Probabilistic Flood Mapping

Existing Applications

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Probabilistic Flood Mapping

- Main goal: generate flood forecast maps based on ESP approach to account for uncertainty

- Experimental applications developed by OHD and/or RFCs:
  - Flood mapping tool + interactive mapping tool
  - Under evaluation by NWS Real-Time Inundation Mapping Evaluation (R-TIME) Team

- Required information:

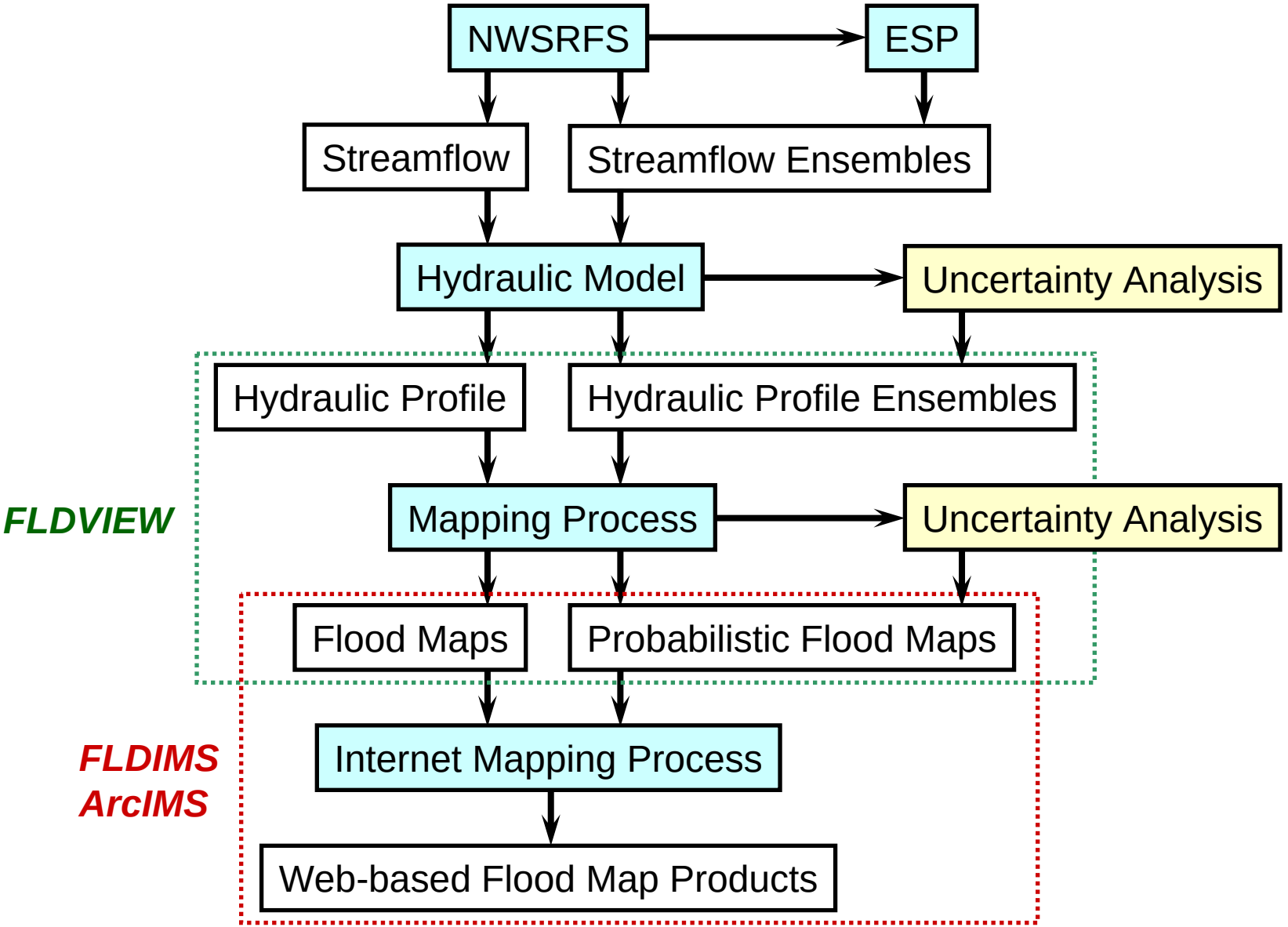
  hydraulic profiles for desired probability levels

  + corresponding probabilistic flood maps

- Definitions:
  - probabilistic profiles: profile for which water elevation value of any point has the same probability to be exceeded
  - probabilistic flood map: flood extent for which any point on the limits has the same probability to be flooded

Flood Mapping

Forecasting System to produce deterministic and probabilistic flood maps

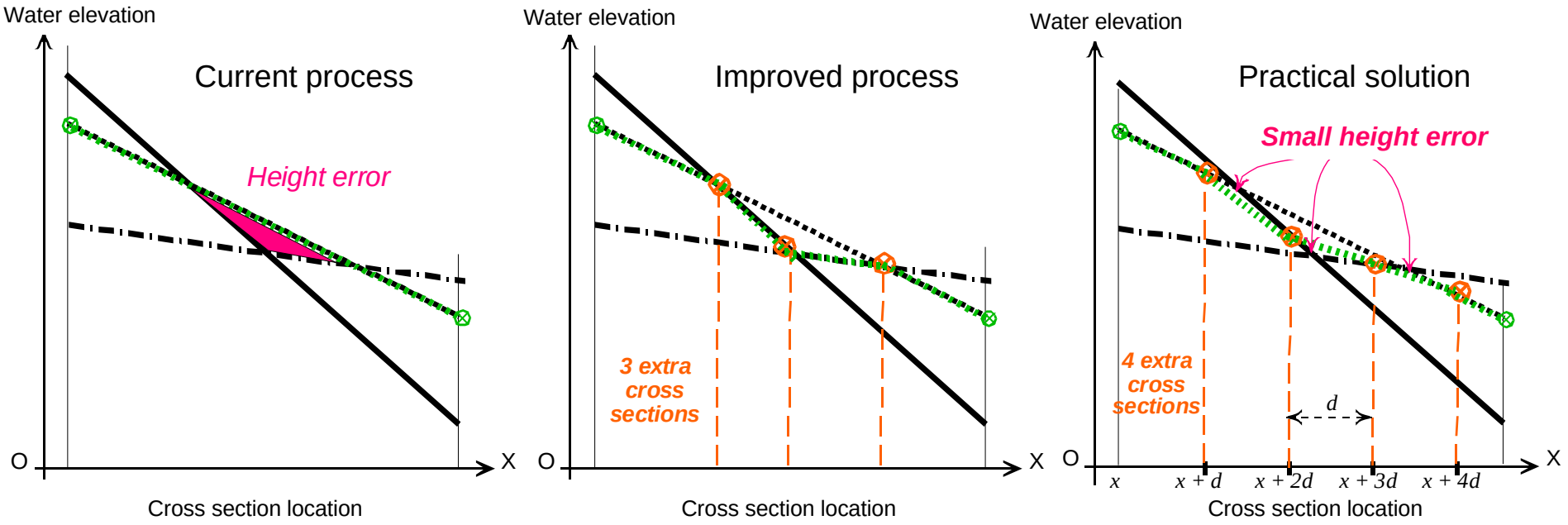


Existing Experimental Applications

- Applications developed by OHD with collaboration of RFCs:
  - GIS tool for flood maps
  - Internet tool for interactive flood maps
  - Analysis of probabilistic flood map generation process using ESP outputs
- Main goal: generate real-time flood maps using ESP hydrological outputs and FLDWAV (to produce probabilistic river stages)
- Existing tools:
  - FLDVIEW: GIS application to produce flood forecast maps
  - FLDIMS/ArcIMS: internet mapping application to publish forecast maps
- Limitations: do not account for uncertainties in hydraulic modeling and geospatial modeling
- Generation of probabilistic hydraulic profiles:
  - may require additional cross sections when input hydraulic profiles cross each other
  - for any intermediate probabilistic value, generate fuzzy probabilistic profile (profile envelop) (no interpolation)

Probabilistic Hydraulic Profiles

Generation of probabilistic hydraulic profiles may require additional cross sections when input hydraulic profiles cross each other



3 individual hydraulic profiles (same frequency)

Probabilistic hydraulic profile for P=0.7

Original probabilistic water surface elevation

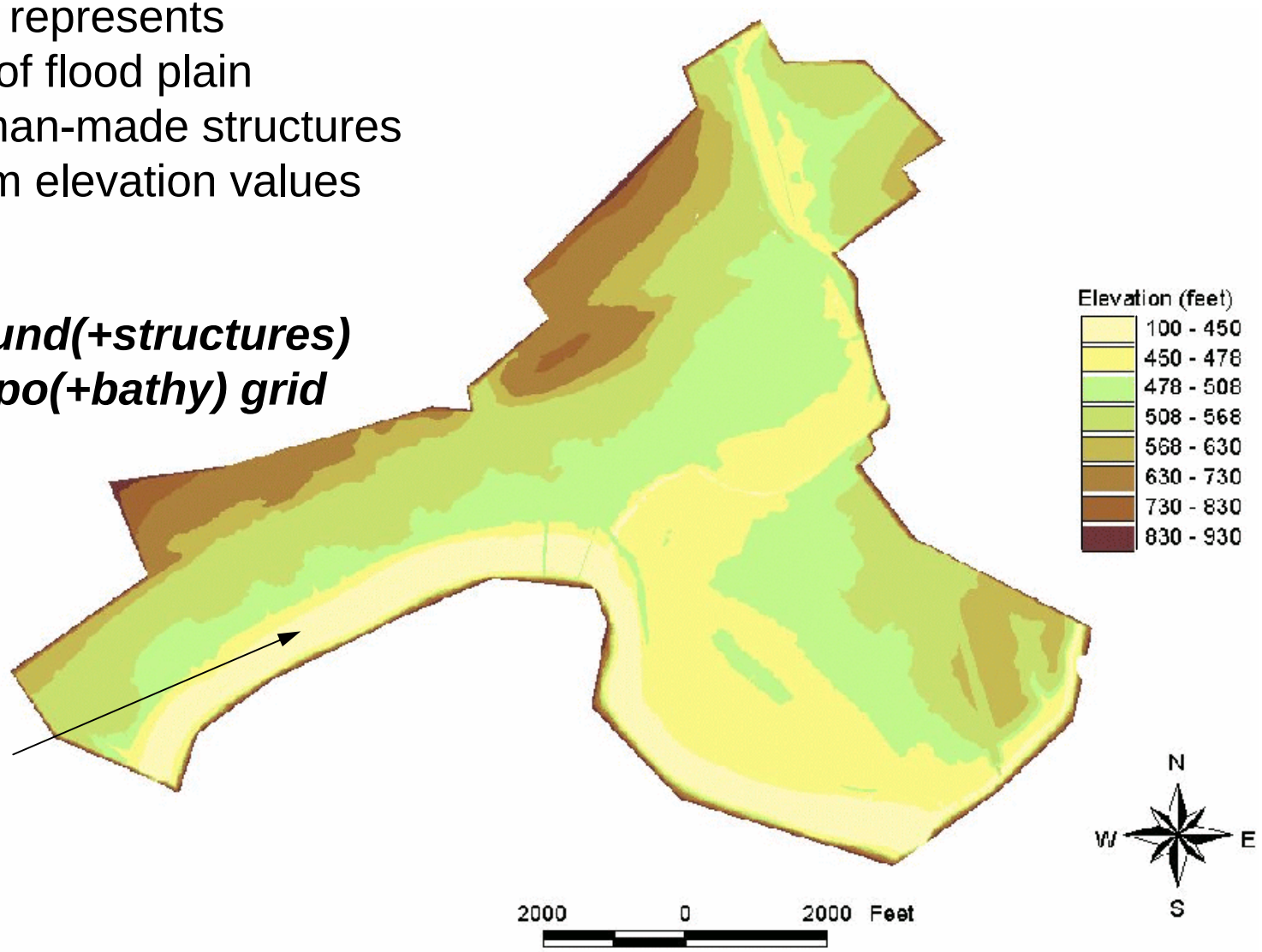
Extra probabilistic water surface elevation

FLDVIEW (1): Ground Grid

Ground Grid represents
- topography of flood plain
- eventually man-made structures
 & river bottom elevation values

ground(+structures)
topo(+bathy) grid

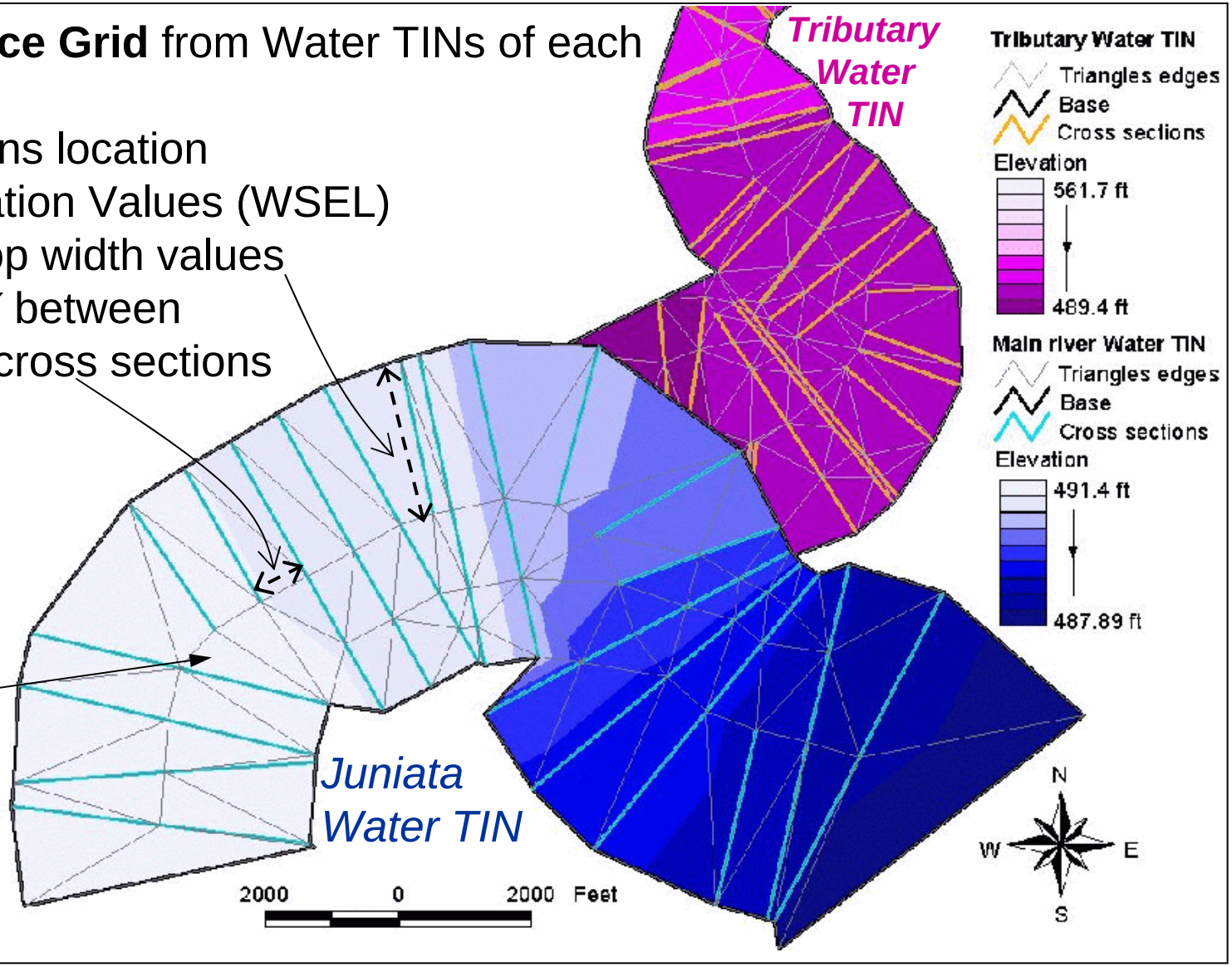
Ground
elevation Z



FLDVIEW (2): Water Surface Grid

Water Surface Grid from Water TINs of each reach using:
- cross sections location
- Water Elevation Values (WSEL)
- estimated top width values
- distance *DX* between interpolated cross sections

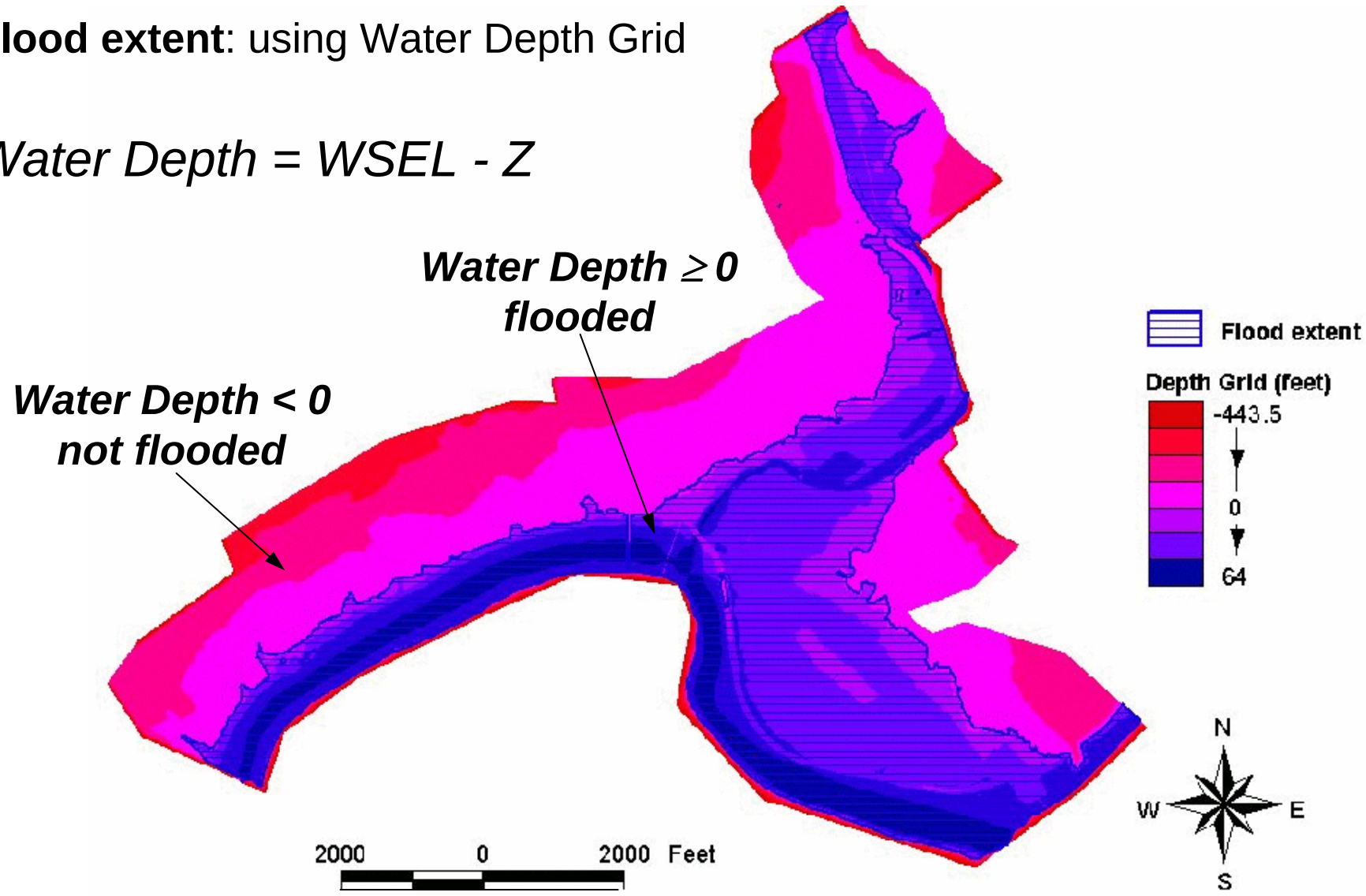
WSEL interpolated from neighboring cross sections



FLDVIEW (3): Flood Extent

Flood extent: using Water Depth Grid

Water Depth = WSEL - Z

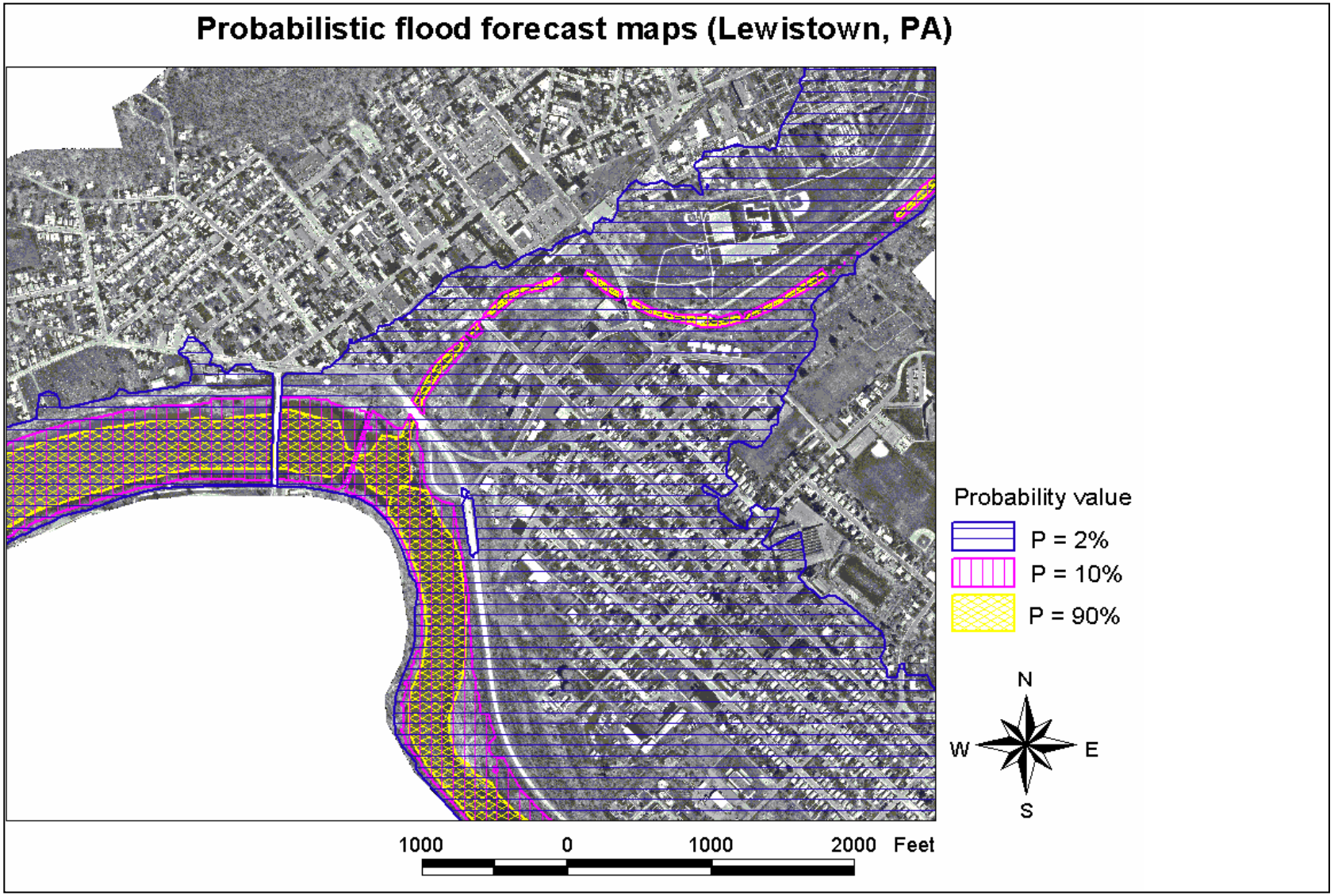


FLDVIEW (4): Deterministic Maps

Deterministic flood map: 1984 flood event

FLDVIEW (4): Probabilistic Maps

Probabilistic flood forecast maps for different probability values



FLDIMS (1): Dynamic Maps on Web

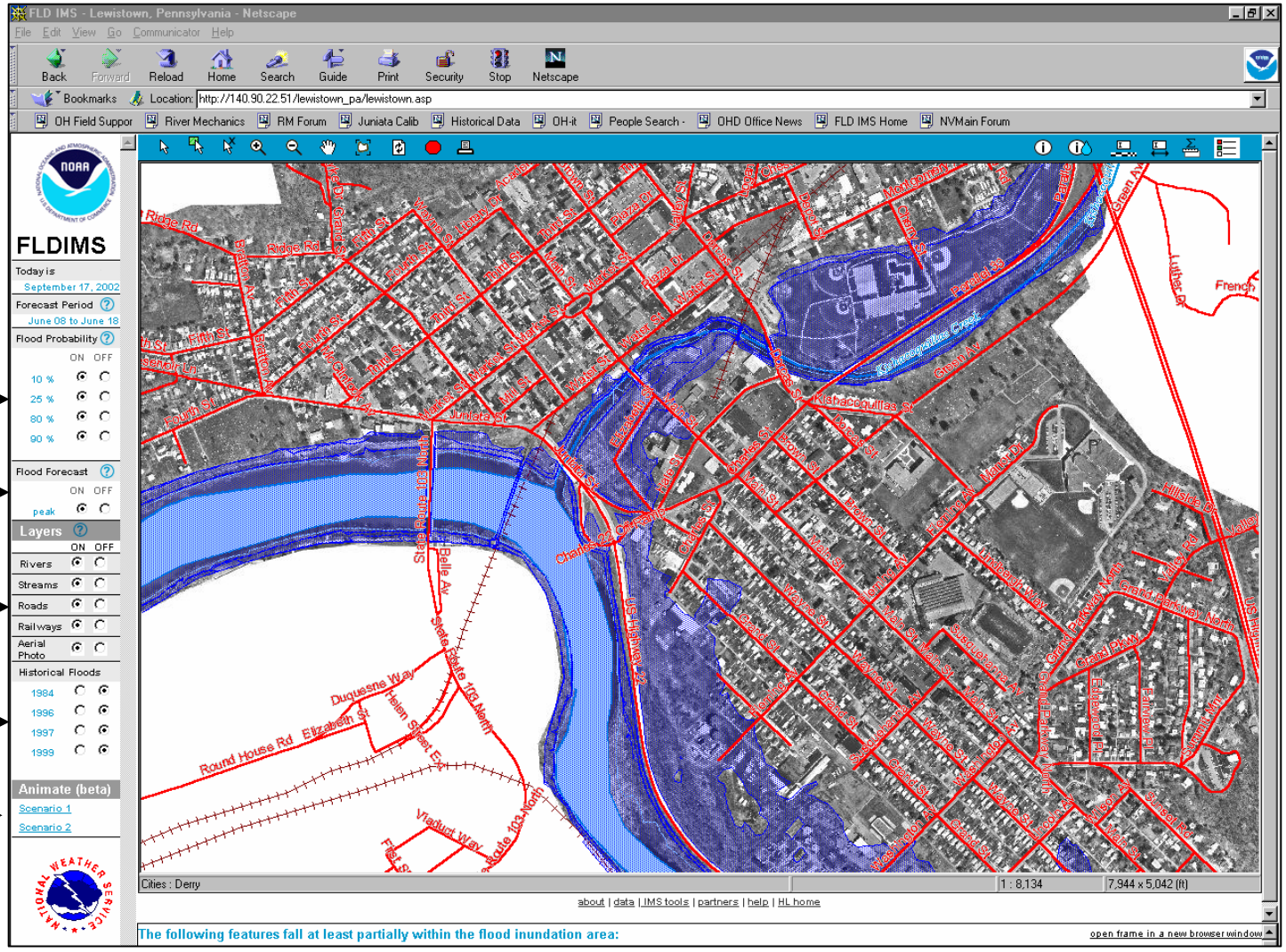
Probabilistic flood forecast maps

Deterministic peak flood forecast map

Display other layers

Historical flood maps

Flood animation



FLDIMS (2): Dynamic Maps on Web

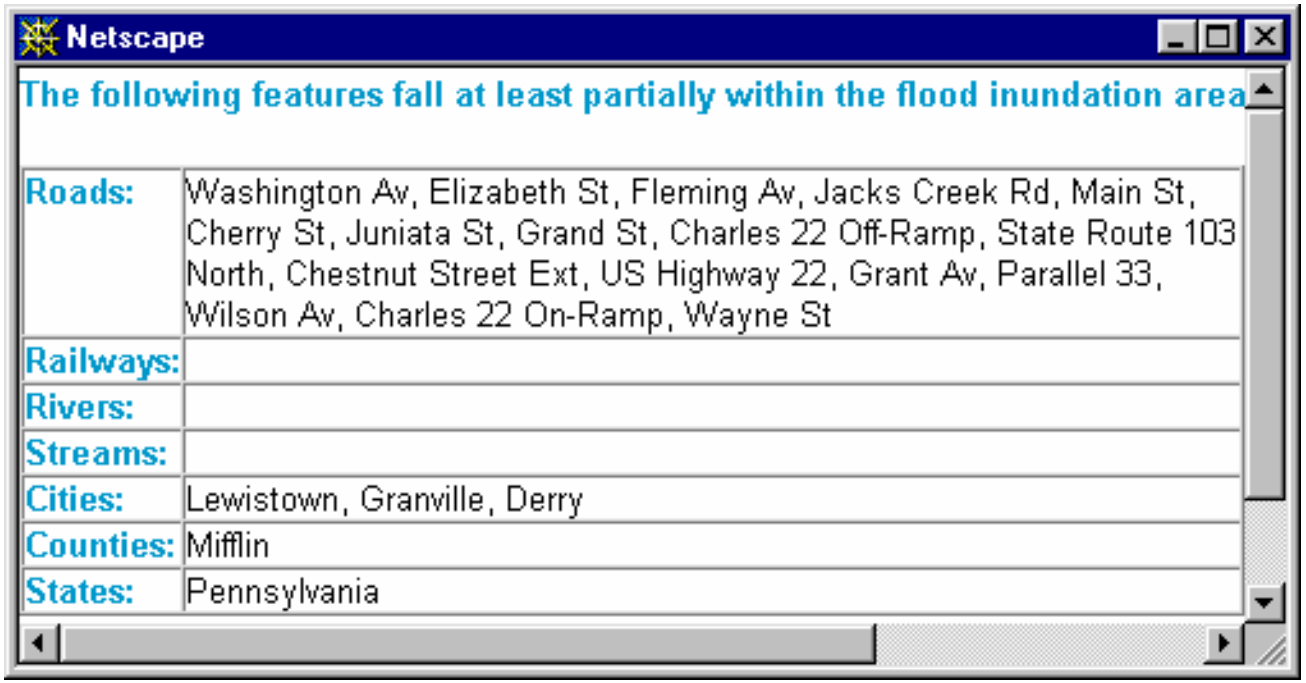
Web-based information provided to NWS partners and customers:

- **Flood forecast extents**: probabilistic floods, deterministic flood (peak conditions), historical floods (1984, 1996, 1997, 1999)

-Other layers: rivers, streams, roads,railways, orthophotos

-Spatial analysis of flood extent:
identify features (roads, railways, cities) within the flood extent, give names of these features and statistics

-Animation of scenarios



Future Flood Mapping Applications