



**Applying the ODOT Location & Design  
Manual to Meet BMP Requirements  
April 13, 2011**

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## Agenda

- The need for *Linear* Transportation Post-Construction BMPs
- Types of Linear Transportation BMPs
- Applying Design Requirements
  - Amount of Treatment
  - Type of Treatment
  - Design Examples
- ODOT Experiences
- Maintenance/Permitting Responsibilities
- What's next?



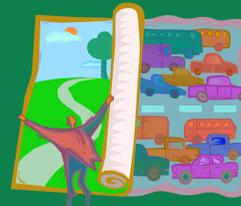
## ODOT/Storm Water Acronyms

- BMP – Best Management Practice
- CGP – Construction General Permit
- EBW – Enhanced Bankfull Width
- EDA – Earth Disturbed Area
- ExT – Exfiltration Trench
- L&D Manual – ODOT Location and Design Manual
- LPA – Local Public Agency
- NOI – Notice of Intent
- NPDES – National Pollutant Discharge Elimination System
- OEPA – Ohio Environmental Protection Agency
- SWPPP or SWP<sub>3</sub> – Storm Water Pollution Prevention Plan
- T% - Treatment Percent
- TSEC – Temporary Sediment and Erosion Control
- VBF – Vegetated Biofilter
- WQf – Water Quality Flow
- WQv – Water Quality Volume



## The Need for Linear Alternatives

- Magnitude of ODOT Permitting
  - Per OEPA database of Construction General Permit: ODOT has ~610 permits
- Consistent application of permit requirements for roadway projects needed
  - ODOT needed to have design guidelines and options for standard project types



# The Need for Linear Alternatives

- Linear Transportation Projects vs. Standard Land Development
  - Difficulty implementing typical BMPs listed in the Construction General Permit
    - R/W limitations (Eminent Domain)
    - Safety of the traveling public
    - Linear nature results in crossing multiple watersheds (centralized BMP impossible)



Dangers of Ponded Water



Multiple Watersheds Crossed



# The Need for Linear Alternatives

- Difficulty implementing BMPs listed in the Construction General Permit (cont.)
  - Roadway improvements offer little ability to change alignment to allow easier BMP implementation. Not an option to relocate existing bridges and roads in most cases.
  - Urban environments – Highly developed areas with little room for storm water facilities
  - All of the above result in increased costs of construction

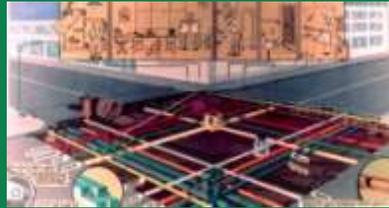


Henderson Road Bridge – Columbus, Ohio



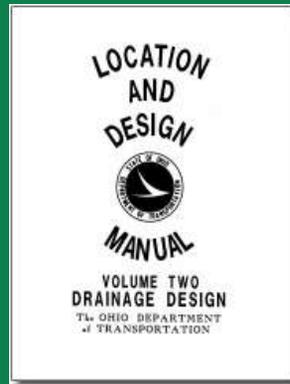
# Linear Transportation BMPs

- Rural Construction
  - Options are limited
    - Vegetated Biofilter
    - Small Detention Areas
- Urban Construction
  - Options are very limited
    - Manufactured Systems
    - Exfiltration Trench
    - Underground Storage



# Linear Transportation BMPs

- Ohio EPA Construction General Permit for Storm Water Discharge (OHC000003)
  - Part III.G.2.e – Post-Construction Storm Water Management Requirements
    - Transportation Projects – ODOT L&D Volume 2
    - Any updates to Volume 2 must be approved by Ohio EPA



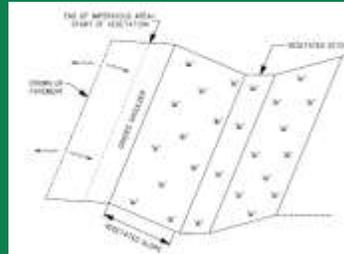
# Linear Transportation BMPs

- ODOT and OEPA agreed that the following alternative BMPs can be used for linear transportation projects subject to certain conditions:
  - Vegetated Biofilter
  - Manufactured System
  - Exfiltration Trench



# Linear Transportation BMPs

- Vegetated Biofilter
  - A Vegetated Biofilter (VBF) is a BMP that filters storm water through vegetation. The vegetated biofilter consists of the vegetated portion of the graded shoulder, vegetated slope, and vegetated ditch.



# Linear Transportation BMPs

- Manufactured Systems – Item 895 and Item 995
  - Filtering devices that allow for treatment of a portion of the flow in a storm sewer
  - Qualified Products List for approved devices:



<http://www.dot.state.oh.us/Divisions/ConstructionMgt/Materials/Pages/QPL.aspx>



Note off-line configuration so that storm sewer system is not impacted by failure/clogging



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# Linear Transportation BMPs

- Exfiltration Trench – Item 835
  - Pervious concrete layer at top allowing water to enter filter material
  - Standard Construction Drawing: WQ-1.3



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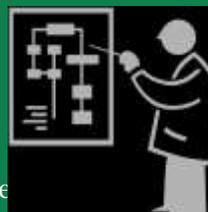
# Linear Transportation BMPs

- Other BMP Options in L&D Volume 2
  - Extended Detention
  - Retention Basin
  - Bioretention Cell
  - Infiltration Trench
  - Infiltration Basin
  - Constructed Wetlands



# Design Requirements

- BMP Design Process
  - NPDES Coverage Required?
    - Routine Maintenance
    - Less than 1 acre Project Earth Disturbance
  - Redevelopment or New Construction?
    - New Construction Projects need to determine the amount of treatment needed – Treatment Percent
  - Water Quantity Treatment (Stream Protection/Volume Control) needed?
  - BMP Selection & Implementation



# Design Requirements

- ODOT Location & Design, Volume 2
  - Project Thresholds
    - Earth Disturbed Area (EDA > 1 acre)
  - Routine Maintenance Projects are exempt



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# Design Requirements

- Routine Maintenance Projects must meet the following criteria:
  - Projects that do not change original line, grade and hydraulic capacity of the facility (i.e. resurfacing)
  - EDA < 5 acres
- List of typical maintenance activities in L&D Vol. 2, Section 1200



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# Design Requirements

- ODOT Location & Design, Volume 2
  - Project Classifications for Post-Construction Storm Water BMP Design
    - Redevelopment vs. New Construction
      - Redevelopment - 20% treatment required
      - New Construction – Treatment % (T%) required or weighted average based on impervious area added



# Design Requirements

- Impervious Area
  - All areas within existing roadway R/W are considered to be impervious for the purpose of BMP calculations
    - Not necessarily reality. Simplification for calculations and consistency of application.



# New Construction

- New Construction
  - Does not need to be a brand new highway alignment.
  - Includes any project where pavement is added *outside* the existing R/W resulting in a change in the runoff coefficient.



Calculate Weighted Average of New Impervious vs. Existing Impervious to determine amount of treatment – Minimum 20% Treatment



# New Construction

- New Construction
  - Allows for a reduction of treatment based on the weighted average of existing vs. new impervious area in a drainage area or for a project (Treatment Percent)



A brand new alignment project would require 100% treatment



# New Construction

## – Determining Treatment Percent

- Entire Project (Typical)
  - Existing and New impervious areas are calculated for the entire project and the resulting T% is applied to all calculations.
- Individual Drainage Areas
  - Existing and New impervious areas are calculated for each drainage area. The resulting T% is applied only to the BMP treating that drainage area.
- Do not mix the two approach options



# New Construction

## – Treatment Percent Example

- Determining Treatment Percent – Entire Project Approach
  - Existing Impervious Area within Project Limits: 5 acres
  - New Impervious Proposed in Project Limits: 2 acres
  - Treatment Percent = 0.43 or 43%
- Determining Treatment Percent – Drainage Area Approach
  - For each BMP, you must provide the following information:
    - » Existing Impervious Area within drainage area: 1 acres
    - » New Impervious Proposed in drainage area: 0.4 acres
    - » Treatment Percent = 0.43 or 43%



# Redevelopment

- Redevelopment Projects
  - Projects that do not increase the existing runoff coefficient
  - 20% Treatment



# Redevelopment

- Redevelopment
  - Projects that do not add impervious area outside the existing R/W are considered redevelopment
    - Includes most ultra-urban projects and divided highways that widen toward the median



Widening toward the median would be considered redevelopment for this divided highway



# Design Requirements

- Water Quantity/Water Quality Differences
  - Most linear BMPs treat water quality only
  - Water quantity post-construction BMPs are typically detention facilities (difficult to fit in the linear transportation footprint)



# Design Requirements

- Water Quantity (stream protection/stability) treatment not needed when:
  - One or less acre of new impervious area is created in new permanent right-of-way area being acquired for the project
  - Discharging to 4th order stream or larger
  - Ultra-urban areas



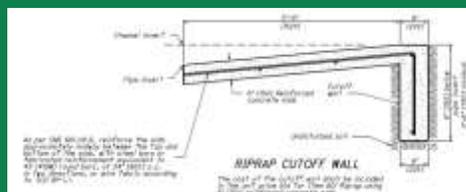
# Design Requirements

- Water Quantity (stream protection/stability)
  - BMPs in L&D Volume 2
    - Exfiltration Trench
    - Extended Detention
    - Retention Basin
    - Bioretention Cell
    - Infiltration Trench
    - Infiltration Basin
    - Constructed Wetland



# Design Requirements

- Water Quantity alternative options:
  - Stream Protection through culvert design
    - Provide grade controls for culverts
    - L&D Volume 2, Section 1115.2 provides information for culvert design options that provide water quantity credit (i.e. concrete aprons, bankfull design)
    - Provide for all culverts to meet requirement



ODOT/OEPA allow cutoff walls at culverts as a grade control/stream protection



# Design Requirements

- Where do you provide treatment (L&D Vol. 2, Sec. 1115.6.1)?
  - Localized Treatment: 100% treatment for an area of the project equal to  $T\% \times \text{Project Earth Disturbed Area}$   
or
  - Project Wide Treatment: Provide reduced treatment throughout the entire project based on application of the T%
  - For redevelopment,  $T\% = 20\%$



# Design Requirements

- When storm water treatment is being applied using a “Localized Treatment”:
  - Credit toward meeting the treatment goal (% of EDA) is only applied to the portion of the contributing drainage area to the BMP **within the roadway right-of-way (on-site)**.
  - Any offsite contributing drainage area must be included in the BMP calculations for sizing purposes (i.e. width of ditch, length of ExT, etc.). The offsite area will not be included in the reduction of the required amount of project EDA that requires treatment.



# Design Example – Vegetated Biofilter

Project Information	
Project EDA	3.0 acres
20% Project EDA	0.6 acres
Area 1 - Drainage Area to Ditches	4.0 acres
Area 2 - Drainage Area to Ditches	2.1 acres
Area 3 - Drainage Area to Ditches	0.6 acres
Area 1 - ODOT R/W Draining to Ditches	1.1 acres
Area 2 - ODOT R/W Draining to Ditches	1.3 acres
Area 3 - ODOT R/W Draining to Ditches	0.2 acres

**Legend:**  
 Drainage Area to Ditch  
 ODOT R/W Portion of Drainage A

**BMP Design Approach**

The treatment goal is 0.6 acres. The 0.6 acres must be comprised primarily of drainage within ODOT R/W.

Note that the northeast corner of the project area sheet flows off the project and outside ODOT right-of-way. No treatment is required in this area.

While Area 3 has a contributing drainage area of 0.6 acres, the ODOT component is only 0.2 acres. Therefore, an additional 0.4 acres would still require treatment if this ditch were used as a vegetated biofilter.

Area 1 has a drainage area of 4 acres, and ODOT contributing of 1.1 acres. This would satisfy the requirements of 0.6 acres of treatment. The ditch width would be 9' (EBW=5.4\*(1.1)<sup>0.75</sup>=8.8)

Area 2 has a drainage area of 2.1 acres, and ODOT contributing of 1.3 acres. This would satisfy the requirements of 0.6 acres of treatment. The ditch width would be 7' (EBW=5.4\*(1.3)<sup>0.75</sup>=7.0)

Area 1 or 2 would be acceptable locations for a vegetated biofilter. The utility and right-of-way impacts should be evaluated and factored into the decision between choosing Area 1 or Area 2.

# Design Example – Exfiltration Trench

Project Information	
Project EDA	3.0 acres
20% Project EDA	0.6 acres
Area 1 - Drainage Area to Ditches	4.0 acres
Area 2 - Drainage Area to Ditches	2.1 acres
Area 3 - Drainage Area to Ditches	0.6 acres
Area 1 - ODOT R/W Draining to Ditches	1.1 acres
Area 2 - ODOT R/W Draining to Ditches	1.3 acres
Area 3 - ODOT R/W Draining to Ditches	0.2 acres

**Option #1**

ExT Lengths	
20% x Area 1 ExT Lengths Rounded up to 4' increment:	11'
20% x Area 2 ExT Lengths Rounded up to 4' increment:	12'
20% x Area 3 ExT Lengths Rounded up to 4' increment:	2'

**Option #2**

ExT Lengths	
Area 1 Rounded up to 4' increment:	54'
Area 2 Rounded up to 4' increment:	57'
Area 3 Rounded up to 4' increment:	12'

**BMP Design Approach**

The treatment goal is 0.6 acres. The 0.6 acres must be comprised primarily of drainage within ODOT R/W.

Note that the northeast corner of the project area sheet flows off the project and outside ODOT right-of-way. No treatment is required in this area.

The tables on this sheet show the options available for providing exfiltration trenches.

Option #1 multiplies the calculated length of trench by 20% for all inlets. All inlets will require treatment using Option #1.

Option #2 uses the entire calculated ExT length for the drainage area, but only requires that ExTs be provided to treat 20% of the Project EDA (0.6 acres). Therefore, it is possible to provide an ExT of only one inlet, if the inlet has 0.6 acres of ODOT R/W draining to it.

## Design Examples

- The Design Examples for vegetated biofilters and exfiltration trenches can be found at the following website:
  - <http://www.dot.state.oh.us/Divisions/ProdMgt/Production/bmp/Pages/PostConstructionBMP.aspx>



## Design Requirements

- Nothing fits my project – What now?
  - ODOT-Let Projects – Contact ODOT Central Office Production (Mike Wawzkiewicz – 614-728-4585)
  - Local-Let Projects – Contact the appropriate municipality or Ohio EPA District Contact
    - [http://www.epa.ohio.gov/dsw/storm/contacts\\_storm.aspx](http://www.epa.ohio.gov/dsw/storm/contacts_storm.aspx)
  - Possible Options
    - Offsite Mitigation at increased ratio (1.5:1 – WQv)
    - Conservation Easements
    - Offsite mitigation and conservation easements should be coordinated through Ohio EPA prior to NOI submittal



# ODOT Experiences

- Consider the impacts of BMPs early in plan development
  - Right-of-way Issues need to be identified early
  - Calculate the T% correctly
  - Do not provide post-construction BMPs on Routine Maintenance Projects unless special need
- Why?
  - Construction Cost
  - R/W Cost and Acquisition Time
  - Maintenance Costs and Time to Maintain



# ODOT Experiences

- Important Design Considerations
  - Depth of BMP (manufactured system)
  - Location of BMP for access (i.e. vacuum trucks needed for manufactured systems)
  - Location of BMP with respect to future Maintenance of Traffic
  - Confined Space issues



# ODOT Experiences

- Important Design Considerations (cont.)
  - Can one manufactured system replace multiple runs of Exfiltration Trench? The initial cost may be higher. However, for maintenance purposes, it may be more beneficial to use a single manufactured system.
  - Detention Facilities: Consider the effects of ponding water on the upstream drainage system.
    - Culvert tailwater effects
    - Ditch flow depths
    - Storm sewer capacity



# ODOT Experiences

- Constructability Issues
  - Utility Conflicts
  - Maintaining BMPs free of construction debris (sequencing of construction activities)
  - Condition of BMP at point of hand-off from construction to maintenance



# ODOT Experiences

- Maintenance Issues
  - Understand the materials/equipment/training needed for maintenance are available for the specified BMPs
  - Disposal of BMP wastes...Hazardous?



# Maintenance Responsibilities

- Part IV.B.1 of CGP requires that a maintenance agreement is in place when filing the NOT
  - ODOT will maintain BMPs on ODOT maintained roadways and facilities



# Maintenance Responsibilities

- ODOT projects that extend onto Local Public Agency roadways
  - Similar to other roadway features, ODOT will NOT maintain post-construction BMPs outside of ODOT right-of-way
  - Local is responsible for maintenance
  - Coordination needed during Preliminary Legislation development



# Maintenance Responsibilities

- ODOT Projects extending onto LPA roadways
  - Local may request a specific BMP type based on maintenance concerns
    - ODOT may require Local to pay the difference in cost and may refuse based on safety considerations



# Maintenance Responsibilities

- Maintenance Issues
  - Where are the BMPs? Inventory/Database needed
  - ODOT is training staff (County Managers) on maintenance procedures for BMPs
  - Maintenance Cycle – Manufacturer recommendations and monitoring



# Permitting Responsibilities

- Local-let LPA projects filed through ODOT
  - Local agency files the NOI
    - The LPA is responsible for providing post-construction BMP that meet Ohio EPA expectations (may use L&D Volume 2 or other EPA approved guidance)
- The LPA, not ODOT, must coordinate with Ohio EPA if deficiencies are identified.



# What's next?

- Watershed Specific Permits
  - Chagrin was being developed
  - Big Darby and Olentangy are active
- Next generation Construction General Permit (current expires April 20, 2013)
  - Could include
    - Numeric thresholds for runoff quality?
    - Infiltration/Recharge?
- Refinements to existing BMPs and continued monitoring



# Watershed Specific Permits

- Big Darby
  - Riparian Setback and Groundwater Mitigation
  - Sediment Pond size: 134 CY/Ac of drainage
  - Total Suspended Solids testing
    - 45 mg/l TSS performance required





**Detention Basin**



**Exfiltration Trench**



**Manufactured System**



**Vegetated Biofilter**

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## Questions?

- Mike Wawzkiewicz, P.E.
  - Phone: 614-728-4585
  - Email: [michael.wawzkiewicz@dot.state.oh.us](mailto:michael.wawzkiewicz@dot.state.oh.us)
  - ODOT Post-Construction BMP Website: <http://www.dot.state.oh.us/Divisions/ProdMgt/Production/bmp/Pages/PostConstructionBMP.aspx>

