

# Foster City Drainage Design Criteria

## 1. GENERAL

All drainage facilities shall be designed in accordance with accepted engineering principles and shall conform to these Design Standards, which are organized as follows:

- Section 1 – General
- Section 2 – Submittal Requirements
- Section 3 – Design Standards
- Section 4 – Design Discharge Calculations
- Section 5 – Hydraulic Grade Line Calculations
- Section 6 – Storm Drain Design Criteria
- Section 7 – NPDES Compliance

### 1.1 Applicability

On-site drainage facilities shall comply with the level of service criteria prescribed in sections 3, 4, and 5. Design of drainage infrastructure within public property (within the City’s right-of-way) shall conform to the specific details and standards in *Section 6 - Storm Drain Design Criteria*. All development shall comply with the San Francisco Bay Region Municipal Regional Stormwater NPDES Permit (MRP) issued by the California Regional Water Quality Control Board.

All applicants that replace and/or develop 2,500 square feet (sf) or more of impervious surface must fill out a *C3 & C6 Development Review Checklist*. Table 1 summarizes the requirements of projects based on development type and size.

**Table 1: Projects that Require C3 & C6 Development Review Checklist**

Development Type	Impervious Surface (sf)	Site Design <sup>1</sup>	Source Control <sup>1</sup>	Treatment Measures <sup>1</sup>	Checklist Worksheets
<b>C3 REGULATED PROJECTS</b>					
Uncovered Parking Areas	5,000 or greater	✓	✓	✓	A, B, C, D, D-1, D-2
Restaurants	5,000 or greater	✓	✓	✓	A, B, C, D, D-1, D-2
Auto Service Facilities	5,000 or greater	✓	✓	✓	A, B, C, D, D-1, D-2
Retail Gasoline Outlets	5,000 or greater	✓	✓	✓	A, B, C, D, D-1, D-2
All Other	10,000 or greater	✓	✓	✓	A, B, C, D, D-1, D-2
<b>NOT C3 REGULATED</b>					
All Other <sup>2</sup>	2,500-10,000	✓	✓		A, B, C

1. Refer to Appendix A and C3 and C6 Development Review Checklist for definitions.
2. Project is not C3 regulated, but must comply with Provision C.3.i.



All development sites that replace or develop 10,000 sf of impervious surface shall comply with C3 and C6 requirements described in *Section 7 - NPDES Compliance*).

In addition, projects that disturb 1.0 acre or more of land shall comply with the California General Construction Permit and requirements stated in *Section 7 - NPDES Compliance* by completing a Stormwater Pollution Prevention Plan (SWPPP), preparing an Operation & Maintenance (O&M) Agreement, and submitting a Notice of Intent (NOI).

Projects are not subjected to hydromodification within Foster City as shown by the Hydromodification Control Area Map for San Mateo County on the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) website.

## 1.2 Foster City Drainage System

The Foster City Central Lagoon acts as a drainage detention basin for the city and is designed to accommodate runoff from a storm of 100-year return frequency, or a storm with a one percent annual average chance of exceedance. Stormwater collected throughout the City flows to the Foster City Lagoon in a wet system, meaning that the pipes are always full of water. All stormwater enters the storm drain system through curb inlets and catch basins, and drains into the lagoon from which it is pumped into the San Francisco Bay. These drainage standards are predicated upon normal operation of the Foster City Central Lagoon.

## **2. SUBMITTAL REQUIREMENTS**

The project applicant must submit improvement plans, drainage calculations, and supporting NPDES compliance to the City for review. These items are detailed in the proceeding sections. The submittal requirements are:

- Plans (See Section 2.2)
- Calculations (See Section 4)
- C3 & C6 Development Review Checklist (if applicable, see Table 1)
  - NPDES Compliance Submittal (if project is C3 regulated, Section 7)
- Encroachment Permit

### 2.1 Requirements

Prior to issuance of a building permit for grading/drainage and utilities, the improvement plans shall include the on site design for a stormwater collection system as described in *Section 4 - Design Discharge Calculations* and show that the City's storm drain system does not require expansion or modification as a



result of the applicant's development. The applicant shall pay for all necessary improvement costs.

Prior to building occupancy, the existing storm drain lines on the development site and downstream pipes (as approved by Public Works) shall be televised to verify they have not become filled with sediment, and cleaned if necessary. If damages are identified, the applicant is responsible for repairs and/or replacement unless prior inspection can prove that damage was pre-development.

During construction, and prior to building occupancy, inspections of the treatment control measures, site design and source control measures for C3 and C6 compliance will be conducted and the property owner shall submit a Maintenance and Operation Agreement for Stormwater Treatment Measures. See *Section 7.7 - Operations and Maintenance Agreement* for additional details.

## 2.2 Plan Sheet Submittal Package

Improvement plans must be signed and stamped by a California Registered Professional Engineer, and must be drawn to scale in Imperial Units. Drawing sets for drainage review must include the following on 3 sets and 1 flash drive (including DXF and DWG files) unless approved otherwise:

- Plans with (NAVD) datum shown on every plan sheet
  - Grading plans
  - Utility plans showing elevations and plan/profile of storm drain pipes, catch basins, and manholes. Include 25-year and 100-year hydraulic grade lines on profiles in NAVD.
  - Landscape planting plans **OR** planting plans for stormwater treatment measures (if a C3 regulated project)
  - Erosion and Sediment Control Sheet with San Mateo Countywide Water Pollution Prevention Program's Construction BMP plan sheet (All projects) <https://www.flowstobay.org/wp-content/uploads/2020/04/Countywide-Program-BMP-Plan-Sheet-June-2014-Update.pdf>
  - Treatment Measure Design Details (if a C3 regulated project)
- Calculations of Design discharges in Tabular format (See Sections 4 & 5)
- C3 & C6 Development Review Checklist (see Table 1)



- NPDES Compliance Submittal (See also Section 7.5) – Required **only** if based on the C3 & C6 Development Review Checklist, the project is **C3 regulated**. Submit the following: (if not C3 regulated, skip)
  - Stormwater Control Plan Sheet
    - Delineated drainage sub-basins within the site with storm drain system schematic and flow directions
    - Source Control Measures
    - Site Design Measures
    - Sizing Calculations for each C3 treatment measure in tabular format
    - Location of treatment measures
  - Operation and Maintenance Agreement (O&M)
  - The Applicant shall submit a letter signed and stamped by the licensed landscape architect verifying that the plants that have been selected for the C3 treatment measures are drought tolerant, inundation tolerant, and require minimal maintenance consistent with the C3 & C6 Development Review Checklist, as provided in Appendix A of the *San Mateo County Wide Water Pollution Prevention Program's C3 Stormwater Technical Guidance Handbook* at [https://www.flowstobay.org/wp-content/uploads/2020/03/SMCWPPP-C.3-Regulated-Project-Guide-High-Res\\_021220\\_0.pdf](https://www.flowstobay.org/wp-content/uploads/2020/03/SMCWPPP-C.3-Regulated-Project-Guide-High-Res_021220_0.pdf)
- Projects that disturb 1.0 acre or more:
  - SWPPP
  - NOI
- Pre-development CCTV inspection (optional)
- Post-development CCTV inspection

Plans and calculations shall be submitted on the NAVD88 vertical datum on every sheet. Vertical datum conversions are as follows:

- Foster City Datum: NGVD29 +100 feet
- NAVD88: NGVD29 + 2.7 feet

*Example Conversion:*

- 103-ft Foster City Datum
- 3-ft NGVD29
- 5.7-ft NAVD88



### 2.3 C3 Regulated Project Submittal

In accordance with current NPDES requirements, new development or significant redevelopment (replacement or development of 2,500 sf of impervious surface) requires incorporation of site design practices that reduce the impacts of development on water quality.

Projects that replace/develop 2,500 sf of impervious surface or more must submit the *C3 & C6 Development Review Checklist*. The checklist should be completed early in the development stage so the City and applicant can better understand the project's NPDES requirements.

Table 1 describes the size and type of projects that are C3 Regulated Projects. Projects that are 1 acre or larger must prepare a SWPPP, NOI, and an O&M Agreement as detailed in *Section 7 - NPDES Compliance*.

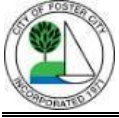
Hydromodification Management Plans (HMPs) are not required in Foster City as shown on the Hydromodification Control Area Map for San Mateo County on the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP) website. <http://www.flowstobay.org/>

Applicants are encouraged to review the information and guidance documents provided by the San Mateo Countywide Pollution Prevention Program (SMCWPPP). <http://www.flowstobay.org/>

## **3. DESIGN STANDARDS**

On-site stormwater collection systems shall be designed to accommodate runoff from the **25-year design storm** prescribed herein with the calculated hydraulic grade line ***maintained at least 0.5-ft below the minimum ground elevation adjacent to an open drainage system element (e.g. catch basin grate).***

Runoff from the design **100-year design storm** prescribed herein is ***confined to street right-of-way or other open space without reaching the lowest adjacent grade of any structure on site.*** The streets and/or open space areas shall convey 100-year stormwater flows to a safe release point at the public right of way.



## 4. DESIGN DISCHARGE CALCULATIONS

The following methodology shall be used to calculate the quantity of runoff (Q) from the site during a 25-year and 100-year storm event.

Calculations shall be submitted in prescribed tabular format. Estimates of relevant parameters should be given along with supporting assumptions, calculations, and documentation.

### 4.1 Rational Method

The Rational Method or NRCS Method ( $Q=CiA$ ) shall be utilized to calculate peak flows for small drainage areas (less than 200 acres), and can be used for surface drainage, culvert, and storm drain design. The Rational Formula is generally written:

$$Q_T = k C i_T A$$

- Where:
- $Q_T$  = peak discharge (cfs)
  - T = recurrence interval (years)
  - k = 1.008 (generally rounded to 1)
  - C = A dimensionless runoff coefficient (**Table 2**)
  - i = The design rainfall intensity in inches/hour for a duration equal to the time of concentration of the watershed (**Table 3**)
  - A = Watershed area in acres.

**The runoff coefficient, C**, is a function of land use and underlying soil type. In Foster City, the underlying soils are poorly draining and classified as D soils. Table 1 values based on land use over D soils shall be used to calculate peak runoff.



**Table 2: Runoff Coefficients by Land Use to be used in Foster City**

Land Use	"C" Factor
Low Density Residential	.45
Medium Density Residential	.60
High Density Residential	.75
Commercial	.80
Industrial	.75
Parks	.35
Agricultural	.40
Urban Open Space	.45
Shrub Land	.30
Paved/Impervious Surface	.85

Where drainage areas contain more than one land use, runoff coefficients shall be weighted based on area. Engineering judgment shall be used to modify runoff coefficients for land uses not listed, and supporting assumptions shall be submitted.

**Time of concentration,  $t_c$ ,** is defined as the travel time of a drop of water from the most hydraulically distant point in the tributary area to the point where peak discharge is being estimated (the "point of interest"). Use of the Rational Method depends upon computation of the time of concentration, which includes overland flow time and travel time in street gutters, swales, storm sewers, drainage channels or ditches, small streams, and any other drainage passages.

Runoff in urbanized basins travels in three phases:

- 1) **Initial overland flow:** Represented by rainfall collected on roof tops traveling to an impervious surface. This value is assumed to be *ten minutes* unless only street or parking lot sections are drained, in which case this value is assumed to be *five minutes*.
- 2) **Gutter flow:** Represented by sheet flow over impervious and pervious surfaces toward a collection point where flow enters the storm drain system. Calculation of this portion's contribution to the time of concentration shall be calculated based on:



$$T_o = \frac{0.007 (nL)^{0.8}}{S^{0.5} i^{0.4}}$$

- Where  $T_o$  = Overland flow time of concentration (minutes)  
 $L$  = Overland flow length in feet  
 $n$  = Roughness coefficient (**Table 3**)  
 $S$  = Average slope of flow path in ft/ft  
 $i_{25,24}$  = 25-yr, 24-hr intensity in inches per hour = 0.175 in/hr

**Table 3: Roughness coefficients for various land types**

Surface Description	n
Smooth surfaces (concrete, asphalt, gravel, bare soil)	0.011
Grass	
Short grass prairie	0.15
Dense grasses	0.24
Bermuda Grass	0.41
Range (natural)	0.13
Woods	
Light underbrush	0.40
Dense underbrush	0.80

*(It is noted that the coefficient “n” given in the overland flow time of concentration equation is not necessarily equivalent to Manning’s roughness coefficient for flow over the indicated surface.)*

- 3) Pipe flow in a storm drain system: Calculated by dividing the distance between design points by the average flow velocity in the reach of pipe between.

The sum of these components for flow traveling to a point of interest is the time of concentration used in the Rational Method calculations.

The rainfall intensity-duration-frequency (IDF) curve is used to determine the average rainfall intensity to be applied over the drainage area to produce peak discharge estimates for a return period of interest. Design rainfall intensity values have been calculated for Foster City using a precipitation data from the San Francisco Airport and Palo Alto rainfall gages. Values of rainfall intensity provided in **Table 4** for select return periods and durations shall be used in the Rational Formula to compute design discharges. The corresponding IDF curves for Foster City are provided in Figure 1. Applicants may interpolate rainfall intensity values using Table 3 or obtain them directly from **Figure 1**.





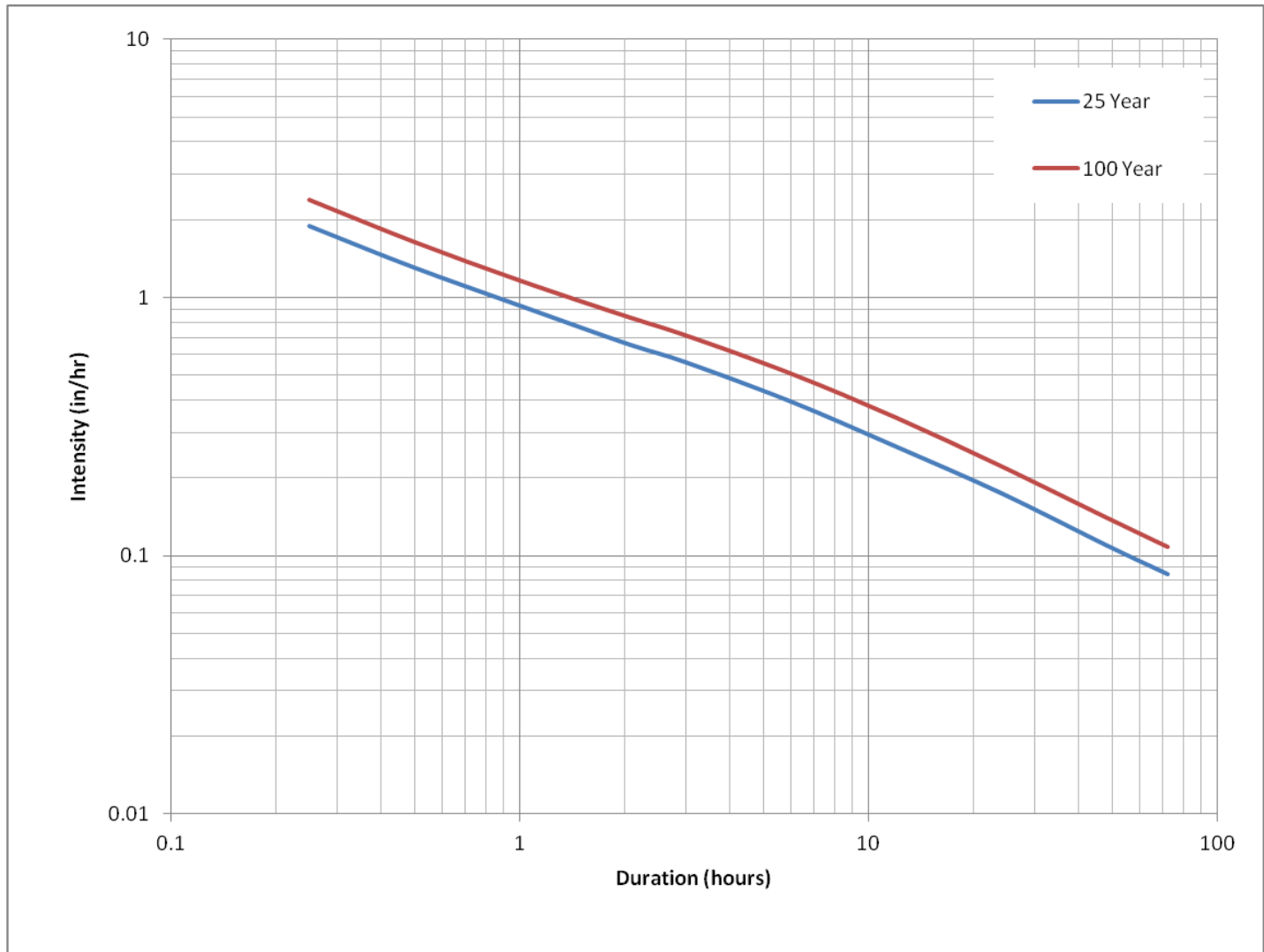
**Table 4: Rainfall intensity in Foster City**

Duration	Return Period (yrs)	
	25	100
	in/hr	in/hr
15 min	1.888	2.397
30 min	1.303	1.646
1 hour	0.930	1.168
2 hours	0.666	0.852
3 hours	0.560	0.715
6 hours	0.395	0.508
12 hours	0.264	0.343
1 day	0.175	0.223
2 days	0.110	0.141
3 days	0.085	0.108

Calculations shall be submitted in the following tabular format:

**Table 5: Design Discharge Submittal Table**

Design Discharge Calculations Summary Table								
Watershed	Area	Area	Composite	T <sub>c</sub>	I <sub>25yr</sub>	I <sub>100yr</sub>	Q <sub>25yr</sub>	Q <sub>100yr</sub>
	acre	ft <sup>2</sup>	C <sub>runoff</sub>	min	in/hr	in/hr	cfs	cfs
A								
B								



**Figure 1: Intensity-Duration-Frequency (IDF) curve for Foster City  
25- and 100-year return period even**



## 5. HYDRAULIC GRADE LINES CALCULATIONS

Manning’s formula shall be used to determine the depth of flow in pipes for the design discharges calculated in *Section 2 – Design Discharge Calculations*.

Manning’s Equation is as follows:

$$Q = \frac{1.49}{n} AR^{\frac{2}{3}} S_f^{\frac{1}{2}}$$

Where  $Q$  = flow rate (cfs) calculated for 25-year and 100-year design discharges

$A$  = cross sectional area (sf)

$n$  = coefficient of friction (**Table 5**)

$S_f$  = friction slope (feet per foot)

$R$  = hydraulic radius (feet) = Area/Perimeter

$P$  = wetted perimeter (feet)

The friction factor, “n” in the Manning’s formula shall be based on **Table 6**.

**Table 6: Manning’s n Value**

Material	n value
Concrete	0.013
PVC/HDPE	0.010

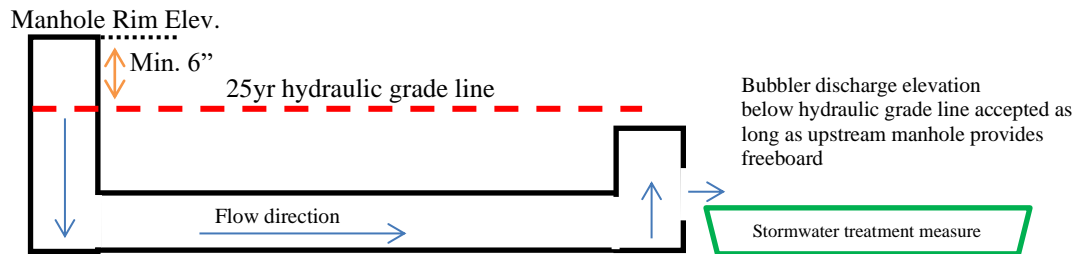
All calculated and assumed values (e.g. manning’s roughness coefficient, run-off coefficients, head losses, hydraulic grade lines, pipe flow velocity, pipe flow rate, pipe flow time, overland flow time, storm intensity, etc.) should be documented in a detailed set of calculations.

All hydraulic gradelines are to be shown on utility plan sheets.

### 5.1 Maximum Allowable

Storm drains shall be designed to carry the calculated peak 25-year design discharge so that a minimum of 0.5 foot of freeboard is provided above the calculated hydraulic grade line at all locations where the storm drain system is exposed to atmosphere.

Exceptions to the above standard as related to “bubble ups” into stormwater treatment measures shall be approved by Engineering Division given that the upstream manhole meets the freeboard requirement. See image below.



In addition, calculations shall be provided per *Section 4.1 - Rational Method* that show that no structures will be inundated by the calculated hydraulic grade lines for the design 100-year runoff.

The hydraulic gradeline within the City’s pipe network is driven by the lagoon elevation. The existing design 25-year hydraulic grade line within the City’s storm drain system is at **1.5-feet NAVD88 (98.8-ft Foster City Datum)**. The design 100-year hydraulic grade line in the City’s storm drain system is at **2-feet NAVD88 (99.3-ft Foster City Datum)**. Calculations shall document hydraulic parameters including pipe roughness and minor losses used to calculate hydraulic grade lines and shown on pipe profiles.

## 6. STORM DRAIN DESIGN CRITERIA

The following criteria pertain only to facilities located within the **public right-of-way** and for **City facilities** that are to be replaced in-kind.

### 6.1 Alignment

Pipes shall be laid in conformity with the prescribed lines and grades shown on project drawings. After each length of pipe has been laid to line and grade, it shall be joined to the preceding section.

Adjustment of pipes to line and grade shall be made by scraping away or filling in and tamping material under the body of the pipe throughout its entire length, and not by blocking or wedging. Bell holes shall be provided at the ends of each pipe length, of sufficient size to permit making up the particular type of joint being used and to assure uniform surface contact between the pipe and the bedding for the entire length of the pipe.

### 6.2 Minimum Pipe size

The minimum pipe size within public rights of way shall be 18 inches in nominal diameter, unless infeasible. Smaller diameter pipes within public right of way are to be replaced in-kind with 18 inch pipes unless it can be demonstrated that it is



infeasible, in which case the new pipe diameter shall match the replaced pipe diameter.

### 6.3 Material

Selection of storm drain pipeline materials shall consider the following: intended use, scour or abrasion conditions, installation and handling requirements, potential for corrosion, flow requirements, product characteristics, cost effectiveness, and physical properties. The following pipe materials are allowed for use in storm drainage systems:

- Reinforced Concrete Pipe (RCP)
- Polyvinyl Chloride (PVC) Pipe
- High-density polyethylene (HDPE)

### 6.4 Pipe Slope

All pipes shall be positively sloped to permit drainage.

### 6.5 Manhole Spacing

Manholes shall be designed and installed per standard specifications and standard storm drain details. Spacing shall be no less than 400 feet on center, or as existing for replacement manholes.

### 6.6 Drainage Structures

Shall comply with City Standard Details and Specifications.

### 6.7 Connections to City storm drains

Shall comply with City Standard Details and Specifications.

### 6.8 Pipe Cover

Minimum pipe cover shall be 2.5-ft.

### 6.9 Pipe Flow

Maximum pipe flow shall be 3.0-ft/s.

### 6.10 Encroachment Permit

Encroachment Permit is required for all work in the Public ROW.



## **7. NPDES COMPLIANCE**

### **7.1 C3 & C6 Development Review Checklist**

Every project that creates/replaces 2,500 sf of impervious surface or more must submit the *C3 & C6 Development Review Checklist*.

### **7.2 Site Design Measures (C3)**

Project applicants are encouraged to implement as many site design measures as feasible to protect water quality. If the project received tentative map approval after December 1, 2012 and creates/replaces 2,500 square feet or more, the project must include at least one of the following site design measures:

- a. Direct roof runoff into cisterns or rain barrels and use rainwater for irrigation or other non-potable use.
- b. Direct roof runoff onto vegetated areas.
- c. Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
- d. Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
- e. Construct sidewalks, walkways, and/or patios with permeable surfaces.
- f. Construct bike lanes, driveways, and/or uncovered parking lots with permeable surfaces.

### **7.3 Source Control Measures (C3)**

Source control measures are intended to reduce pollution at its source(s) by way of maintenance activities or schedules, management practices, structural devices, and other practices or activities. The following practices are required by the City for every project regardless of size.

- Covered or roofed trash enclosures
- Connection of indoor mat/equipment wash racks to the sanitary sewer (with approval from the City)
- Regular street sweeping on site
- Regular cleaning of storm drain inlets on site

### **7.4 Sediment and Erosion Control BMPs (C6)**

Projects that disturb over 1.0 acre must submit a Notice of Intent (NOI) with the State Water Resources Control Board and a Stormwater Pollution Prevention Plan (SWPPP). More information may be found at the State Water Resources Control Board (SWRCB) and the California Stormwater Quality Association (CASQA) websites.



Projects that disturb less than 1.0 acre are still encouraged to incorporate Best Management Practices (BMPs) listed on Worksheet A of the Checklist.

### 7.5 C3 Regulated Project Submittal (NPDES Compliance Submittal)

Refer to Table 1 to identify what projects are C3 regulated. C3 Regulated projects may be reviewed by a third party. In order to facilitate this review, project applicants are required to submit a separate package as described in Bullet 4 of Section 2.2-NPDES Compliance Submittal, and below:

- Stormwater Control Plan Sheet
  - Delineated drainage sub-basins within the site with storm drain system schematic and flow directions
  - Source Control Measures
  - Site Design Measures
  - Sizing Calculations for each C3 treatment measure in tabular format
  - Location of treatment measures
  
- Treatment measure design details
  
- Landscape planting plans **OR** planting plans for stormwater treatment measures
  
- Operation and Maintenance Agreement (O&M)
  
- The Applicant shall submit a letter signed and stamped by the licensed landscape architect verifying that the plants that have been selected for the C3 treatment measures are drought tolerant, inundation tolerant, and require minimal maintenance consistent with the C3 & C6 Development Review Checklist, as provided in Appendix A of the *San Mateo County Wide Water Pollution Prevention Program's C3 Stormwater Technical Guidance Handbook* at [https://www.flowstobay.org/wp-content/uploads/2020/03/SMCWPPP-C.3-Regulated-Project-Guide-High-Res\\_021220\\_0.pdf](https://www.flowstobay.org/wp-content/uploads/2020/03/SMCWPPP-C.3-Regulated-Project-Guide-High-Res_021220_0.pdf)

### 7.6 Treatment Measures

The MRP requires stormwater treatment to be met by using evapotranspiration, infiltration, rainwater harvesting and reuse. Where this is infeasible, landscape-based biotreatment is allowed. Because of high groundwater and poorly draining soils in Foster City, biotreatment is recommended.

In some Special Projects, media filters and high flow rate tree well filters are allowed. See Appendix J of the *C3 Stormwater Technical Guidance Manual* for Special Project criteria.



Section 5.1 of *San Mateo C3 Technical Guidance Manual* describes how to properly size treatment measures to comply with the MRP requirements and Chapter 6 provides technical guidance to commonly used treatment measures.

### 7.7 Operations and Maintenance Agreement

Maintenance is required to assure the long-term, correct functionality of stormwater treatment measures, as well as prevent flooding and presence of mosquitoes. Prior to occupancy, the property owner shall submit an Operations and Maintenance Agreement for Stormwater Treatment Measures, including a Maintenance Plan pertinent to the type(s) of measures included in the project, pursuant to SMCWPPP. Reports documenting inspections and maintenance shall be submitted to the City on an annual basis. Agreement shall include provisions for municipal, Water Board, and Mosquito and Vector Control District staff to be granted access, as needed, to ensure proper maintenance and operation.

Agreement shall be recorded by the San Mateo County Recorder's Office.

### 7.8 San Mateo Countywide Stormwater Pollution Prevention Program (SMCWPPP)

The San Mateo Countywide Water Pollution Prevention Program (SMCWPPP or "Countywide Program") is a partnership of the City/County Association of Governments (C/CAG), each incorporated city and town in the county, and the County of San Mateo, which share a common National Pollutant Discharge Elimination System (NPDES) permit. Foster City is one of 21 member agencies who are joint permit holders of the San Francisco Bay Region MRP. SMCWPPP provides guidance documents that should be followed in compiling NPDES compliance submittals.





## **Appendix A – Glossary of Terms**

**Best Management Practices (BMPs):** Any program, technology, process, siting criteria, operational method or measure, or engineered system, which when implemented prevents, controls, removed or reduces pollution. Includes schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce water pollution. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, litter or waste disposal, or drainage from raw material.

**C3 Regulated Project:** Development projects as defined by Provision C.3.b.ii of the MRP. This includes public and private projects that create and/or replace 10,000 square feet or more of impervious surface, and restaurants, retail gasoline outlets, auto service facilities, and uncovered parking lots (stand-alone or part of another use) that create and/or replace 5,000 square feet or more of impervious surface.

**Biotreatment:** A type of low impact development (LID) measure designed to detain stormwater runoff, filter stormwater runoff through biotreatment soil media and plant roots, and release the treated stormwater runoff to the storm drain system.

**Design Discharge or Design Flow:** The flow that a structure or system of structures is expected to convey, usually without damage to property or people. This is usually expressed as a peak value in cubic feet per second, or cfs.

**Freeboard:** The vertical distance between a flood level and an elevation of interest (e.g. top of a catch basin or top of building slab) for a return period of interest. Freeboard is a factor of safety in the design of stormwater systems.

**Hydraulic Grade Line:** The energy grade line or water surface profile within a non-surcharged pipe.

**Infiltration:** Seepage of runoff through soil pores to groundwater.

**Low-Impact Development (LID):** Design measures that reduce water quality impacts by preserving existing nature landscape or re-creating natural features which minimize imperviousness. Examples include evaporation, transpiration, infiltration, rain water harvesting and reuse.

**Municipal Regional Stormwater Permit (MRP):** Requirements set forth by the Water Quality Control Board for discharge of stormwater runoff to and from municipal separate storm sewer systems, which must be met prior to development or redevelopment in the San Francisco Bay Region.



**National Pollutant Discharge Elimination (NPDES) Program:** As part of the 1972 Clean Water Act, Congress established the NPDES permitting system to regulate the discharge of pollutants from municipal sanitary sewers and industries. The NPDES program was expanded in 1987 to incorporate permits for stormwater discharges as well. Regional Water Quality Control Boards issue stormwater NPDES Permits to local government agencies in order to regulate discharges of municipal stormwater to waters of the state.

**Return Period:** Also known as a “recurrence interval” is an estimate of the likelihood of a flood event occurring, indicating the number of years, on average, in which a specified flow is expected to be equaled or exceeded one time. Return period is the inverse of the exceedance probability. For example, if the probability of an event being exceeded is 0.01 (or 1%), the return period of the event is 100 years.

**San Mateo Countywide Water Pollution Prevention Program (SMCWPPP):** A program that is a partnership of the City/County Association of Governments (C/CAG), each incorporated city and town in the county, and the County of San Mateo, which share a common National Pollutant Discharge Elimination System (NPDES) permit. The program provides guidelines for jurisdictions within San Mateo County to comply with the MRP.

**Self-Retaining Area:** A portion of a development site designed to retain the first one inch of rainfall (by ponding and infiltration and/or evapotranspiration) without producing stormwater runoff. Self-retaining areas must have at least a 2:1 ratio of contributing area to a self-retaining area and a 3” ponding depth. Self-retaining areas may include graded depressions with landscaping or pervious pavement.

**Self-Treating Area:** A portion of a development site in which infiltration, evapotranspiration and other natural processes remove pollutants from stormwater. Self-treating areas may include conserved natural open areas, areas of landscaping, green roofs and pervious pavement. Self-treating areas treat only the rain falling on them and do not receive stormwater runoff from other areas.

**Site Design Measures:** Design features that reduce the amount of impervious surface on a site of new development or significant redevelopment, thereby minimizing runoff and transport of pollutants.

**Source Control:** Source control includes activities, structural devices, prohibition of practices, maintenance schedules and procedures, management practices, and operations that prevent stormwater pollution by mitigating pollution at its source.

**Special Projects:** See Appendix J of the C3 Stormwater Technical Guidance Manual.



**SWPPP:** Stormwater Pollution Prevention Plan. A SWPPP is required for sites that disturb 1.00 acre or more of land.

**Watershed or Drainage Area:** The total area that drains overland or through channels or pipe systems to a specified point of interest based on topography or site grading.