General Sizing Guidelines

One of the major questions when planning for and designing a green street or parking lot stormwater facility is: "How much landscaped space is needed?" For an effective stormwater treatment facility, a quick rule of thumb is that the dedicated landscape space be 4% of the total impervious catchment area. However, the specific answer depends on soil properties, whether or not the project is subject to C.3 requirements, and the specific type of stormwater facility chosen.

The sizing of stormwater facilities depends largely on the soil infiltration capacity. The 4% rule mentioned above is based on percolation rates of 5-10 inches/hour. If the native soil is outside of that range, soil amendments can be imported to help meet that criterion. In most cases where soil amendments are used, it will also be necessary to construct the facility with an underdrain in order to maintain hydraulic capacity throughout the duration of the storm. In all cases, in-situ testing must be conducted by a qualified professional (soils scientist, licensed geologist, or registered professional engineer) to verify that the material meets the percolation requirements.

If the percolation rate is less than 5.0 inches/hour, but the native soil is Hydrologic Soil Group A or B (> 0.5 inch/hour), direct infiltration can still be an effective strategy without soil amendments. However, the stormwater facility should be proportionately larger than 4% of the tributary impervious area. For instance, if the native soil has a demonstrated percolation rate of 1.0 inch/hour, then the facility should be sized at 20% of the tributary impervious area. Additional details on numerical sizing can be found in the C.3 Technical Guidance.

A reasonable native soil infiltration rate estimate can be made by physical inspection of the soil and by using the NRCS interactive online soil survey tool (http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx).

In all cases, thoughtful site design measures that reduce stormwater runoff from impervious areas can help reduce the amount of landscape area needed for stormwater treatment.

Projects Subject to C.3 Requirements

There are specific minimum hydraulic capacity and facility sizing requirements for projects subject to C.3 stormwater regulations. The C.3 Technical Guidance describes the sizing criteria for both volume-based and flow-based facilities. In summary, volume-based facilities must be sized to capture and treat 80% or more of annual runoff. There are three allowable methods to size flow-based facilities, but the simplest and most commonly used method is to size the facility to treat a flow rate equal to the runoff resulting from a constant rainfall intensity of 0.2 inches/hour. For additional information for both volume-based and flow-based facilities, see Section 5.1 of the C.3 Technical Guidance.

Projects <u>Not</u> Subject to C.3 Requirements

Smaller projects do not have to meet the C.3 requirements. However, they are encouraged to have landscape-based stormwater facilities incorporated to the maximum extent practicable. All the same benefits are realized as with larger projects, just on a smaller scale. In retrofit conditions, where site constraints can be overwhelming, the goal of simply introducing as much stormwater-related landscape area as possible is encouraged even if the general 4% sizing criteria cannot be achieved. If only limited measures can be implemented due to site constraints, these measures still carry proportional benefits.

In addition, non-C.3 required stormwater facilities may not need an underdrain system in poor soil conditions if the facility is shallow enough to prevent prolonged periods of standing water (see "Designing with Poor Soils" in this chapter).

SOURCE: GOOGLE EARTH

Figure 5-4: *A typical low-density residential street example in San Mateo County.*

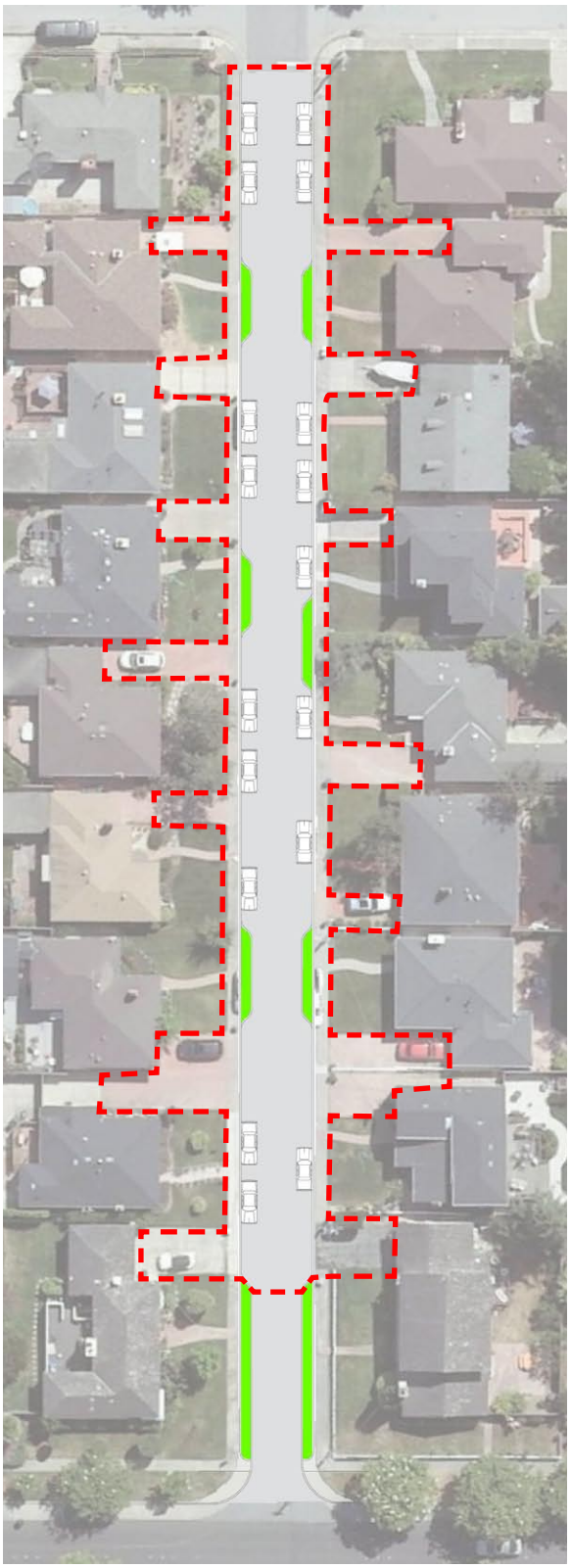
Sizing Example for a Residential Street

The following example illustrates the amount of landscaped space needed to manage the stormwater runoff when using the 4% rule of thumb sizing criteria.

Figure 5-4 shows a typical low-density residential street condition in San Mateo County. This two-way, low-volume street measures approximately 28 feet wide and allows for on-street parking on both sides of the street. There are sidewalks on both sides of the street with no landscape strip along the street curb. The existing driveways, some of which are shared, drain toward the street and contribute additional stormwater runoff.

Due to the wide spacing between driveway locations and the infrequent use of the parking zone, this particular street lends itself to using stormwater curb extensions at specific locations along the street frontage. Using curb extensions would be the simplest and most cost effective stormwater strategy. There would be some on-street parking loss along the street to accommodate the new stormwater facilities.

Figure 5-5 on the opposite page shows eight stormwater curb extensions that could be retrofitted within the parking zones of the street. The green space shown meets the amount of landscape needed using the 4% rule. The stormwater catchment area is delineated by the red dashed line (which includes the residents' driveways). The stormwater curb extensions vary in length in order to fit in between existing driveway locations and to provide for some on-street parking. Figure 5-6 on the opposite page provides more detailed information on this example.



SOURCE: GOOGLE EARTH

Figure 5-5: *The same street utilizing stormwater curb extensions sized according to the 4% rule of thumb. The dashed red line delineates the catchment area and the green space denotes stormwater curb extensions.*

Figure 5-6:
STREET EXAMPLE DETAILS

Street Type: Residential

Street Width: 28 feet wide

On-Street Parking: Both sides of street, not frequently used

Proposed Stormwater Facility: Stormwater curb extensions

Stormwater Facility Dimensions: 4' wide, length varies from 30' to 60'

Total Landscape Area: 960 square feet

Total Stormwater Catchment Area: 22,940 square feet (6,785 square feet of runoff is from driveways)

Overall Sizing Percentage: 4.2% (6% if driveway runoff is not a contributing factor)

On-Street Parking Spaces Retained: 17 spaces (a loss of 10 spaces)

Of particular note in this sizing example, is the amount of runoff that residential driveways contribute. This driveway runoff could be reduced or eliminated by incorporating any of the techniques described earlier in Chapter 4 under "Residential Driveway Options" or by redirecting the flow into rain gardens within existing front yards. Taking such measures would reduce the amount of stormwater runoff flowing into the street and could increase the