

# Linear and Redevelopment

MIDS Work Group

April 19, 2013

# Objectives

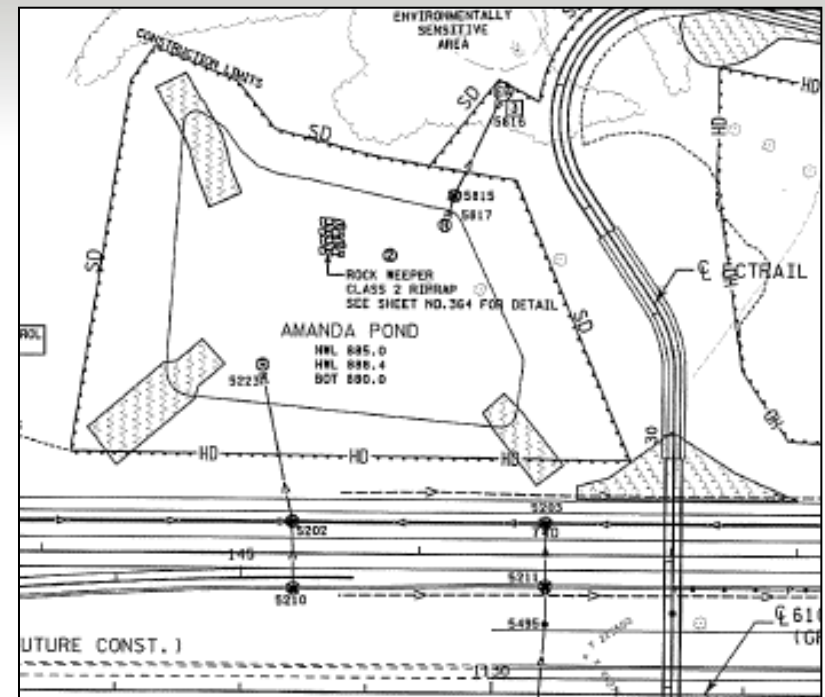
- Review linear and redevelopment projects to determine
  - Water quality performance as designed
  - Do sites meet retention recommendation?
  - Can site designs be modified to meet retention recommendation?
    - Conceptual design of retention BMPs
    - Water quality performance with BMPs

# Project Examples – Linear

- Criterion = 0.5” retention from impervious area
- TH 610 Phase 1 (Fernbrook to Hemlock)



Source: Bing



# TH610 Drainage Areas

- Project includes off-site drainage area
- Impervious area = 55% of total area

	Impervious (acres)	Pervious (acres)	Total (acres)
Hennepin Co.	11	0	11
Maple Grove	67	95	162
MnDOT	63	13	76
Total	141	108	249

# TH610 Drainage Areas

- MnDOT total area = 31% of total area
- MnDOT impervious area = 25% of total area

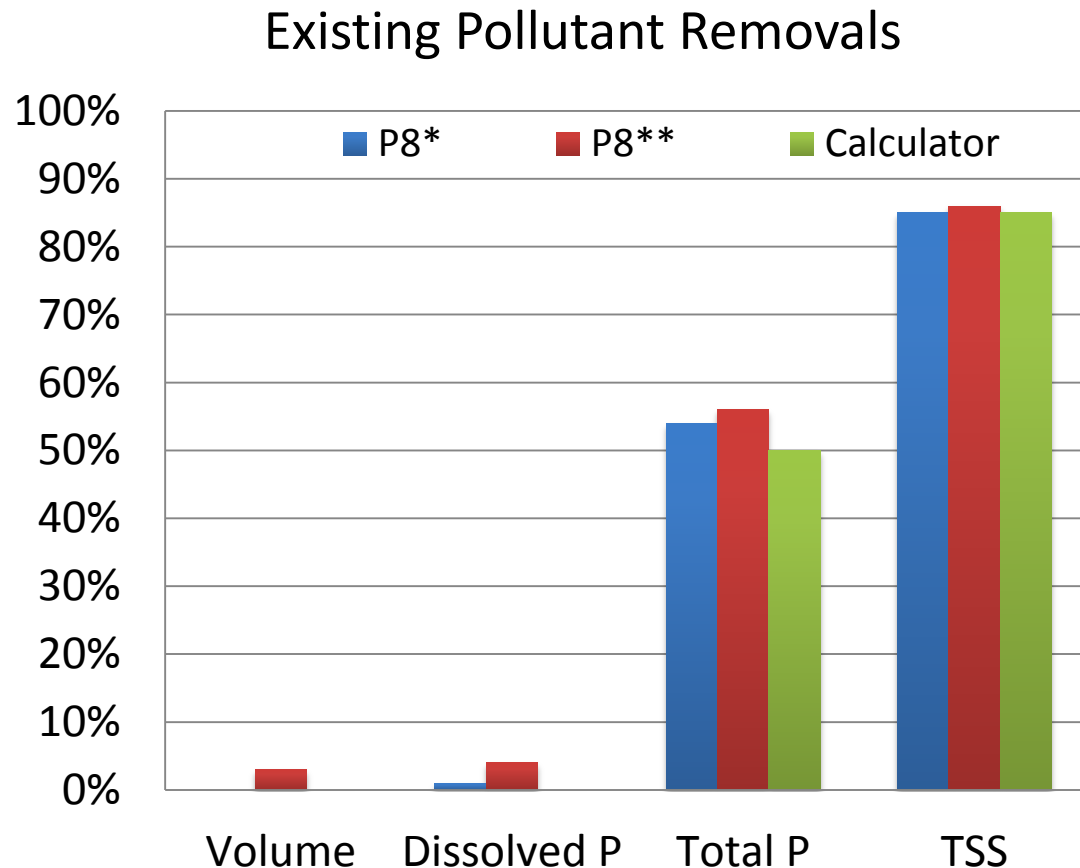
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Hennepin Co.	11	0	11
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<b>MnDOT</b>	<b>63</b>	<b>13</b>	<b>76</b>
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# TH610 Existing Models

- Existing P8 model covers 204 acres
  - MnDOT drainage area and BMPs included
  - 135 acres of non-MnDOT area included
    - Pervious area with composite CN
- Existing HydroCAD and P8 models exclude 44 acres of non-MnDOT area
  - BMPs evaluated are sized for MnDOT impervious area

# TH 610 – Existing Performance

- Existing BMPs:
  - 7 wet ponds
  - 2 drainage ditches (1 wet, 1 dry)
  - Minimal volume reduction
- P8 models
  - with and without ditch infiltration
- MIDS calculator



\* P8 model without infiltration from ditches

\*\* P8 model including infiltration from ditches

# TH 610 – Conceptual BMP Design

- Retention requirement based on MnDOT impervious are = 2.46 acre-feet
- Site limitations
  - Limited ROW area
  - Rate control requirements
- Convert 4 wet ponds to infiltration basins
  - Add upstream sump pretreatment

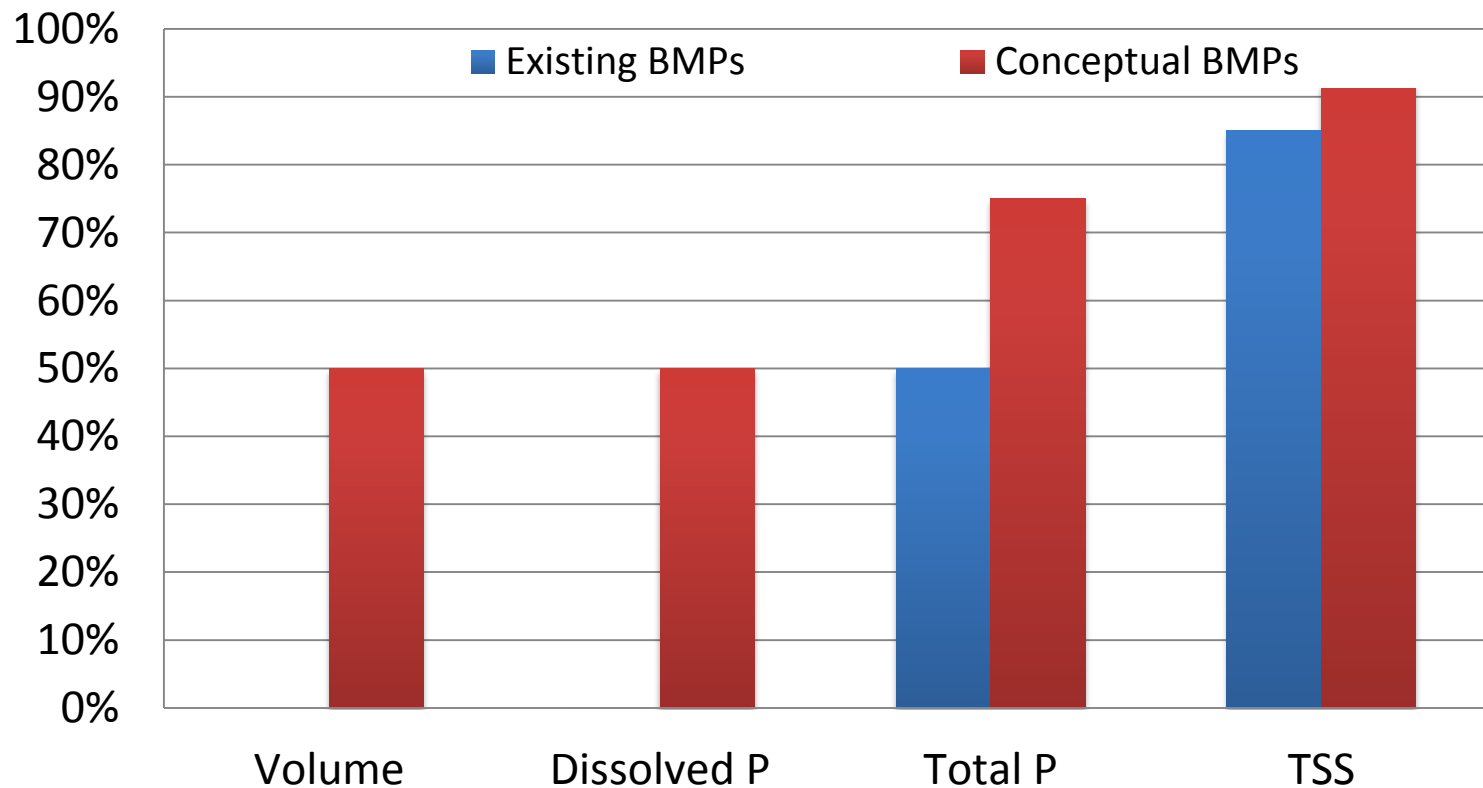


Photo: Barr Engineering Company



# TH 610 – Conceptual BMP Performance

Pollutant Removals Estimated using MIDS Calculator



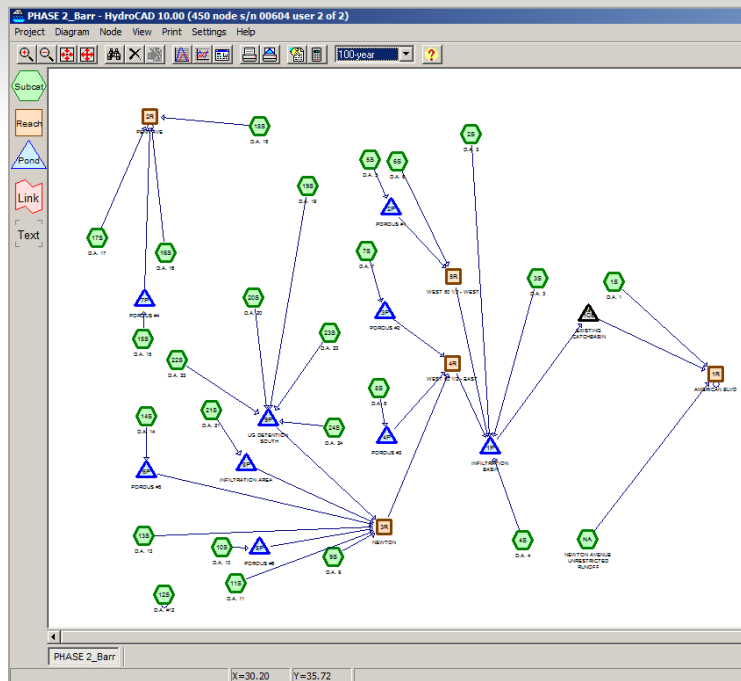
**Note:** removals based on loading from on-site and off-site drainage areas

# Project Examples – Redevelopment

- Multiple criteria evaluated
  - 0.4” retention from impervious area
  - 0.8” retention from impervious area
  - 1.1” retention from impervious area
- Project examples include:
  - Penn & American Phase II
  - R&D Hematology

# Redevelopment – Penn & American

- Project area = 8.6 acres
- Impervious = 5.1 acres (59%)
- HydroCAD model provided
  - Drainage to four outlets
- No water quality model
  - Volume retention satisfies WQ requirements



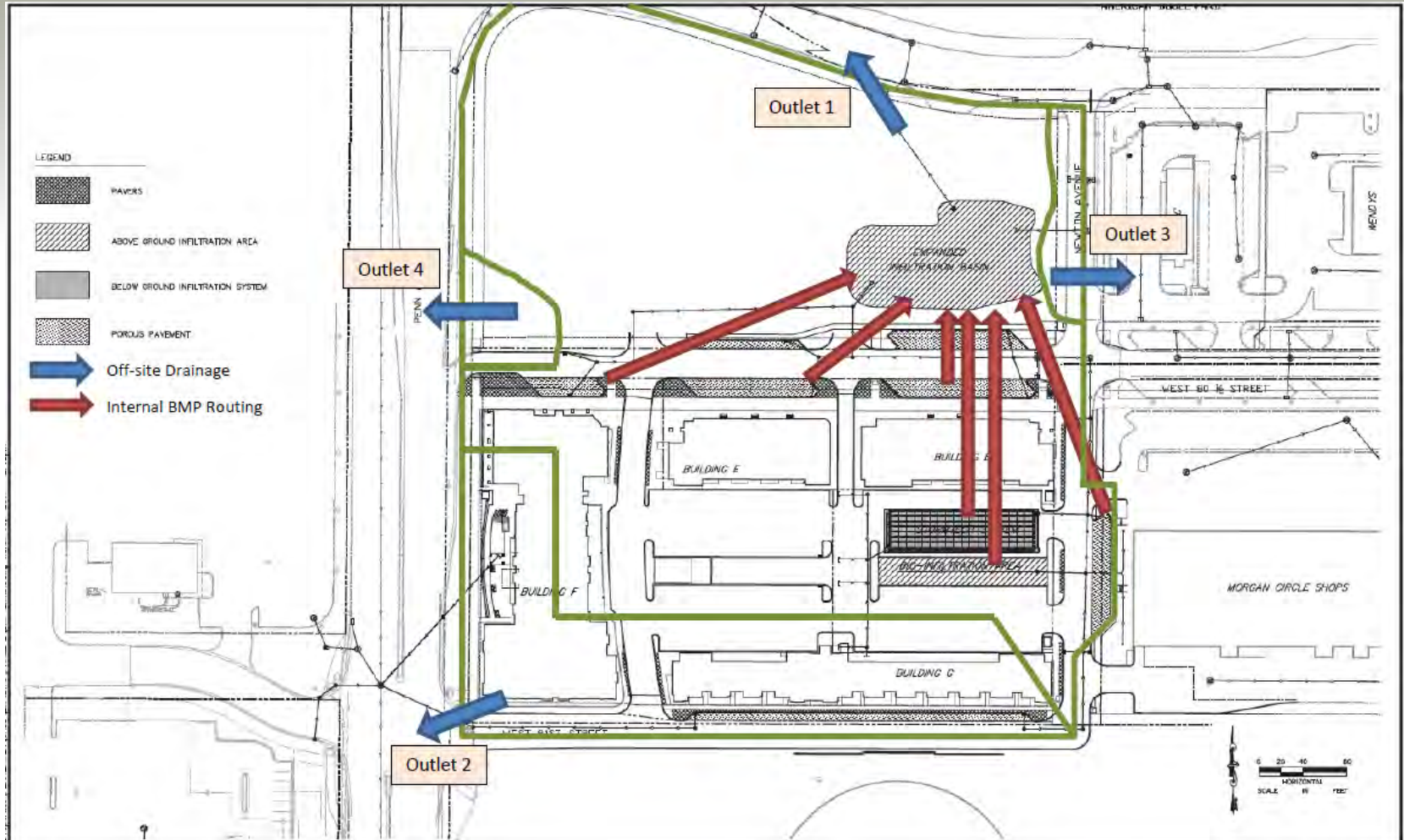
# Penn & American – Existing Performance

- Existing BMPs:
  - Underground storage
  - Small infiltration area
  - 6 pervious pavement areas
  - Large infiltration basin (downstream of several BMPs)



Photos: Barr Engineering Company

# Penn & American – Existing Performance

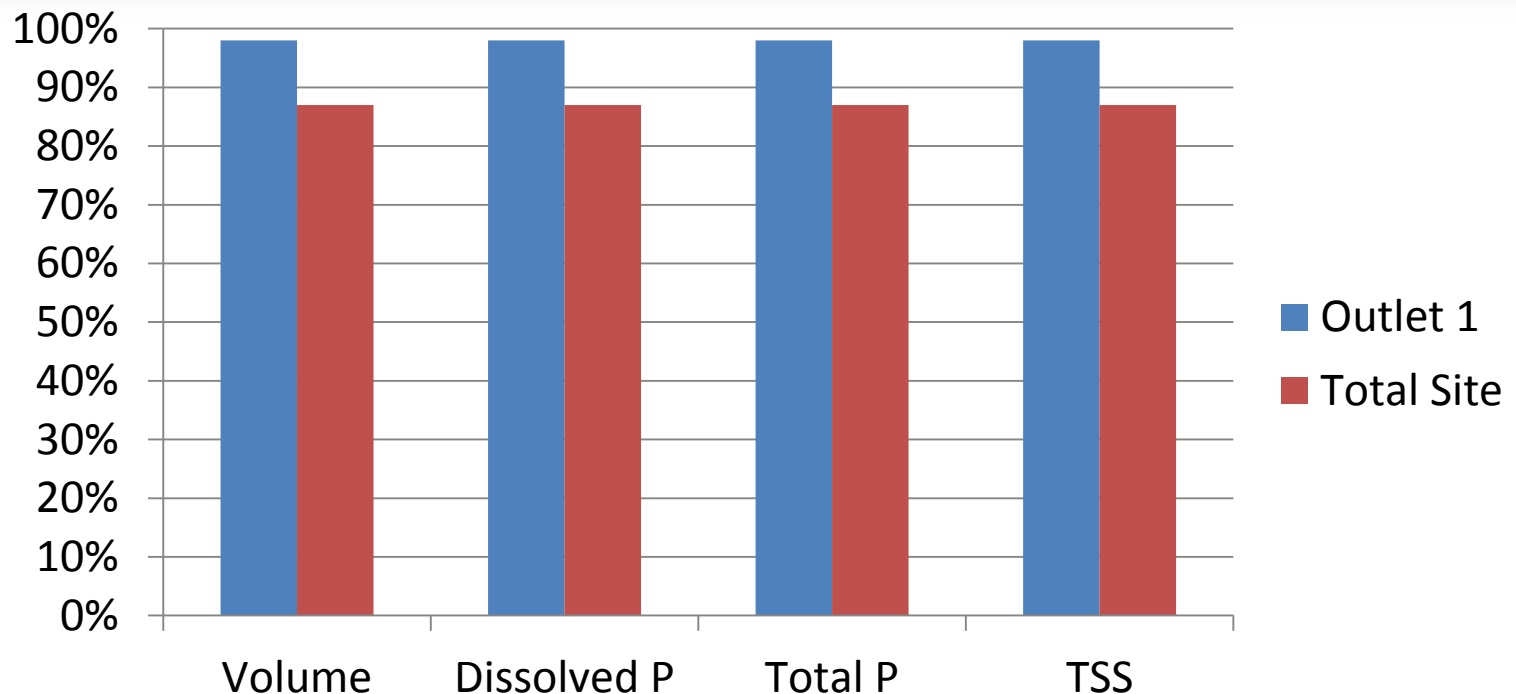


# Penn & American – Existing Performance

- Existing BMPs provide  $> 1.1''$  of retention from impervious areas (cumulative)
  - Excess retention volume upstream of Outlet 1 (large infiltration basin)
  - Insufficient retention volume upstream of Outlets 2, 3 and 4
- Performance estimated with MIDS calculator

# Penn & American – Existing Performance

- Performance upstream of Outlet 1 is greater than overall site performance

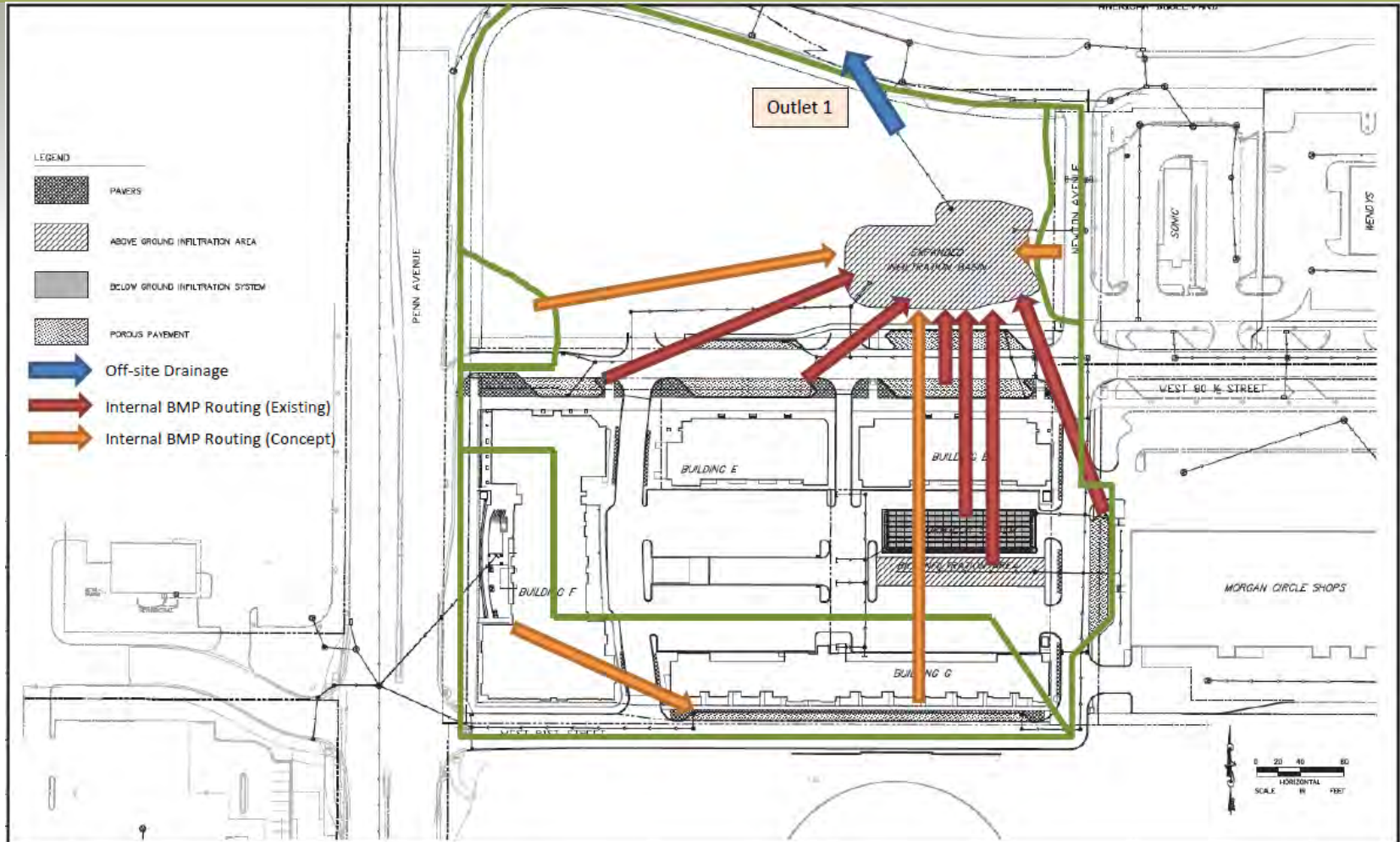


# Penn & American – Conceptual BMPs

- Total on-site volume retention > 1.1” from impervious areas
  - No additional BMPs
  - Re-route drainage to utilize excess capacity in large infiltration basin
- Increases total discharge to Outlet 1
  - Rate control increases relative to existing condition (but less than pre-project)

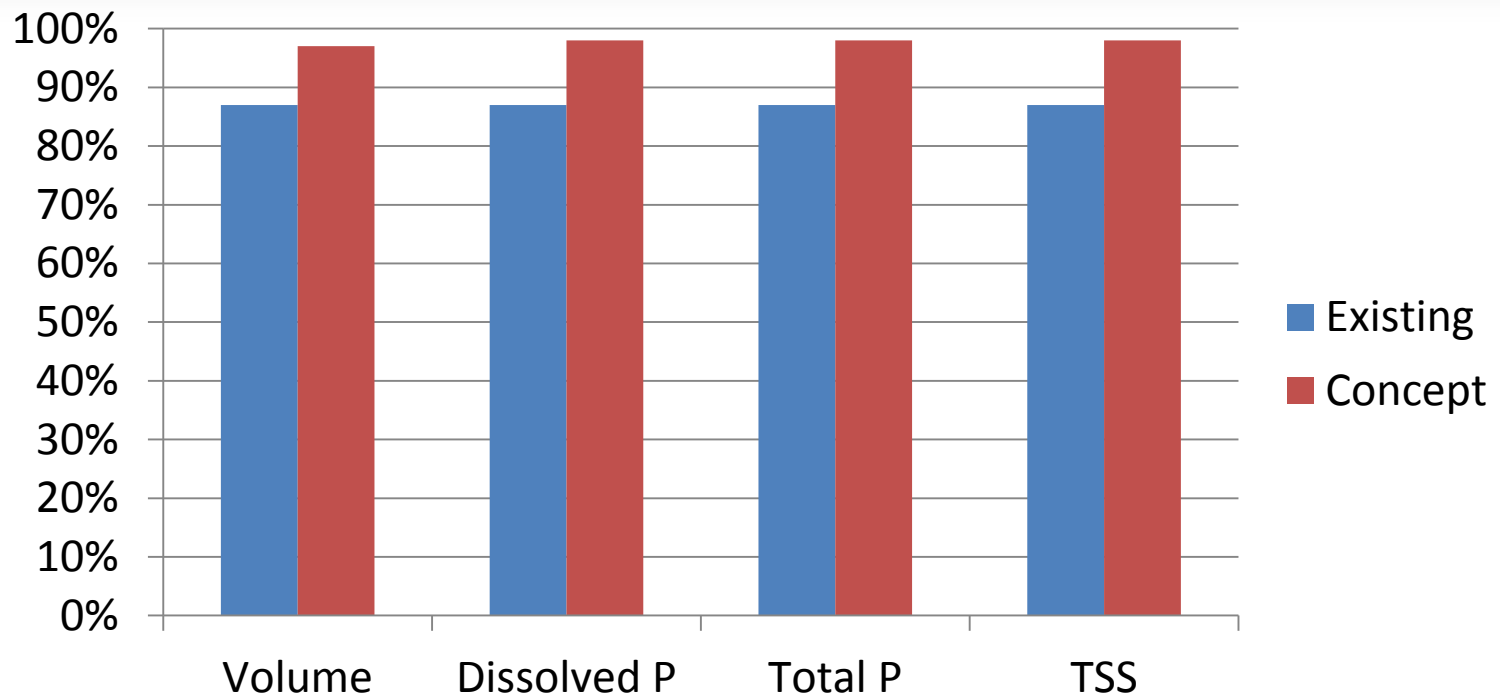


# Penn & American – Conceptual BMPs



# Penn & American – Conceptual BMP Performance

- Pollutant removal from overall site improves from 87% to 98% with rerouting

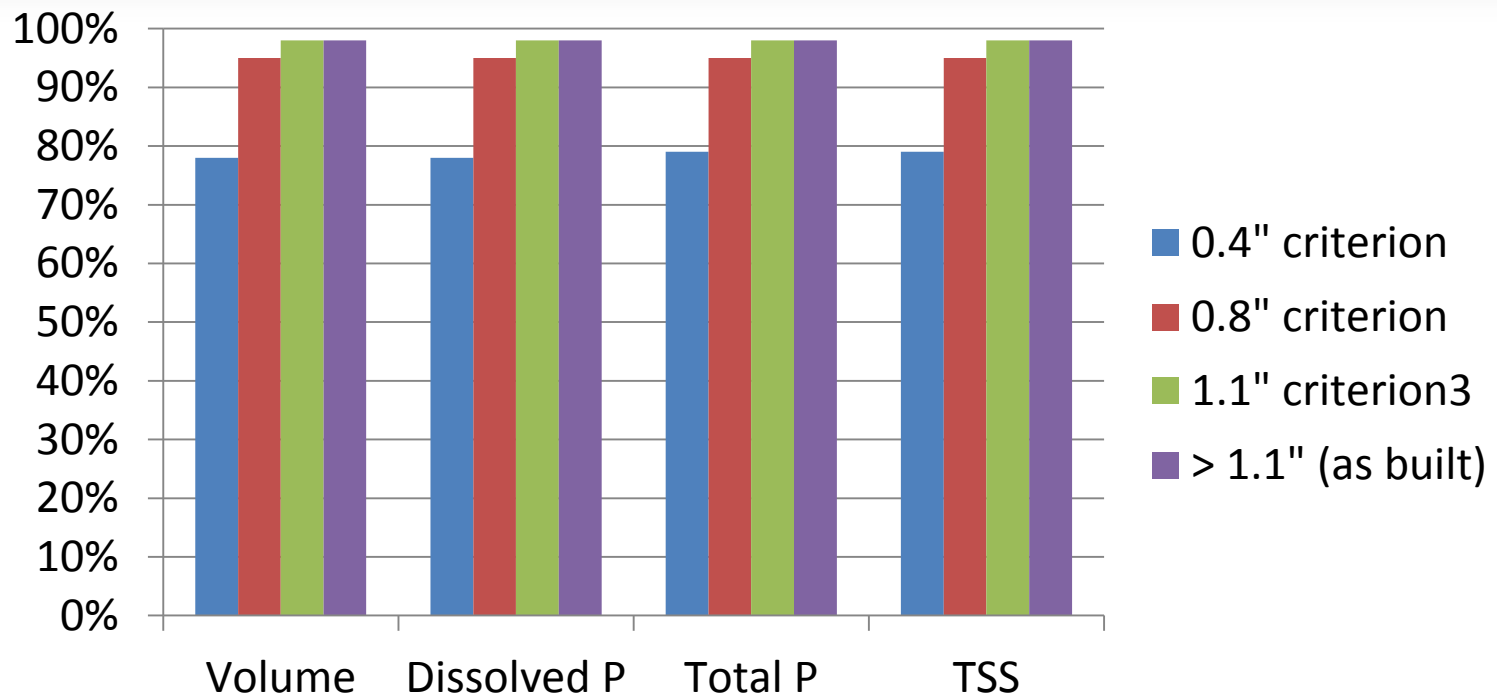


# Penn & American – Conceptual BMP Performance

- Re-routing achieves retention  $> 1.1''$  from total impervious area
- Existing BMPs were downsized to achieve overall site retention of  $0.4''$  ,  $0.8''$  , and  $1.1''$ 
  - Where volume (as designed) did not meet criteria, BMP routed through large infiltration basin

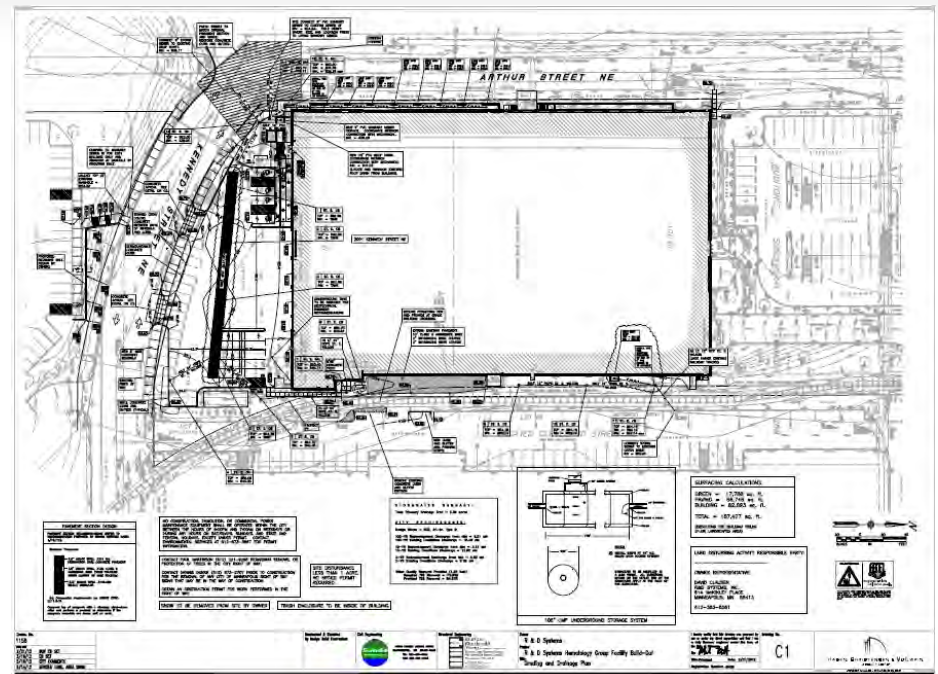
# Penn & American – Conceptual BMP Performance

- Pollutant removal ranges from 78% to 98%



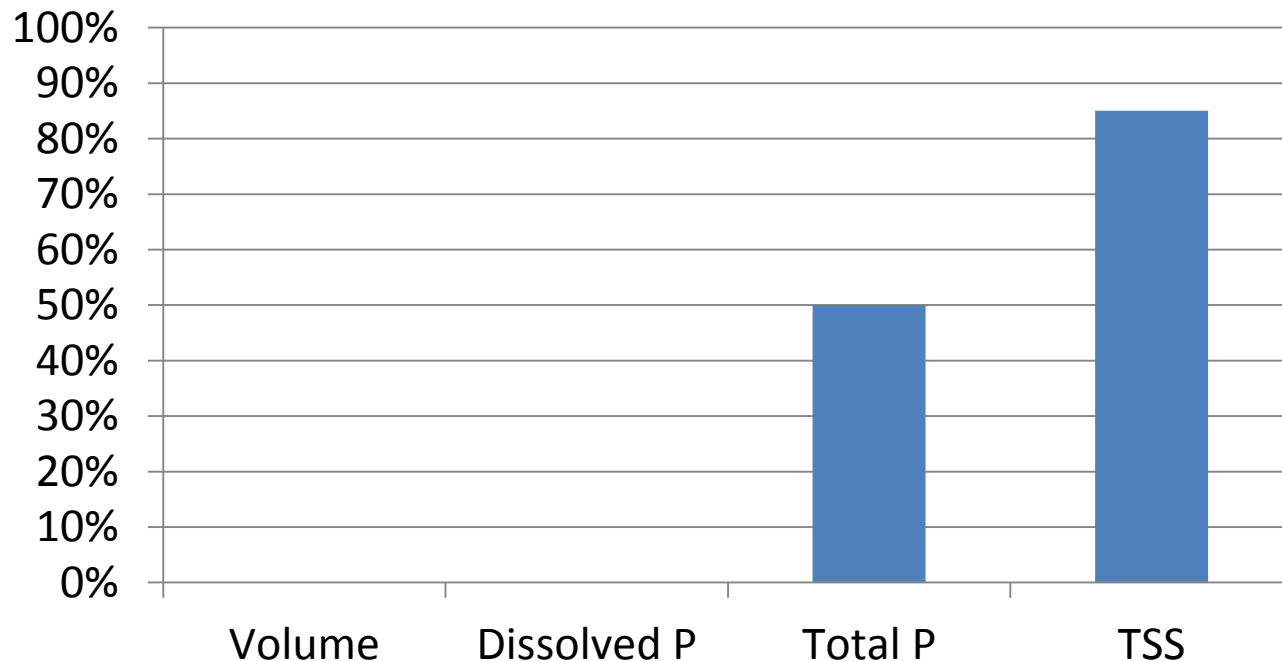
# Redevelopment – R&D Hematology

- Project area = 2.5 acres
- 96% impervious area
- Large underground storage tank
  - Contaminated soils
- HydroCAD model



# R&D Hematology – Existing Performance

- Existing WQ assumes NURP pond performance
- No volume reduction



# R&D Hematology – Conceptual BMPs

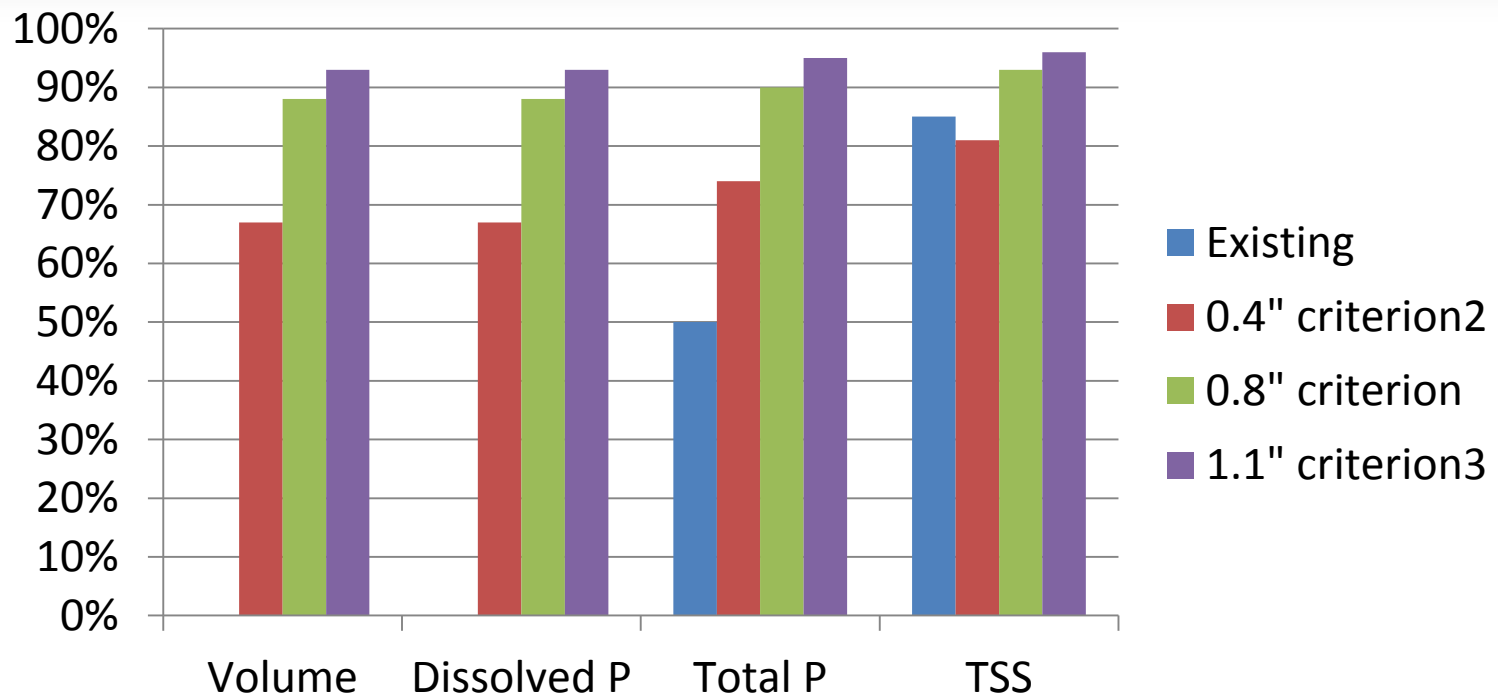
- Site conditions do not support infiltration
  - Without volume reduction, maximum achievable TP reduction is 55% (MIDS calculator)
  - Alternative BMPs necessary to achieve greater performance (e.g., iron-enhanced filtration)
- Infiltration BMPs evaluated for comparison

# R&D Hematology – Conceptual BMPs

- Underground storage replaced with underground infiltration basin(s)
  - Sized for 0.4”, 0.8”, and 1.1” from impervious area (0.08, 0.16, and 0.22 acre-feet, respectively)
- Sump pretreatment added upstream of infiltration
- Outlet modified to maintain peak rate control



# R&D Hematology – Conceptual BMP Performance



# Summary

- Linear Case Study
  - TH610 Fernbrook to Hemlock
- Redevelopment Case Studies
  - Penn & American Phase II
  - R&D Hematology
- Drainage areas range from 2.5 to 200+ acres
- Impervious areas range from 55% to 96%

# Summary

- Site limitations pose challenges to achieving volume retention goal
  - Limited footprint for BMPs
  - Unsuitable soil conditions for infiltration
  - Competing goals (e.g., rate control)
- When infiltration is possible, goals of 0.8” and 1.1” resulted in TP reduction of >90% among redevelopment projects

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