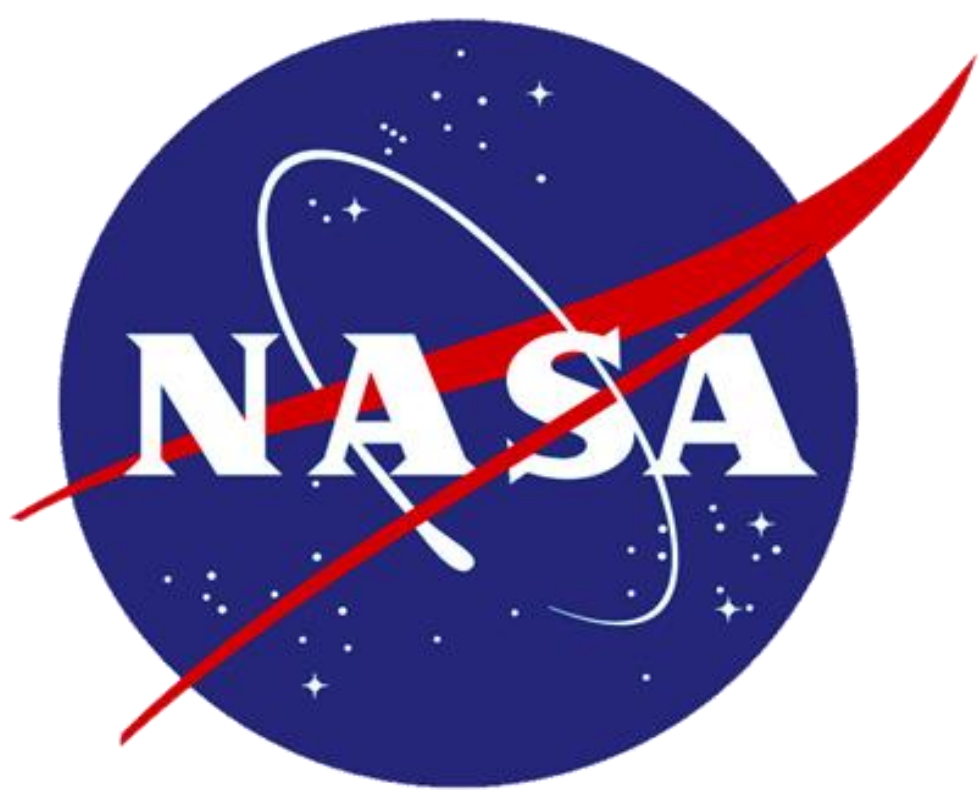


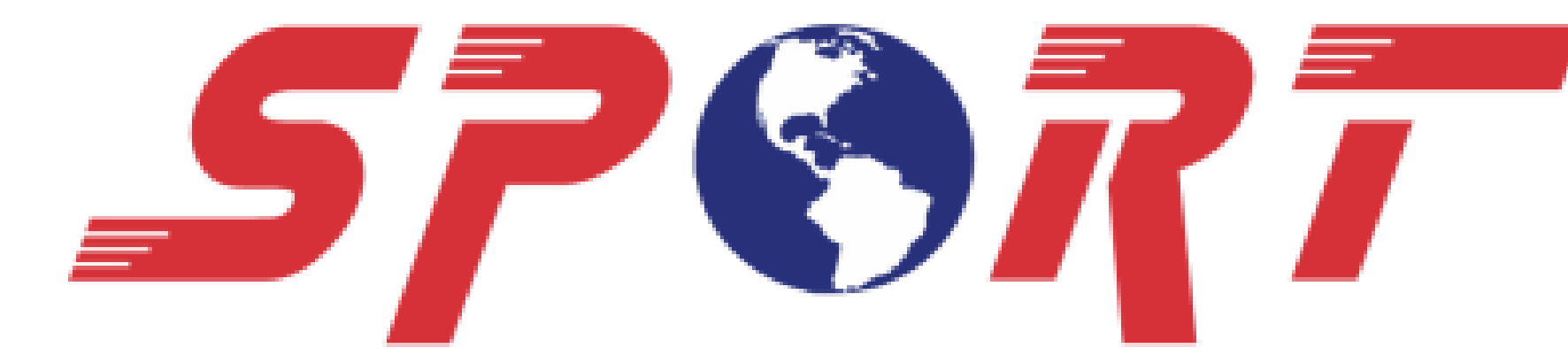


# Using ISERV and Commercial Satellite Imagery to Assess and Monitor Recovery Efforts in Urban Damaged Areas

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## Introduction and Motivation

- NASA's Short-term Prediction Research and Transition (SPoRT) Center supports the transition of unique NASA and NOAA research activities to the operational weather forecasting community.
- SPoRT continues to support and expand disaster activities to support end users such as the National Weather Service (NWS) to help respond and assist with the disaster assessment process.
- High resolution commercial imagery and ISERV data provide alternative ways to view damaged areas. Additionally, imagery can provide details about damage to areas that are beyond the accessibility of damage assessment teams.

## Commercial and ISERV Data

- High resolution commercial satellite imagery is obtained with support from USGS, who coordinates the acquisition of the commercial satellite data with partnerships with federal agencies and the commercial vendors.
- USGS distributes the imagery through their Hazards Data Distribution System (HDDS) portal. Depending on the sensor the resolution can range from 0.5 m to 5 meters.
- ISERV is a camera system that is aboard the International Space Station used to monitor the impacts of disasters and to provide decision support to officials. ISERV resolution is roughly 5 meters.
- ISERV and commercial data latency periods are all dependent on orbits, cloud cover and sun angles.

## Moore, Oklahoma EF-5 Tornado

- Commercial satellite imagery was first available on May 22. Especially in heavily damaged area, imagery showed damage in great detail.
- SPoRT explored to what extent that the damage could be assessed from high resolution imagery. Figure 3 shows a potential methodology that categorizes damage based on roof damage and the whether or not walls remain standing.
  - Blue dots- No visible damage
  - Green dots- Damage to the roof, but still intact
  - Yellow dots-Parts of roof missing, only walls standing
  - Red dots-No visible parts of the structure are standing
- ISERV was not first available until late June because of ISS orbit and cloud cover, however the damage scare was still very apparent.



Figure 1. Pleiades imagery acquired on 29 April 2013 . Resolution is 0.50 x 0.50 meters.



Figure 2. Pleiades imagery acquired on 22 May 2013 . Resolution is 0.50 x 0.50 meters.

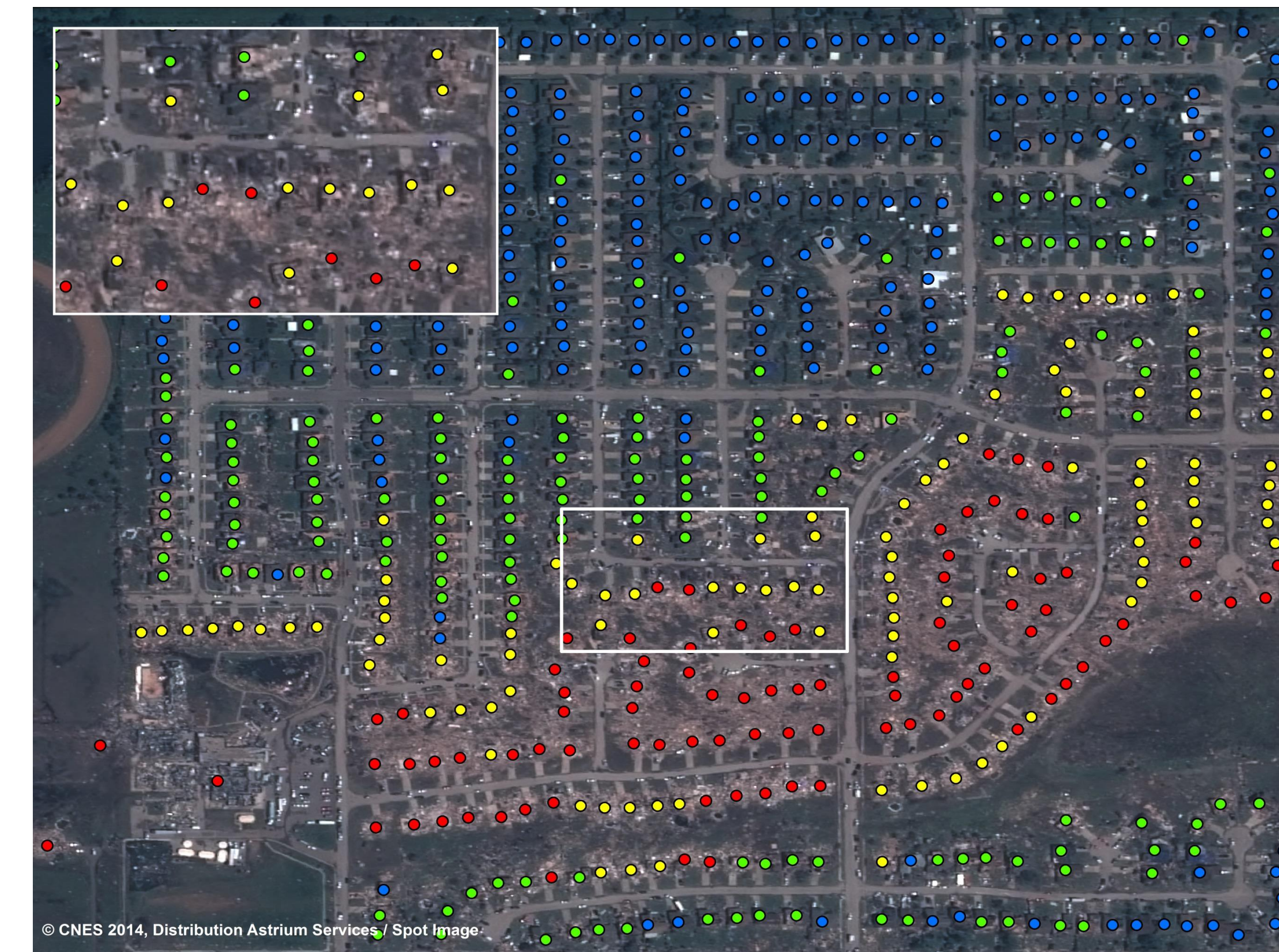


Figure 3. Example of experimented methodology exploring what damage can be seen from high resolution imagery

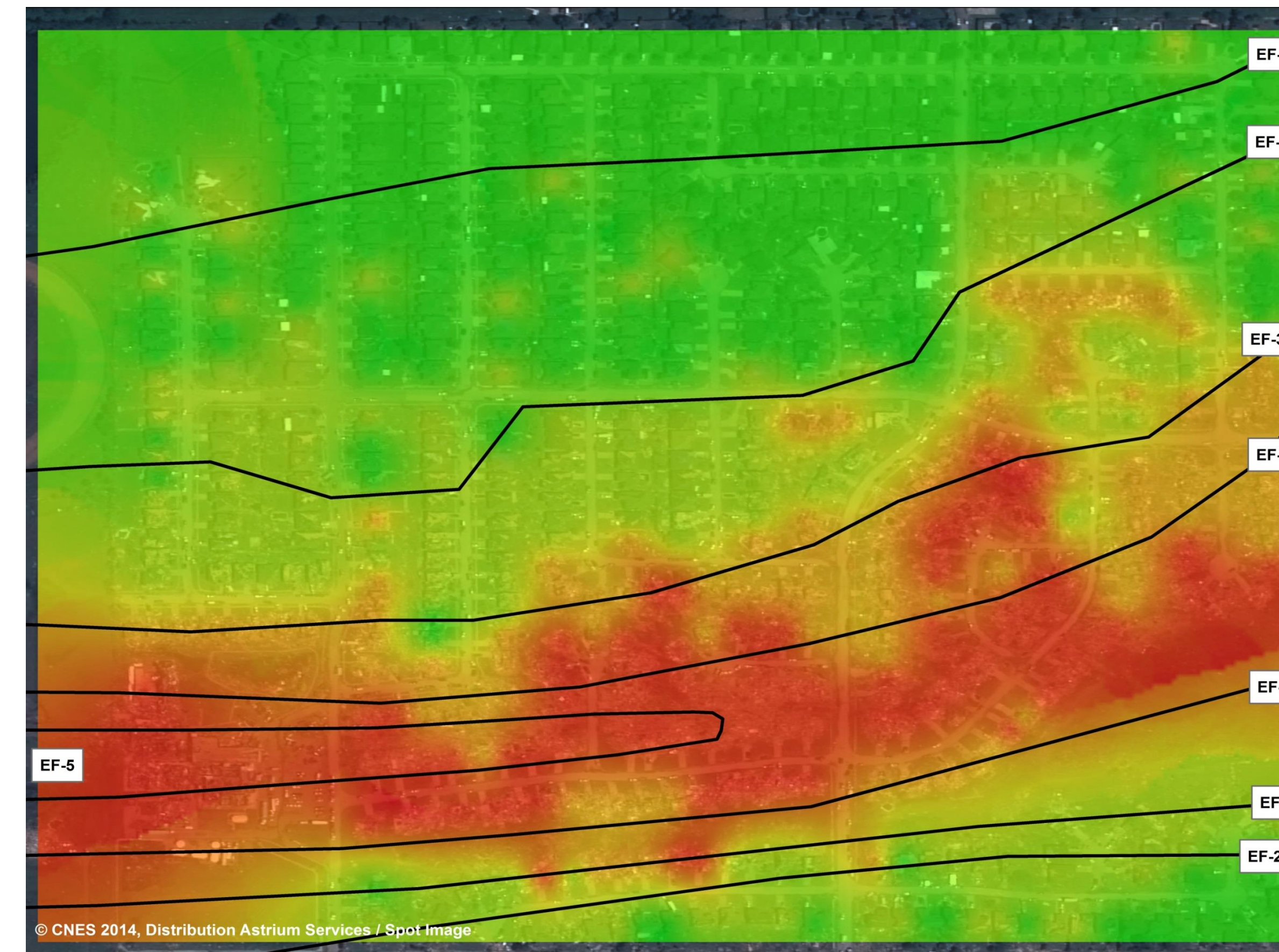


Figure 4. Kriging interpolation of dots compared with official survey from the Norman WFO.

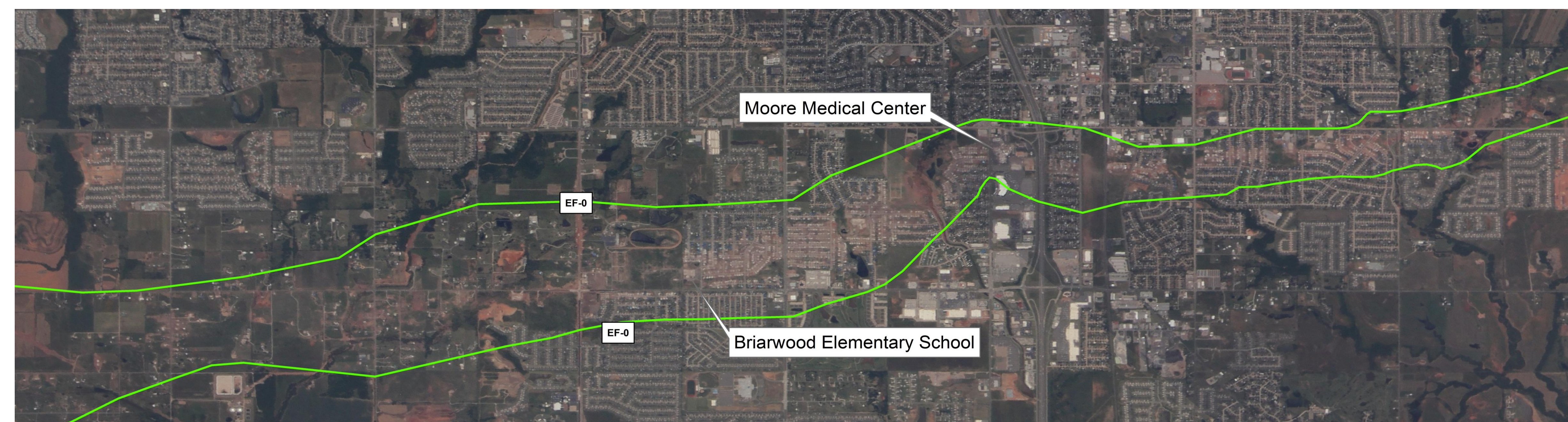


Figure 5. ISERV Imagery acquired on 27 Jun 2013. The EF-0 outline from the Norman, OK (OUN) WFO is overlaid on the map with two points of reference. Resolution is ~5 meters.

## Washington, Illinois EF-4

- Commercial satellite data was available November 18, 2013, just one day after the event



Figure 6. Worldview 1 image from November 18, 2013. Resolution is 0.50 x 0.50 meters.



Figure 7. Same as image as in Figure 6, but with SPoRT's damage analysis overlaid.

## Other Applications

- Both high resolution and ISERV imagery can utilized by decision makers to monitor the progress of the disaster and the recovery .
- SPoRT has developed a Web Mapping Service (WMS) to serve up this these data sets to the Damage Assessment Toolkit (DAT) to provide additional data to the survey teams.