



WAYNE COUNTY STORMWATER ORDINANCE UPDATE

STORMWATER SUMMIT
NOVEMBER 20, 2019



Agenda

- Welcome and Introductions
- County Initiatives Update
- Post-Construction stormwater ordinance updates
 - Regulatory need for changes (EGLE/MDEQ)
 - Proposed updates to stormwater rules
 - Site development impacts (examples)
 - Operations & maintenance
 - Schedule and rollout

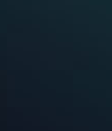


Introductions

- Wayne County Staff
 - Patrick Cullen
 - Elizabeth Taylor
 - Noel Mullet
- OHM Advisors (Consultant)
 - Greg Kacvinsky, P.E. greg.kacvinsky@ohm-advisors.com
 - Valerie Novaes, P.E. Valerie.novaes@ohm-advisors.com

Special Thanks to...

- Kelly Cave
- Alliance of Downriver Watersheds
- Oakland County
- Macomb County
- Livingston County





Today's Goals

- ✓ Communicate County initiatives
- ✓ Communicate proposed updates to the County's Stormwater Ordinance and Design Standards
- ✓ Seek feedback from County stakeholders

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COUNTY UPDATE

Patrick Cullen



DPS Reorganization

- Former Land Resources, Water Quality and Facilities Management Division merged into new Environmental Services Division
- Essential services:
 - solid waste regulation and planning
 - stormwater permit compliance
 - wastewater facility operation and maintenance



Wayne County Drains

- Drain Commissioner Elmeka N. Steele, Esq.
- Recognition of the critical need for properly functioning stormwater outlets
- 1/3 of Wayne County Drains currently under petition for maintenance and improvement
- Wayne County bond rating has improved; will allow for financing of major projects
- Begin work in 2020 based on priority list



New DPS Initiatives

- wcCompass App – Scheduled release this month
- Recycle Wayne County App
- Nankin Mills Interpretive Center Improvements
- Construction Permit Online Access Portal – Spring 2020
- GIS-based stormwater inventory – 2020/2021



POST CONSTRUCTION STORMWATER ORDINANCE

Program Updates



Purpose of Stormwater Program

- Permit requirement (MS4)
- Environmental stewardship
- Incremental reductions to peak flows
- Provide a consistent level of service to all property owners



Rain pain: Metro residents recover from floods, brace for storms

Francis X. Donnelly, Charles E. Ramirez and Candice Williams, The Detroit News

Published 6:19 a.m. ET May 1, 2019 | Updated 6:49 a.m. ET May 2, 2019



This is the view of the flooded neighborhood from the front porch of Dearborn Heights resident Maria Rodriguez-Torres. Maria Rodriguez-Torres, Special to Detroit News



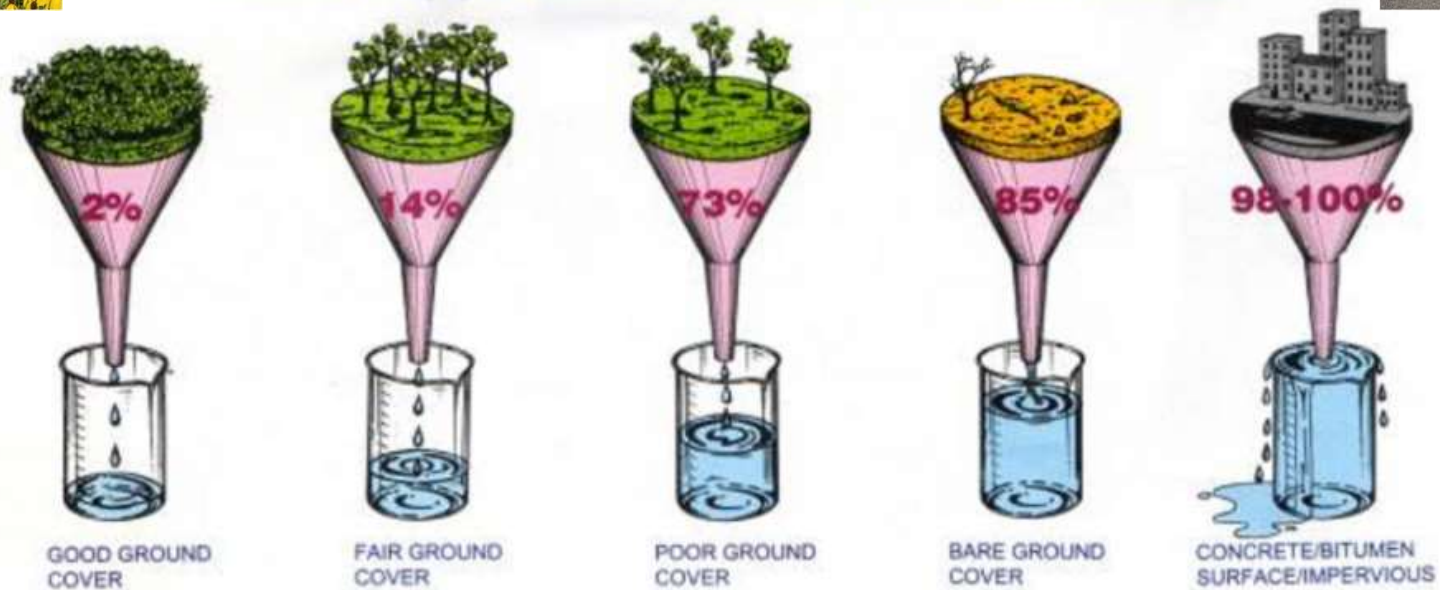
Drive in Dearborn, Mich. Kimberly P. Mitchell

Image Sources: Detroit Free Press and Crain's

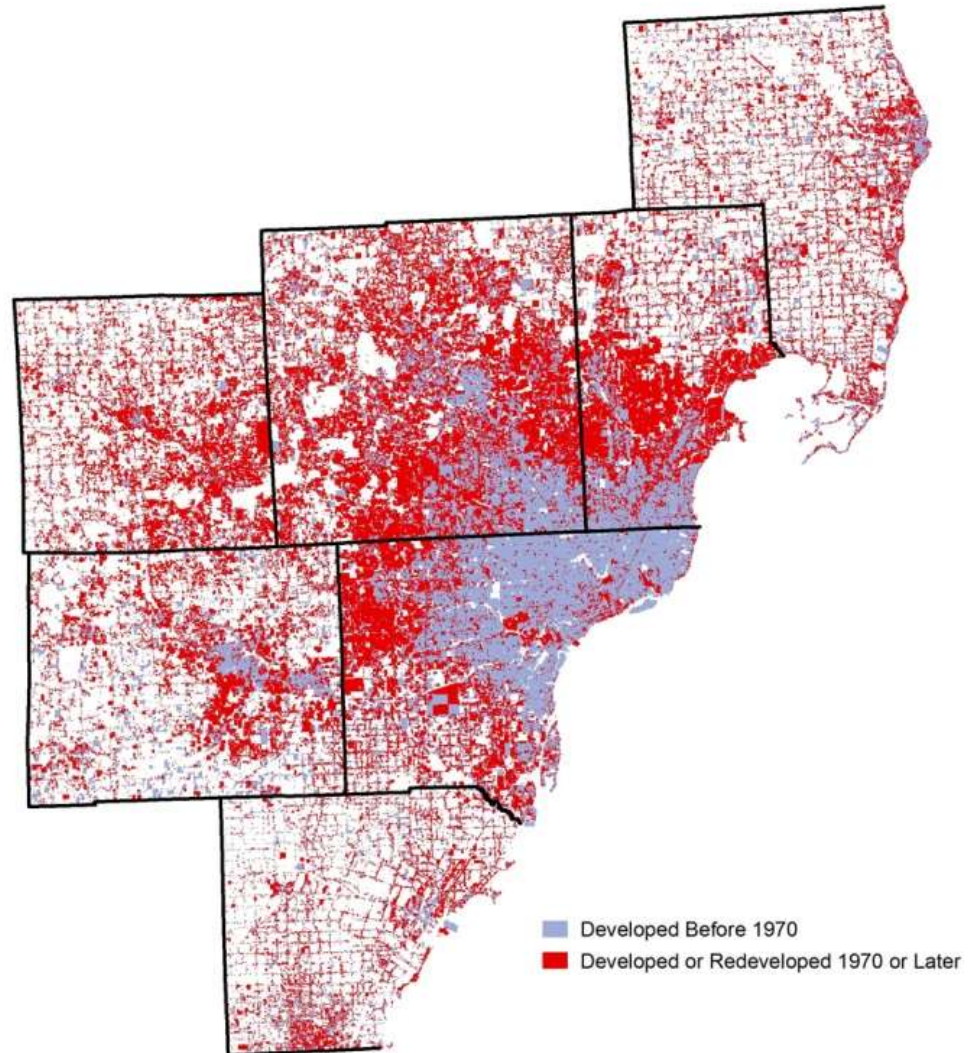
Need for Stormwater Management in Wayne County: **Runoff Volumes** are huge



PERCENTAGE (%) OF SURFACE RUNOFF ON A VARIETY OF SURFACES



Metro Detroit Urbanization





What is the County's Stormwater Authority?

Sites that discharge to:

- ✓ A County Road drainage system
- ✓ A designated County Drain
- ✓ To or through County parks or property
- ✓ A watershed in Wayne County not regulated under another MS4 permit jurisdiction



Intent of Stormwater Ordinance Update

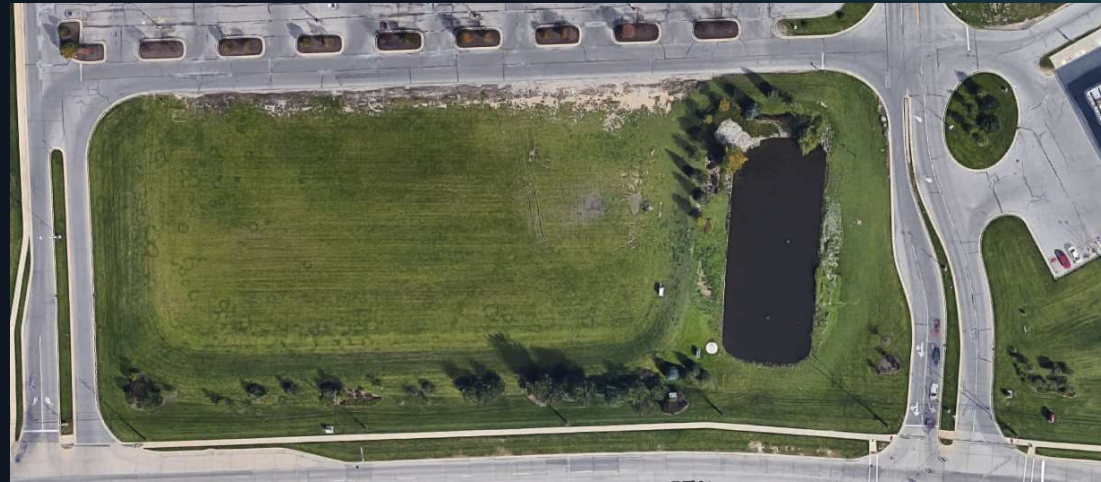
- ✓ Comply with NPDES MS4 permit requirements
- ✓ Ensure program is reflective of current conditions and technology
- ✓ Simple Rules
- ✓ Streamline review process
- ✓ Consistency between counties



Regional Stormwater Standards Coordination Committee (RSSCC) Goals

DEVELOP A SET OF CLEAR, CONSISTENT IMPLEMENTABLE, ENFORCABLE RULES

RSSCC consists of stormwater experts across SE Michigan, both in the public and private sectors. These professionals know how the site plan design and review process works.





RSSCC Schedule

20 MONTHS OF COORDINATION

- Meetings began in April 2018, 26 meetings total
- Draft rules submitted to EGLE in November 2018
- Ongoing coordination with EGLE staff, primarily focused on volume control and channel protection
- Goal is to codify rules in 2020 (implement the rules as a group)





Wayne County & RSSCC Goals

BALANCE ECONOMIC REALITIES WITH ENVIRONMENTAL PROTECTION

- Rules should:
 - Be implementable
 - Meet or exceed the EGLE MS4 permit guidance for Channel Protection
 - Consistent rules
 - Encourage redevelopment
 - Prevent 'gaming' by developers' engineers
 - Put all counties, municipalities, and developers on a level playing field
- Economic realities
 - Appropriate stormwater 'footprint'
 - Encourage efficient investment in water quality and flood control



Where do rules apply?

All sites with 0.5 acres or more of new or replaced impervious area

Some local jurisdictions may choose a lower threshold for development size

If disturbed area is greater than 1-acre, stormwater rules apply regardless of impervious area created or replaced





KEY RULE COMPONENTS

PEAK AND VOLUME CONTROL



Water Quality / TSS

- 1-inch storm
- Reduce TSS by 80% or limit concentration to 80 mg/L



NEW

Volume Control

Channel Protection Volume Control (CPVC)

Infiltrate first 1.0 inch



Rate Control

Channel Protection Rate Control (CPRC): 1.9 inches, extended detention

Flood Control: 100-year event; variable release rate and storage curve



KEY NEW RULES

CHANNEL PROTECTION VOLUME CONTROL (CPVC)

CHANNEL PROTECTION RATE CONTROL (CPRC)

CPVC

1.0 inch

Applies to all regulated sites to the Maximum Extent Practicable (MEP)

Alternative approach to 2-yr / 24-hr volume control in EGLE permit guidance document

CPRC

1.9 inches

Applies to all regulated sites; also serves as an alternative compliance measure to volume control.

48-hour extended detention for runoff volume from a 1.9-inch rain event



KEY NEW RULES

CHANNEL PROTECTION VOLUME CONTROL (CPVC)

CPVC

- Exceptions**
- Soil infiltration rate is less than 0.24 inches/hour
 - Prevailing groundwater is within 2 vertical feet of the bottom of infiltration BMP
 - Contaminated soils on site (i.e. 'hot spots')

When CPVC cannot be met, CPRC serves as an alternative method



1-inch standard

WHAT DID WE LEARN?

- Curve number method is not ideal for small storm hydrology
- Infiltration standard should be based on a simple equation that prevents misuse/gaming
- Applying 1-inch infiltration standard to redevelopment provides a major benefit
 - Annual runoff volume reduced by up to 90%
 - Reduces flashiness in receiving streams



1-inch standard

KEY ADVANTAGES

- Standardization across all developments; increases likelihood of widespread adoption
- Allowance for underdrain in tighter soils makes infiltration BMPs more attractive to designers
- Simplified calculations reduce design barriers and encourage proliferation of infiltration BMPs





KEY NEW RULES

CHANNEL PROTECTION RATE CONTROL (CPRC)

a/k/a EXTENDED DETENTION

CPRC

CPRC is the alternative compliance for 1-inch infiltration

What is it for?

- Addresses peak flow control for the 2-yr / 24-hr storm; discharge over a 48-hour period (extended detention)
- Why 1.9 inches?
 - 2-yr/24-hr storm is ~2.35 inches
 - Even under pre-settlement conditions (Type A/B soils), runoff still occurs (~0.4 inch)
 - 1.9 inches ensures 2-yr/24-hr peak flow control on all sites
- Same standard for redevelopment sites; this rule will significantly reduce peak flows and address stream flashiness



SIMPLIFIED EQUATIONS

- Less reliance on the curve number method
- Newer equations guarantee BMP volumes are attained without 'gaming' the system
- Makes site plan design and review more efficient

CPVC Volume (infiltration BMPs)

$$V_{\text{CPVC}} = 3,630 * C * A$$

CPRC Volume (part of detention pond)

$$V_{\text{CPRC}} = 6,897 * C * A$$

C = runoff coefficient

A = regulated drainage area (acres)



FLOOD CONTROL RULES

New Equations



CURRENT STANDARDS

- Allowable peak flow limit of 0.15 cfs/acre
- For sites less than 5 acres, flood control requirement for the 10-year design event
- For sites greater than 5 acres, flood control requirement for the 100-year design storm event
- Yrjanainen Method
- Old equations out of date based on changes to rainfall depths and intensities

(Orifice Outlet)			
Frequency Of Storm	Rainfall Intensity	Storage Time Equation	Storage Volume Equation
1 Year	$\frac{72}{T+25} *$	$T=-25+ \sqrt{\frac{2700.0}{Q_o}}$	$V_s = \frac{4320T}{T+25} - 40Q_oT$
5 Year	$\frac{145}{T+25}$	$T=-25+ \sqrt{\frac{5437.5}{Q_o}}$	$V_s = \frac{8700T}{T+25} - 40Q_oT$
10 Year	$\frac{175}{T+25}$	$T=-25+ \sqrt{\frac{6562.5}{Q_o}}$	$V_s = \frac{10500T}{T+25} - 40Q_oT$
25 Year	$\frac{215}{T+25}$	$T=-25+ \sqrt{\frac{8062.5}{Q_o}}$	$V_s = \frac{12900T}{T+25} - 40Q_oT$
50 Year	$\frac{245}{T+25}$	$T=-25+ \sqrt{\frac{9187.5}{Q_o}}$	$V_s = \frac{14700T}{T+25} - 40Q_oT$
100 Year	$\frac{275}{T+25}$	$T=-25+ \sqrt{\frac{10312.5}{Q_o}}$	$V_s = \frac{16500T}{T+25} - 40Q_oT$



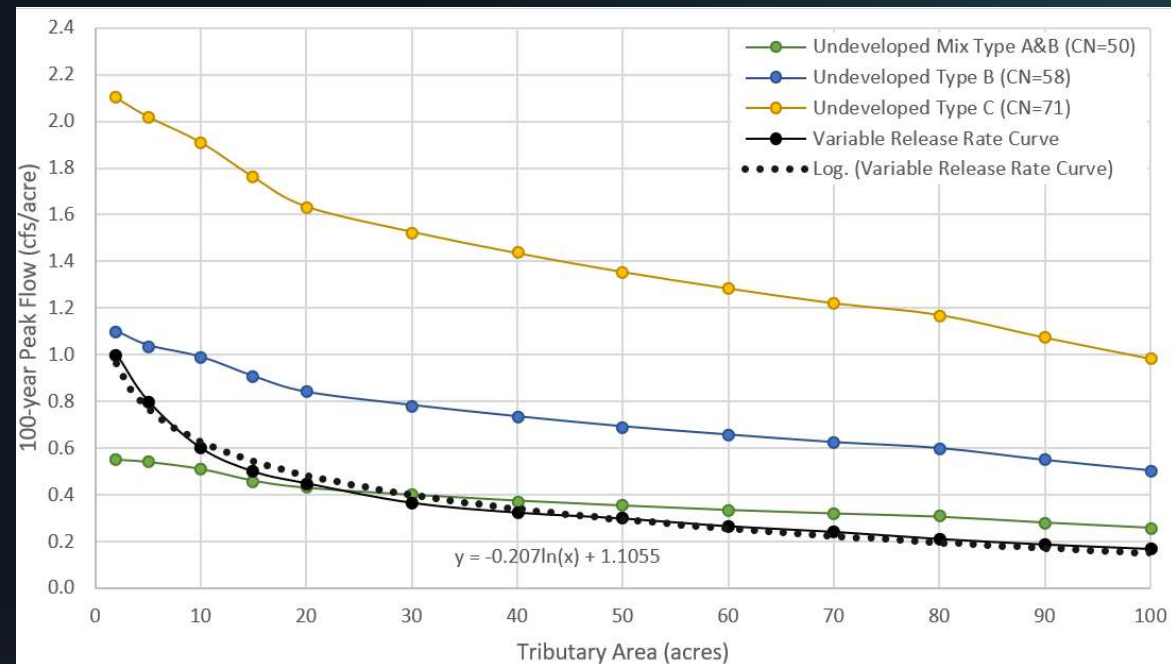
PROPOSED STANDARDS

- Consistent design (100-year storm for all ponds)
- Variable release rate
- Update standards to reflect current climate data (NOAA Atlas 14)
- Credit infiltration (CPVC) volume against flood control volume (with ceiling at CPRC)
- Provide more realistic flow/storage requirements for smaller sites



VARIABLE RELEASE RATE

- Recognizes that runoff potential (cfs/acre) is much higher for smaller sites
- 0.15 cfs/acre may be too restrictive for smaller sites
- Set variable release rate
 - 0.15 cfs/acre for sites larger than 100 acres
 - Gradual increase to 1.0 cfs/acre sites 2 acres and smaller
- Allows for a shift in capital from storage to water quality BMPs



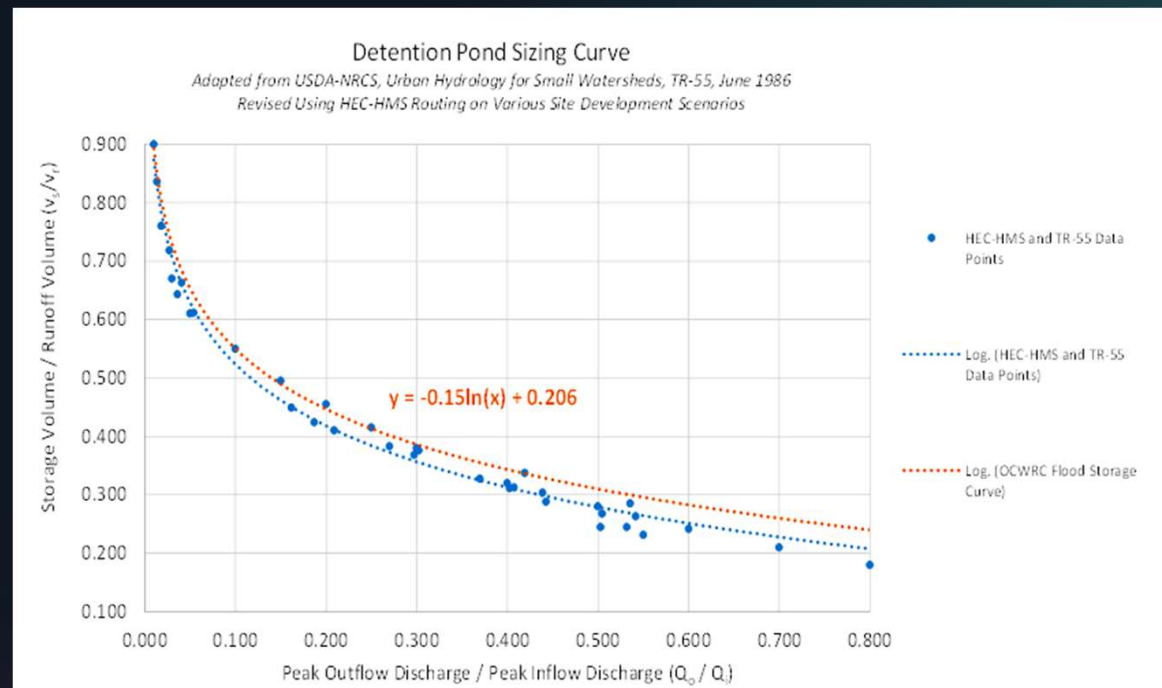
Rules still provide for more restrictive release rate if downstream conditions warrant



STORAGE CURVE

- Single equation to size detention pond
- Based on TR-55 curve
- Verified by hydrologic routing of dozens of hypothetical developments
- Will adapt to changing climate conditions
- Only variables needed:
 - Peak post-development pond inflow
 - Post-development runoff volume
 - Peak allowable discharge

$$Y = -0.15\ln(x) + 0.206$$



SIMPLIFIED EQUATIONS

- Fewer equations than current method
- Doesn't rely on curve numbers
- Makes site plan design and review more efficient

Allowable Peak Discharge Rate

$$Q_{\text{allow}} \text{ (cfs/acre)} = -0.207 * \ln(A) + 1.1055$$

$$Q_o = Q_{\text{allow}} * A$$

100-yr Storage Volume (Detention Pond)

$$V_s = V_r * [-0.15 * \ln(Q_o/Q_i) + 0.206]$$

V_s = 100-yr storage volume

V_r = 100-yr developed runoff volume

Q_o = 100-yr Allowable peak discharge

Q_i = 100-year peak pond inflow



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Site Plan Examples

Real world scenarios

Existing Rules

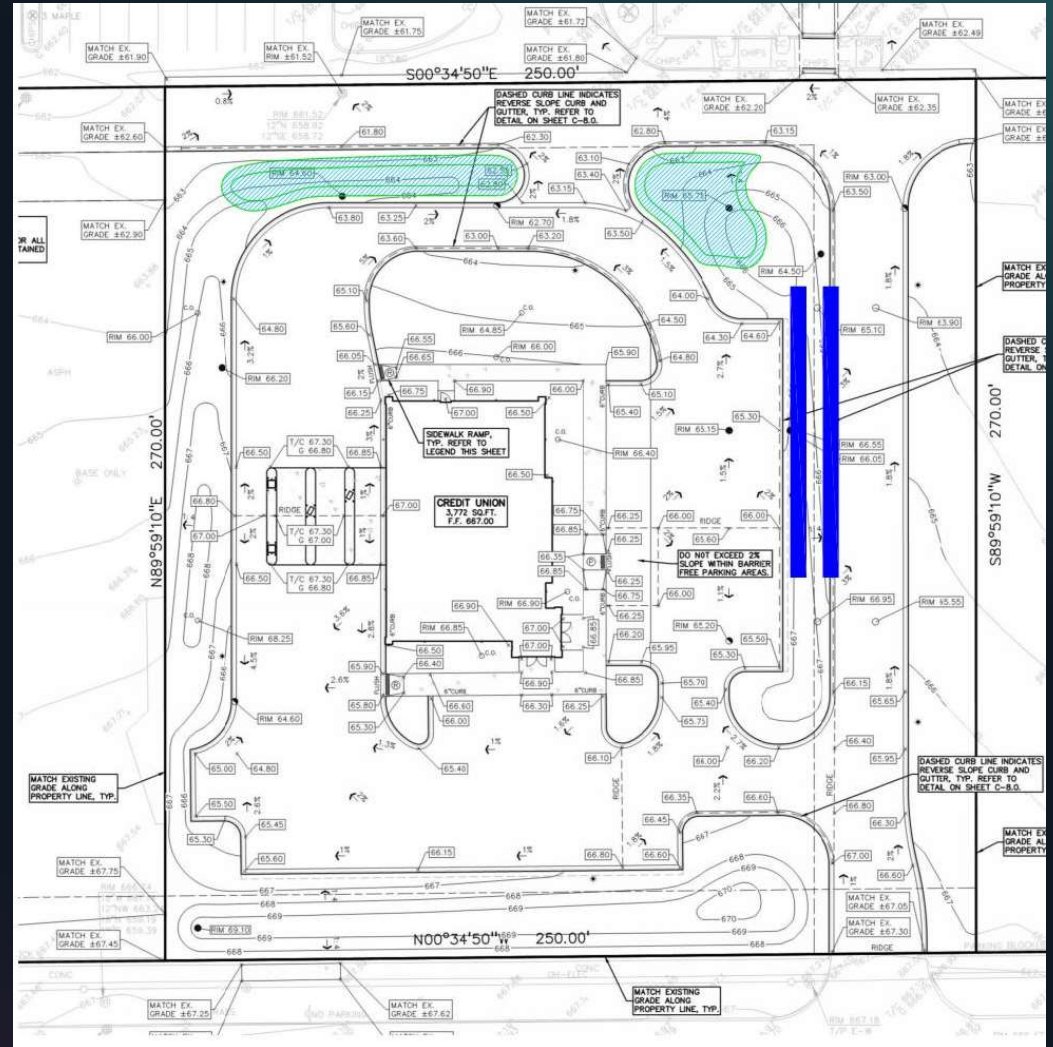
- ## Stormwater Mgt. Costs:

-
- The site plan illustrates the proposed parking lot layout for the Credit Union. Key features include:
 - Property Lines:** Indicated by dashed lines with bearings and distances (e.g., N89°59'10"E 270.00', N00°34'50"E 250.00').
 - Grades:** Numerous spot grades are shown throughout the site, ranging from 61.80 to 68.60.
 - Annotations:**
 - "DASHED CURB LINE INDICATES REVERSE SLOPE CURB AND GUTTER. TYP. REFER TO DETAIL ON SHEET C-8.0."
 - "DO NOT EXCEED 2% SLOPE WITHIN BARRIER FREE PARKING AREAS."
 - "SIDEWALK RAMP. TYP. REFER TO LEGEND THIS SHEET."
 - "CREDIT UNION 3,772 SQ. FT. FF 667.00"
 - Match Lines:** Various match lines are labeled, such as "MATCH EX. GRADE #61.90", "MATCH EX. GRADE #62.90", "MATCH EX. GRADE #63.75", "MATCH EX. GRADE #64.20", "MATCH EX. GRADE #64.35", "MATCH EX. GRADE #62.30", "MATCH EX. GRADE #62.90", "MATCH EX. GRADE #63.30", "MATCH EX. GRADE #63.50", "MATCH EX. GRADE #63.90", "MATCH EX. GRADE #65.50", "MATCH EX. GRADE #66.00", "MATCH EX. GRADE #66.20", "MATCH EX. GRADE #66.40", "MATCH EX. GRADE #66.60", "MATCH EX. GRADE #66.80", "MATCH EX. GRADE #67.00", "MATCH EX. GRADE #67.20", "MATCH EX. GRADE #67.40", "MATCH EX. GRADE #67.60", "MATCH EX. GRADE #67.80", "MATCH EX. GRADE #68.00", "MATCH EX. GRADE #68.20", "MATCH EX. GRADE #68.40", "MATCH EX. GRADE #68.60".
 - Other Features:** The plan includes a sidewalk ramp, a credit union building, and various drainage features like ridges and slopes.

Example Site #1

Proposed Rules

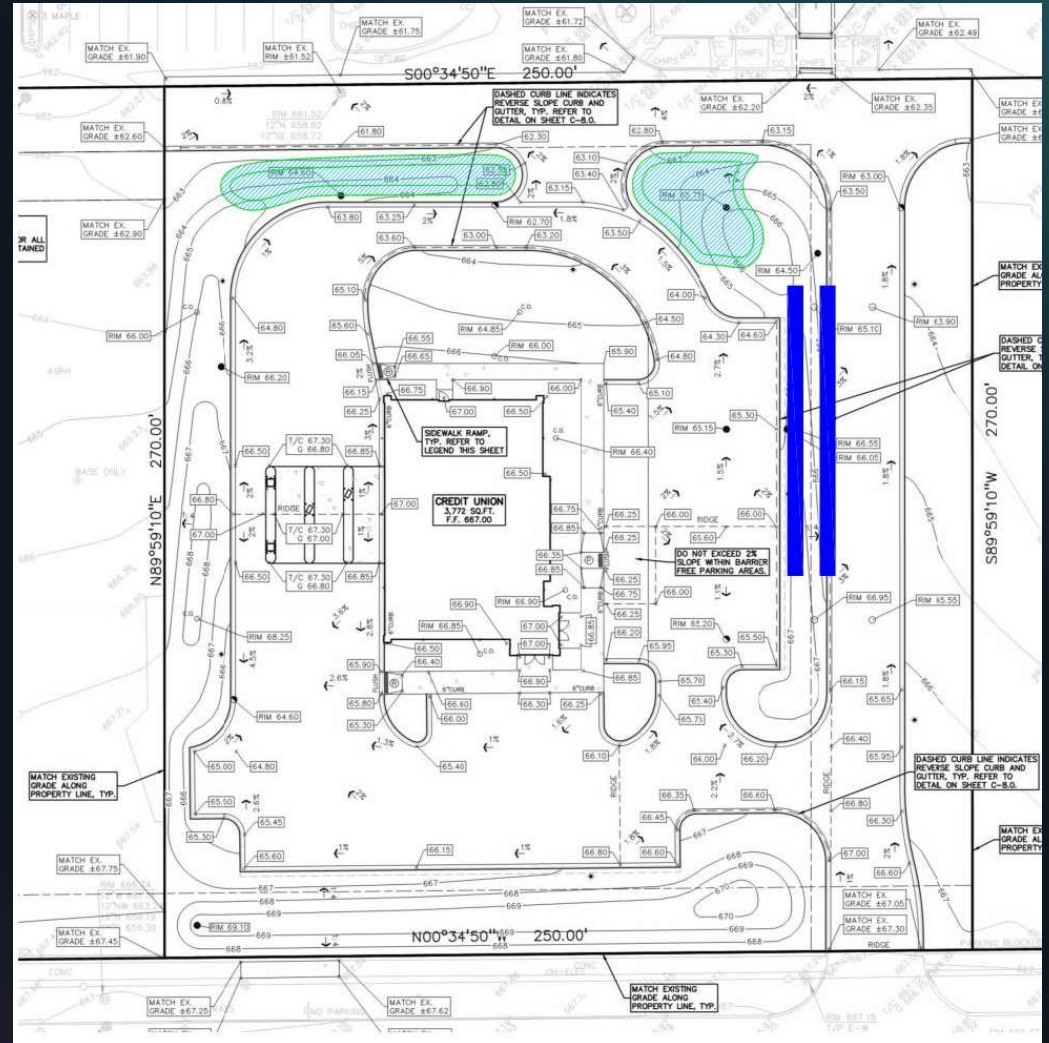
- 1-inch infiltration: 2,900 CF
- 1.9-inch extended detention: 6,400 CF
- 100-year peak flow (1.0 cfs/acre) = 1.15 cfs
 - Storage required: 6,000 CF
 - Less than extended detention
- Additional flood control detention needed: 6,400 CF
 - Approximately the same as existing
 - 340 LF 60-inch sewer (underground detention)



Example Site #1

Proposed Rules

- Stormwater Management Costs:
 - \$35,000 (bioretention)
 - \$275,000 (underground detention)
 - TOTAL: \$310,000
 - (less than existing cost of \$325,000)



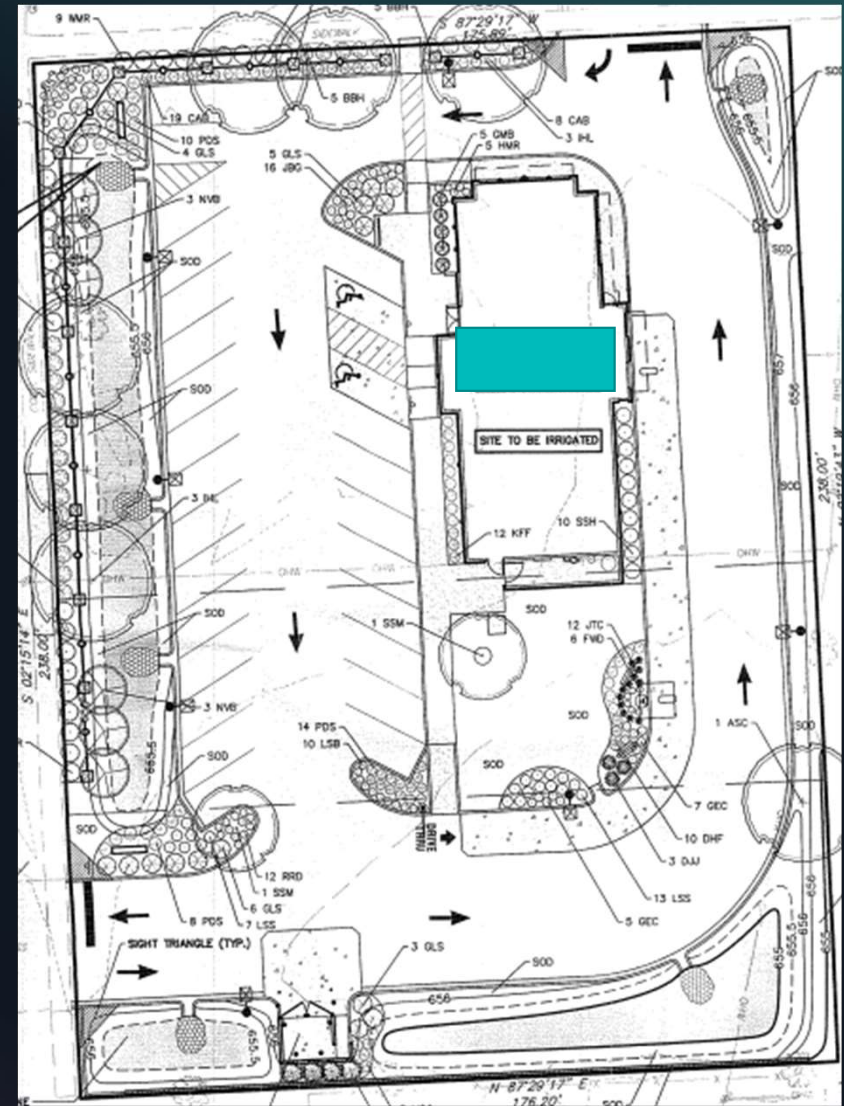
Example Site #2

Existing Rules

- 0.96-acre redevelopment
 - 0.5 acres impervious area disturbed
- Bioretention used for water quality
- 10-year peak flow = 0.14 cfs, 4,434 CF storage

Stormwater Mgt. Costs:

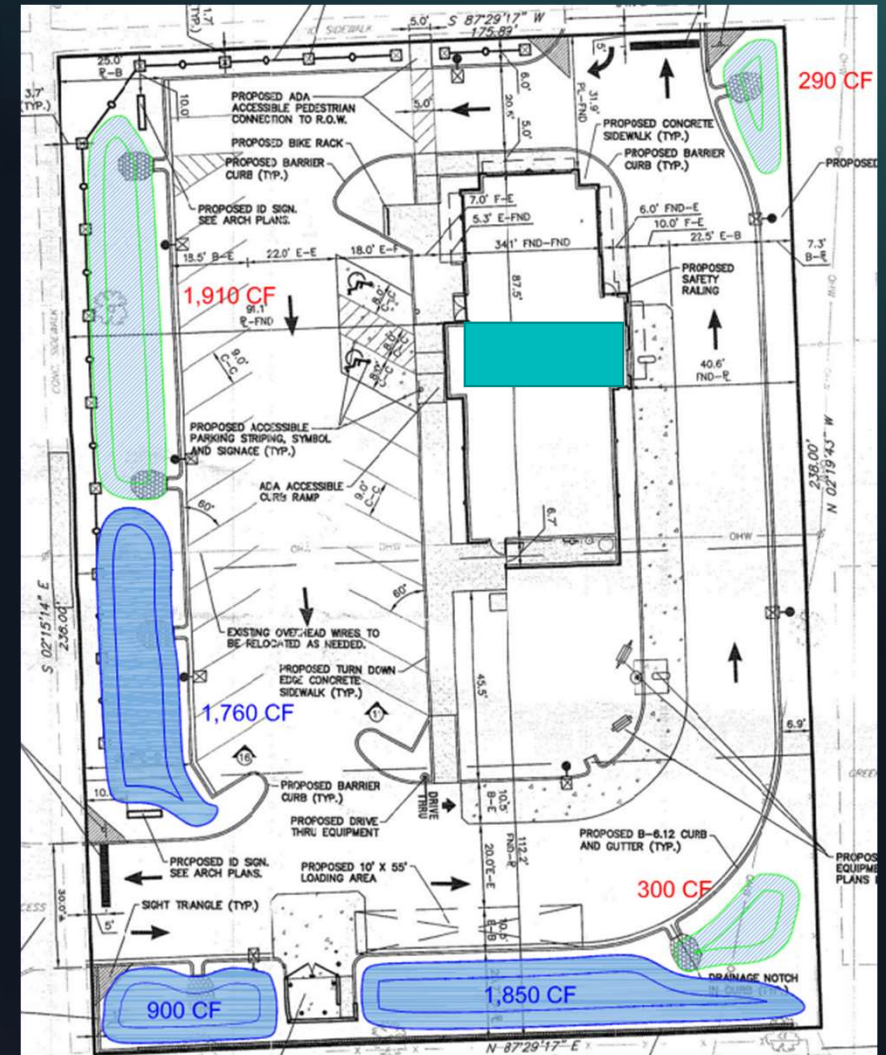
- \$57,650 (bioretention)



Example Site #2

Proposed Rules

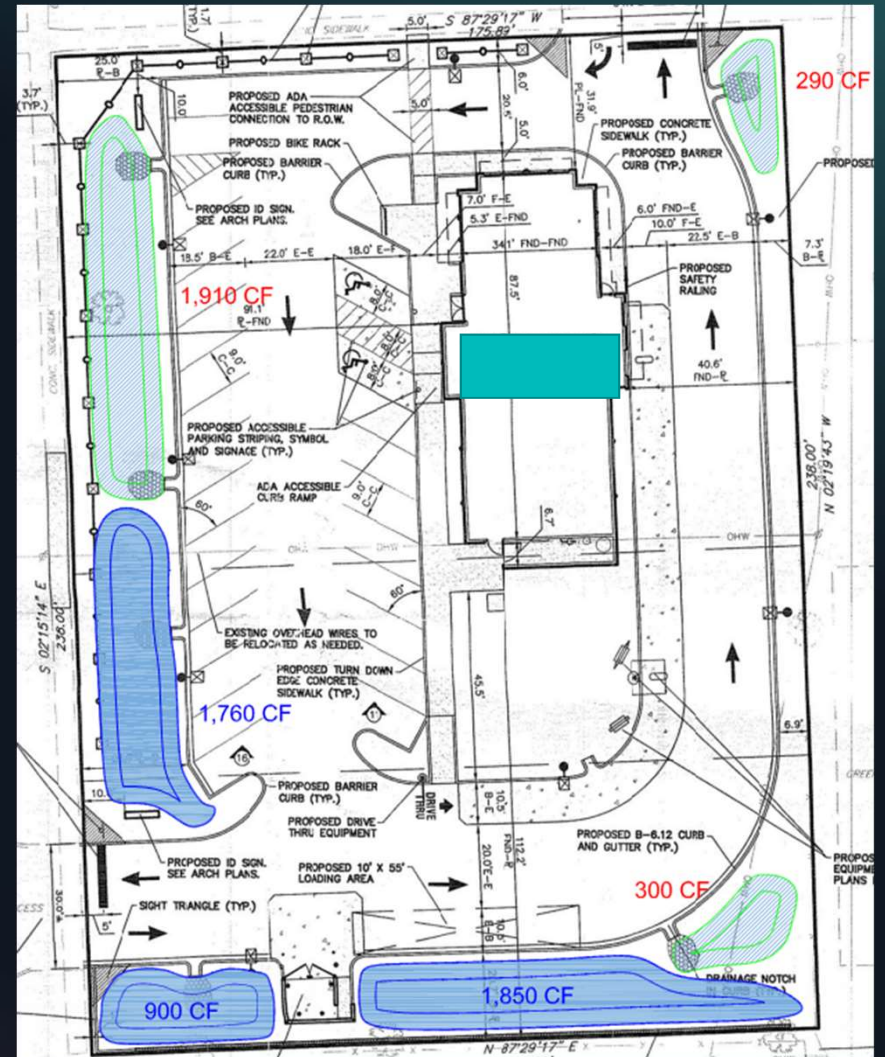
- 1-inch infiltration: 2,370 CF
- 1.9-inch extended detention: 4,510 CF
- 100-year peak flow (1.0 cfs/acre) = 0.96 cfs
 - Storage required: 5,350 CF
- Flood control detention reduced from infiltration, only need: 4,510 CF
 - Same flood storage needed under existing rules



Example Site #2

Proposed Rules

- Stormwater Management Costs:
 - \$31,000 (bioretention)
 - \$9,000 (detention)
 - TOTAL: \$40,000
 - Compared to \$57,650 under existing rules



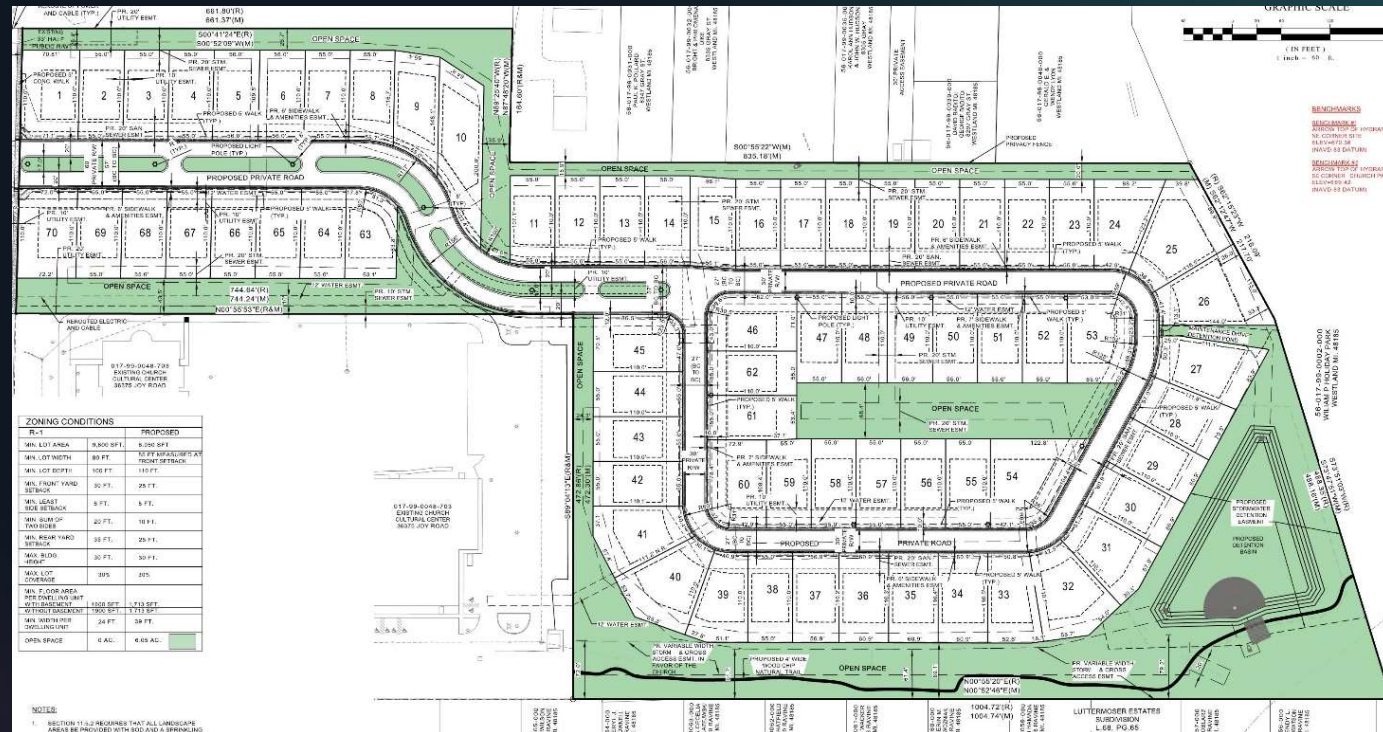
Example Site #3

Existing Rules

- 16.7 acre redevelopment
- Mechanical Separators (2)
- 100-year peak flow: 2.5 cfs
 - 117,262 CF storage

Stormwater Mgt. Costs:

- \$100,000 (2 mech. separators)
- \$235,000 (detention pond)
- \$167,000 (landscaping)
- Total: \$602,000



Example Site #3

Proposed Rules

- 1-inch infiltration: 34,490 CF
- 1.9-inch extended detention: 65,540 CF
- 100-year peak flow (0.52 cfs/acre) = 8.7 cfs (existing rules = 2.5 cfs)
 - Storage required: 86,060 CF
- Subtracting the 1-inch infiltration volume credit, additional detention needed: 65,540 CF
 - Only 56% of storage volume as compared to existing rules

Stormwater Management Cost:

- \$448,000 (bioretention)
- \$132,000 (detention pond)
- Total: \$580,000
 - Key offsets:
 - Bioretention costs replace landscaping costs for infiltration zones
 - No mechanical separators
 - Reduced pond excavation costs

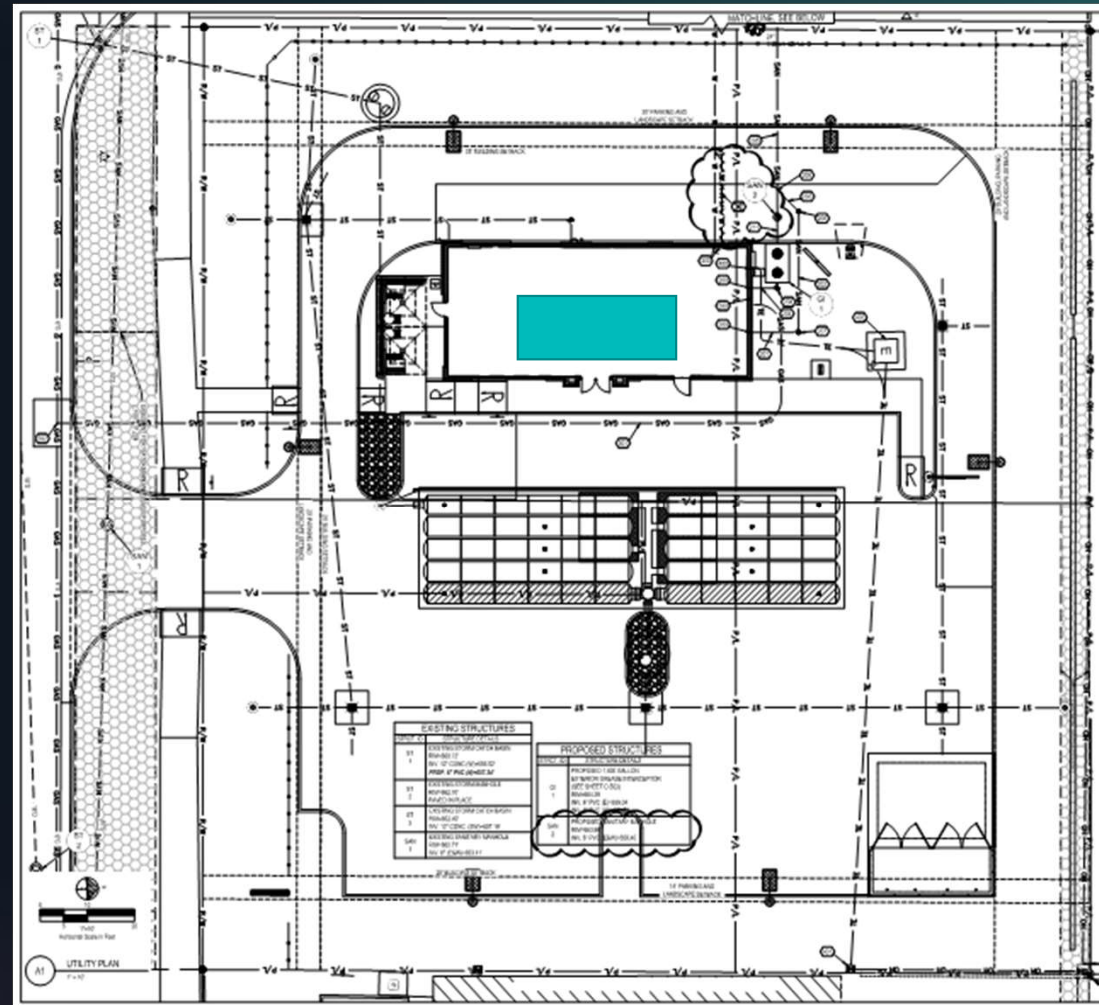
Example Site #4

Existing Rules

- 0.86 acre redevelopment
- Mechanical Separator
- 10-year peak flow = 0.13 cfs, 3,959 CF storage
- Underground Detention

Stormwater Mgt. Costs:

- \$50,000 (mechanical separator)
- \$67,000 (underground detention)
- Total: \$117,000



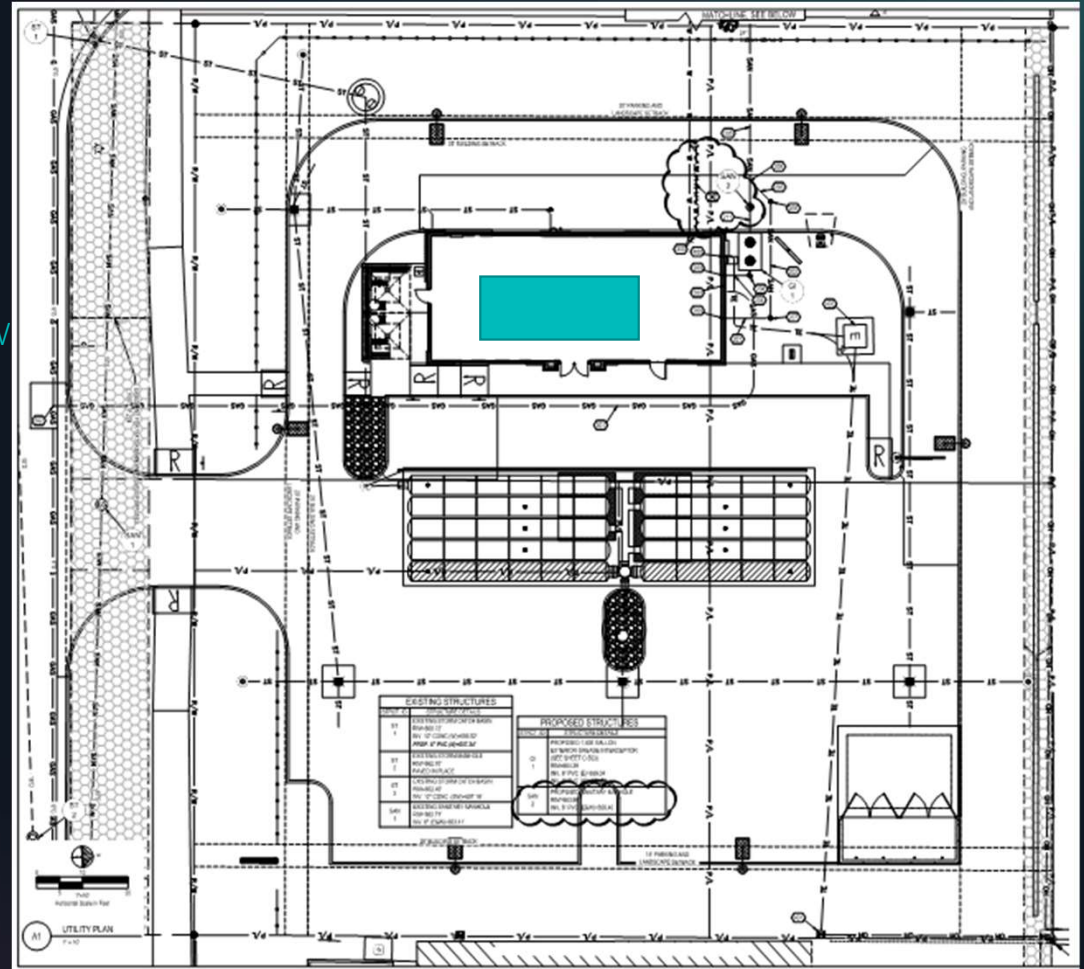
Example Site #4

Proposed Rules

- ASSUME that we cannot infiltrate due to low soil permeability (tight clayey soils)
- 1.9-inch extended detention: 4,050 CF
- 100-year peak flow (1.0 cfs/acre) = 0.86 cfs
 - Storage required: 4,805 CF

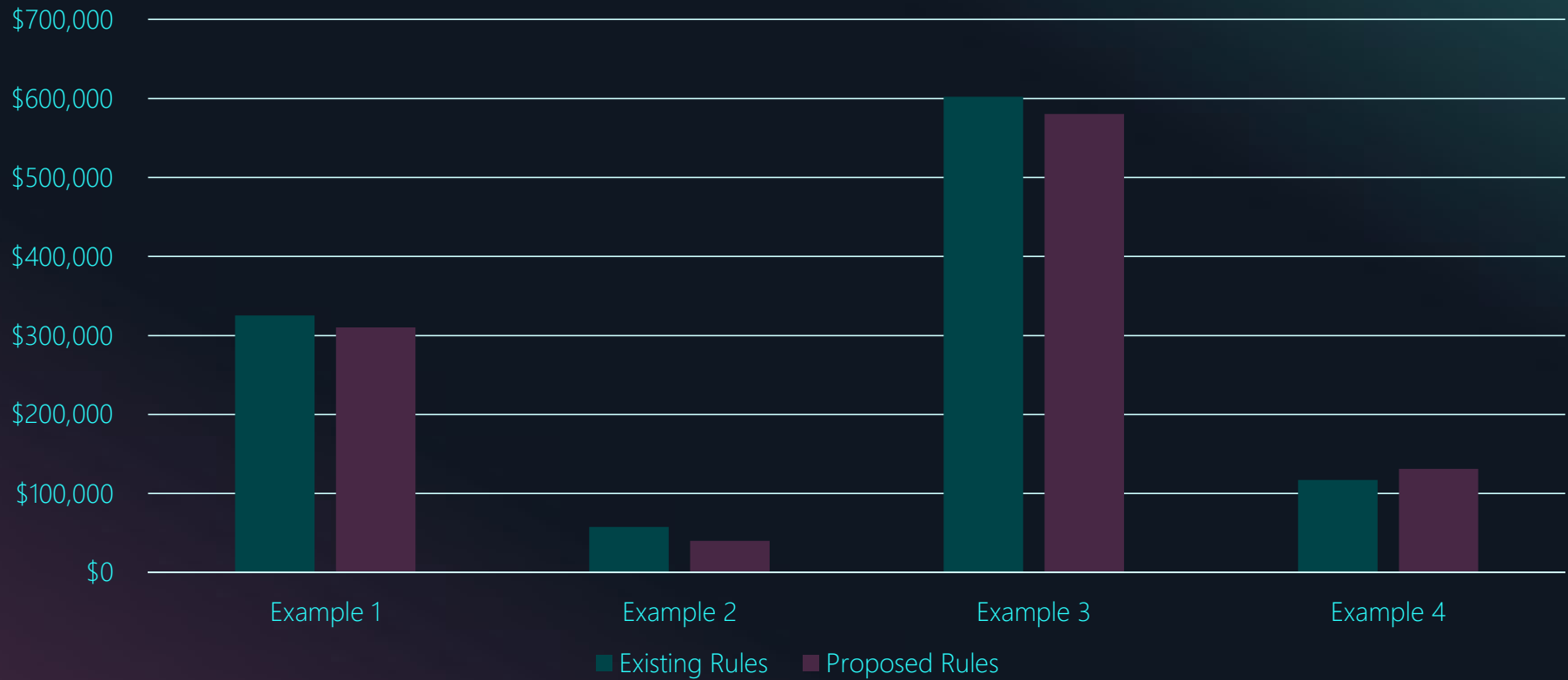
Stormwater Management Cost:

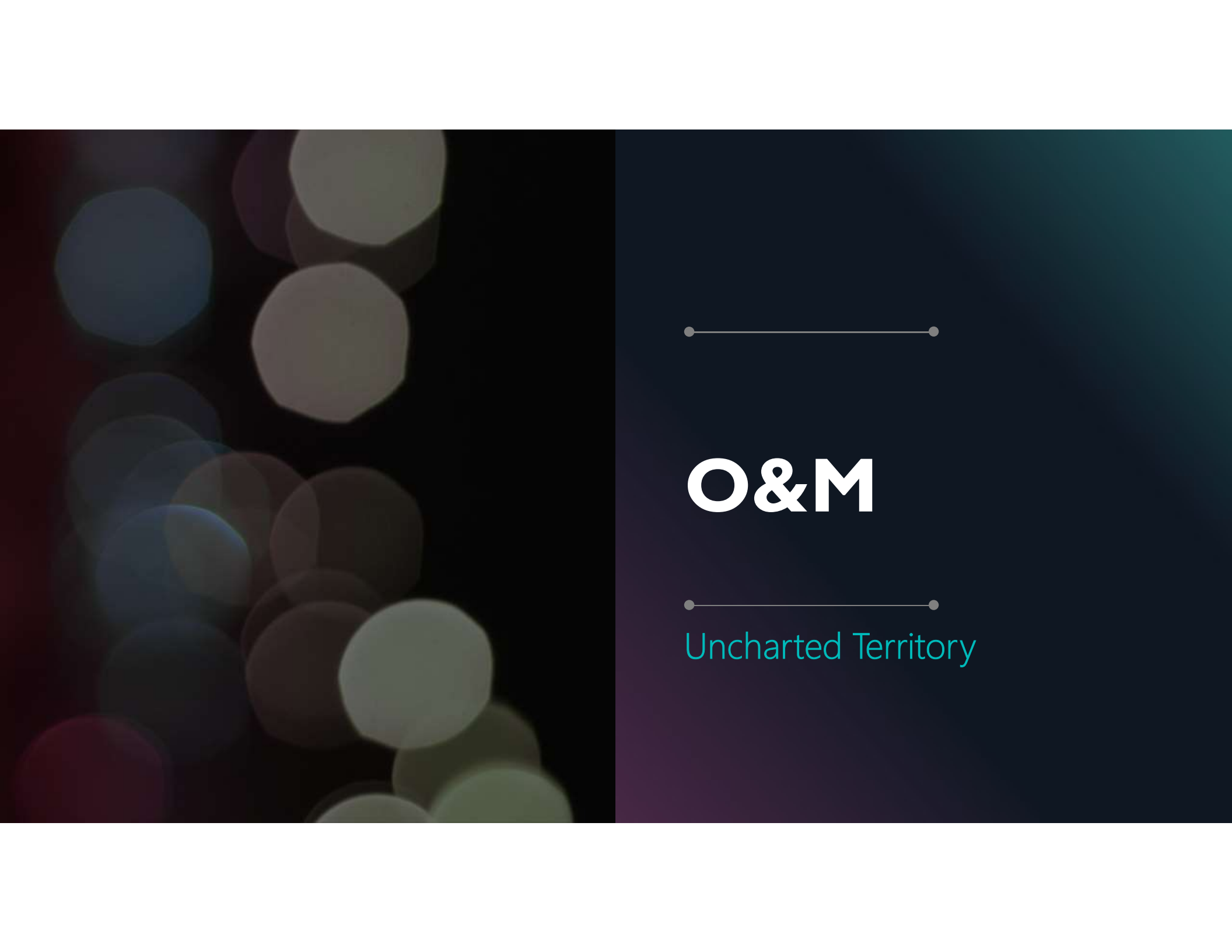
- \$50,000 (mechanical separator)
- \$81,000 (underground storage)
- TOTAL: \$131,000
 - 10% increase relative to existing





Site Plan Example Cost Comparison





O&M

Uncharted Territory

MAINTENANCE IS ESSENTIAL

- Maintenance agreements between developers and local municipalities
- Restrictions recorded
- Counties and local municipalities required to verify stormwater maintenance through MS4 permits





FUTURE O&M APPROACH

GIS-BASED TRACKING AND INSPECTION PROGRAM ADMINISTERED AT THE COUNTY

- Years 1-2: O&M program will begin with an inventory and inspection program
 - GIS-based
 - Real-time data collection with standardized forms
 - Initial focus on detention ponds and culverts
 - Require developers to submit electronic CAD/GIS files upon site plan approval
 - Scoring system to prioritize repairs

swPondInventory	
FacilityID	swBasin-TY-037
Jurisdiction	Taylor
Development Type	Residential
Pond Type	Wet
Pond Ownership	Private
Source For Irrigation	No
Shoreline Veg/Treatment	Naturalized
Water Fowl Present	No
Invasive Species Present	Hybrid Cattail
Percent Invasive	0-5
Aeration System Present	Yes
Pond Perimeter Fence Present	No
Length (ft)	





FUTURE O&M APPROACH

INVENTORY-BASED INSPECTION, REPAIR AND ENFORCEMENT PROGRAM

- Focus on County jurisdiction areas (roadways, County drains, Townships)
- Use initial inventory to determine scope and cost of an enforcement and repair/rehab program
- Meet as a group to discuss next steps
- Final step = enforcement and implementation program (after funding is programmed)
 - Stormwater Utilities are the most useful tool to ensure inspection and enforcement



OUR TEAM

Stormwater Technical and Policy Experts Across SE Michigan



Elmeka Steele

Wayne County



Patrick Cullen

Wayne County



Beth Taylor

Wayne County



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Wayne County



Haaris Ahmad

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Valerie Novaes

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Nancy Russell

OHM Advisors



Don Carpenter

Drummond Carpenter



Kelly Cave

Project Consultant



Alliance of Downriver Watersheds

Tech Committee



SUMMARY

UPDATED STORWATER STANDARDS TO ROLL OUT SOON

-
- Updated standards are intended to be simpler and more flexible for implementation
- Consistent with EGLE criteria
- Aligns with regional goal to improve water quality and reduce flooding
- County will continue public rollout in the coming months
- Formal adoption of rules in 2020 (collaborative with the regional group)



OPEN DISCUSSION & QUESTIONS

THANK YOU!
