Outline of Presentation

- Overview
- Handbook Contents
- Example Details
Overview

- MRP requires GSI Plans to include general design guidelines, details, and specifications
- SCVURPPP members requested county-wide guidance document
- Companion to C.3 Stormwater Handbook (June 2016)
  - Guidance for Regulated Projects
C.3 Stormwater Handbook

- Municipal Staff and Project Applicants
- Concepts
  - LID site design
  - Treatment Measures
  - Sizing Methodology
- Technical Guidance
  - Bioretention Area
  - Tree Well Filter
  - Pervious Pavement
  - Infiltration Trench

Guidance for Implementing Stormwater Requirements for New Development and Redevelopment Projects

Santa Clara Valley Urban Runoff Pollution Prevention Program

June 2016
GSI Handbook

- Part 1—General Guidelines
  - Final Draft February 2018
  - SCVURPPP SWRP webpage
- Part 2—Details & Specifications
  - Revised Draft June 2018
  - Final available early 2019
Part 1

- Chapter 1: Introduction
- Chapter 2: Integration of GSI w/Public Streets, Parking Lots, and Parks
- Chapter 3: Design Guidance for GSI Measures
- Chapter 4: Sizing Methodology for GSI Measures
- Chapter 5: Post Construction Maintenance
- Chapter 6: Example GSI Applications
Chapter 1

- Non-Regulated Projects
- Integration of LID into public rights-of-way
  - Streets and sidewalks
  - Parking lots
  - Public parks/landscape areas
- Focus on special considerations
  - Retrofits
  - Streetscape vs parcel
Chapter 2

- Integration of GSI with:
  - Public Streets
  - Parking Lots
  - Parks and other Public Outdoor Areas
- Considerations unique to streets and public rights-of-way
- Public Street Terminology
Chapter 2

Street Cross Section

Figure 2-1. Street and sidewalk cross section, conceptual example (courtesy of Streetmix.net)
Chapter 2

- Street Functional Classification

Arterial

Collector

Local
Chapter 2

- Cycling Infrastructure Typologies

Class I - Paths/Trails

Class II - Lanes

Class III - Routes

Class IV - Protected
Chapter 2

- LID Treatment Measures in Public Spaces
  - Benefits
  - Potential Constraints and Considerations
  - Potential Locations
Treatment Measures

- Bioretention
  - Stormwater Planter
  - Stormwater Curb Extension (corner and mid-block)
  - Stormwater Tree Well Filter

[Image of bioretention and tree well filter]
Treatment Measures

- Pervious Pavement
  - Cross walks
  - Sidewalks
  - Parking areas
  - Streets
Treatment Measures

- Infiltration Facilities
  - Dry wells (deep)
  - Trenches (shallow)
  - Subsurface systems
Identify Potential Sites

- Leverage Planned Projects
  - Capital Improvement Projects
  - Utility maintenance or relocation
  - Public school redevelopment
  - Partnerships with private redevelopment projects

- Suitable Project Sites for Landscape GSI

- Siting Considerations
  - Parking Lots
  - Parks/Plazas/Outdoor Areas
  - Public Rights of Way
Identify Potential Sites

- **Parking Lots**
  - Shortening parking stalls for planters
  - Leftover space e.g., in front of and/or next to angled parking
  - Perimeter locations
  - Permeable pavement in parking stalls
Identify Potential Sites

- Parks/Plazas/Outdoor Areas
  - Combine with public art projects
  - Use park as off-site area or regional project
  - Use C.3 Handbook for parcel-based areas
  - National Recreation and Park Association Guide
Identify Potential Sites

- Public Right of Way (ROW)
  - Street Functional Classification
  - Land Use Type
    - Low density residential
    - High density residential
    - Commercial main street
    - Industrial
    - Alley

![Low Density Residential – Palo Alto](image)
Identify Potential Sites

- Public ROW (continued)
  - Other Components/Travel Use
    - High volume pedestrian
    - Walkable commercial corridor
    - Auto oriented
    - Transit focus
    - Bike focus (bike route)
    - Truck/freight route
    - Emergency routes
    - Shared
Identify Potential Sites

- Public ROW (continued)
  - Site Conditions (existing and future)
    - Gradient/drainage patterns
    - Storm drain system
    - Subterranean conditions (soil & groundwater depth)
  - Assess Street Trees
  - Utilities
  - Roadway width (road diets)
  - Sidewalk width
Chapter 3

- Design Guidance
- Integration w/Parks, Plazas & Public Outdoor Areas
- Integration w/Roadway Design
  - Lane width
  - Diverters/closures

Full closure concept courtesy of City of Emeryville
Chapter 3

- Integration with Cycling Facilities
- Integration with Pedestrian Facilities
  - Curb extensions – traffic calming
  - ADA issues
Chapter 3

- Utility Coordination
  - Avoidance – change project location
  - Acceptance – protect utility in place
  - Mitigation – change project design
  - Relocation – move/replace utility

Gas        Phone/Internet Cable
Sewer      Power (Underground and Overhead)
Water      Streetlights, traffic signals
Fire Hydrants
Chapter 3

- Landscape Design
  - Sustainable landscape principles
  - Plant selection
  - Plant spacing/location
  - Tree planting
  - Minimum soil volume
  - Strategies for achieving larger soil volumes
  - Biotreatment Soil Media (BSM)
  - Mulch
Chapter 3

- Design with Maintenance in Mind
  - Work in high traffic areas
  - Safety
  - Equipment
  - Street sweeper
  - Litter

- Trash/Litter Capture Guidance

Figure 3-64. Litter needing manual collection in a stormwater planter in the City of San Mateo. (Credit EOA)
Chapter 4

- Sizing Methodology
  - Standard
    • C.3 Stormwater Handbook
    • C.3.d volume for Regulated Projects
  - Alternative – BASMAA Guidance
    • Document project constraints
    • Use sizing chart to determine smallest size that will meet C.3.d
    • If this facility size is still infeasible, identify variations needed from standard design
    • Estimate percent of C.3.d volume that will be treated and evaluate cost-effectiveness
Chapter 5

- Post-construction Maintenance Guidance
  - Train staff
- May change over time
  - Establishing vegetation
  - Maintenance of vegetation
- Surface level
  - Pruning/weeding/invasive vegetation control
  - Replacing treatment soil and mulch
  - Watering
  - Vacuum/street sweeper (permeable pavement)
Maintenance Guidance

- **Cleaning actions**
  - Trash removal
  - Sediment removal

- **Erosion control**
  - Mulch
  - Cobbles/splash blocks/flow dissipaters

- **Inlet/outlet cleaning**

- **Subsurface maintenance**
  - Pipe flushing
Maintenance Guidance

- Minor structural and functional repairs
  - Replacing broken or damaged pervious pavement
  - Regrade soil surface
- Suggested frequencies
Chapter 6

- Sample Applications
  - Public Streets
    - Functional classifications
    - Land use
  - Parking Lots
  - Parks
  - Other Public Outdoor Areas

- Case Studies
  - Key elements
  - Additional benefits
  - Project outcomes and lessons learned
Chapter 6: Southgate

- Local, narrow streets
- Low density residential area with on-street parking

Figure 6-5. Localized ponding before green stormwater infrastructure upgrades in the Southgate Neighborhood. (Credit: Palo Alto.)
Chapter 6: Southgate

- 16 bioretention stormwater planters & corner curb extensions
- Permeable concrete pavers in intersection crosswalks and pedestrian walkway
Chapter 6: Southgate

- Bioretention areas
  - Underdrains or infiltration columns
  - Shape affected by
    - Utility conflicts
    - Existing, mature trees
    - Flat slope
- Corner curb extensions
  - Traffic calming
  - Minimize parking loss

Graphic from Carlet presentation 6/4/14
Chapter 6: Southgate

- Permeable pavers
  - Infiltration columns w/sand layer to protect GW
  - Concrete bands prevent paver migration in crosswalks
Part 2: Details & Specs

- Compilation of available details and specifications from:
  - BASMAA
  - Central Coast Low Impact Development Initiative
  - Other jurisdictions (revised for local area as needed)
    - SFPUC (2016)
    - CalTrans (2016)
    - Philadelphia (2011)
    - District of Columbia (2014)
    - Denver (2016)
    - New York City (2014)
    - Portland OR (2016)
    - Seattle (2016)
    - Moreland Australia (2013)
Part 2: Details & Specs

- Pervious pavement
- Stormwater Planter
- Stormwater Curb Extension
- Stormwater Tree Well Filter
- Infiltration Facilities (trenches and dry wells)

Components
- Edge treatment
- Utility Clearances
- Inlet/curb cuts
- Outlet/Overflow
- Underdrain
Part 2: Details & Specs

- Reviewed by SCVURPPP member agencies
- Series of workshops
- Now focusing on SFPUC, BASMAA and Central Coast LIDI details
- Revise for SCVURPPP typical details (early 2019)
NOTES:
1. AVOID UTILITY CONFLICTS WHENEVER POSSIBLE IN THE SITING OF BIORETENTION PLANTERS. IF UNAVOIDABLE, PROTECT EXISTING UTILITIES AND MAINTAIN MINIMUM SETBACKS AS REQUIRED BY LOCAL UTILITY PROVIDER.
2. PROVIDE UNDERDRAIN WHERE REQUIRED TO MEET THE MINIMUM SURFACE WATER DRAWDOWN TIME. LONGITUDINAL SLOPE OF PIPE SHALL BE 0.5% MINIMUM.
3. FOR OFFLINE FACILITIES IN WHICH UNDERDRAINS ARE REQUIRED, DESIGNEE TO SPECIFY WHETHER UNDERDRAIN PIPE WILL DIRECTLY CONNECT TO STORM DRAIN MAIN OR TO NEARBY CATCH BASIN STRUCTURE TO MEET CITY REQUIREMENTS.
4. ADHERE TO ALL LOCAL AND FEDERAL ACCESSIBILITY REQUIREMENTS FOR THE SIDEWALK AND CURB RAMP DESIGNS. PROVIDE TWO PERPENDICULAR CURB RAMPS AT CORNERS WHEREVER FEASIBLE.
CONSTRUCTION NOTES:


2. EXISTING UTILITIES AND NATIVE SOIL AROUND EXISTING UTILITIES SHOULD REMAIN IN PLACE WHERE POSSIBLE. IF A PORTION OR ALL OF THE UTILITY IS UNCOVERED DURING EXCAVATION OR EXISTING SOIL WITHIN 1 FOOT OF THE KNOWN EXISTING UTILITY IS SCARIFIED, NATIVE SOIL OR APPROVED ENGINEERED BACKFILL SHALL BE CAREFULLY PLACED AND COMPACTED AROUND THE UTILITY PER THE UTILITY PROVIDER'S REQUIREMENTS.

3. UTILITY PROVIDER MAY ALLOW UTILITY SERVICES TO BE LEFT IN PLACE AND WRAPPED WITH A WATER-TIGHT WRAP OR TAPE IN LIEU OF A SLEEVE. THIS MUST BE APPROVED PRIOR TO THE START OF CONSTRUCTION.
**MINIMUM MATERIAL THICKNESS (IN):**

<table>
<thead>
<tr>
<th>LAYER</th>
<th>MATERIAL TYPE*</th>
<th>MODERATE VEHICULAR</th>
<th>LIGHT VEHICULAR</th>
<th>PEDESTRIAN</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>GOOD SOILS**</td>
<td>POOR SOILS**</td>
<td>GOOD SOILS**</td>
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<tr>
<td>A</td>
<td>PERMEABLE UNIT PAVERS</td>
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<td>3 1/8</td>
<td>3 1/8</td>
</tr>
<tr>
<td>B</td>
<td>LEVELING COURSE ASTM NO. 8</td>
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<td>2</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>BASE COURSE ASTM NO. 57</td>
<td>6</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>RESERVOIR COURSE ASTM NO. 2, 3, OR 57</td>
<td>22</td>
<td>28</td>
<td>-</td>
</tr>
</tbody>
</table>

* MATERIAL FINER THAN NO. 100 SIEVE SHALL NOT EXCEED 2 PERCENT FOR ANY AGGREGATE LAYER (LICENSED PROFESSIONAL TO SELECT AGGREGATE).

**GOOD** AND **POOR** SOIL CLASSIFICATIONS BASED ON AASHTO GUIDE FOR DESIGN OF PAVEMENT STRUCTURES. SEE DESIGNER NOTES FOR SUBGRADE ASSUMPTIONS. LICENSED PROFESSIONAL MUST CALCULATE REQUIRED DEPTH BASED ON SITE CONDITIONS.

**TYPICAL JOINT FILLER AGGREGATE SIZE:**

<table>
<thead>
<tr>
<th>GAP WIDTH (IN)</th>
<th>JOINT FILLER AGGREGATE *</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 OR 1/2</td>
<td>ASTM NO. 8</td>
</tr>
<tr>
<td>1/4</td>
<td>ASTM NO. 9 OR 89</td>
</tr>
<tr>
<td>1/8</td>
<td>ASTM NO. 10 **</td>
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</tbody>
</table>

* PROVIDED FOR REFERENCE ONLY, FOLLOW MANUFACTURER'S RECOMMENDATIONS

**FOR POROUS PAVERS ONLY, ASTM NO. 20 SAND NOT ALLOWED PER MANUFACTURERS RECOMMENDATIONS.

**CONSTRUCTION NOTES:**

1. SEE PERMEABLE/POROUS UNIT PAVER SPECIFICATIONS FOR WEARING COURSE, PAVEMENT BASE, SUBGRADE, AND OTHER REQUIREMENTS FOR PERMEABLE/ POROUS UNIT PAVER FACILITIES.

2. MINIMUM UTILITY SETBACKS AND PROTECTION MEASURES MUST CONFORM TO CURRENT SFPUC ASSET PROTECTION STANDARDS AND OTHER UTILITY PROVIDER REQUIREMENTS. COORDINATE WITH ENGINEER IN THE EVENT OF UTILITY CROSSINGS AND UTILITY CONFLICTS.
Part 2: Details & Specs

- Municipal GSI Plans will
  - Reference Handbook
  - Incorporate into local standards (modified as needed)
  - Combination
    - Incorporate most commonly used details
    - Reference others
Contact Information

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