Geographic Information System Tools for Stormwater Quality Management

Working Smarter...
Lending a Helping Hand to Water Authorities through Technology

Presented by: Harshal Desai

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Municipal Separate Storm Sewer System (MS4)

An MS4 is a conveyance or system of conveyances that is:

- Owned by a state, city, town, village, or other public entity that discharges to waters of the U.S.;
- Designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.);
- Not a combined sewer; and
- Not part of a Publicly Owned Treatment Works (sewage treatment plant).
NPDES (MS4) Permit

Environmental Protection Agency (EPA) regulations requires Municipal Separate Storm Sewer System communities (MS4s) to develop, implement, and enforce a stormwater management program to reduce the discharge of pollutants from the stormwater system within their municipal limits into State’s water resources.

For a community to implement and enforce a stormwater management plan requires significant investments of time and resources to comply with the ever-changing regulatory requirements. In addition, effective management of MS4 permit generates considerable amount of data and information.
MS4 Permit

- MS4 Inventory and Mapping
- Discharges to Impaired Waters
- Public Street Maintenance
- Construction Site Program
- Education, Outreach, & Training
- Post-Construction
- IDDE
MS4 Permit

GIS Based Permit Manager

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Overview

Compliance with the EPA’s stormwater discharge regulations and developing a stormwater management program is important for a utility. This solution allows field crews to collect stormwater asset locations and attach a photo of the completed inspection form. The information collected can then be used by the utility office staff for MS4 annual reports. MS4 Inventory Recorder is a configuration of ArcGIS Online and the Collector for ArcGIS application.
Stormwater DCS

ATKINS Mobile SOLUTIONS

ATKINS Stormwater Data Collection System™

Show inspections with pending lab results  Show inspections with completed lab results (for reporting)  Logout

Show 10 entries

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Showing 1 to 10 of 341 entries
BMP Assessment Tool (BAT)

- Built for: City of Bonita Springs, Florida
- Users:
  - City/County/District as users
  - State/Federal as regulators
- Purpose: Allows Community Managers to assess effectiveness of existing BMPs across watersheds/communities, and assess proposed BMP Plans.
Basic Procedure for Estimating System-wide Stormwater Pollutant

Regulated by Florida Dept. of Env. Protection (FLDEP)

2010 Stormwater Rule

1. Estimate runoff from sub-basins
2. Estimate pollutant within sub-basin Runoff
3. Route pollutant through system

2a. Reduce sub-basin pollutant where BMPs are installed in sub-basin.
3a. Reduce conveyance pollutant where BMPs are installed in conveyance.
BAT: Functionality

• **Build Databases of Record** (one-time process)
  - Parcels, Soils, Landuse
  - Roads, Buildings, Driveways
  - Stormwater System Network (through existing model, NHD+)

• **Regular Usage:**
  - **Scenario Modeling:**
    - Create a Scenario (based on database of record)
    - Add BMPs.
    - Evaluate Runoff/Pollutant from Basins
    - Route through Network.
  - **Scenario Comparisons:**
    - Designate Existing and Proposed.
    - Evaluate Differences in Pollutant at Nodes throughout system.

Tool installs as Table of Contents View in ArcMap

Basins colored according to pollutant level

Nodes sized and colored according to pollutant level

Big component is DCIA Virtualization.

- Most communities don’t have Impervious area gis layers.
- Producing them is expensive through aerial imagery.
- Atkins has developed a GIS algorithm to virtualize based on available GIS layers:
  - Parcel records of heated square footage, number of stories etc.
  - Road network.
  - Zoning
- Virtualize the impervious areas explicitly using an Atkins GIS Algorithm.
BAT: Relevancy to your Community

- More rigorous documentation of BMP performance
- Assess effectiveness of existing BMPs across watersheds/communities
- Geospatial Inventorying of BMPs
- Leveraging Legacy MPU GIS Data
  - Subbasins, Land Use, Facilities, etc.
FDOT Pollutant Load Calculator

Database tool developed by Atkins to calculate pollutant loading for pollutants of concern in support for FDOT’s NPDES MS4 Permit requirements...

- Total Nitrogen (TN)
- Total Phosphorus (TP)
- Total Suspended Solids (TSS)
- Biological Oxygen Demand (BOD)
- Copper (Cu)
- Zinc (Zn)

Utilizes Event Mean Concentration and Best Management Practice efficiency data from Florida Department of Environmental Protection; can be customized to meet other regional needs

✓ Model inputs can be imported from a GIS Environment or User Input
Includes:

- Pollutant EMC’s for 61 different Land Use types
- 20 Different Best Management Practices
- Runoff is calculated by Land Use and Soil Type
- Pollutants are removed from land use types where BMP’s are chosen

✓ Multiple automatically generated spreadsheet reports can be generated
✓ A Single Detailed Outfall Report is also available
FDOT Pollutant Load Calculator

Outfall Summary including all loads, Area, Runoff Volume, Rainfall used, and Lat/Long if input

Detailed results for each Land Use input, including: Input data, Runoff, TN, TP, TSS, BOD, Cu, Zn
BMPbase

- Harris County Flood Control District (HCFCD) maintains a database of regional BMP monitoring data.
- Website interface accesses the BMP database and provides:
  - Mapping capabilities
  - Reports and plotting for monitoring data
  - Downloading of monitoring data
  - Uploading of monitoring data
BMPbase

- HCFCD’s permit requires a master planning process of controls to minimize pollutants from new development.

- To meet the permit requirement, HCFCD:
  - Monitors regional BMPs
  - Maintains a BMP design manual

- BMPbase provides a publically accessible central repository for BMP monitoring data to support regional BMP design criteria enhancements.
TXDOT Outfall Tracking System

- Currently under contract for Statewide Stormwater Services
- Atkins developed Outfall Tracking System (OTS) to
  - Eliminate hard copy forms/documents
  - Consolidate isolated databases
  - Reduce program costs
  - Aid in annual report production
  - Facilitate decision making
- Database stores
  - Outfall location
  - Structural information
  - Physical observations
  - Flow rate
  - Field and lab water quality measurements
TXDOT Outfall Tracking System

- TxDOT Advanced Outfall Tracking System (AOTS)
  - Current system (modified by others)
  - Only accessible by TxDOT
  - Application style workflow
  - Maps outfalls
  - Tracks dry weather screening activities
  - Tracks Illicit Discharge Detection and Elimination (IDDE) activities

- AOTS system components
  - Tablet data collection (photos, GPS, web-form)
  - Web-form remote uploads (near real-time reporting)
FDOT GIS Outfall Report & Mapping

- Report generated through a GIS Tool once the outfall location is selected
- Outfall report can be customized to include Estimated Pollutant Load or Actual Field Monitored data
- Report is made available to FDOT Maintenance and Drainage Staff
- Mapping application can select all NPDES features in single basin and generate a map identifying location and number of unique features
BMP Designer

• Built for: Tahoe Regional Planning Agency (TRPA)

• Users:
  • Public, Residents of Lake Tahoe.
  • BMP Design Professionals.

• Purpose: To protect Lake Tahoe, the Tahoe Regional Planning Agency requires all developed parcels to install and maintain BMPs.

Residential BMP Certification
BMP Designer: Functionality

• Create BMPs for your rooftops, driveways, decks, steep sloped areas, and disturbed areas.

• Sketch drainage areas right on the map, using the aerial image as a guide.

• BMP Designer suggests the BMPs that could be used under the conditions, and you select the one you want.
BMP Designer: Functionality

Modeled after Turbo-Tax

Step-by-step wizard breaks down complex regulatory and design process into easy steps.

Navigate backward and forward in the process using the same buttons on every screen.

Workflow diagram is always shown, and shows you where you are in the process.
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Conclusion – Why Permit Management Suite?

GIS Based Permit Management Suite

- Effective Data Management
- Geospatial inventory of MS4/BMP
- Central Repository
- Data Analysis
- Simplify Data Entry/Collection
- BMP Tracking/Assessment
- Helps in Annual Reporting
- Enforce Consistent Procedures
Questions/Open Discussion

Contact:

Harshal Desai
Vice President, Water & Environment, Atkins
702-408-7808
Harshal.Desai@atkinsglobal.com