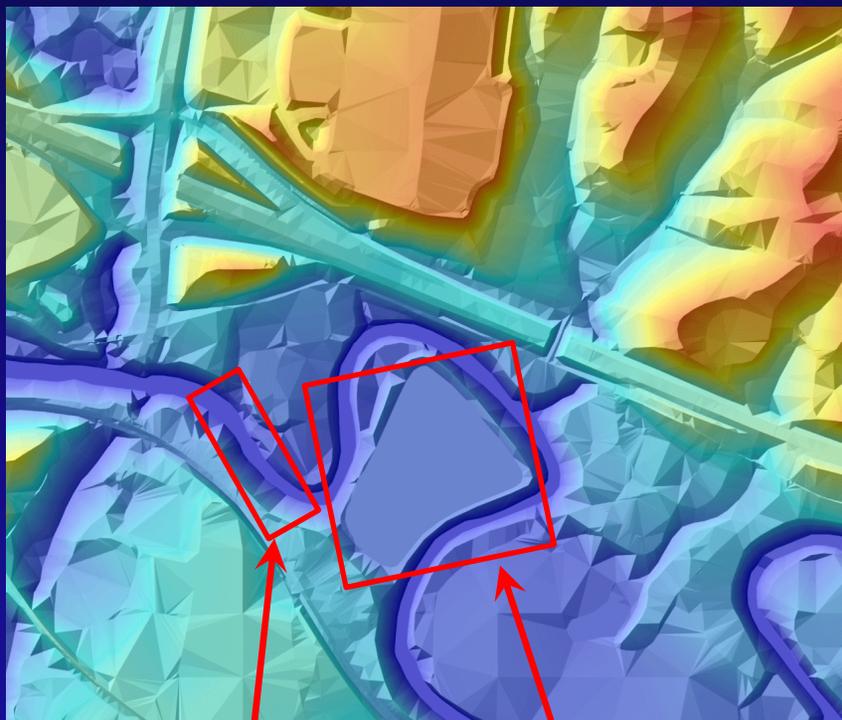




HYDRO TREATMENTS OF LIDAR-DERIVED DEMS

LIDAR-DERIVED DEMS
HYDRO TREATMENTS OF

Stereo DTM (Topographic Surface)



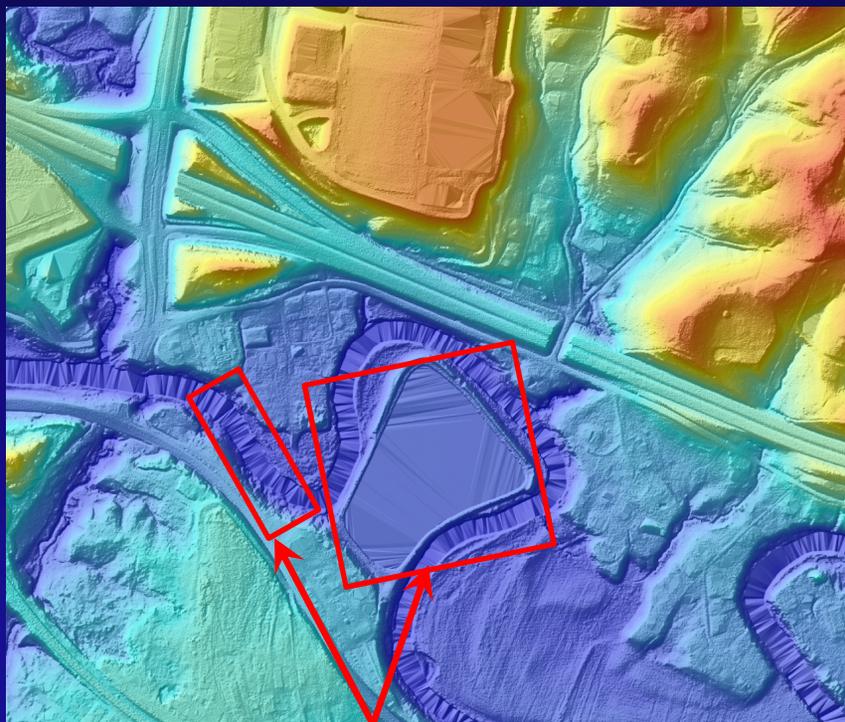
Stream

Waterbody

- ☀ Reference image of the traditional stereo-compiled DTM
- ☀ Built from Masspoints and Breaklines
- ☀ Much coarser resolution than lidar
- ☀ Demonstrates the familiar and usually expected character of a topographic DEM
- ☀ Most notably, the “flat” water surfaces



Pure LiDAR (Topographic Surface)

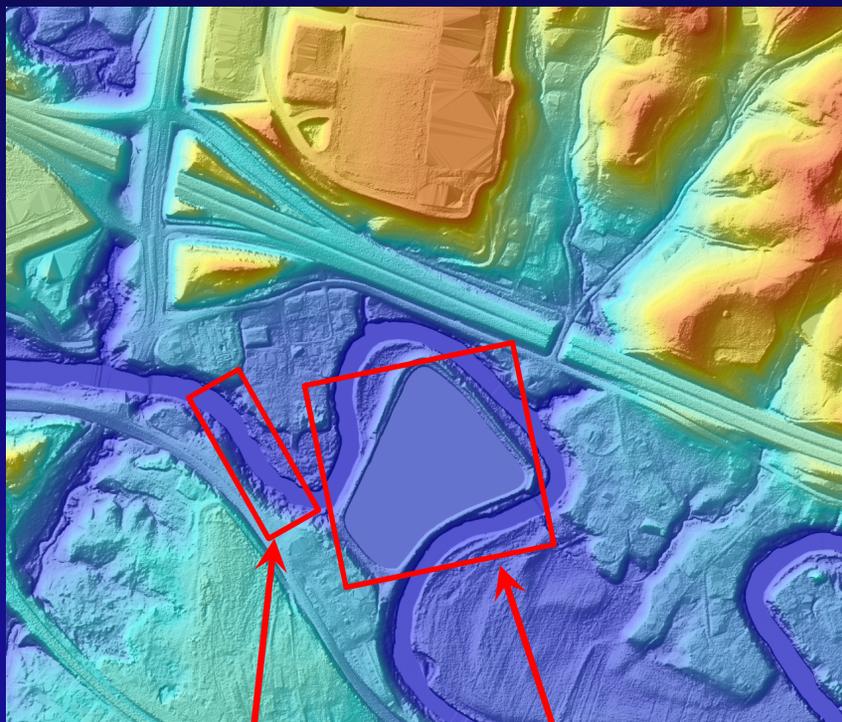


Tinning in Water Areas

- DEM created only using Bare-Earth lidar points
- Surface contains extensive triangulation artifacts (“tinning”).
- Cause by the absence of:
 - Lidar returns from water
 - Breakline constraints that would define buildings, water, and other features (as in the Stereo DTM).
- Aesthetically and cartographically unacceptable to most users



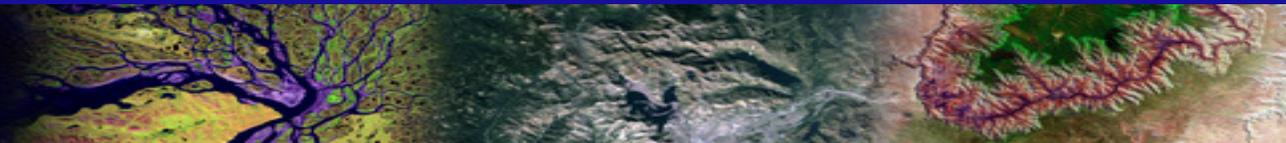
Hydro Flattened (Topographic Surface)



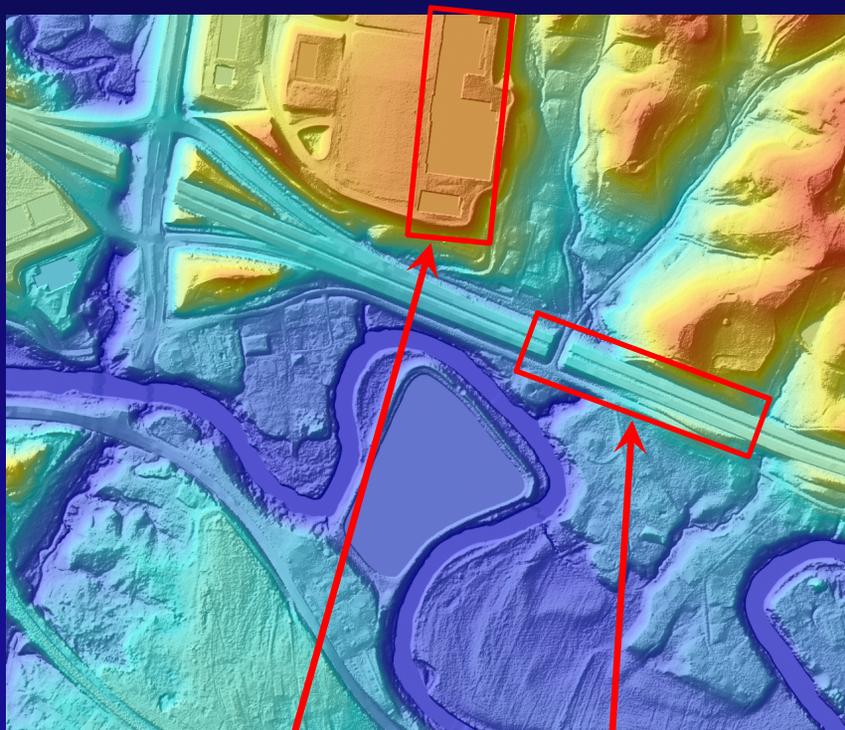
Stream

Waterbody

- The goal of the v13 Spec.
- Intent is to support the development of a consistent, acceptable character within the NED, suitable for contouring.
- Removes the most offensive pure lidar artifacts: those in the water.
 - Constant elevation for waterbodies.
 - Wide streams and rivers are flattened bank-to-bank and forced to flow downhill (monotonic).
- Carries **ZERO** implicit or explicit accuracy with regards to the represented water surface elevations – It is **ONLY** a Cartographic/Aesthetic enhancement.
- Building voids are too costly to correct.
- Most often achieved via the development and inclusion of hard breaklines.



Full Breaklines (Topographic Surface)

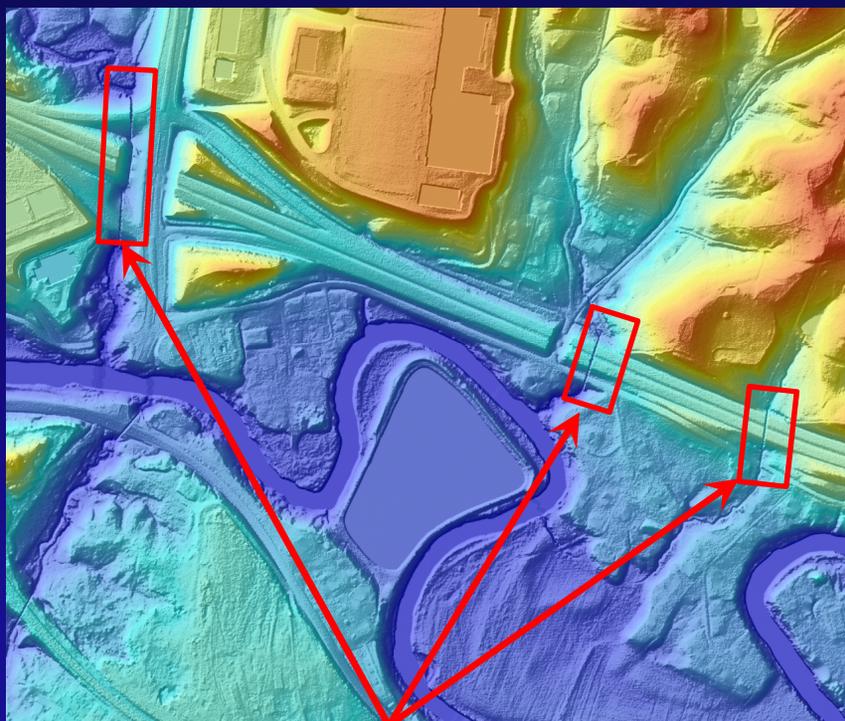


Buildings

Roads

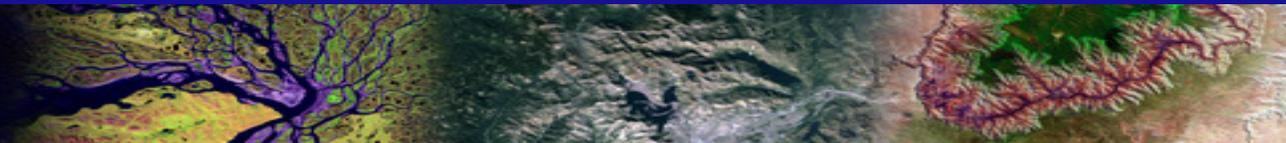
- ☀ A further possible refinement of the Hydro Flattened surface
- ☀ Removes artifacts from building voids
- ☀ Refines the delineation of roads, single-line drainages, ridges, bridge crossings, etc.
- ☀ Requires the development of a large number of additional detailed breaklines
- ☀ A higher quality topographic surface, but significantly more expensive.
- ☀ Not cost effective for the NED.

Hydro Enforced (Hydrologic Surface)

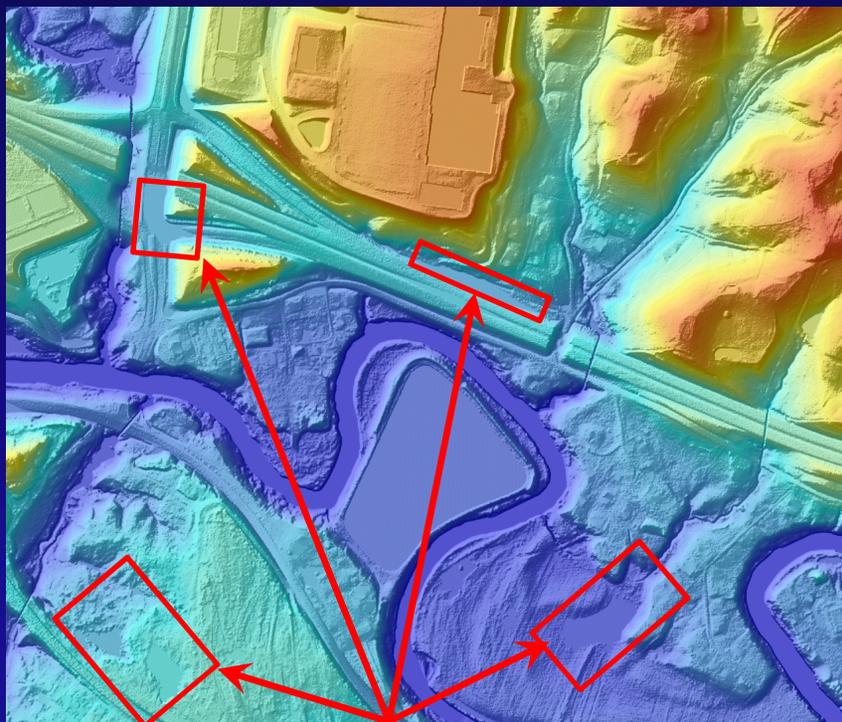


Culverts Cut Through Roads

- ☀ Surface used by engineers in Hydraulic and Hydrologic (H&H) modeling.
- ☀ NOT to be used for traditional mapping (contours, etc.)
- ☀ Similar to Hydro Flattened with the addition of Single Line Breaklines: Pipelines, Culverts, Underground Streams, etc...
- ☀ Terrain is then cut away at bridges and culverts to model drain connectivity
- ☀ Water Surface Elevations (WSEL) are often set to known values (surveyed or historical).



Hydro Conditioned (Hydrologic Surface)

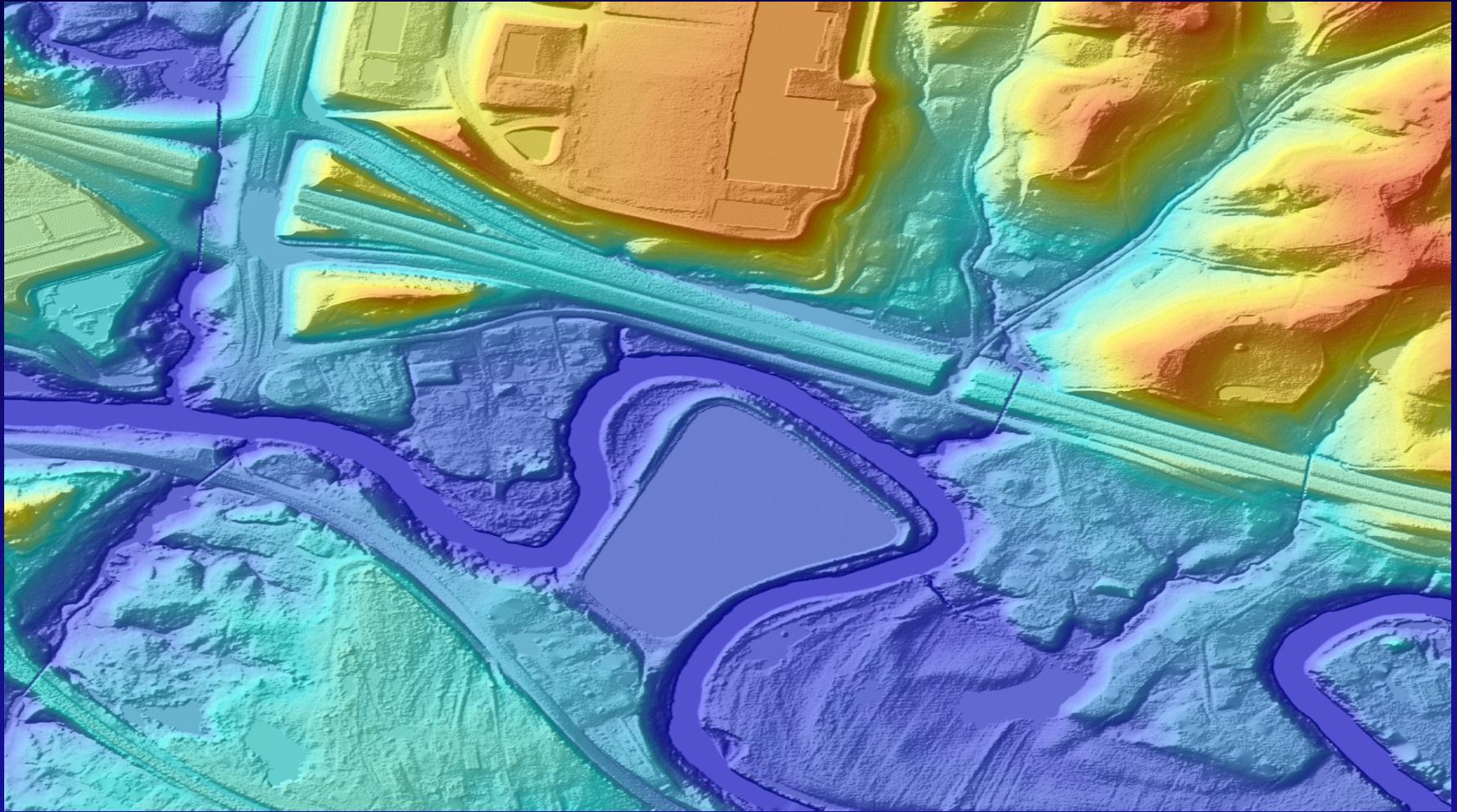


Filled Sinks

- ☀ Another type of surface used by engineers for H&H modeling.
- ☀ Similar to the Hydro Enforced surface, but with sinks filled
- ☀ Flow is continuous across the entire surface – no areas of unconnected internal drainage
- ☀ Often Achieved via ArcHydro or ArcGIS Spatial Analyst



Active Comparison Slide (click the buttons below)



Stereo
DTM

Pure
Lidar

Hydro
Flattened

Full
Breaklines

Hydro
Enforced

Hydro
Conditioned

References

- ☀ USGS-NGP v13 Draft LiDAR Base Specification
- ☀ Special Thanks to:
 - ☀ Hans Karl Heidemann
 - ☀ Jeremiah Ross Vinyard-Houx
 - ☀ James V Mauck

