 5.7% over the area of the site to be developed and the distance traveled is 70 feet and the runoff coefficient is 0.55.

   \[ T_c = 4.7 \text{ minutes}. \]

   From the Intensity Duration Curve on page 83

   \[ I_{100} = 4.4 \text{ inches} \]

   Since the design elevation is less then 1500' there is no correction factor for elevation.

2. **Coefficient Determination**

   Using the County of San Diego method for determining runoff coefficient and impervious area (San Diego County Hydrology Manual Table 3-1, "D" Soil Type):

   Pre-Construction (60.3% imperviousness) \( C = 0.68 \)
   Post Construction (67.0% imperviousness) \( C = 0.72 \)

3. **Volume calculations**

   \[ Q = CIA \]
Areas of Drainage

The total area of the site to be developed is shown on the drainage area maps since that is the area to be compared pre-construction and post-construction due to the Pre-Construction versus the Post-Construction area of improvements.

Pre-Construction

Area draining northerly to neighboring property (C = 0.68) \( X = 0.0152 \) Acres

Area draining southerly to Prospect Place (C = 0.68) \( Y = 0.1113 \) Acres

Post-Construction

Area draining driveway catch basin (C = 0.71) \( A = 0.1044 \) Acres

Area draining southerly to Prospect Place (C = 0.71) \( B = 0.0221 \) Acres

Pre-Construction

\[
Q_{100X} = (0.68) (4.4) (0.0152) \\
Q_{100Y} = (0.68) (4.4) (0.1113)
\]

\( Q_{100X} = 0.05 \text{ cfs} \)

\( Q_{100Y} = 0.33 \text{ cfs} \)

Post-Construction

\[
Q_{100A} = (0.71) (4.4) (0.1044) \\
Q_{100B} = (0.71) (4.4) (0.0221)
\]
0100A = 0.33 cfs
0100B = 0.07 cfs

4. Discussion

Prior to development some runoff flows from the site northerly to the adjacent property, with the majority of the site runoff flowing onto Prospect Place. Following construction all onsite runoff will be conveyed onto Prospect Place. Since there is a slight increase in total site imperviousness, a slight increase in runoff (0.02 cfs) is expected to leave the site. No runoff will flow over the neighboring property. So, there will be a slight but insignificant increase in runoff from the site. There will be no adverse effect on public storm drain system from this small increase in total runoff.

5. Biofiltration of Site Runoff

Since it is not possible to treat all impervious surface runoff by allowing it to flow over landscaped areas (some location elevations prohibit flow by gravity to landscaped areas, all area runoff will be conveyed to a 4' x 4' Filterra Biofiltration Unit (even landscaped areas). To determine the required size of the unit to treat this runoff the site area (0.1265 Ac), the Intensity (0.2 in/hr for flow through treatment) and a runoff coefficient of C=0.55) This results in a required treatment capacity of 0.014 cfs). The unit is capable of treating 0.037 cfs and so is adequate.
6. Test for Adequacy (fill in for final drainage study)

The attached programs were used to test for adequacy of the PVC drain, as well as the exiting private 18" PVC shown on drawing 31378-2-D. The runoff from the area covered by this study and shown on the attached drainage area map accounts for a total quantity of 4.9 cfs. This total runoff reaches and is conveyed by the existing private 18" PVC drain from the curb inlet located in Carrizo drive. The attached program was used to determine the capacity of the existing 18" PVC drain. A minimum slope of 2% was selected to determine a conservative value for the capacity of the drain. Using this slope and runoff coefficient of 0.01 for the PVC drain the capacity was calculated. Using this value the PVC drain can convey 19.4 cfs, well in excess of the calculated 4.9 cfs that is expected to reach the existing and proposed curb inlets.

The change in imperviousness due to the new construction is expected to increase runoff by only 0.27 cfs, approximately 6% of the total area runoff. This increase in runoff will have an insignificant effect on the downstream system.

The concrete ditches and onsite drains were tested and were found to be adequate to convey the expected runoff.

The greatest water quality volume to be treated is 0.37 cfs or 166 gpm. The 36x35 filter is capable of treating 2.4 cfs so it is adequate to treat the expected water quality volume. It has a bypass capacity of 9.1 cfs and can therefore accept the total volume of runoff from a 100-yr storm without being compromised.
Type of conveyance is a: Sidewalk Underdrain
Diameter of conveyance equals .25 Feet
Slope of conveyance equals 2 %
Roughness equals .01
Flow quantity equals .1100314 CFS
Area equals 2.992894E-02 Square Feet
Velocity equals 3.675372 FPS
Depth of flow equals .1680001 Feet
APPENDIX
TABLE 2

RUNOFF COEFFICIENTS (RATIONAL METHOD)

DEVELOPED AREAS (URBAN)

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Coefficient, C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential:</td>
<td></td>
</tr>
<tr>
<td>Single Family</td>
<td>.55</td>
</tr>
<tr>
<td>Multi-Units</td>
<td>.70</td>
</tr>
<tr>
<td>Mobile Homes</td>
<td>.65</td>
</tr>
<tr>
<td>Rural (lots greater than 1/2 acre)</td>
<td>.45</td>
</tr>
<tr>
<td>Commercial (2)</td>
<td></td>
</tr>
<tr>
<td>80% Impervious</td>
<td>.85</td>
</tr>
<tr>
<td>Industrial (2)</td>
<td></td>
</tr>
<tr>
<td>90% Impervious</td>
<td>.95</td>
</tr>
</tbody>
</table>

NOTES:

(1) Type D soil to be used for all areas.

(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in no case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

\[
\text{Actual imperviousness} = 50\% \\
\text{Tabulated imperviousness} = 80\% \\
\text{Revised } C = \frac{50}{80} \times 0.85 = 0.53
\]
To obtain correct intensity, multiply intensity on chart by factor for design elevation.

### ELEV. FACTOR

<table>
<thead>
<tr>
<th>Elevation</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1500</td>
<td>1.00</td>
</tr>
<tr>
<td>1500-3000</td>
<td>1.25</td>
</tr>
<tr>
<td>3000-4000</td>
<td>1.42</td>
</tr>
<tr>
<td>4000-5000</td>
<td>1.60</td>
</tr>
<tr>
<td>5000-6000</td>
<td>1.70</td>
</tr>
<tr>
<td>Desert</td>
<td>1.25</td>
</tr>
</tbody>
</table>

**APPENDIX I**

**RAINFALL CURVES - DURATION - FREQUENCY**

**COUNTY OF SAN DIEGO**
Example:
Given: Length of flow = 400 ft.
Slope = 1.0%
Coefficient of runoff C = 0.70
Read: Overland flow time = 15 minutes
DRAINAGE AREA MAPS
PRE-DEVELOPMENT
DRAINAGE AREA MAP
POST-DEVELOPMENT
DRAINAGE AREA MAP