Overview of the Final LID Feasibility Worksheets

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SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

Outline of Presentation

- Why are there 3 worksheets and how do they fit together?
- Screening worksheet
- Infiltration feasibility worksheet
- Rainwater harvesting and use feasibility worksheet
- Attachments to the worksheets

Why are there 3 worksheets?

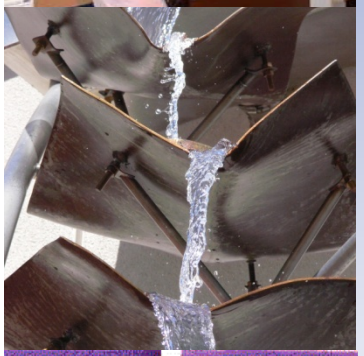
- For most projects:
  - It will be infeasible to treat the C.3.d amount of runoff with infiltration or harvesting/use.
  - The screening worksheet should allow you to make a finding of infeasibility.
- For a few projects:
  - A more detailed analysis will be needed.
  - The infiltration and/or harvesting & use worksheets will help with the detailed analysis.

How do the worksheets fit together?

- If results from the screening indicate further analysis is needed, the applicant will:
  - Complete the infiltration feasibility worksheet, or
  - Complete the harvesting and use feasibility worksheet, or
  - Use information in the LID feasibility report to do a project-specific analysis of harvesting/use feasibility.

Screening Worksheet: Quick “off-ramps”

- Applicants are advised to ask agency staff about Special Project status:
  - If it is a Special Project, LID treatment requirements are reduced.
- Infiltration is infeasible if soils:
  - Have a saturated hydraulic conductivity rate of < 1.6, OR
  - Are Type C or D.
- Harvesting/use is infeasible if:
  - The project will install and use recycled water for non-potable uses.



Screening Worksheet

Calculate the "Potential Rainwater Capture Area"

- This is the area (sq.ft.) from which rainwater could potentially be harvested for use.
- Evaluate the whole project.
- If the screening results in infeasibility due to lack of demand, AND if the project includes a roof with an area $\geq$ 10,000 sq.ft., THEN, complete this form for that roof area only.
- If there is more than 1 such roof, evaluate each roof separately.

Screening Worksheet

Estimate potential demand for harvested rainwater

- The “potential rainwater capture area” is used to determine if the C.3.d amount of runoff could be used for:

1. Irrigation

Is there enough landscaping to use all this water?

Could water be conveyed by gravity?

How Do We Know How Much Landscaping Is Enough?

- Screening Worksheet shows a threshold for irrigation demand:
  - If landscaped area is **LESS than 3.2 times the potential rainwater capture area**, then harvesting for irrigation is infeasible.
  - This ratio comes from Table 11 in the LID Feasibility Report.

Irrigation Demand Feasibility Threshold

Table 11: EIATIA Ratios for Rain Gauges Analyzed

Rain Gauge	Required Daily Demand[1] (gal/day)	ET Data Location[2]	Conservation Landscaping			Turf Areas		
			Demand per Irrigated Acre[3]	EIATIA	Resultant Imper-viousness (%)	Demand per Irrigated Acre[3]	EIATIA	Resultant Imper-viousness (%)
Palo Alto	2,900	Redwood City	450	6.4	13%	900	3.2	24%
San Francisco	4,600	San Francisco	360	12.8	7%	720	6.4	14%
San Francisco Oceanside	4,300	San Francisco	360	11.9	8%	720	6.0	14%

Footnotes:

[1] To achieve 80 percent capture within maximum allowable drawdown time (Table 9).

[2] Closest location selected, from Table F-1.

[3] From Table 7.

- Source: Table 11, LID Feasibility Report
- EIATIA = Ratio of “Effective Irrigated Area to Impervious Area”

Screening Worksheet
Estimating Residential Toilet Flushing Demand

- The “potential rainwater capture area” is used to determine if the C.3.d amount of runoff could be used for:

2. Toilet flushing

- For **Residential Projects:**
  If there are LESS than 124 dwelling units per impervious acre, then harvesting for toilet flushing is infeasible.

Residential Toilet Flushing Demand Feasibility Threshold

LID Feasibility Worksheet
Attachment 2: Toilet-Flushing Demand Required for Rainwater Harvesting Feasibility per Impervious Acre (IA) [1,2]

Table 1 – San Mateo County:

Rain Gauge[3]	Required Demand (gal/day/IA)[4]	Residential		Office/Retail[5]		Schools[6]	
		No. of residents per IA[7]	Dwelling Units per IA[8]	Employees per IA[9]	Interior Floor Area (sq.ft./IA)[10]	Employees[11] per IA	Interior Floor Area (sq.ft./IA)[12]
Palo Alto	2,900	340	124	420	84,000	90	27,000
San Francisco	4,600	530	193	670	134,000	140	42,000
SF Oceanside	4,300	500	182	620	124,000	130	39,000

- Table in Worksheet Attachments, based on Table 10 in LID Feasibility Report (assume 2.7 residents per dwelling unit)
- IA = Impervious Acre

Screening Worksheet
Estimating the Commercial/Industrial Toilet Flushing Demand

- The "potential rainwater capture area" is used to determine if the C.3.d amount of runoff could be used for:

2. Toilet flushing

- For **Commercial, Institutional or Industrial Projects:**
  If there is LESS than 84,000 square feet of interior floor area per impervious acre, then harvesting for toilet flushing is infeasible.

Office/Industrial Toilet Flushing Demand Feasibility Threshold

LID Feasibility Worksheet

Attachment 2: Toilet-Flushing Demand Required for Rainwater Harvesting Feasibility

Table 1 – San Mateo County:

Rain Gauge[3]	Required Demand (gal/day/IA)[4]	Residential		Office/Retail[5]		Schools[6]	
		No. of residents per IA[7]	Dwelling Units per IA[8]	Employees per IA[9]	Interior Floor Area (sq.ft./IA)[10]	Employees[11] per IA	Interior Floor Area (sq.ft./IA)[12]
Palo Alto	2,900	340	124	420	84,000	90	27,000
San Francisco	4,600	530	193	670	134,000	140	42,000
SF Oceanside	4,300	500	182	620	124,000	130	39,000

- Office/Retail also applies to industrial toilet use.
- Square footage derived from State plumbing code occupant load factors for toilet use.
- IA = Impervious Acre

Screening Worksheet
Estimating School Toilet Flushing Demand

- The “potential rainwater capture area” is used to determine if the C.3.d amount of runoff could be used for:

2. Toilet flushing

- For **School Projects:**
  If there is LESS than 27,000 square feet of interior floor area per impervious acre, then harvesting for toilet flushing is infeasible.

School Toilet Flushing Demand Feasibility Threshold

LID Feasibility Worksheet

Attachment 2: Toilet-Flushing Demand Required for Rainwater Harvesting Feasibility

Table 1 – San Mateo County:

Rain Gauge[3]	Required Demand (gal/day/IA)[4]	Residential		Office/Retail[5]		Schools[6]	
		No. of residents per IA[7]	Dwelling Units per IA[8]	Employees per IA[9]	Interior Floor Area (sq.ft./IA)[10]	Employees[11] per IA	Interior Floor Area (sq.ft./IA)[12]
Palo Alto	2,900	340	124	420	84,000	90	27,000
San Francisco	4,600	530	193	670	134,000	140	42,000
SF Oceanside	4,300	500	182	620	124,000	130	39,000

- Square footage derived from State plumbing code occupant load factors for toilet use.
- IA = Impervious Acre

Screening Worksheet
Estimating Mixed-Use Toilet Flushing Demand

- The "potential rainwater capture area" is used to determine if the C.3.d amount of runoff could be used for:

2. Toilet flushing

- For **Mixed Residential and Commercial Use:**
  - Evaluate the residential toilet flushing demand, using a prorated acreage of impervious surface.
  - Evaluate the commercial toilet flushing demand using a prorated acreage of impervious surface.

Screening Worksheet
Estimating Industrial Process Demand

- The “potential rainwater capture area” is used to determine if the C.3.d amount of runoff could be used for:

3. <u>Onsite Industrial Process</u>

  - For industrial projects:
    - Is the industrial process demand for non-potable water LESS than 2,900 gallons/day per acre of the Potential Rainwater Capture Area?

Industrial Process Water Demand Feasibility Threshold

LID Feasibility Worksheet

Attachment 2: Toilet-Flushing Demand Required for Rainwater Harvesting Feasibility

Table 1 – San Mateo County:

Rain Gauge[3]	Required Demand (gal/day/IA)[4]	Residential		Office/Retail[5]		Schools[6]	
		No. of residents per IA[7]	Dwelling Units per IA[8]	Employees per IA[9]	Interior Floor Area (sq.ft./IA)[10]	Employees[11] per IA	Interior Floor Area (sq.ft./IA)[12]
Palo Alto	2,900	340	124	420	84,000	90	27,000
San Francisco	4,600	530	193	670	134,000	140	42,000
SF Oceanside	4,300	500	182	620	124,000	130	39,000

- The “Required Demand” is the same for all types of uses for captured rainwater.
- For industrial process water, there is no linkage between non-potable water demand & building occupancy or square footage.
- IA = Impervious Acre

Results of Screening Analysis

- The screening analysis will lead to one of the following “next steps”:
  - Either implement biotreatment, or
  - Conduct further analysis.

Results of Screening Analysis

- Further analysis of **Infiltration** is needed if:
  - A site-specific soils report found that:
    - soils have a saturated hydraulic conductivity rate of 1.6 or higher, OR
    - soils are Type A or B.
  - The project does not require a soils report, but the map in Attachment 3 of the LID feasibility worksheets indicates the site is in an area where saturated hydraulic conductivity > 1.6.

Results of Screening Analysis

- Further analysis of **Rainwater Harvesting and Use** is needed if:
  - The project will NOT install and use a recycled water plumbing system, AND
  - There was a “No” answer to any of the questions in Sections 2 or 5 of the screening worksheet.

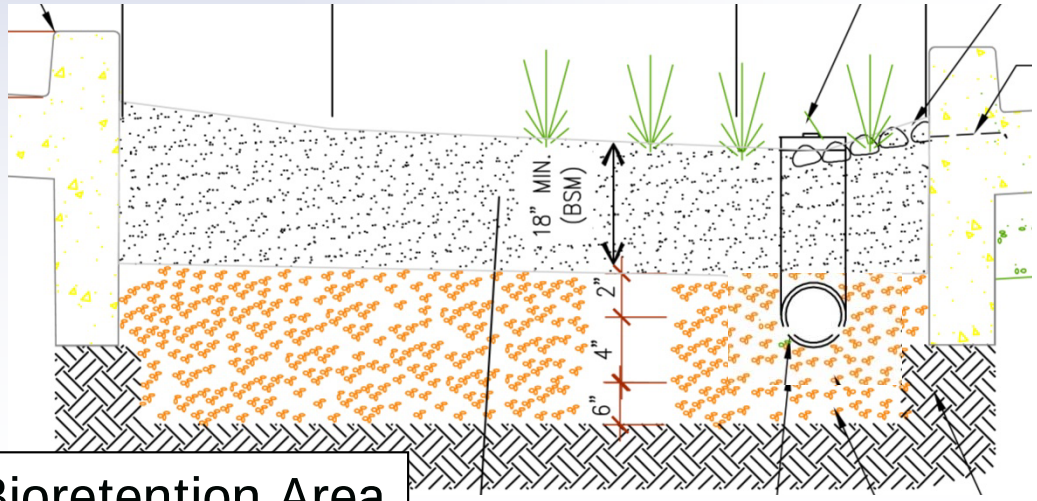
Infiltration Feasibility Worksheet

- Fill out this worksheet ONLY for projects where soils either:
  - Have a saturated hydraulic conductivity (Ksat) rate $\geq$ 1.6 in/hr, or
  - Are Type A or B soils (if Ksat rate not available).
- This worksheet will help identify potential hazards to infiltration.

Infiltration Worksheet

Makes a Distinction between “infiltration devices” and “infiltration measures”

- “Infiltration Devices” are deeper than they are wide. Examples include <u>some</u> infiltration trenches and basins.
- “Infiltration Measures” are wider than they are deep. Examples include bioretention areas and <u>shallow</u> infiltration basins and trenches.
- “Infiltration Facilities” include both infiltration measures and infiltration devices.

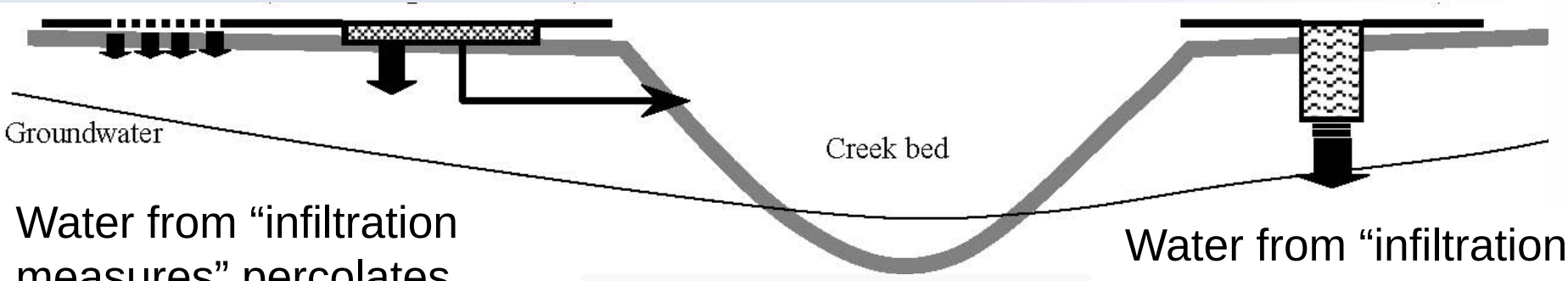


Profile of Bioretention Area

Infiltration Worksheet

Why distinguish between “infiltration devices” and “infiltration measures”?

- Because infiltration devices bypass surface soils and introduces rainwater **directly** to subsurface soils.
- With infiltration measures, water reaches the subsurface soils **indirectly** after filtering through surface soil.



Water from “infiltration measures” percolates through surface soils, and may use an underdrain.

Water from “infiltration devices” bypasses surface soils.

Source: Contra Costa C.3 Handbook

Infiltration Worksheet

Questions that apply to BOTH devices and measures

1. Would infiltration facilities conflict with underground utilities?
2. Is there potential to mobilize soil or groundwater pollutants?
3. Are there geotechnical hazards?
   - Slopes > 10%,
   - Buildings < 10 feet from infiltration facility,
   - Etc.

Infiltration Worksheet

Questions that apply ONLY to devices (direct infiltration)

4. Do water district or other **agency policies** regarding separation from groundwater table or setbacks prevent use of an infiltration device?
5. Would the device be < 100 feet from:
   - Septic tank,
   - Underground storage tank with hazardous materials, or
   - Other potential underground source of pollution?

Infiltration Worksheet

Questions that apply ONLY to devices (direct infiltration)

6. Would a seasonal high **groundwater table** be within 10 ft of the base of the device?
7. Do **land uses** pose a high threat to groundwater, including:
   - Industrial and light industrial activities?
   - Avg. daily traffic of 25,000 or more on a main roadway, or 15,000 or more on an intersecting roadway?
   - Auto repair shops, fleet storage, car washes?
   - Nurseries?

Infiltration Worksheet

Questions that apply ONLY to devices

8. Is there a ground water **production well** that would be within 100 feet of the device?

Rainwater Harvesting and Use Worksheet

- This is an Excel spreadsheet that includes pre-set formulas.
- Section 1 – Project Data:
  - 1.5 Identify project type (dropdown table selects “Commericial”, “Residential”, etc.)
  - 1.5 For residential or mixed use, enter number of dwelling units.
  - 1.6 Enter the square footage of non-residential interior floor area.
  - 1.7 Enter rainwater capture area.

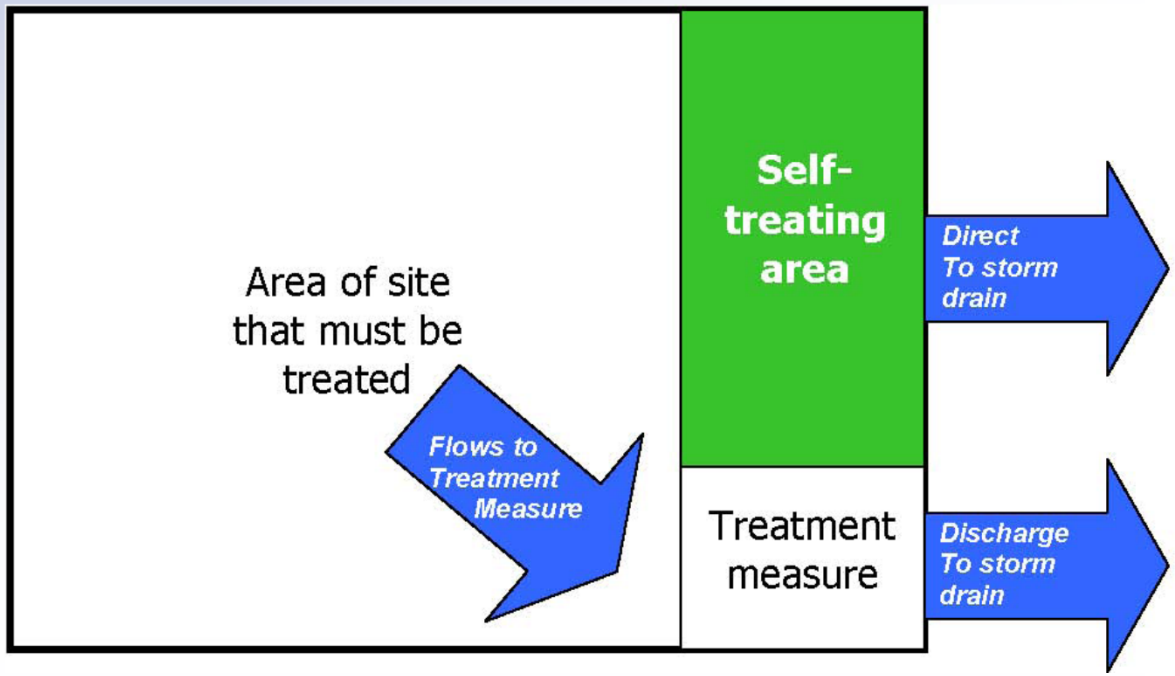
Rainwater Harvesting and Use Worksheet

- Section 1 – Project Data:
  - 1.8 Enter percentage of **Special Project** LID treatment reduction (if applicable).
  - 1.9 LID treatment reduction is subtracted from Potential Rainwater Capture Area.

- Section 2 - Self-treating Areas, Etc.
  - 2.1 Enter the square footage of any **self-treating area** that is included within the Potential Rainwater Capture Area.

Self-Treating Areas Reduce the Area that Requires Treatment

- Stormwater from **pervious** portions of the project can flow directly to the storm drain (no mixing with runoff from impervious areas):
  - Landscaping
  - Green roof
  - Properly-designed pervious paving

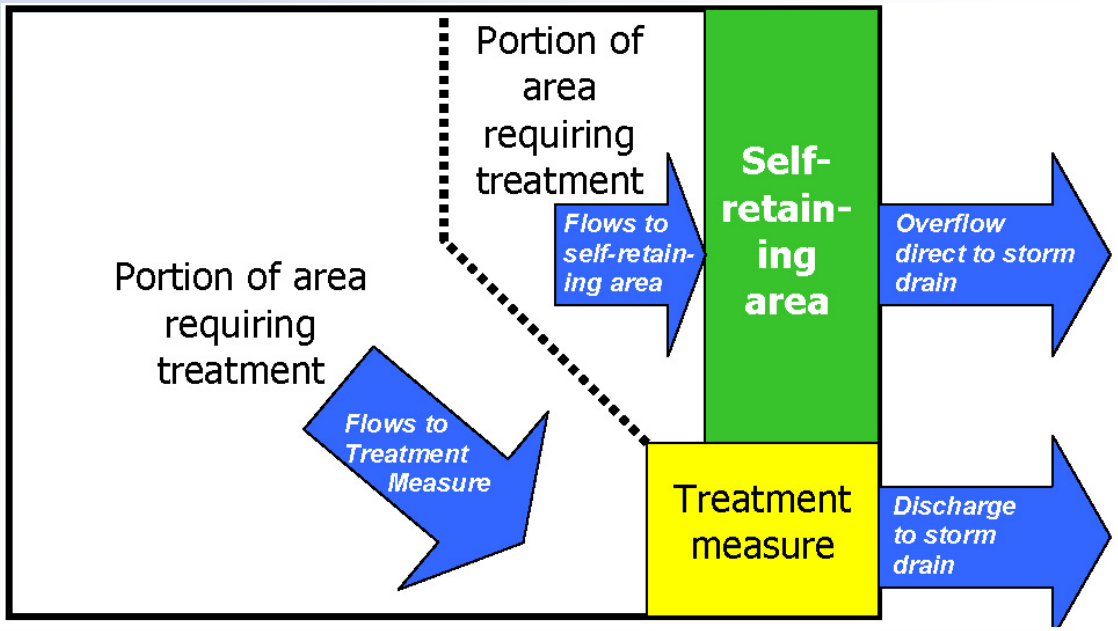


Rainwater Harvesting and Use Worksheet

- Section 2 – Self-treating Areas, etc:
  - 2.2 Enter square footage of any **self-retaining area** that is included in the Potential Rainwater Capture Area.
  - 2.3 Enter square footage of any area included in the Potential Rainwater Capture Area that **contributes runoff to a self-retaining area.**

Self-Retaining Areas Reduce the Area that Requires Treatment

- Concave area of landscaping that retains runoff from adjacent impervious surface (e.g, roof)
  - Sized at 2:1 ratio (area of tributary impervious surface: area of landscaping)
  - 3-inch ponding depth
  - No special soils required



Rainwater Harvesting and Use Worksheet

- Section 3 – Subtract Self-treating Areas, etc., from Potential Rainwater Capture Area:
  - 3.1 Subtract the square footage of any self-treating areas, self-retaining areas, etc., from the Potential Rainwater Capture Area.
  - 3.2 Convert to acres.

Rainwater Harvesting and Use Worksheet

- Section 4 – Feasibility Based on Toilet-Flushing Demand
  - 4.1 Calculate number of dwelling units per impervious acre.
  - 4.2 Calculate non-residential interior floor area per impervious acre.
  - 4.3 and 4.4 Identify applicable feasibility thresholds in Appendix 2.
  - 4.5 and 4.6 Compare project density to feasibility thresholds.

Rainwater Harvesting and Use Worksheet

- Section 5 – Feasibility Based on Factors Other than Demand
  - 5.1 Does it conflict with building codes?
  - 5.2 Would harvesting system exceed 2% of Total Project Cost?
  - 5.3 Infeasible due to slope > 10%, lack of space, or other site constraint?
  - 5.4 Geotechnical/stability concerns?
  - 5.5 Are there conflicts with utilities, heritage trees, or septic system?

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