VDOT MS4 Target Modeling and Mobile Applications

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Topics of Discussion

- Project Team
- Program Overview
- VDOT MS4 Program Background
- MS4 GIS Desktop Target Model
- ArcGIS Online (AGOL)
- Lessons Learned
The Virginia Department of Transportation (VDOT) Maintenance Division is responsible for mapping all locations in the Census Urban Areas where stormwater is discharged from a pipe, ditch or drop inlet into Waters Of the United States (WOUS). Each of the discharge points within VDOT’s Right of Way is known as a MS4 outfall.

There are 15 Census Urban Areas located in Virginia and within those areas VDOT has approximately 21,300 centerline miles of roadway. This presentation will explain the GIS tools that VDOT has implemented to reduce the cost of collecting the MS4 outfalls.
Examples of Outfalls

Richmond Area 2011 Apr 14
VDOT’s MS4 Program Background

Under the General Permit for discharges of stormwater from small municipal separate storm sewer systems (MS4) pursuant to 9VAC25-890-40. The general permit requires:

- Within 48 months of issuance updating of all outfalls on maps, more specifically to map all MS4 outfalls located within the newly defined 2010 Decennial Census “urbanized” areas

- Recording inventory data
  - Location of outfall
  - Outfalls type (pipe, ditch or drop inlet)
  - Pipe information (size, condition, number, material type)
  - Assessment of outfall for potential illicit discharges (IDDE)
  - Taking digital pictures
  - Outfall channel condition
MS4 Census Urban Areas (15)
VDOT’s MS4 Desktop GIS Model Development
Purpose of Desktop GIS Model

❖ To eliminate the requirement to walk each side of the road on the 21,300 miles of roadway VDOT chose to develop a GIS Model that would predict the most likely location of “potential” discharges

❖ Data Sources:
  ❖ VDOT LRS (VDOT roads information)
  ❖ USGS National Hydrologic Data Set (NHD)
  ❖ NWI – National Wetlands Inventory Data Set
  ❖ Georeferenced “As built” transportation project
  ❖ Collected points/features from other cities, counties, towns or consultants
Developing GIS Model

- Hydrology layers include:
  - Bluelines (streams/rivers)
  - Blueline buffer (25 m)
  - Waterbodies (ponds, lakes)
  - Waterbody buffer (35 m)
  - NWI
  - NWI buffer (35 m)

- Linear Referencing System (LRS) Layer
Terminology

Targets - A “Target” is any roadway centerline segment that is intersected by a stream, waterbody, or wetland and its associated buffer. There can be multiple targets on a road depending on number of lanes, intersections and direction (N, S, E, W).

Clusters - A grouping of multiple “Targets” in the same area that have been buffered (15 meters) to ensure that all targets are captured, thus defining the number of locations to be investigated.

Total targets created from the last MS4 model: over 27,700 targeted points of interest, clustered into 9,258 areas of investigation.

To date: 8438 Clusters or 91% have been investigated.
Combined Hydrology Layers
Targets & Clusters
IDDE Determination
VDOT MS4 Desktop GIS Model

- Challenges
  - Challenges within the CUAs with density, geographic location and political jurisdictions
  - Dynamic changes to roads data
  - Determining ownership of road segments
  - Determining new targets/clusters
  - Determining Right of Way and maintenance easements
  - Complex road segments such as the Springfield Interchange in Northern Virginia
  - Collection of outfalls on non-centerline assets such as stormwater BMP’s
Additional Information - Project Points
VDOT’s MS4 Outfall Collection
Leveraging AGOL using ArcGIS Collector
Reason for Mobile Application

- Reduce the quantity of fieldwork, data processing, and make collection safer and easier for investigators
- Improve efficiency of data collection for outfalls, standardize information collection & ensuring QA/QC
- To make VDOT’s Illicit Discharge Detection and Elimination (IDDE) investigation more proactive by producing IDDE mapping and reports within 2 weeks of classification by field inspections
- Results feed directly into ArcGIS Collector (mobile application)
- Ability to visually show real-time data
SCHEMA & DATABASE DESIGN

The Geodatabase was designed to mimic the standardized outfall collection forms.
VDOT has been able to track and close out 75 IDDE’s. At this time we have no outstanding IDDE’s. The data is checked every two weeks to make sure VDOT is staying current.
Other uses for Collector

**Existing Uses:**
- Storm water basin inventory and inspection
- MS4 ownership/connections with localities
- Collection/inspection of signs in Outdoor Advertising
- Collection of Shellfish Sanitation Areas (VDH-DSS)

**Potential Uses and Those Being Discussed:**
- Collection of road projects in Maintenance
- Collection of assets in Traffic Engineering
- Tracking bat activity under bridges
ArcGIS Online Advantages

- Real time data
- Standardized field collection data and reports
- Leverage VDOT’s existing AGOL Subscription
- Use ESRI’s free Collector app
- Customize desktop tool for standardized reports meeting VDOT, DEQ and EPA requirements
- Use of iPad or Android device (Phone/Tablet)
LESSONS LEARNED: DATA & TECHNICAL

- AGOL Form Design and field formatting
- AGOL Viewing Constraints with form on iPad
- Symbol Size (desktop vs iPad)
- Query of tables
- iPad functionality in field
  - Weak or dropped signal
  - Too bright of a day
  - Slow connection
- Desktop Export Tool

(VDOT ArcGIS Online, 2014)