Outfall Elimination

Is it a Cost-Effective Alternative?

Managed by: Teresa Reed-Jennings, PE, City of Pasco
(509)544-8080
reed-jenningst@pasco-wa.gov

Presented by: Matt Fontaine, PE, Herrera
(206)787-8270
mfontaine@herrerainc.com

HERRERA

CITY OF PASCO

Presentation Outline

Part 1: Setting

Part 2: Why Outfall Elimination?

Part 3: Opportunities and Constraints

Part 4: Methods

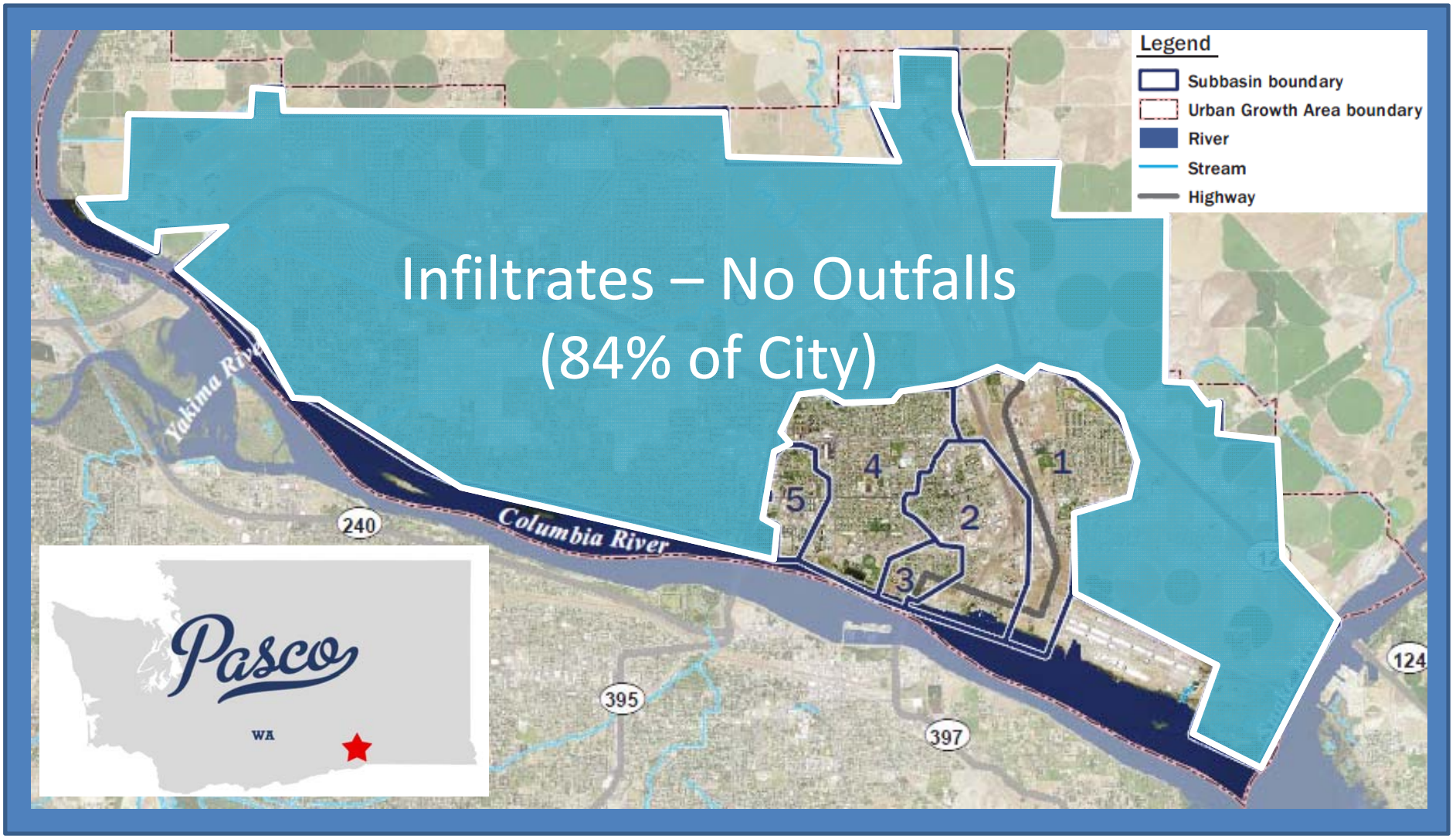
Part 5: Results

Part 6: Next Steps

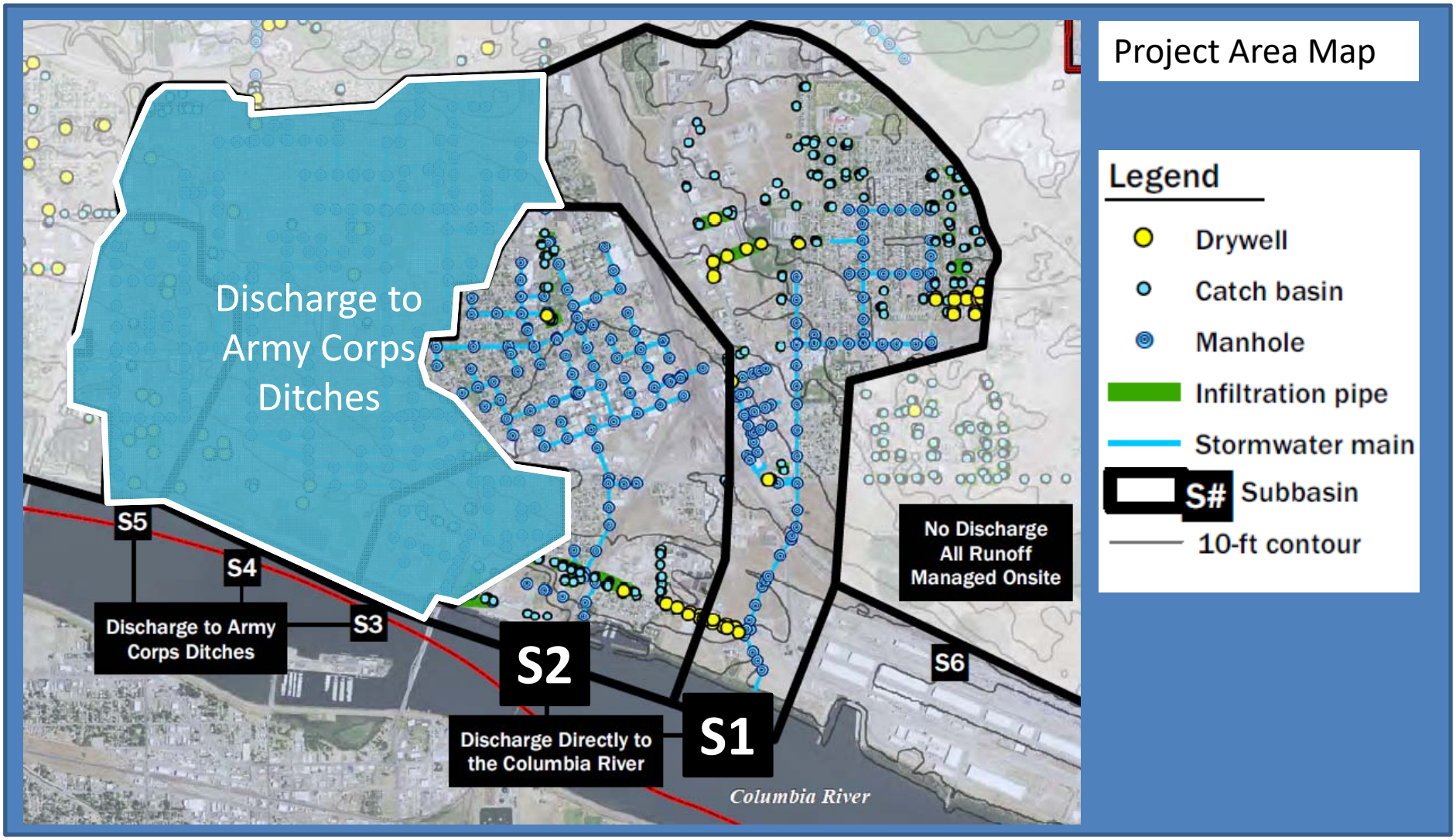
Part 1: Setting

Welcome to Pasco

Pasco Stormwater Subbasins



5 Subbasins with Outfalls

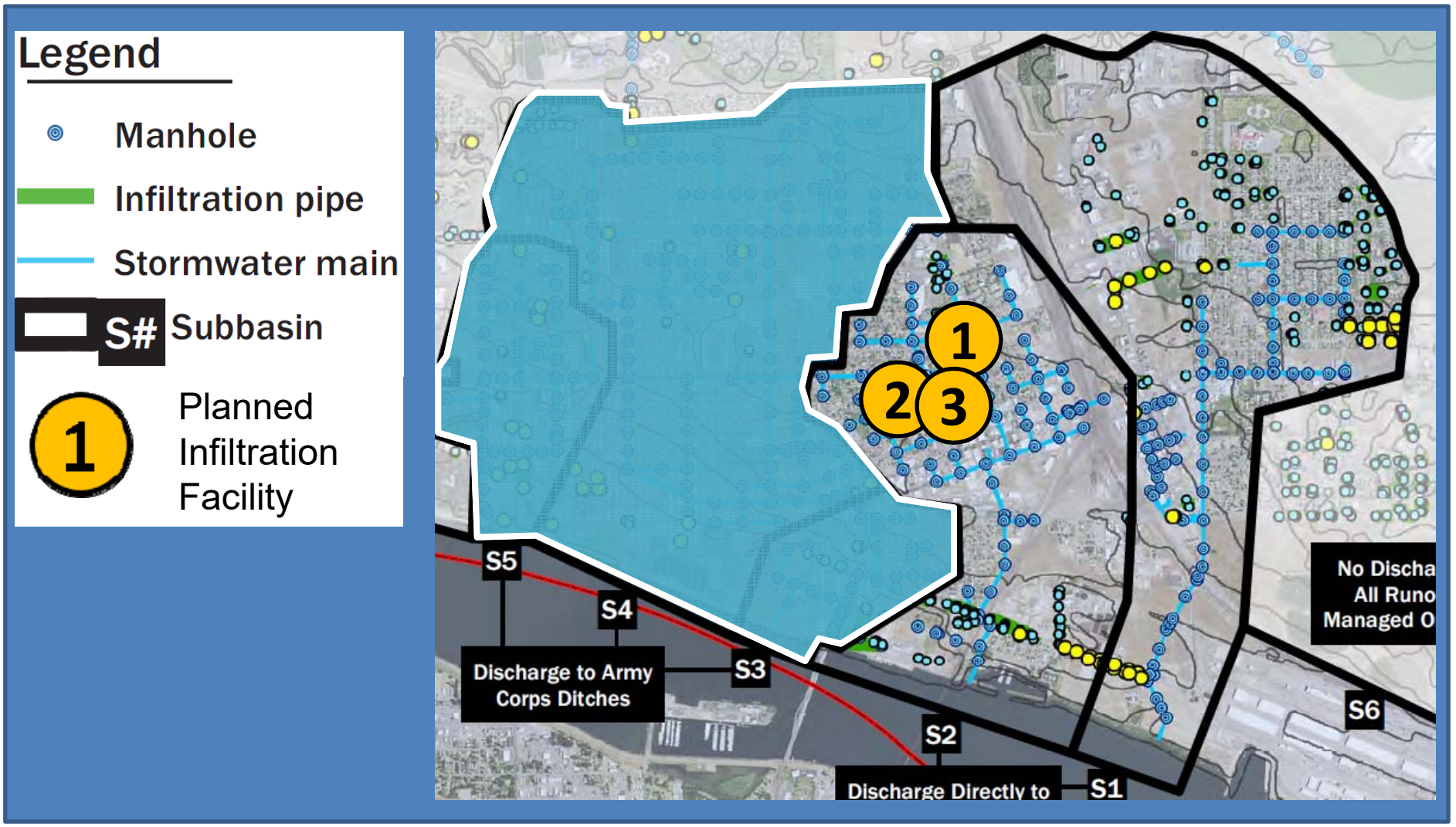


Aging Stormwater Infrastructure

Erosion

Holes in pipes

Existing Retrofit Plans



Part 2: Why Outfall Elimination?

MM7
MM9

Potential Advantages and Disadvantages of Outfall Elimination

Advantages

- Reduced risk of surface water pollution and liability
- Improved surface water quality
- Eliminated or reduced cost of conveyance system rehabilitation
- Opportunity to address other existing problems
- Potential reduction in regulatory requirement

Disadvantages

- Increased risk of groundwater pollution
- Cost of new facilities
- Cost of infiltration system maintenance

Slide 10

MM7 title: potential benefits of outfall elimination
Meghan Mullen, 5/4/2017

MM9 make title, matt to fill in bullets
Meghan Mullen, 5/4/2017

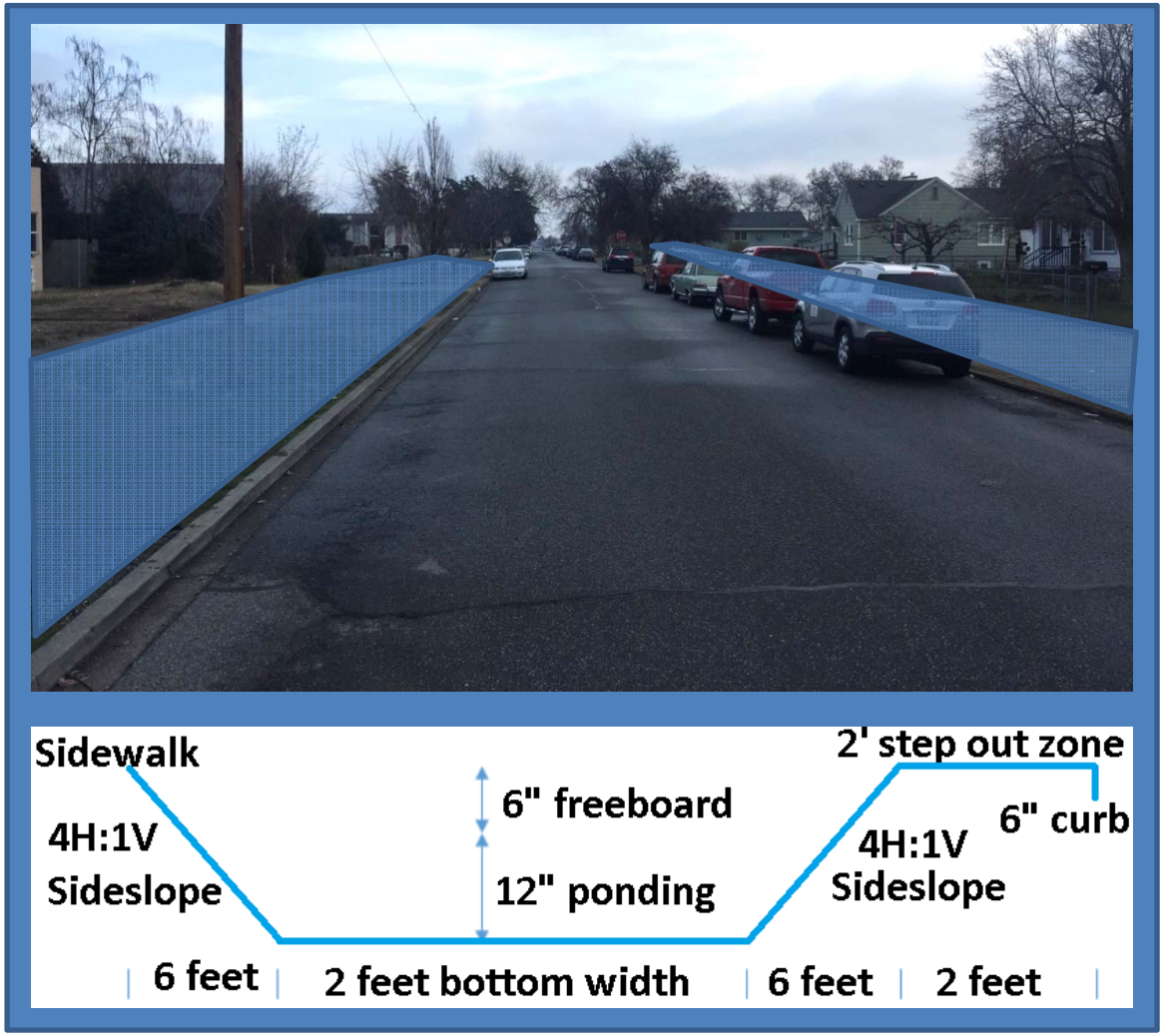
Part 3: Opportunities and Constraints

MM8
MM11
MM38

Opportunities

Ideal conditions in Pasco:

- High infiltration rates
- Low rainfall amounts
- Only 5 outfalls
- Land area associated with outfalls is relatively small (16% of the City)
- Opportunities for retrofitting in the Right of Way



Slide 12

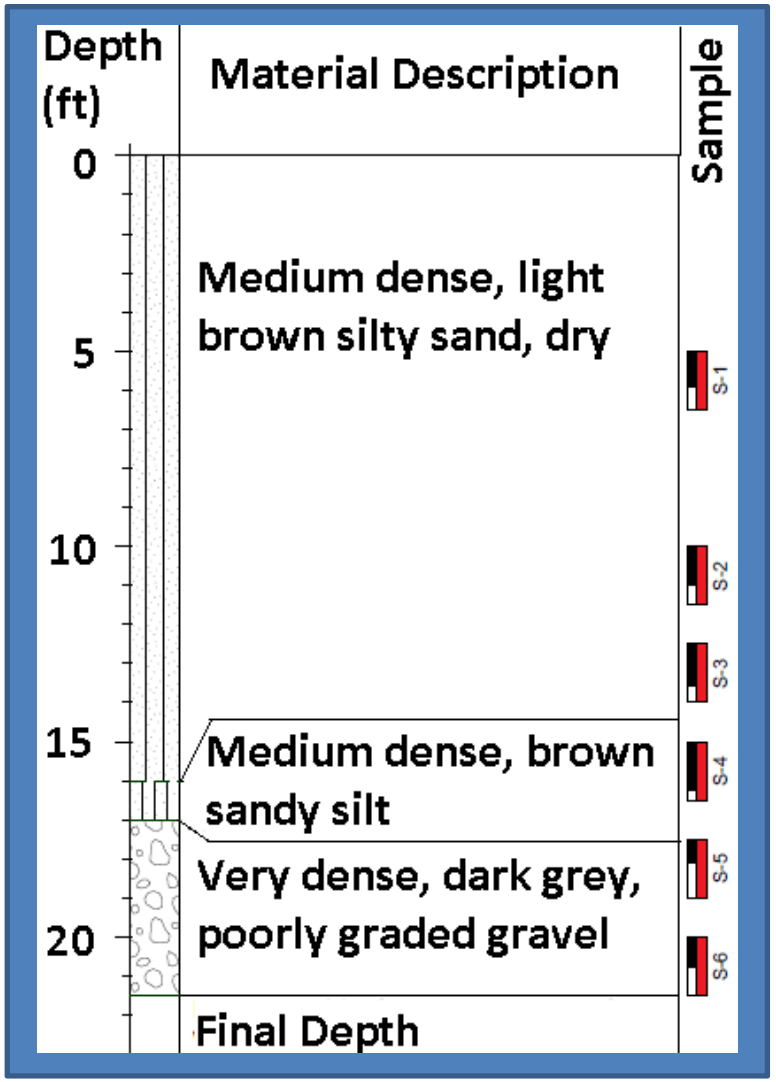
MM8 these make approach feasible; this is an opportunity not an objective
Meghan Mullen, 5/4/2017

MM11 ROW photo
Meghan Mullen, 5/4/2017

MM38 Matt will find a picture of the wide planter with this diagram beneath it (in the opportunity slide)
Meghan Mullen, 5/4/2017

Pasco Soils

- Hydrologic Soil Group A
- 20 to 30 inches per hour infiltration rate
- Design infiltration rate of 5 inches per hour

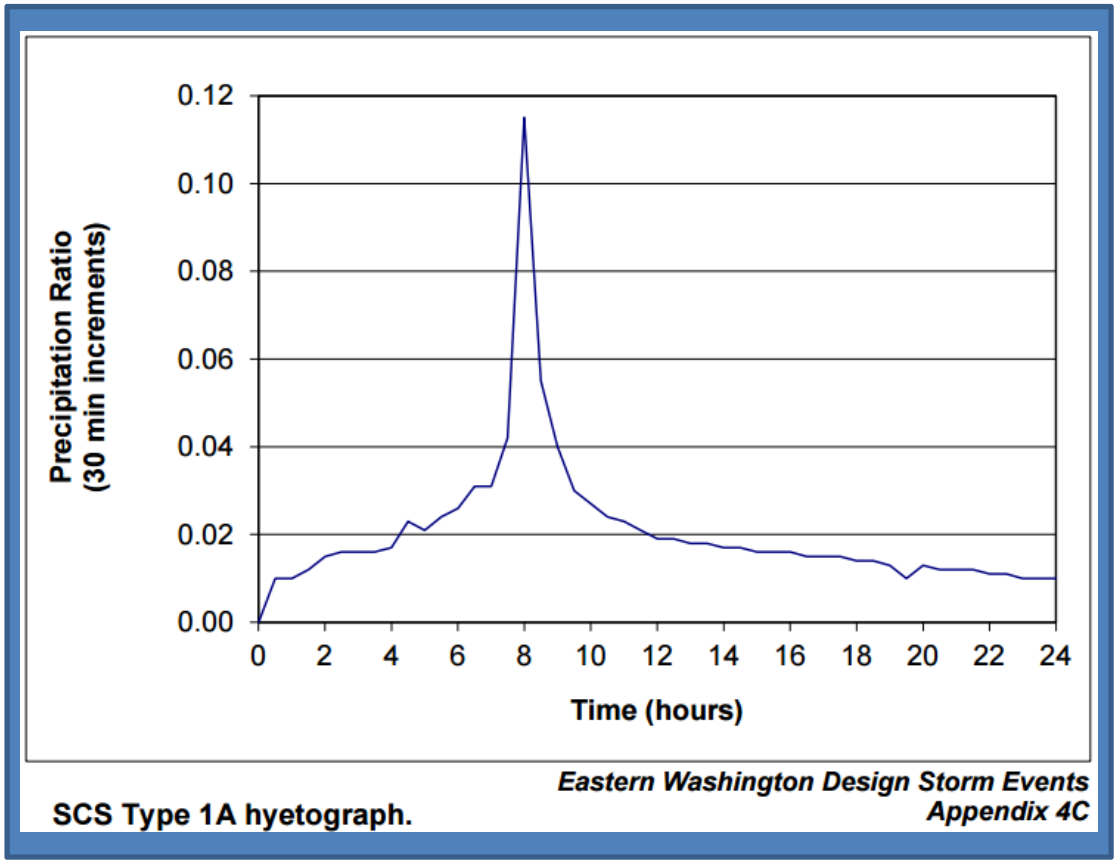


MM34

MM15

Constraints

- Design for the 100 year storm
- High impervious percentages
- Arid climate; < 8” / yr
- Not all ROWs are ideal
- Some ROW outside of City control



SCS Type 1A hyetograph.

Eastern Washington Design Storm Events Appendix 4C

Slide 14

MM12 constraints
Meghan Mullen, 5/4/2017

MM13 WW - only match forest duration standard; 50 year storm only
Meghan Mullen, 5/4/2017

MM14 picture of ROW and figure that illisturates the imperviousness
Meghan Mullen, 5/4/2017

MM15 picture of bioretention facility full of dust and sage brush (Teresa)
Meghan Mullen, 5/4/2017

MM34 potential question: what happens in the bad ROWs? Scaling up assumptions from the good sites missing something?
Meghan Mullen, 5/4/2017

MM2
MM3
MM4

Other Right-of-Way Examples

Slide 15

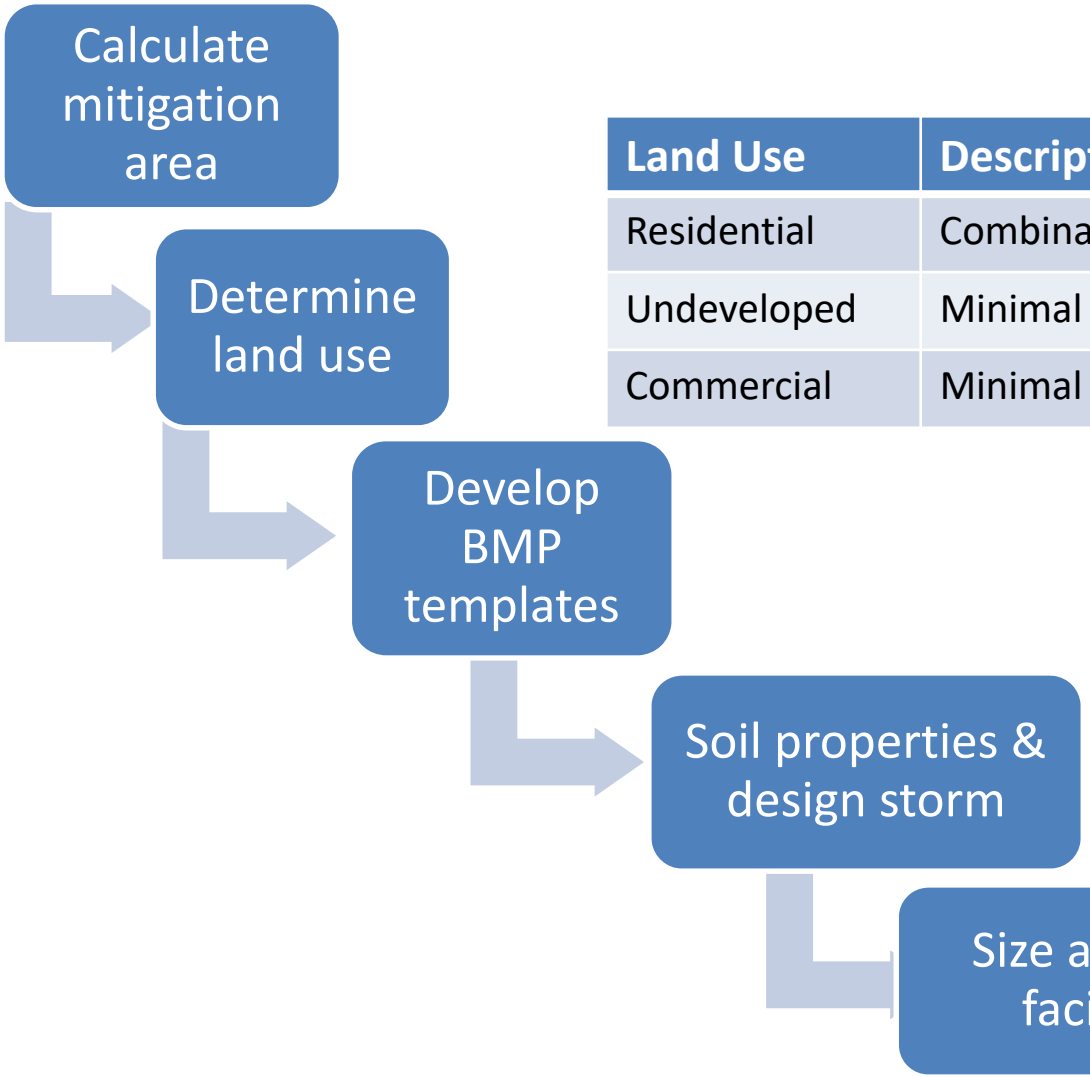
MM2 header = figure title
Meghan Mullen, 5/4/2017

MM3 title: stormwater system rehabilitation
Meghan Mullen, 5/4/2017

MM4 images of conditions in the pipe, things that need to be restored
Meghan Mullen, 5/4/2017

Part 4: Methods

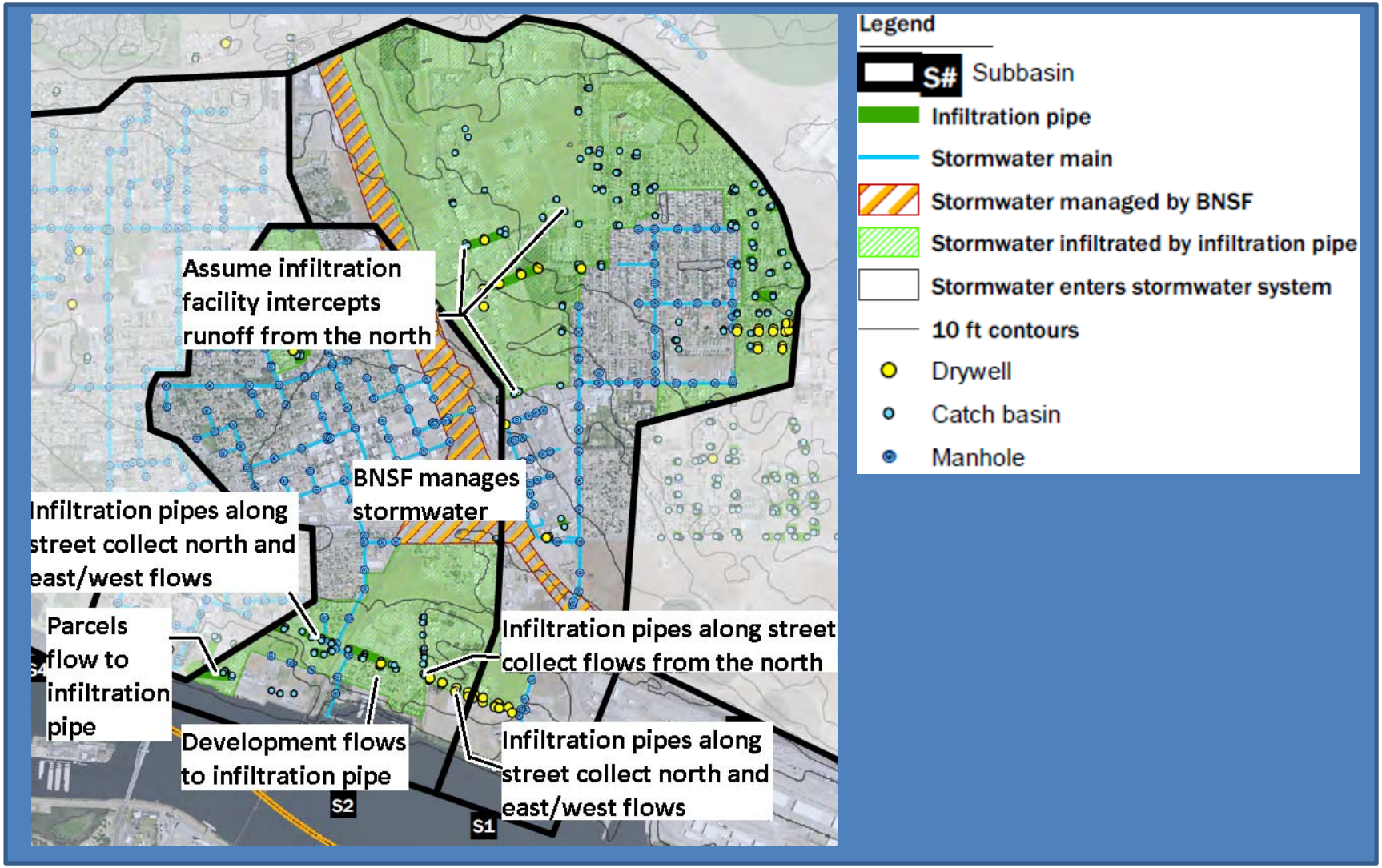
Process



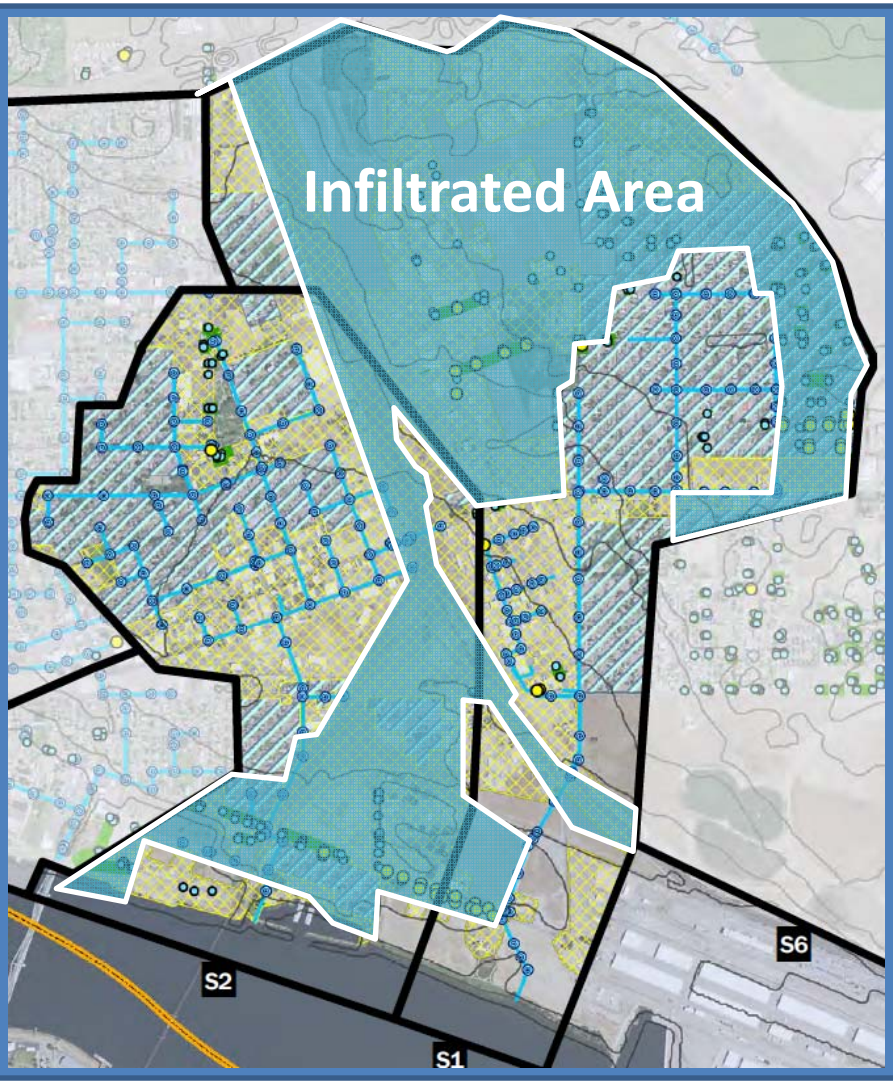
Land Use	Description
Residential	Combination of pervious and impervious area
Undeveloped	Minimal impervious area
Commercial	Minimal pervious area

- Native Soil Infiltration: 5 inches/hour
- BSM Infiltration: 6 inches/hour
- Depth to groundwater: 21.5 feet
- Hydrologic Soil Group: A
- 100-yr, 24 hour storm (2 inches)

Mitigation Area



Land Use



Stormwater System and Land Use Map

Legend

- Commercial
- Residential
- Undeveloped

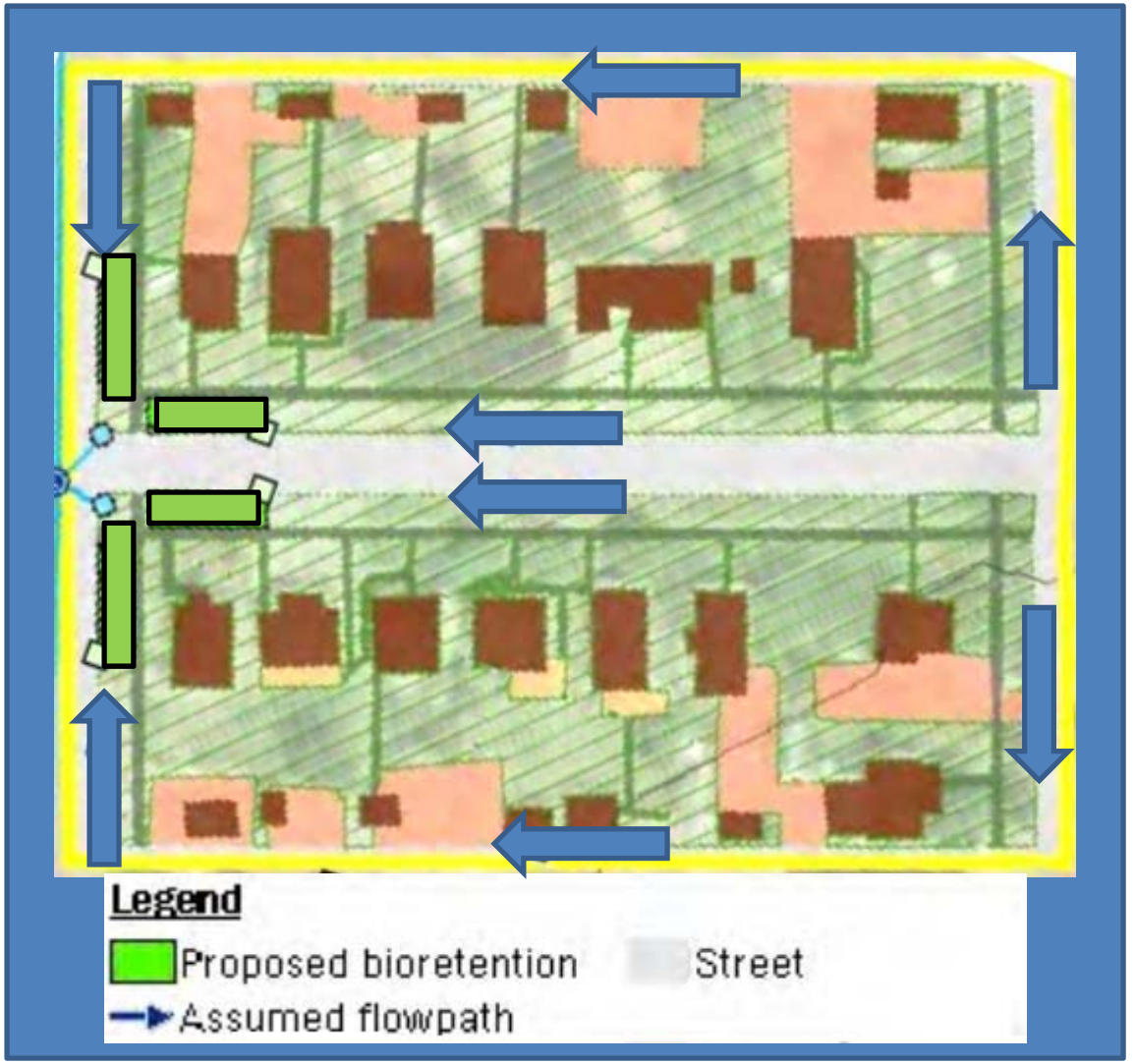
Mitigation Area

- 500 acres per basin (about 50%)

MM24
MM25
MM28
MM29

Residential Template

- Approximately 50 percent impervious
- Roof runoff partially dispersed
- Infiltration swales / Bioretention
- Size facilities to mitigate the 100-year storm event



Slide 20

MM24 take figures from CIP summary sheets
Meghan Mullen, 5/4/2017

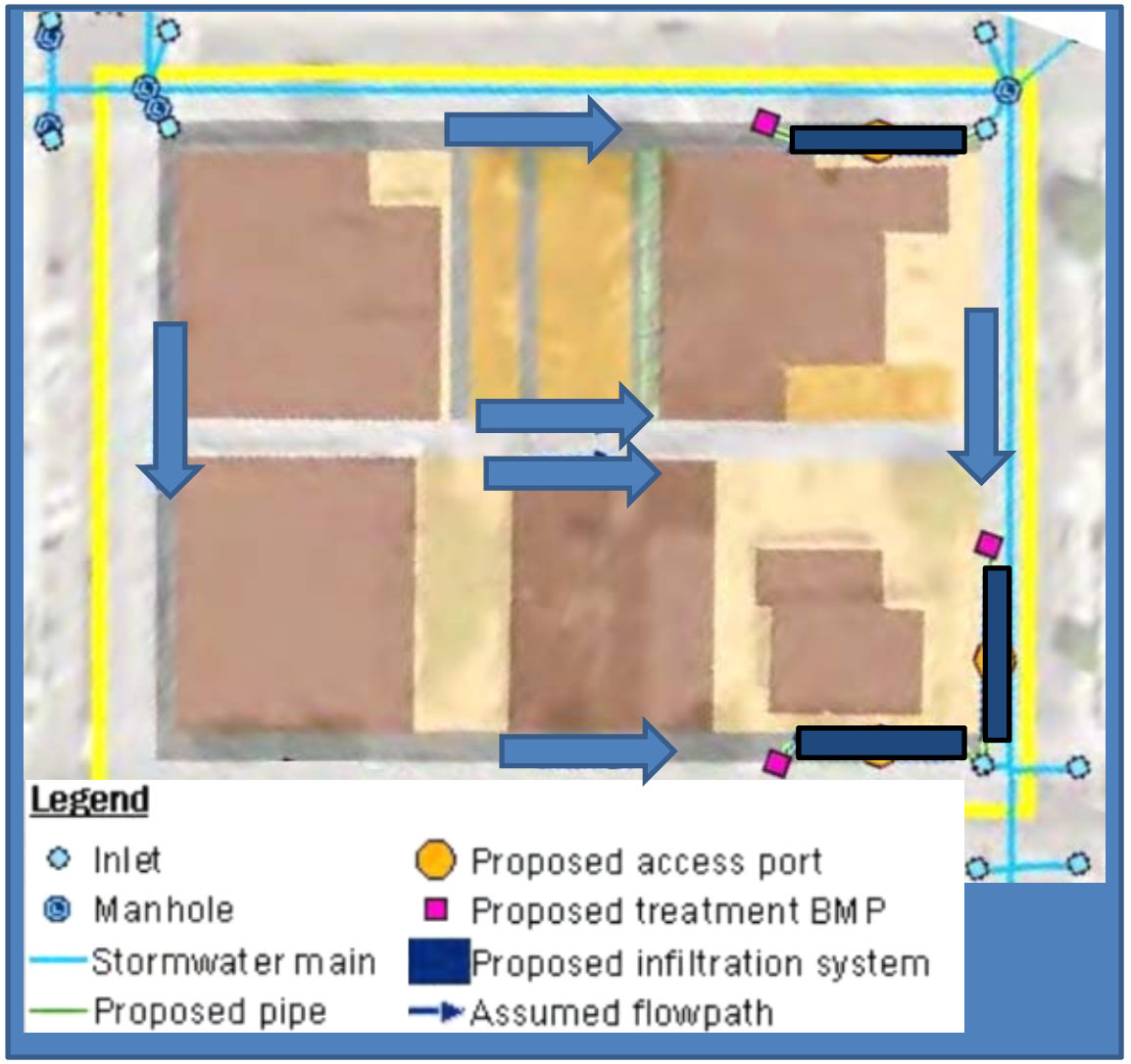
MM25 put them in as-is, may needd to tweak later
Meghan Mullen, 5/4/2017

MM28 figure and basic assumptions and uncertainties (like roof area) in bullets
Meghan Mullen, 5/4/2017

MM29 bullets on impervious area calculations (% roof area, how to model the roof area, % of residential areas that is impervious)
Meghan Mullen, 5/4/2017

Commercial Template

- Approximately 99 percent impervious
- Subsurface infiltration pipes / chambers
- Treatment BMP
- Maintenance access
- Size facilities to mitigate the 100-year storm event



MM30
MM31
MM32
MM33

Sensitivity Analysis

Residential

- Range of facility costs per square foot
- Roof credit in hydrologic modeling

Commercial

- Percent impervious cover
- Site complexity

Roof Modeling

- 100 percent impervious
- 50 percent impervious; 50 percent landscape
- 100 percent landscape
- 100 percent infiltration

Slide 22

MM30 discuss things examined for sensitivity analysis: roof area, impervious area for commercial
Meghan Mullen, 5/4/2017

MM31 figures are somewhere... One in commercial retrofit summary sheet "industrial basin" for simple or complex options
Meghan Mullen, 5/4/2017

MM32 show both options
Meghan Mullen, 5/4/2017

MM33 99 or 95 percent impervious for commercial
Meghan Mullen, 5/4/2017

Part 5: Results

Retrofit Costs Are High

Cost per acre

- Residential: $32,000 to $50,000
- Commercial: $47,000 to $93,000

Cost per Subbasin

- Basin 1: $20 million to $36 million
- Basin 2: $15 million to $27 million

All 5 Subbasins

- $60 million to $110 million

Part 6: Next Steps

Pilot Projects

- Gauge public support for retrofits
- Collect additional soils data
- Refine construction cost assumptions
- Monitor facility performance over time
- Consider lifecycle costs
- Compare with status quo or end-of-pipe

Questions?