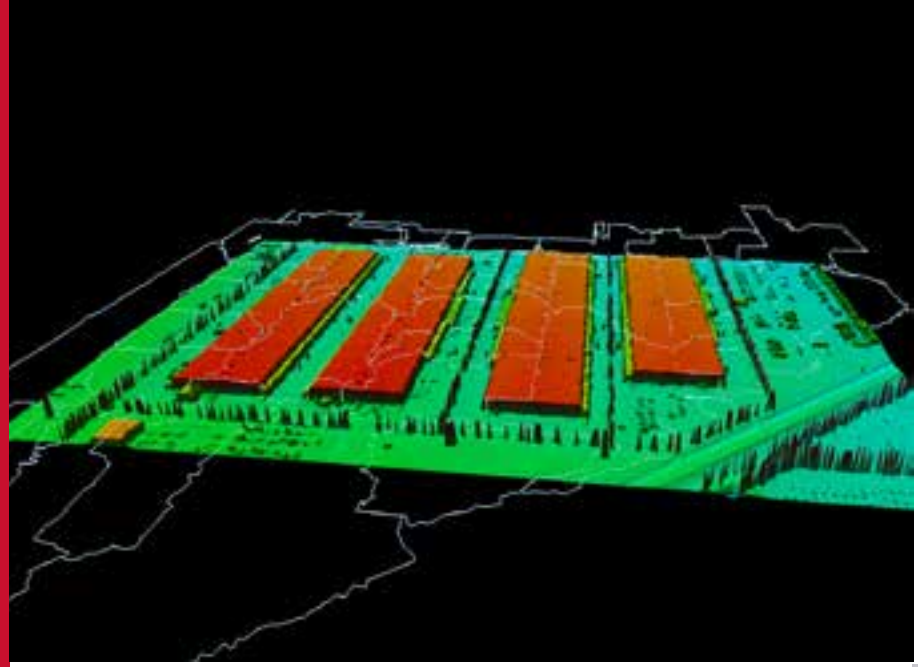


Drainage Area Delineation for Storm Water Drains from LiDAR Data

Brandon Jones and Chieko Plotts

Introduction

- GIS Professionals Supporting Engineers
  - Pre and Post processing of modeling data.
    - Flood modeling
    - Water body temperature modeling
    - Utility modeling
    - Traffic noise modeling

01

Overall Storm Water Modeling Process

Overall Storm Water Modeling Process

- 1D vs 2D

1D

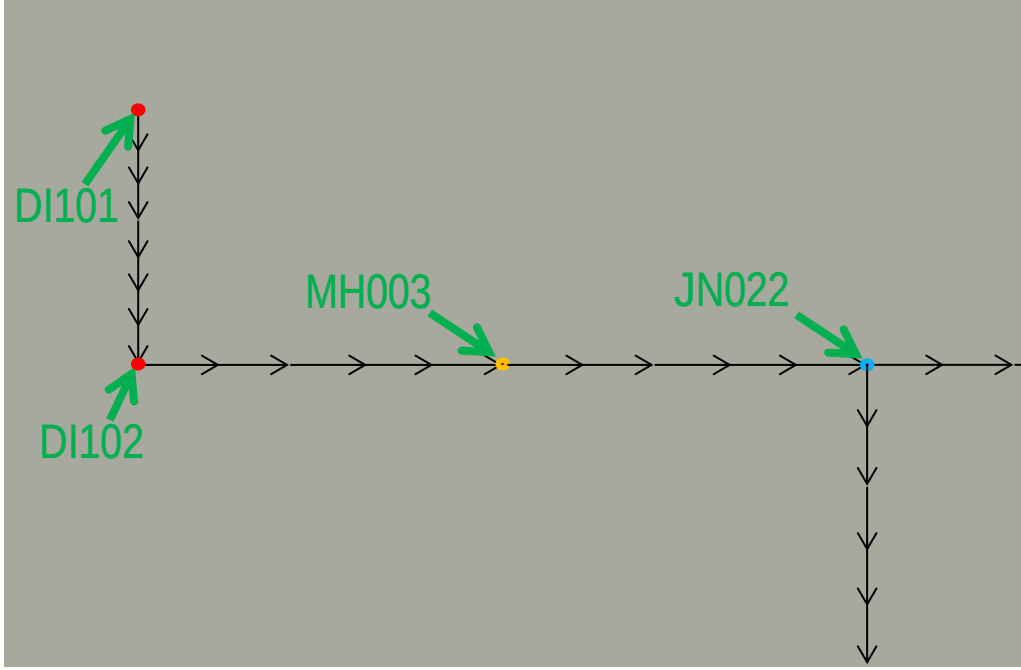
-Requires surface area drained by inlet to be pre-calculated.
-Sufficient for answering many questions, Example: Does this pipe segment have enough capacity for all likely storm events?

2D

-Uses DEM to calculate area drained by each inlet.
-Uses DEM to determine above and below ground (in pipes) drainage behavior.
-More setup intensive.
-Requires more processing time.

Overall Storm Water Modeling Process

- 1D Model Geometry and Attribute Inputs
  - Nodes (manholes [MH], drains [DI] and junctions [JN])
  - Pipe/Ditch Centerlines
  - Fields
    - Manhole and drain rim elevations
    - Node IDs
    - Pipe segment from and to node IDs
    - Pipe segment from and to node pipe elevations
    - Surface area drained by each drain

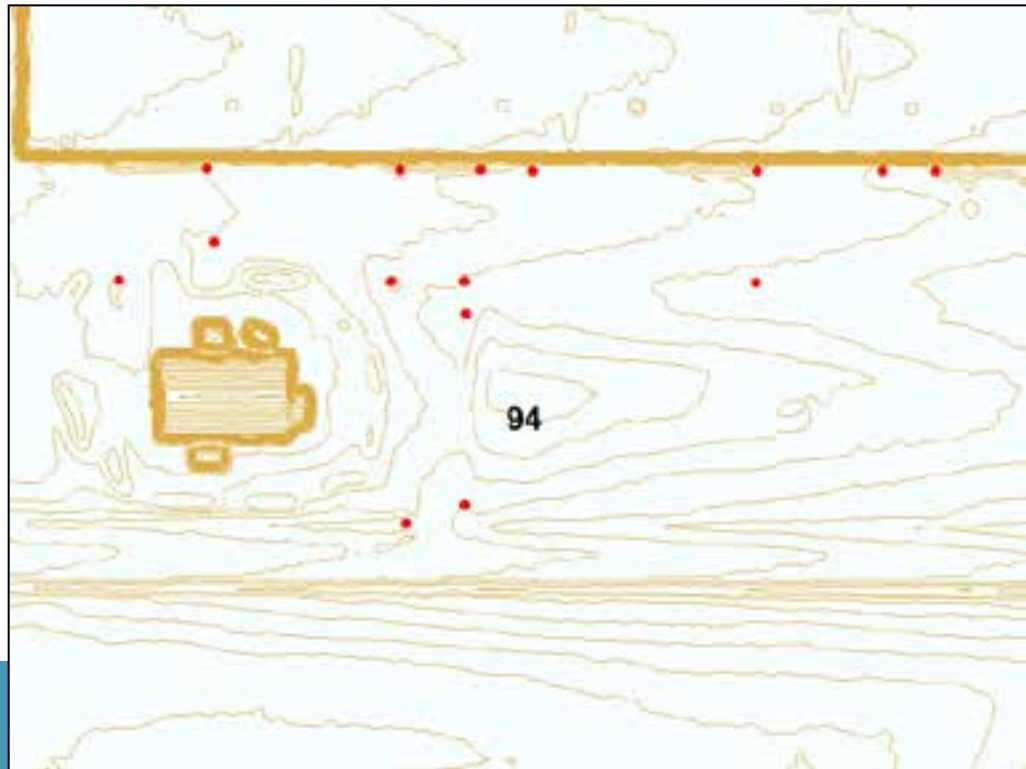


02

Problem

Problem

- Defense Logistics Agency (DLA) Site
- Efficient delineation of drainage basins



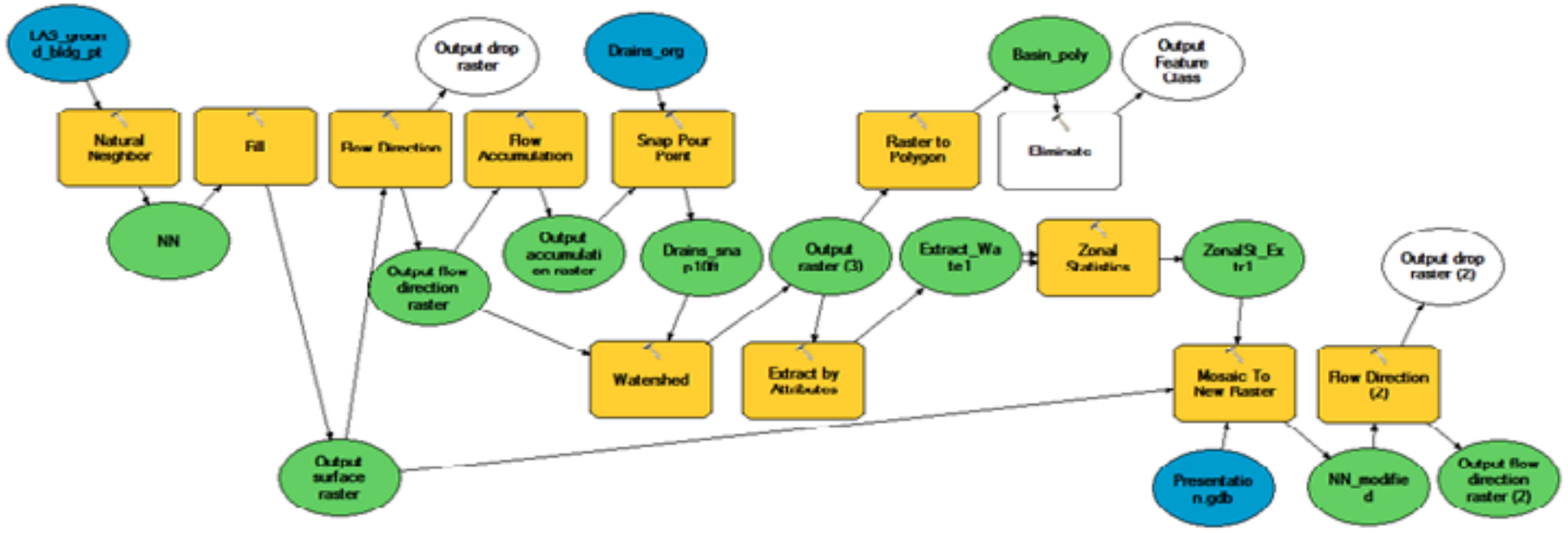
03

Solution

Solution

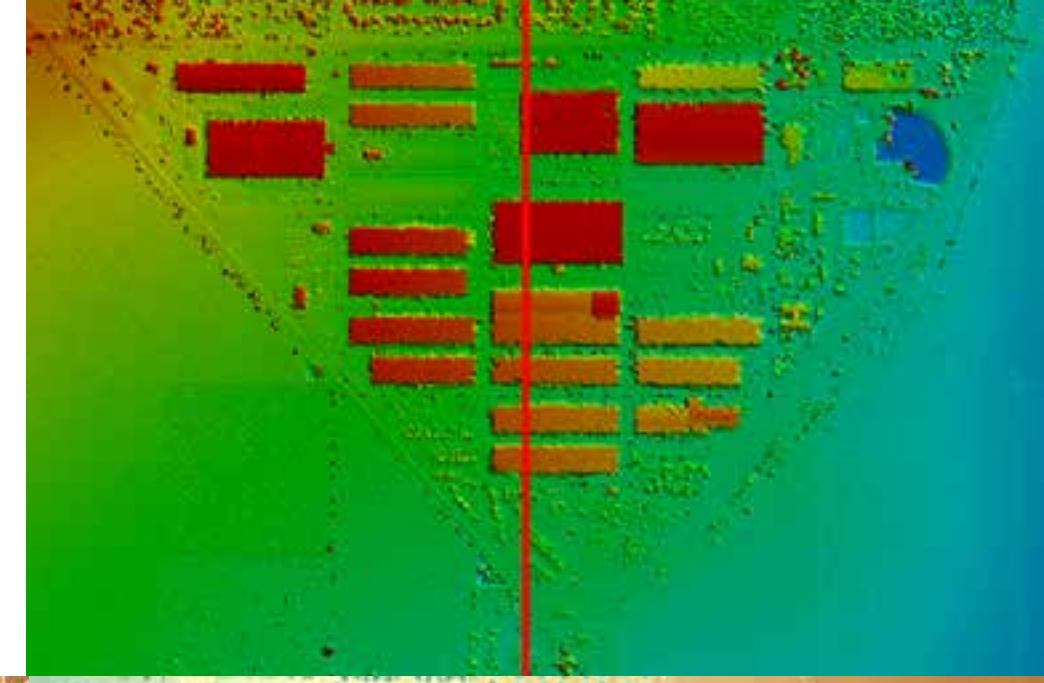
Method

1. Derive natural basins
2. Derive man-made basins
3. Snap drains within 10ft
4. Derive man-made basins for modified locations



Solution

- Extracting bare-ground and top of building surface
- Derive Natural Basins

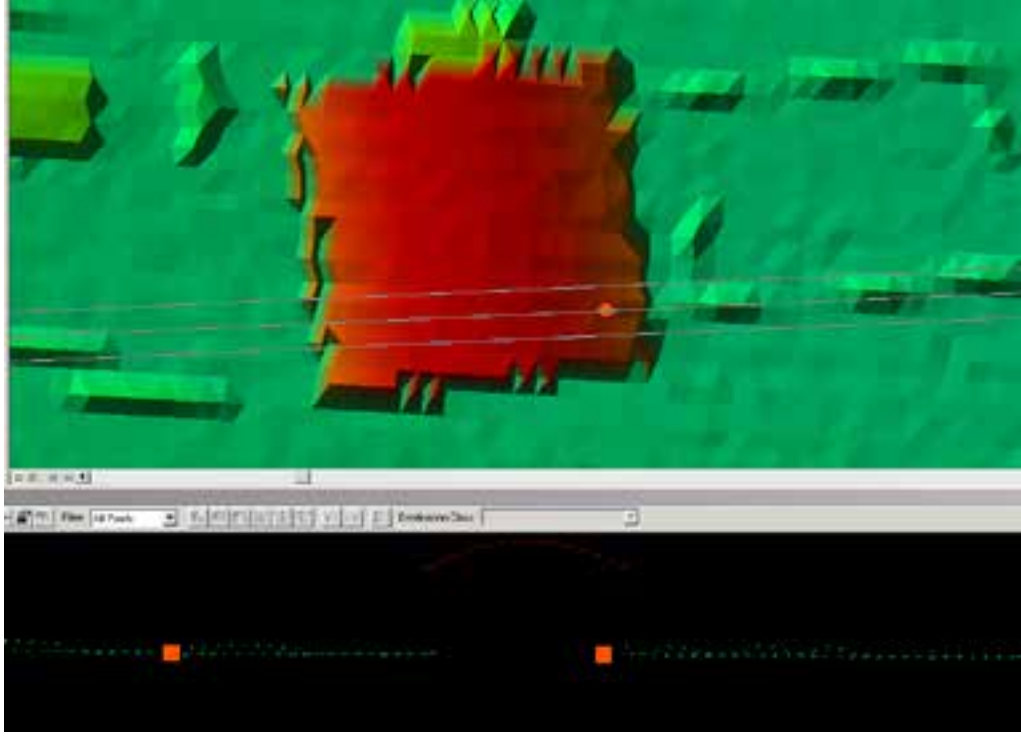


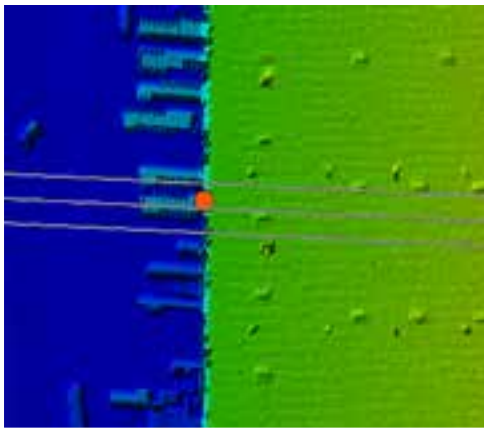
Solution

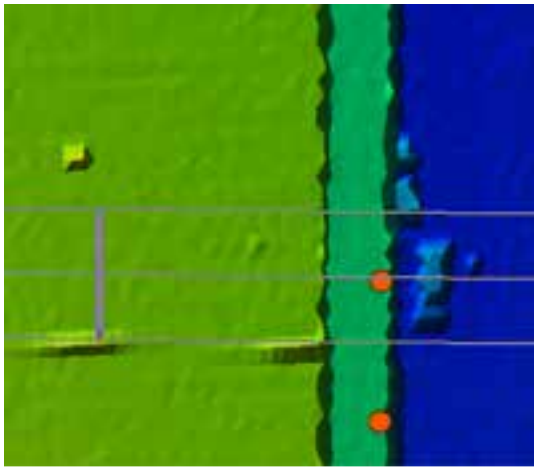
- Drains under the structure

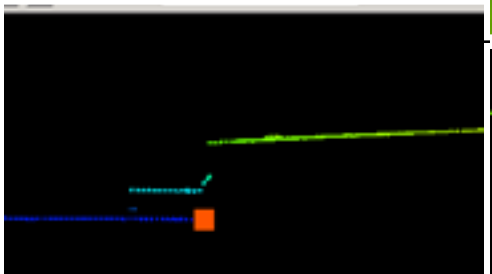
Rim Elevatio	Flow_Line_Elevation	terrain_el	difference
<Null>	72.59' FL 6" Steel	73.2303	-999
<Null>	71.74' FL 12" CMP	73.03066	-999
<Null>	70.85' FL 12" CMP	73.27069	-999
<Null>	72.09' FL 12" Pipe	74.40549	-999
<Null>	69.59' FL 30" RCP	72.70898	-999
<Null>	80.04' FL 6" PVC	97.20391	-999
<Null>	81.87' FL 6" PVC	99.01003	-999
<Null>	85.18' FL 24"x36" CMP	89.34785	-999
<Null>	89.06' FL 12" RCP	91.80791	-999
<Null>	<Null>	77.0193	-999
<Null>	<Null>	98.14682	-999
<Null>	<Null>	86.81376	-999
<Null>	<Null>	83.12508	-999
<Null>	<Null>	82.44493	-999
95.64	92.64'	116.5918	-20.95179
79.45	73.60' (24" RCP-North), 73.36' (	97.1282	-17.6782
82.17	81.17'	98.77338	-16.60338
81.66	80.76'	98.24563	-16.58563
94.67	92.73'	111.427	-16.55702
82.01	81.01'	98.53454	-16.52454
82.51	81.52'	99.00485	-16.49485
81.81	80.81'	98.25717	-16.44717
82.37	81.37'	98.80656	-16.43656
82.03	80.73'	98.27791	-16.24791
81.26	80.24'	97.41805	-16.15804
81.89	80.55'	97.96835	-16.11835
81.44	80.34'	97.54613	-16.10613
81.73	80.48'	97.69049	-15.99649
81.51	80.39'	97.39146	-15.88146
78.91	76.61' (6" In), 75.47 (12" Out)	94.62173	-15.71173
84.23	82.76'	99.85561	-15.62561
84.32	82.97'	99.88116	-15.56116
85.56	Top of Outfall 81.90' Bot Box	77.06490	-11.52490

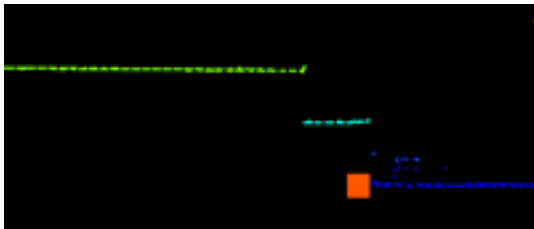
6 (1 out of 415 Selected)





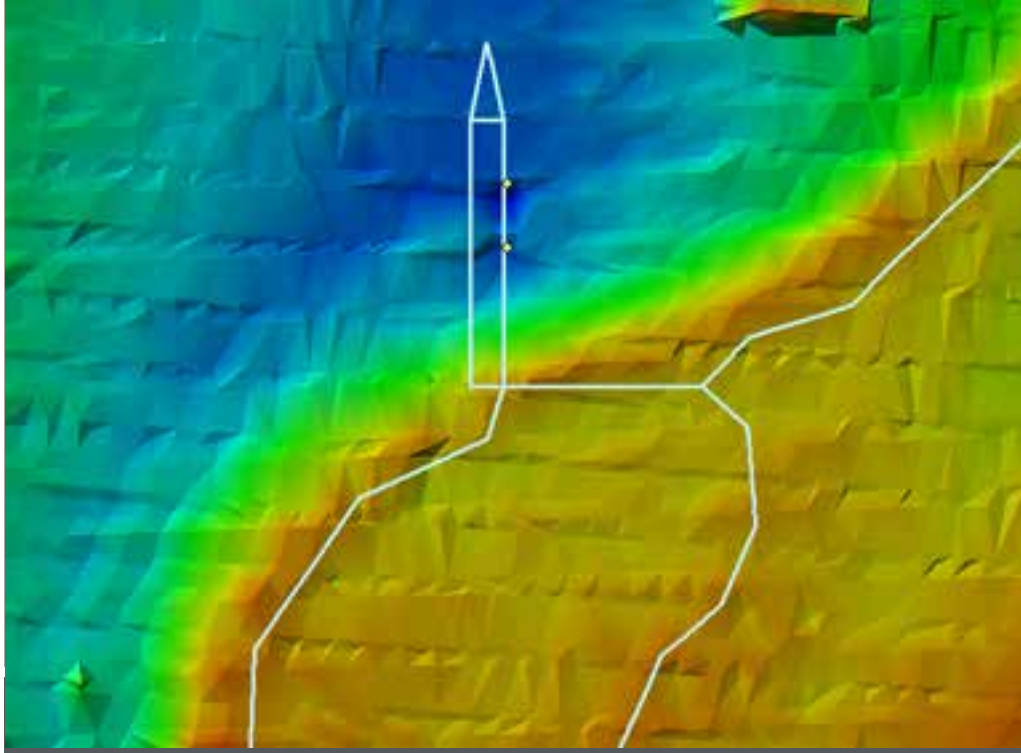






Solution

- Problems
  - Some areas were not covered by basins.
  - Micro-basins were created within the large basins.
  - Resolution:
    - Use ELIMINATE tool to dissolve small basins into large basins.
    - Modify raster surface using ZONAL FILL or Focal Statistics.



04

Conclusion

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- Issues
  - Some of the drains were at the bottom of depressions and had to be delineated manually.
  - Saved time from manually drawing in the delineation.
- Benefits
  - Potentially more accurate.

Conclusion

- Issues
  - Some of the drains were at the bottom of depressions and had to be delineated manually.
  - Saved time from manually drawing in the delineation.
- Benefits
  - Potentially more accurate.
  - This effort shows the value of GIS professionals being integrated with a team of engineers to effectively and efficiently work through a modeling workflow.