Campus Stormwater Management

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Overview

- WMU history
- Voluntary compliance (MS4 permit)
- Change in stormwater policies/philosophy
- Establishing benchmarks/metrics (priorities/regulation)
WMU History

- Direct discharge
  - Pipes to creek
- Preservation of facilities
- Limit liability
- Flooding
- Regulatory compliance
MS4 permit

- Municipalities with Separate Storm Sewer Systems
- 2000 – WMU developed a voluntary permit
- 2003 – First permit issued
  - Public education and participation
  - Locating and eliminating illicit discharge connections
  - Stormwater pollution prevention initiatives (SWIPPI)
2008

Guidelines for Best Management Practices

- No new outfalls or discharges will be created
- Projects over 1-acre will have ZERO discharge
- Modeling required to evaluate stormwater systems
- Contractor requirements
- Routine maintenance
- Testing throughout construction
WMU Stormwater Committee

- Cari DeLong
  Manager – WMU Natural Areas
- Dr Pat Holton
  Director – WMU Environmental Health and Safety
- Tim Holysz
  Director – WMU Landscape Services
- Dan List
  Manager – WMU Geographic Information Systems
- George Wilson
  Senior Engineer – WMU Campus Utilities
- Anand Sankey
  Director – WMU Engineering & Maintenance Services
Geographic Information Systems

- Data Collection of Utility Infrastructure
  - 1426 Storm Points
  - Points of Discharge
  - Over 28 Miles of Storm Lines
- Aerial Imagery Catalog
- Base Mapping
  - Impervious vs. Pervious Surfaces
  - LiDAR Elevation Data (2008)
- Interactive Web Mapping Application
  - Share data University-wide
Regulatory Setting

Total Maximum Daily Load (TMDL)
- CWA Section 303d – requirement to list impaired waters
- Maximum amount of a pollutant that a water body can receive and still safely meet water quality standards
- Kzoo River/Lake Allegan TMDL (2001) for phosphorus

Municipal Separate Storm Sewer System (MS4)
- WMU voluntary stormwater permit 2000
- WMU MS4 Watershed General Permit, issued December 23, 2003

Compliance & Sustainability
Kalamazoo River Watershed

2,020 sq. miles

Portage & Arcadia Creek Subwatershed

Lake Allegan

Kalamazoo River Watershed

WMU
TMDL Compliance Planning Project

- Identify “stormwater footprint” (1998 & present)
- Establish TMDL/other metrics for stormwater
- Determine WMU TMDL compliance status
- Identify future BMP options
- Integrate SW planning for campus projects
- Future BMP monitoring plan
- Pursue Stormwater Neutral™ goal

Net-zero phosphorus load
• Campus area = 807 acres (including BTR park)
• 151.7 acres treated
• 18.8% of campus
• TP Load = 764 lbs/yr
Parking Lot 23

- Sediment Forebay
- Wet Detention/Infiltration
- Native vegetation
- Serves 32 acres

<table>
<thead>
<tr>
<th>Project</th>
<th>BMP Type</th>
<th>Annual TP Reduction</th>
<th>Annual TSS Reduction</th>
<th>Annual Volume Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking Lot 23</td>
<td>Detention/Infiltration</td>
<td>28 lbs</td>
<td>4 tons</td>
<td>30 ac-ft</td>
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</tbody>
</table>

50%
### Chemistry Building

- **Infiltration**
- **Vegetated Swales**
- **Native vegetation**
- **Serves 10.5 acres**

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<th>Annual Volume Reduction</th>
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<tbody>
<tr>
<td>Chemistry Building</td>
<td>Infiltration</td>
<td>15 lbs 100%</td>
<td>2 tons 100%</td>
<td>18.5 ac-ft 100%</td>
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<tr>
<td>Project</td>
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<td>Annual TSS Reduction</td>
<td>Annual Volume Reduction</td>
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</tr>
<tr>
<td>RCVA/Kohrman</td>
<td>Infiltration</td>
<td>23 lbs 100%</td>
<td>3 tons 100%</td>
<td>27 ac-ft 100%</td>
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</tbody>
</table>

- Sub-Surface Retention & Infiltration
- Preserves Open-Space
- Serves 14 acres
Howard/Stadium CMI

- Wet Detention & Infiltration
- Floodplain Enhancement
- Native Vegetation
- Streambank Restoration
- Serves 102 acres

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<th>Annual TP Reduction</th>
<th>Annual TSS Reduction</th>
<th>Annual Volume Reduction</th>
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<tbody>
<tr>
<td>Howard/ Stadium CMI</td>
<td>Detention/ Infiltration</td>
<td>86 lbs, 50%</td>
<td>27 tons, 50%</td>
<td>120 ac-ft, 50%</td>
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</table>
### WMU Parkview Campus

- On-site Retention & Infiltration
- Native Vegetation
- Serves 197 acres

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<th>Annual TSS Reduction</th>
<th>Annual Volume Reduction</th>
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<tbody>
<tr>
<td>BTR/Parkview Campus</td>
<td>Retention/Infiltration</td>
<td>123 lbs</td>
<td>24 tons</td>
<td>150 ac-ft</td>
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2012 WMU Campus BMP Areas

- 14 BMPs since 1998
- 432.8 acres treated including BTR (blue areas)
- 53.6% of campus
2011 WMU TMDL Compliance

**TMDL Goal:** 382 lbs/yr

**1998 TMDL Baseline:** 764 lbs/yr

**On-Campus:** BMPs only

**On-Campus and Off-Campus BMPs** (i.e., offsets)

**Off-Campus BMPs financially supported by WMU**

Remaining Baseline Load = 199 lbs/yr
Total Reduction to date = 565 lbs/yr
Project Benefits and Outcomes

TMDL Compliance

Stormwater Neutral™

Runoff Volume

- **TMDL Compliance**: 74% GOAL ACHIEVED!
- **Stormwater Neutral™**: 100% GOAL! (Net zero discharge)
- **Runoff Volume**: 46%
### Arcadia Creek Loading to K-zoo River

<table>
<thead>
<tr>
<th></th>
<th>TP</th>
<th>TSS</th>
<th>Volume</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>(lbs/yr)</td>
<td>(tons/yr)</td>
<td>(Mgal/yr)</td>
</tr>
<tr>
<td>WMU BMPs</td>
<td>424</td>
<td>123</td>
<td>160</td>
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<tr>
<td>Arcadia Creek Total</td>
<td>2,091</td>
<td>539</td>
<td>769</td>
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<tr>
<td><strong>WMU Reduction (%)</strong></td>
<td><strong>20.3</strong></td>
<td><strong>22.8</strong></td>
<td><strong>20.8</strong></td>
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<tr>
<td><strong>WMU Total Investment</strong></td>
<td><strong>$4,118,086</strong></td>
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Next Steps and New Opportunities

- **Future On-Campus BMP Options**
  - 375 acres of main campus remain untreated
  - Pursue new funding for volume reduction and WQ

<table>
<thead>
<tr>
<th>Stormwater BMP Location</th>
<th>Lot 48-North of BHC</th>
<th>The Oaklands - rain garden</th>
<th>Davis Hall - rain garden</th>
<th>Lawson Ice Arena - Lot 63</th>
<th>Lawson Ice Arena - Lot 64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost ($)</td>
<td>$37,940</td>
<td>$30,685</td>
<td>$20,595</td>
<td>$22,555</td>
<td>$34,305</td>
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<td>($/ac-ft)</td>
<td>$9,164</td>
<td>$6,974</td>
<td>$6,021</td>
<td>$3,803</td>
<td>$6,181</td>
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<tr>
<td>TSS ($/ton)</td>
<td>$48,151</td>
<td>$64,942</td>
<td>$49,270</td>
<td>$21,907</td>
<td>$36,727</td>
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<td>TP ($/lb)</td>
<td>$7,905</td>
<td>$9,298</td>
<td>$6,865</td>
<td>$3,638</td>
<td>$6,125</td>
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Priorities!
Benefits and Outcomes

- 53% of campus now treated by 14 BMPs
- First MS4 to document TMDL compliance
- Planning benchmarks & metrics
- Future project prioritization strategy
  - Pollutant
  - Volume
  - Cost-effectiveness
- Stormwater Neutral™ Progress (phosphorus)
Thank You!

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