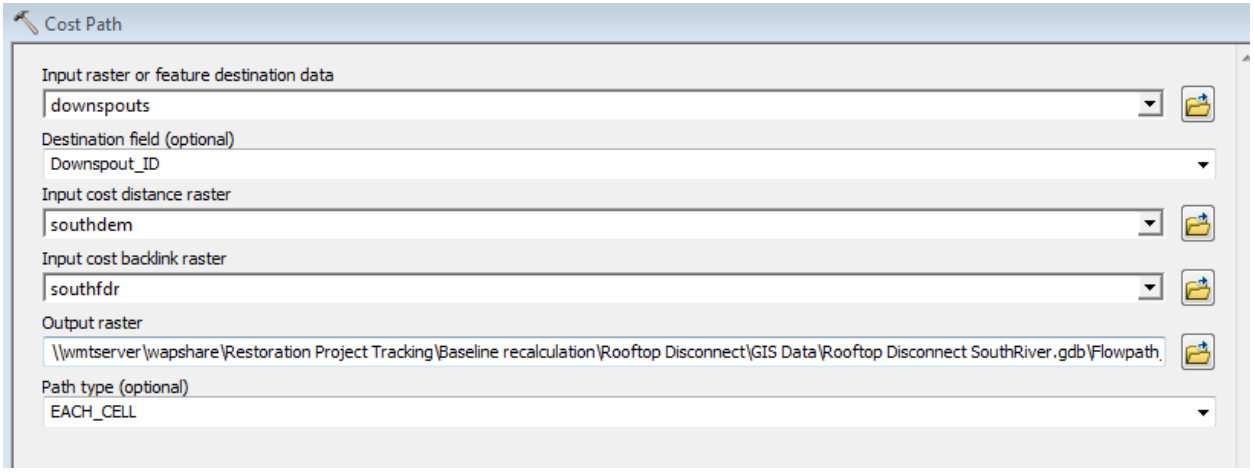
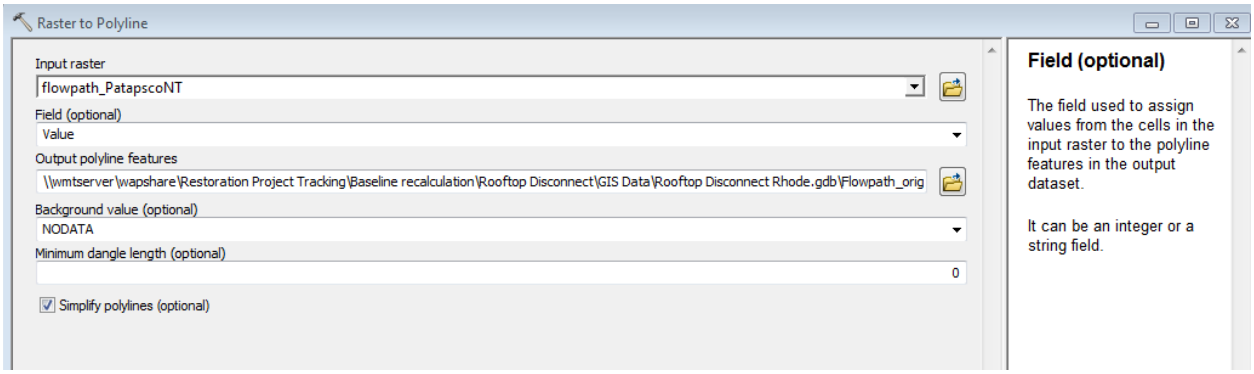
Rooftop Runoff Disconnect GIS Analysis Methodology

1. Create a file geodatabase for your watershed and put it here: \\WMTSERVER\WAPShare\Restoration Project Tracking\Baseline recalculation\Rooftop Disconnect\GIS Data
2. Import watershed layer \\wmtserver\wapshare\Models\StreamAssessmentTool\GISData\SAT.mdb\Hydrology
3. Import D_Soils shapefile \\wmtserver\wapshare\Restoration Project Tracking\Baseline recalculation\Rooftop Disconnect\GIS Data\Rooftop Disconnect.gdb
4. Import DEM (ex. southdem) at: example location: \\WMTSERVER\WAPShare\GIS\Data\Catchments\Magothy\Layers
5. Import Flow direction (ex. southfdr) example location: \\WMTSERVER\WAPShare\GIS\Data\Catchments\Magothy\Layers
6. Import parcel layer \\gis-cloud3\DeptShare\OPZ\OPZ_Data\bm03801f.gdb\bm03801f
    a. Clip parcel layer to watershed you are working in
7. Import inlet layer \\gis-cloud3\DeptShare\DPW\MGI_SharedData\storm
    a. Clip inlets to your watershed, *Toolbox: Clip (Analysis)*
    b. Create 5 foot buffer around inlets, *Toolbox: Buffer (Analysis)*
8. Import land use \\GIS-cloud3\DeptShare\DPW\WERS\Landcover and Impervious Surfaces\LandCoverImpervious 2014.gdb and filter out only land use for Residential 1-acre, Residential 1/2-acre, Residential 1/4-acre, and Residential 2-acre.
9. Import Impervious surface layer \\GIS-cloud3\DeptShare\DPW\WERS\Landcover and Impervious Surfaces\LandCoverImpervious 2014.gdb
    a. Clip Impervious surface to watershed
    b. Filter buildings out of impervious surface layer and export into separate layer
    c. Delete:
        i. All buildings under 500 SF
        ii. Only keep buildings located in all residential land uses except 1/8-acre residential land use
    d. Assign unique ID to each building
        i. Add field (type is long integer) and call it *Building_ID*.
        ii. Use field calculator *Building_ID = ObjectID*
    e. Simply building to decrease amount of downspouts by using *Toolbox: Simplify Building (cartography)*, set simplify tolerance to 10
10. Create downspouts – *Toolbox: Feature Vertices to Points*, convert building polygon to vertices points (downspouts) along corner of buildings
    a. Add a field (type is long integer) and call it *Downspout_ID*
    b. Use field calculator *Downspout_ID = Object_ID*
11. Create flow path from downspouts
    a. *Toolbox: Cost Path (Spatial Analyst*), see below

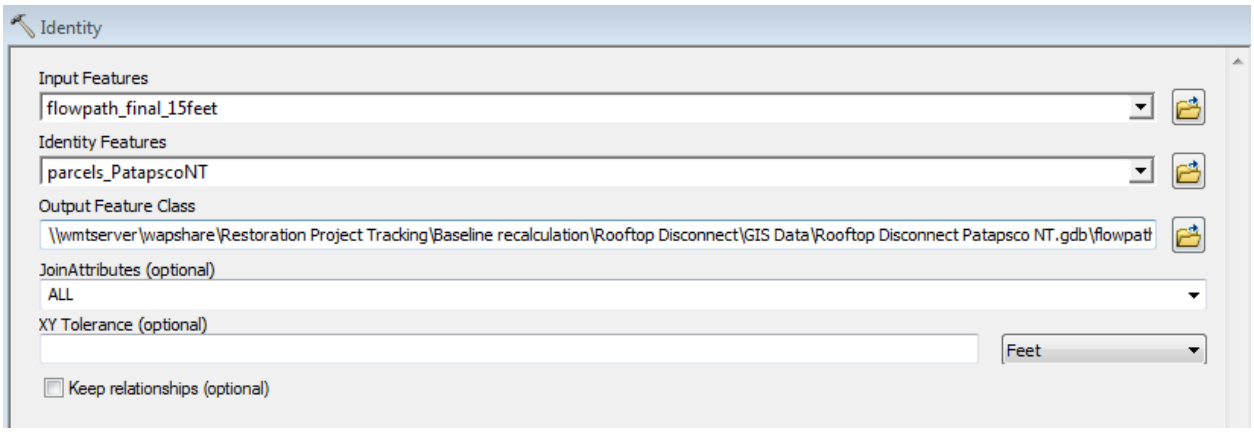
b. Note: for large watersheds the flowpaths may need to get divided up by subwatersheds as the file may be too large to process OR the processing may take over 12 hours



12. Convert flowpath raster to polyline, *Toolbox: Raster to Polyline*

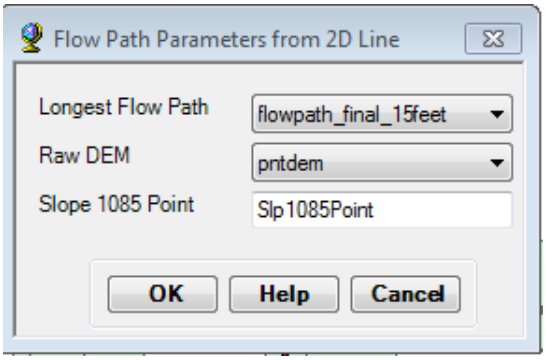


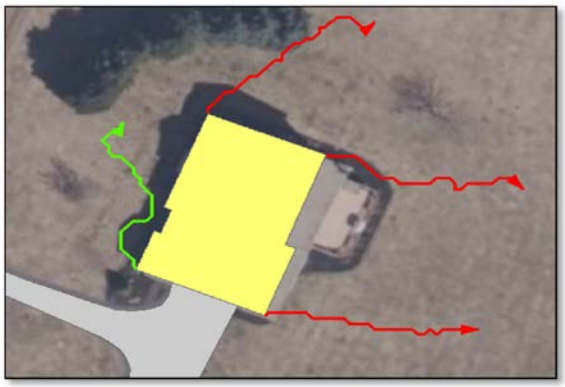
13. Determine which flowpaths we can get credit for
    a. Clip flowpaths to watershed boundary (to take out flowpaths going outside of watershed)
    b. Erase flowpaths in impervious areas, *Toolbox: Erase (Analysis)*
    c. Erase flowpaths in D soils, *Toolbox: Erase (Analysis)*
    d. Erase flowpaths in inlet buffers, *Toolbox: Erase (Analysis)*
    e. Split flowpaths which flow off the property, Toolbox: Identity (Analysis)



f. Add field
    i. Call it length
    ii. Set type as double
    iii. Calculate geometry (in feet)
g. Delete all flowpaths less than 15 feet (you may have to do this is parts to prevent ArcMap from crashing)
h. Locate flowpaths within 2 feet of downspouts and delete all others
i. Explode fragmented flowpaths
    i. Customize: Toolbars: Advanced Editing
    ii. Select all in attribute table
    iii. Explode (this could take a while)
j. Delete all flowpaths less than 15 feet (This is done twice b/c exploding excessive flowpaths is very time consuming)
k. Locate flowpaths within 2 feet of downspouts and delete all others (see comment above)

14. Determine slope of flowpaths
    a. Customize: Toolbars: ArcHydro
    b. Watershed processing: Flow path parameters: Flow path parameters from 2D line (this could take a while)





c. Open up attribute table in latest Flowpath layer and add fields
    i. Call it Rise
        1. Set type as double
        2. Field calculator = Abs (Elev85 – Elev10)
    ii. Call Run
        1. Set type as double
        2. Field calculator = Length * 0.75
    iii. Call it perc_slope (for percent slope)
        1. Set type as double
        2. Field calculator = rise/run * 100
d. Delete all flowpaths with a slope greater than 5.0%

15. Compute credit (in excel)
    a. Copy and paste final flowpath attribute table into excel (this may have to be done in pieces as it may be too large to do at one time)
    b. Determine average building footprint for all buildings with credited flowpaths
        i. Sum total building area with flowpaths (in Square feet) and divide by number of buildings with flowpaths, Example: 3,909,444 SF (Total area of buildings with flowpaths)/2,298 (buildings with credited downspouts) = 1,701 SF (average building roof)
        ii. Divide average building roof by 4 assuming 4 downspouts per roof to get roof area draining to each downspouts (ex. Building roof of 1,701 Sf/4 = 425 SF per downspout)
    c. Break up length of flowpaths and compute credit (P_E * downspout area = credit) per table below http://www.mde.maryland.gov/programs/Water/StormwaterManagementProgram/Documents/www.mde.state.md.us/assets/document/sedimentstormwater/Design_Manual_Revisions.pdf

Table 5.6. ESD Sizing Factors for Rooftop Disconnection

	Disconnection Flow Path Length (ft.)				
Western Shore	15	30	45	60	75
Eastern Shore	12	24	36	48	60
P_E (in.) =	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**