



The BMP Database and Applications: Greenway Village and Clarksburg Village

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Background

- **Development alters surface and ground water hydrology and quality**
 - **Watershed hydrologic modifications**
 - Tree removal, grading, impervious cover
 - Increased storm runoff, volume, flow
 - Stream channel scouring/erosion
 - **Elevated nutrient (i.e., N and P), sediment, and other pollutant loads**



Tributary 104



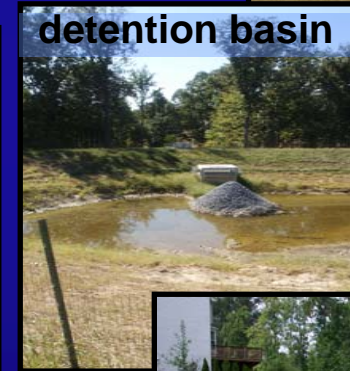
Background

- **Redirection of surface water flow – curb/gutter**
 - Stormwater that previously infiltrated or entered wetlands may now be redirected to stormwater management facilities (BMPs)
 - BMPs responsible for water quality, quantity, and timing



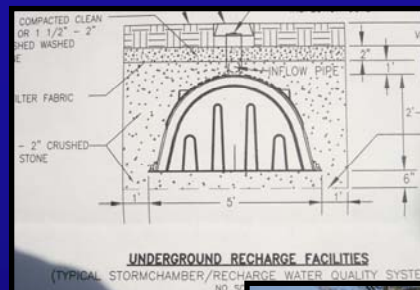
What are Best Management Practices (BMPs)?

- A number of land management actions
 - above/below ground retention or infiltration, wet or dry ponds, sand/gravel filters, constructed wetlands, vegetated buffer strips, etc.
 - public education, septic system control, pollutant disposal, etc.
- Designed to lessen impacts of land use
 - treating and/or retaining or detaining stormwater runoff



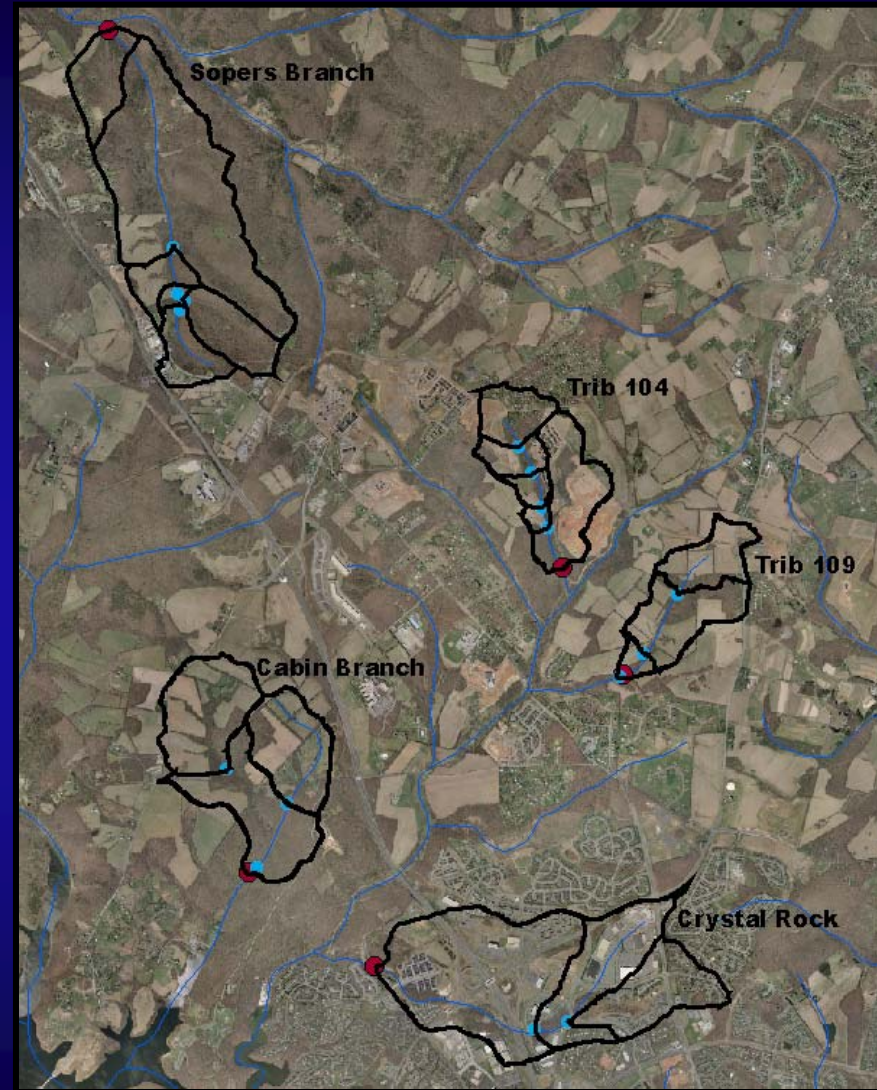
Overall Research Direction

- Understand BMPs and apply information across a broader area
- Goal: Better understand potential pollutant retention (or failure)
 - Chesapeake Bay - water quality goals (nutrient and sediment reductions)
 - Identification of mitigation strategies (location, type, utilization, soils, etc.) to promote ecologically sustainable land use
 - Incorporation of spatially-based factors - parent material, topography, proximity to streams, effect of BMPs in series or concert
- **SCALE**
 - Small study sites – high level of detail
 - Balance between local detail and utility at similar local sites and at the regional scale



Clarksburg Special Protection Area - CSPA

- **Clarksburg Special Protection Area (CSPA)**
 - Undergoing development under SPA (Special Protection Area) guidelines
 - Designed to protect high quality streams in developing areas
- **BMPs**
 - Advanced sediment and erosion controls
 - Stormwater BMPs in series (redundant)
 - Interception of water further upstream



Clarksburg Special Protection Area Partners and Collaborators

- **Montgomery County Dept Environmental Protection**
 - Stream data, maps, development plans, rain gages, developer liaison
- **Montgomery County Water Resources Plan Review**
 - Maps, information, interpretation(!!)
- **EPA (VA and GA)**
 - LiDAR - topographic surface vs engineered flow comparison - streams
 - HSPF and BASINS modeling
- **University of Maryland College Park**
 - *Directed biologic analyses*
- **USGS WRD, Baltimore**
 - Stream gages



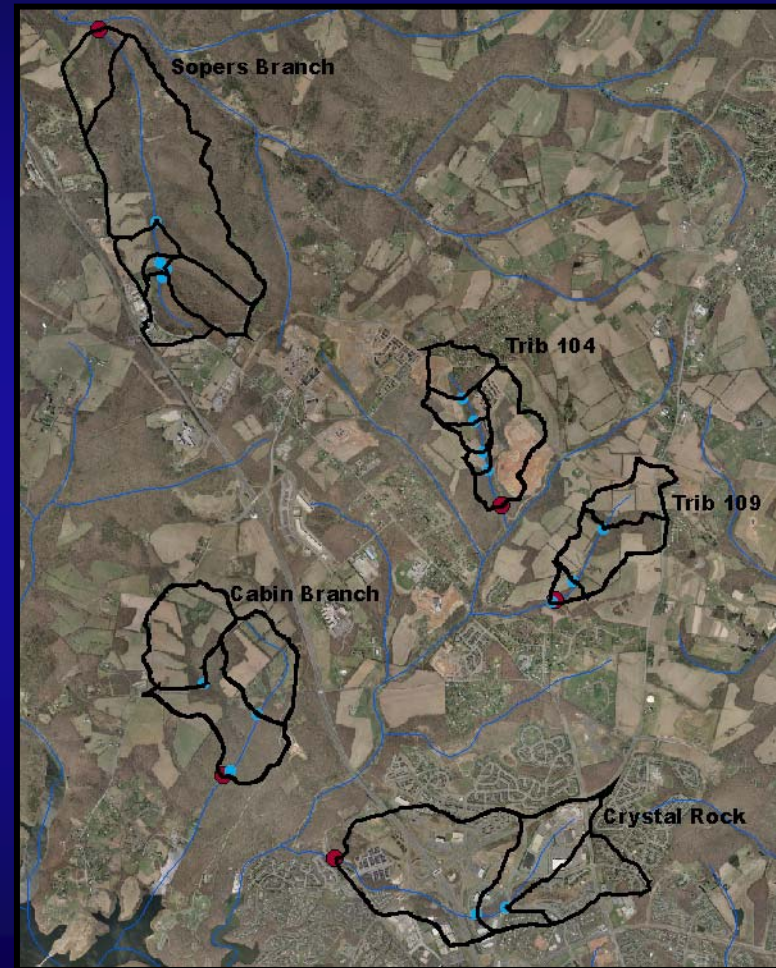
BMP Geographic Database

- Map and interpret use of BMPs
- Provide a spatial analysis of:
 - Application (locations and types)
 - Flow
 - Effectiveness of BMPs
- Integrate with quantitative physical, chemical, and biologic data
- Management of land use and land use change
 - Balance between landscape alterations and the effectiveness of mitigation strategies (i.e., BMPs)
 - Different BMPs work differently
 - Location, type, and efficacy of BMPs are important to understanding the risk of impacts from changing watershed land use patterns
- Platform – landscape analysis for partner studies



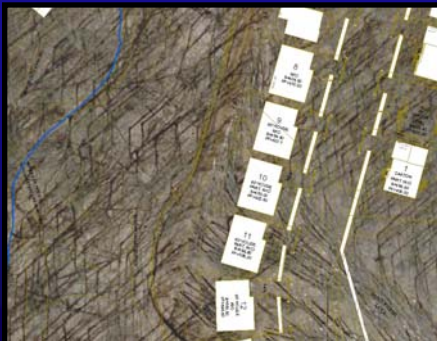
CSPA BMP Geographic Database Applications

- Compare older, versus newer, 'state of the art', BMPs
- Watershed development and BMP utilization correlated with stream analyses
- How did water quality and quantity parameters change with development using these BMPs?
- Examination of different BMP usages with similar land use patterns
 - Spatial patterns of type-specific BMPs (proximity, serial use, type) may affect mitigation success



BMP Database – building blocks

- Surface map (orthos)
- Pre- and post- development plans (CAD)
 - Building footprints, roads, stormwater management infrastructure and conveyance (pipes, swales, treatment trains)
 - BMPs - number, location, type, DA, IC
- County knowledge
- Time, patience, persistence



Database

Inclusive

- Retention or infiltration areas, wet ponds, extended detention ponds, and sand filters
- Private BMPs - dry wells along the back side of houses by streams

Temporal

- Sediment and erosion control during development
- Change to stormwater management BMPs after development



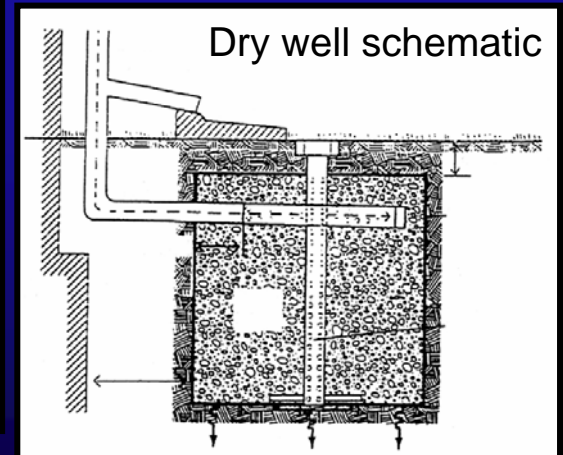
Dry well
Clarksburg, MD 9/05



Adjacent sediment trap prior to conversion to a detention basin
Clarksburg, MD 5/06



Sand filter
Clarksburg, MD 5/06



Dry well schematic

BMP Database Layers

Clarksburg Village and Greenway Village

- **Sediment and erosion control layer**
- **Stormwater management layer: 'as built'**
- **Stormwater Control Treatment Trains – link BMPs**
 - Arrows showing direction of flow; delineate treatment train areas
- **Environmental monitoring information – link database to ArcGIS**
 - Biology – including stream and precipitation information
- **Geomorphology link**
- **SPA BMP monitoring**
 - Data for monitored BMPs



Attributes for Sediment Control

- Facility number (when converted)
- Type of BMP - Forebays (basins, traps); dewatering devices; earth dikes; silt fences
- Map reference/dates, permit
- XY Coordinates for outfall
- Total drainage area and impervious area (acres)
- Sorting ID
- Comments

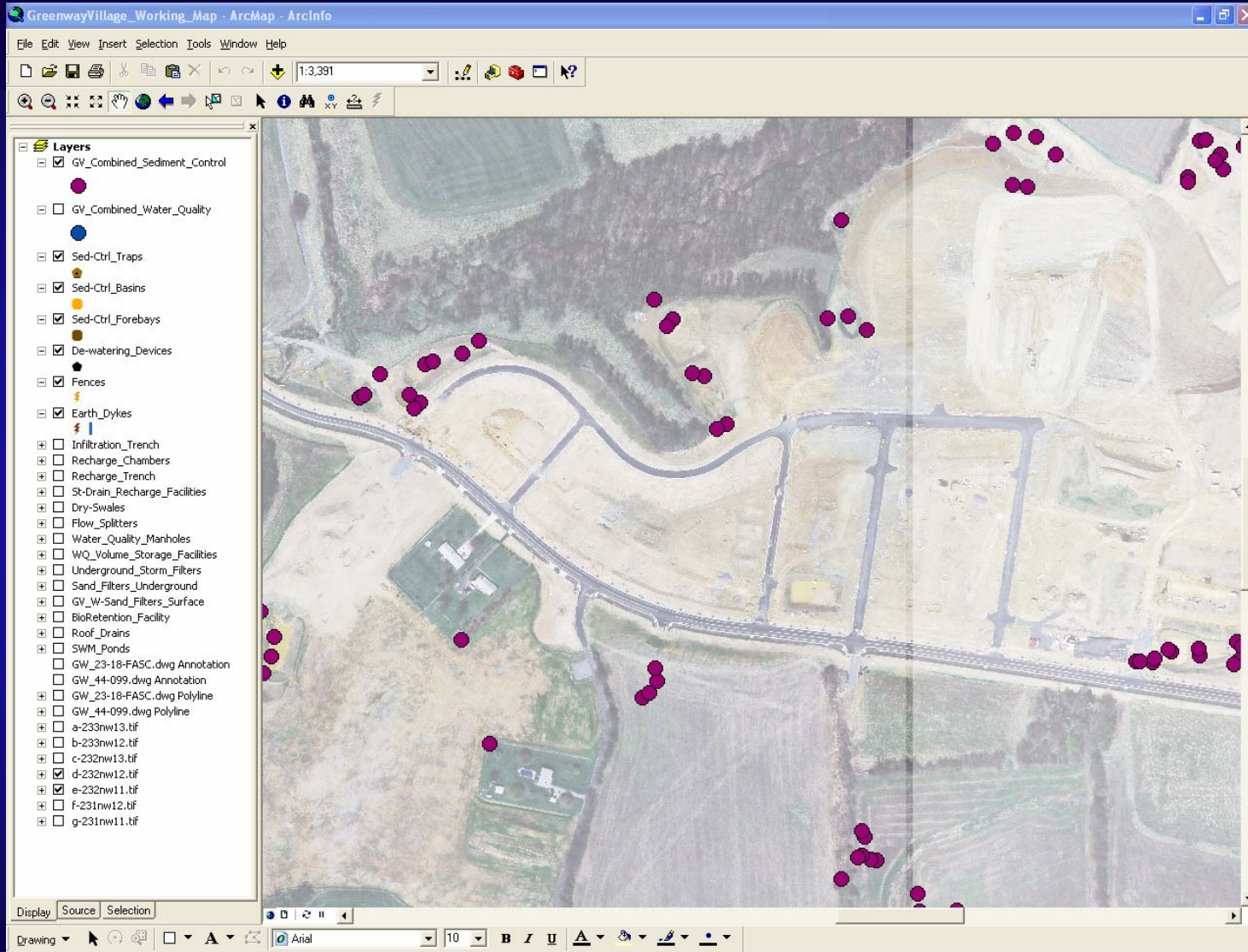
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FID	Shape *	FACILITY_ID	TYPE	MAP_SHEET	TOTALDA	IMPDA	COMMI
0	Point	0	Dewatering (basin)	49	0	0	
1	Point	0	Dewatering (forebay)	49	0	0	
2	Point	0	Dewatering (forebay)	48	0	0	not on CAD or sheet, but can see in 2006 aerial photo
3	Point	0	Dewatering (basin)	48	0	0	
4	Point	0	Dewatering (trap)	49	0	0	
5	Point	0	Dewatering (trap)	48	0	0	
6	Point	0	Dewatering (basin)	47	0	0	
7	Point	0	Dewatering (forebay)	47	0	0	not on CAD; both existing Basin #8B and Basin 8A, w/forebays A & B can be
8	Point	0	Dewatering (basin)	16	0	0	visible in 2006 aerial photo
9	Point	0	Dewatering (forebay)	16	0	0	visible in 2006 aerial photo
10	Point	0	Dewatering (basin)	47	0	0	not on CAD; both existing Basin #8B and Basin 8A, w/forebay A, can be see
11	Point	0	Dewatering (forebay)	47	3.3	0	not on CAD; forebay A w/dewatering device visible in 2006 aerial photo, for
12	Point	0	Dewatering (trap)	49	0	0	
13	Point	0	Dewatering (basin)	1	0	0	

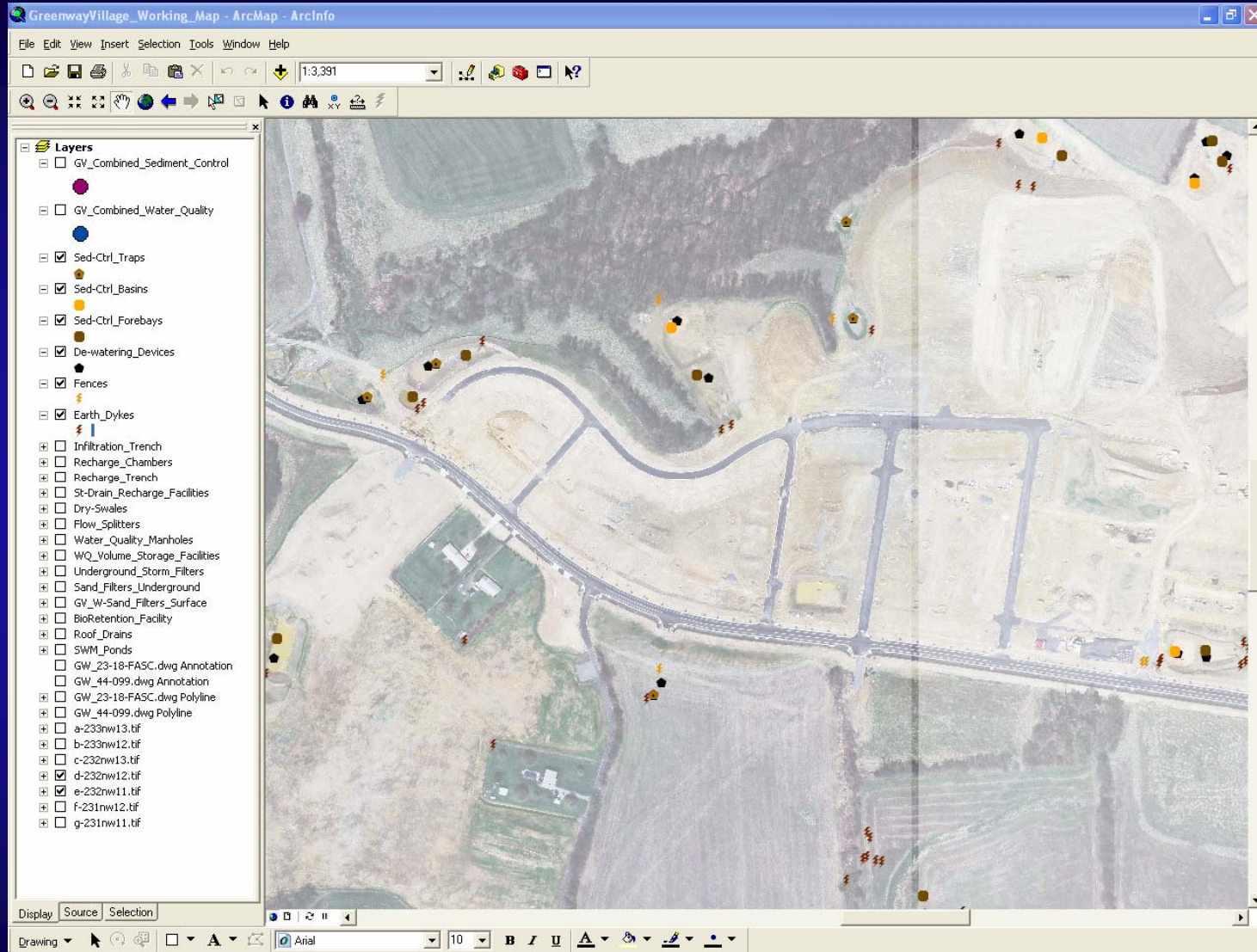
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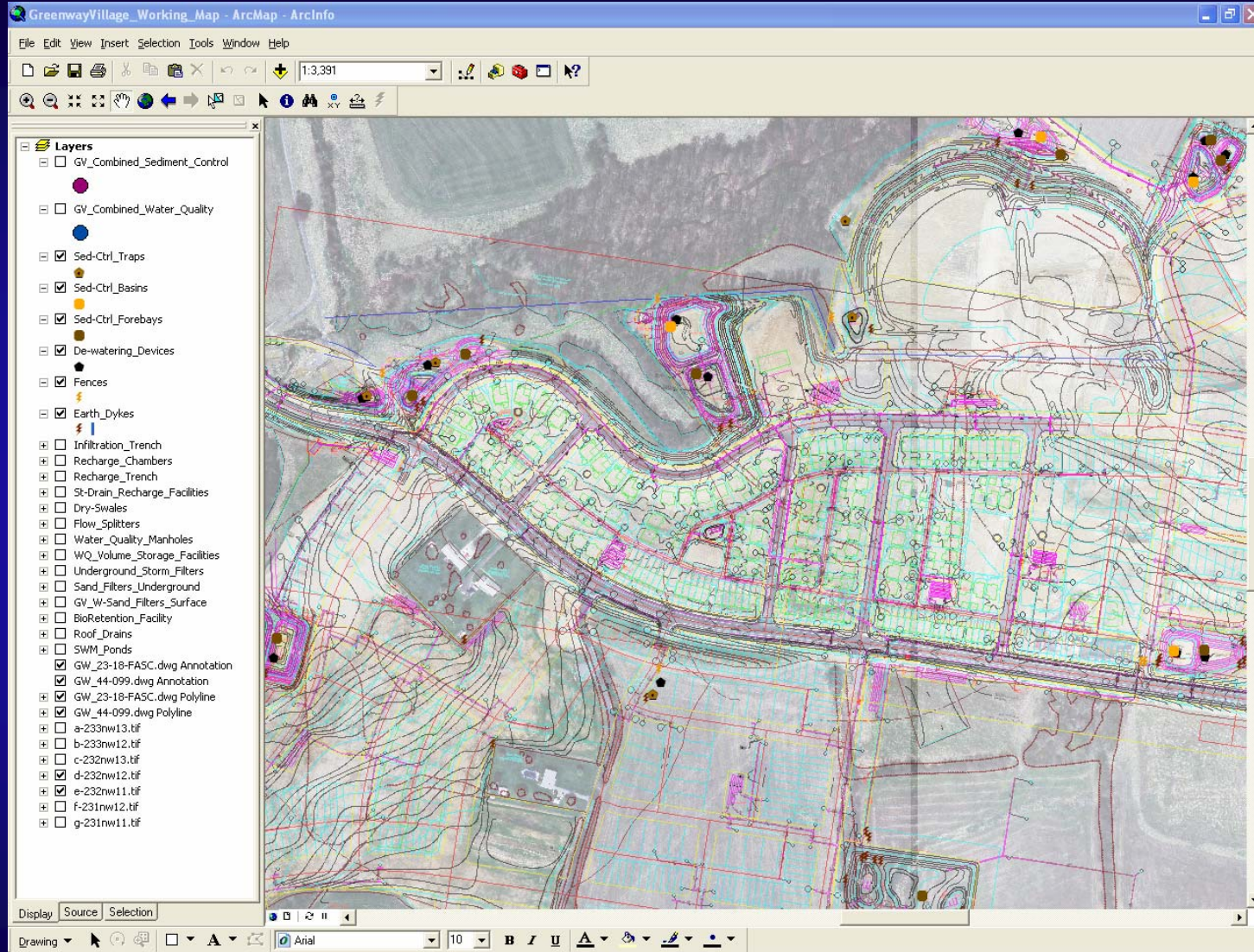
Sediment Control



Sediment Control



Sediment Control



Attributes for Stormwater Management

- Facility number (when as built)
- Type of BMP - Bioretention, Dry swales, Drywell recharge, Flow splitters, Infiltration trenches, Recharge chambers, Recharge facilities, Roof drains, Surface sand filters, Underground sand filters, Recharge, Ponds, Underground storm filters, Water quality manholes, Volume storage facilities

Attributes of GV_Combined_Water_Quality

MAP_SHEET	TOTALDA	IMPDA	COMMENTS	TYPE	LABEL_PRFX	LABEL_SFFX	ID	SORT_1	SORT_2
35	0.34	0	A portion bypasses B portion unless overf	Und Storm Filter	10	F	2-10-10F-0-00-00-000-000	W-Pond 10	UndStrmF 10 F A&B
36	2.57	0	Plan view blowup Sheet 36; overflow at 1	Und Storm Filter	11	I	2-11-11I-0-00-00-000-000	W-Pond 11	SurfSndF 11 A
37	4.74	0		Und Storm Filter	11	G	2-11-11G-0-00-00-000-000	W-Pond 11	SurfSndF 11 A
37	5.13	0		Und Storm Filter	11	N	2-11-11N-0-00-00-000-000	W-Pond 11	SurfSndF 11 A
0	0	0	on CAD not on sheet	Und Storm Filter	11	D	2-11-11D-0-00-00-000-000	W-Pond 11	UndStrmF 11 D
0	0	0		Und Storm Filter	11	M	2-11-11M-0-00-00-000-000	W-Pond 11	SurfSndF 11 C
14	7.6	3.4	plan view blowup sheet 30	Und Storm Filter	UG	01	2-03-UG1-0-00-00-000-000	W-Pond 03	SurfSndF 03
55	3.73	0	Plan view detail sheet 60	Und Storm Filter	07	F	2-07-07F-0-00-00-000-000	W-Pond 07	SurfSndF 07 A
55	4.07	0	Plan view detail sheet 58	Und Storm Filter	07	E	2-07-07E-0-00-00-000-000	W-Pond 07	SurfSndF 07 A
55	5.44	0	Plan view detail sheet 58	Und Storm Filter	07	H	2-07-07H-0-00-00-000-000	W-Pond 07	SurfSndF 07 A
0	2.02	0.9	TDA & IMPDA from Phase IV Computations	Und Storm Filter	11	F	2-11-11F-0-00-00-000-000	W-Pond 11	SurfSndF 11 A
17	2.1	0	plan view blowup sheet 18; can also bypa	Und Storm Filter	11	H	2-11-11H-0-00-00-000-000	W-Pond 11	SurfSndF 11 A
17	1.49	0	plan view blowup sheet 20; can also bypa	Und Storm Filter	11	K	2-11-11K-0-00-00-000-000	W-Pond 11	SurfSndF 11 A
17	2.66	0	plan view blowup sheet 19; can also bypa	Und Storm Filter	11	J	2-11-11J-0-00-00-000-000	W-Pond 11	SurfSndF 11 A
27	4.06	0	plan view blowup sheet 28	Und Storm Filter	11	L	2-11-11L-0-00-00-000-000	W-Pond 11	UndStrmF 11 D
0	0	0	on the CAD but not on sheets yet	Und Storm Filter	11	L	2-11-11L-0-00-00-000-000	W-Pond 11	UndStrmF 11 D

Record: 145 Show: All Selected Records (0 out of 296 Selected) Options



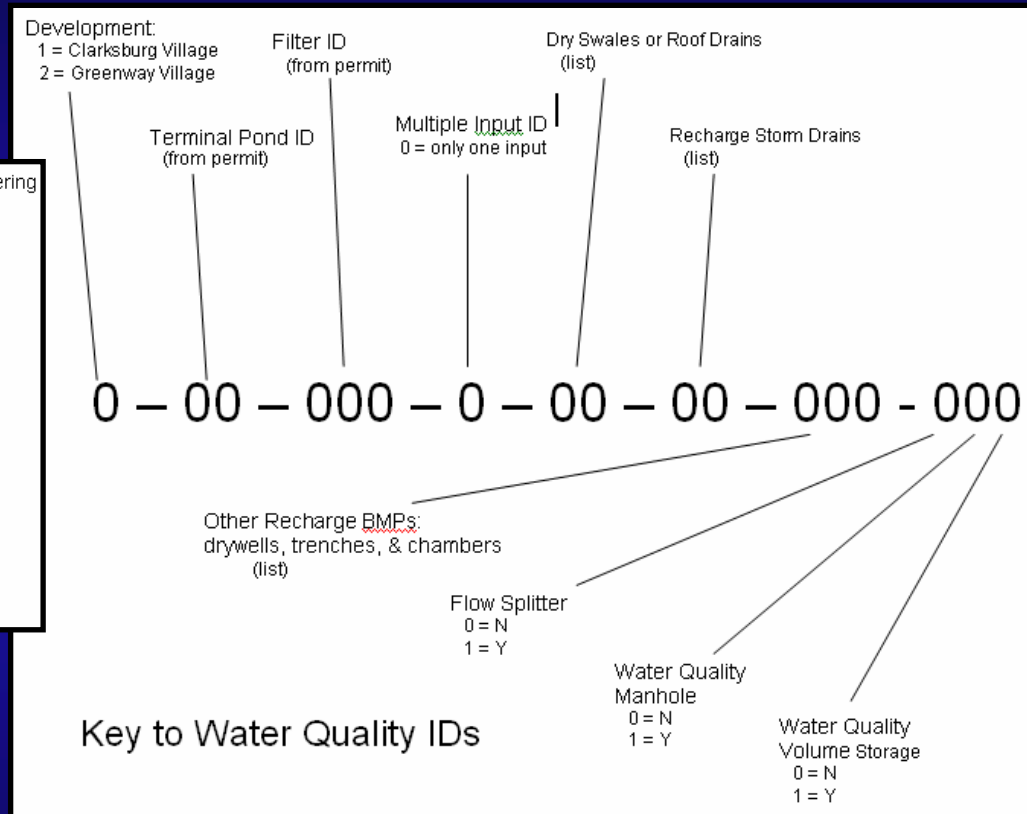
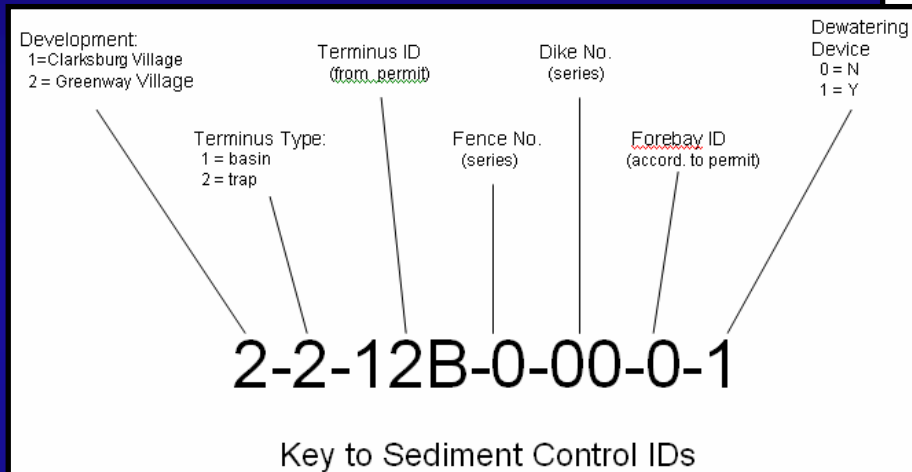
Attributes for Stormwater Management

(Continued)

- Map reference/dates, permit
- XY Coordinates for outfall
- Total drainage area (acres) [still needed; computations books]
- Sorting ID
- One-year control – (volume release @ 1 yr storm)
- Quantity / Quality Control
- Public or Private BMP
- Conversion date
- Comments



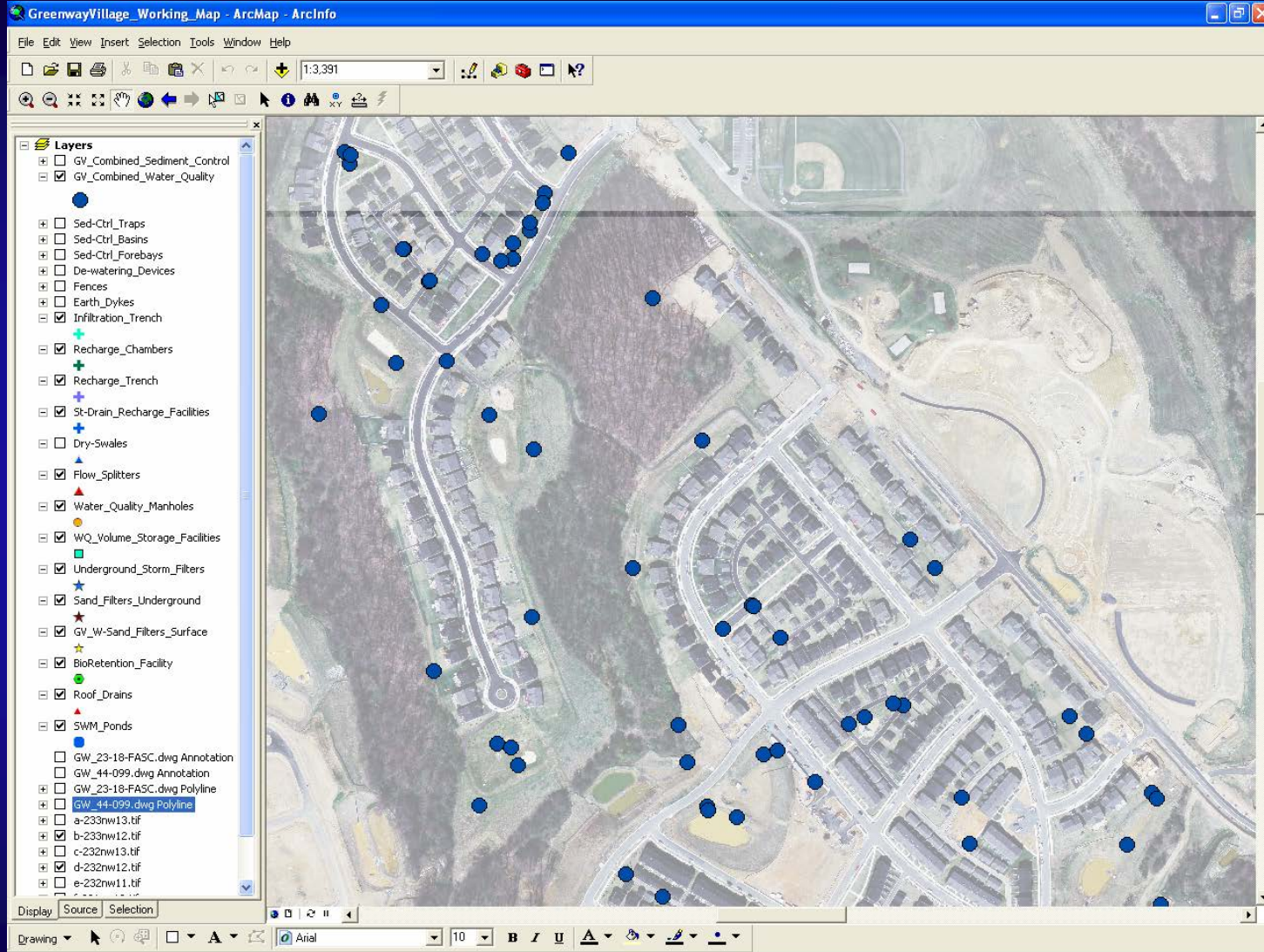
Database BMP ID Tracking



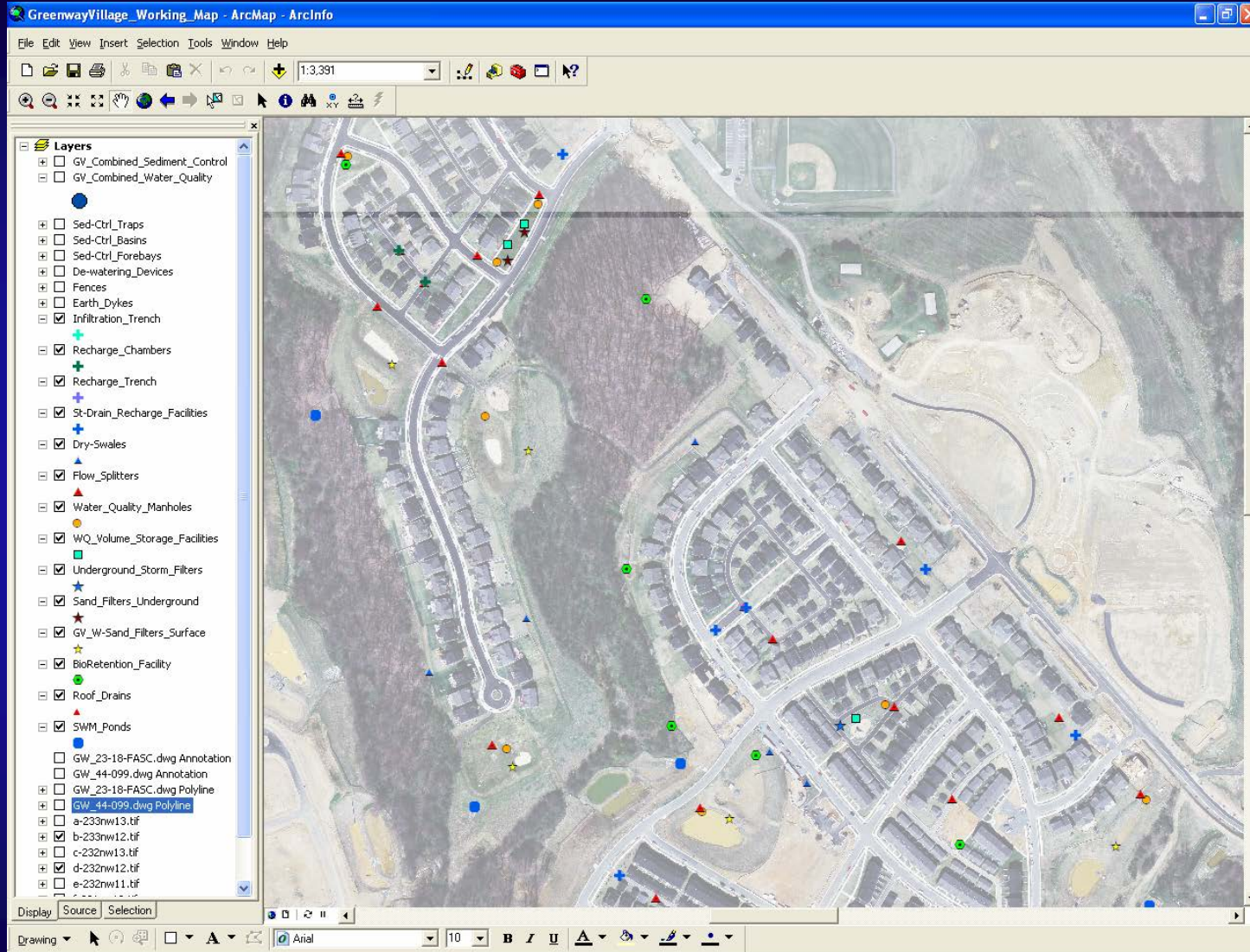
Code BMPs for a group of connected features - run a single numeric sort that consistently groups connected features in the same way



Stormwater Management

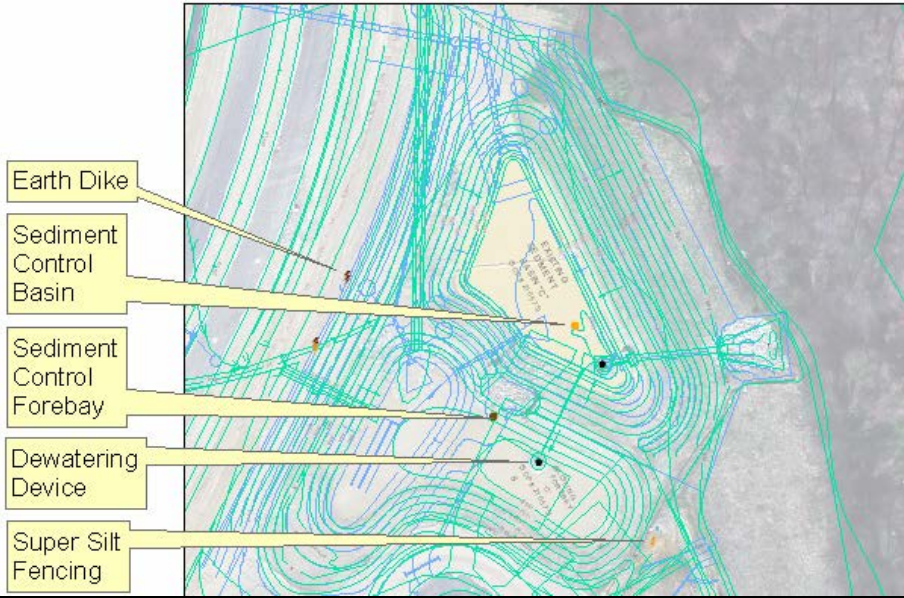


Stormwater Management

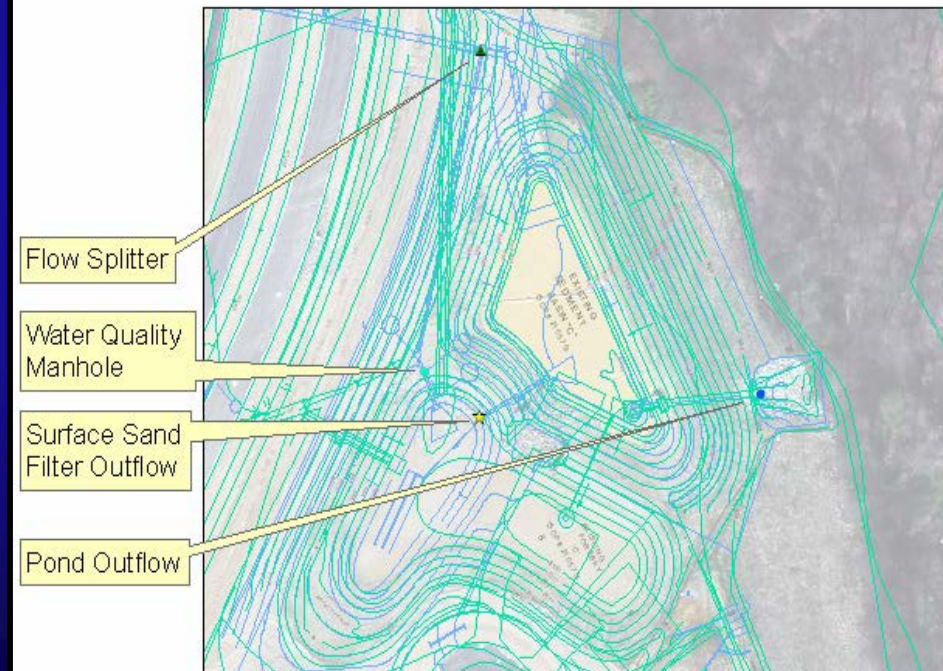


The same area - sediment control during construction then converted to SWM

ClarksburgVillage_Working_Map - Sediment Control Basin C



ClarksburgVillage_Working_Map - WQM Pond C



Is there irreversible receiving stream biotic community and physical damage during sediment control phase?



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Integration of Environmental Information

- Integration of spatial land use and BMP information with environmental (chemical, biologic, physical) data
- Exploring the best ways to integrate environmental information into a searchable format
- **County**
 - Near annual stream monitoring
 - Rain gages
 - Stream flow precipitation response to development type and BMP
- **Monitoring information**
 - Selected individual BMP assessment (sediment / nutrient)
- Estimate the function of post-construction BMPs
- Elucidate patterns of land use and BMP utilization with environmental information
- Better understand the mitigating effects of local level BMPs based on location, type, and land use



Integration of Environmental Information



- Supplement the environmental data, treatment train
- UMD student - field and lab work
 - TSS, Cu^{2+} , TPH
- Integrate the chemical, physical, and biologic information with the spatial analysis



Database Research Direction

- Identify additional study sites
 - Replication of land use, parent material
- Continue database integration (sub watersheds)
 - BMP information
 - Quantitative physical, chemical, and biologic data
- Water quality goals (nutrient, sediment, other pollutant removal and retention)
- Different BMPs will be more or less suited for different environmental settings and locations

