Mitigating Post-Fire Runoff from the Schultz Fire

ASCE/ASHE
2015 Annual State Conference

Restore. Revive. Renew.
Through Partnership

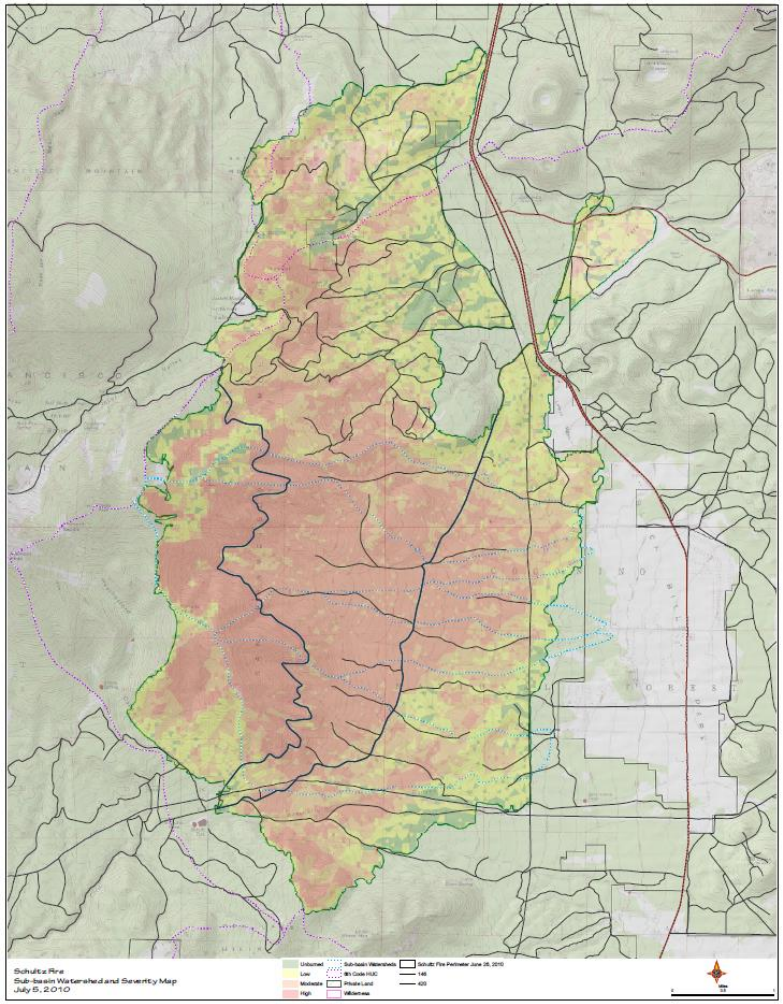
SCHULTZ COMMUNITY RECOVERY

COCONINO COUNTY ARIZONA

Revisiting the Schultz Fire

Burned ~15,000 acres (23.4 sm) in June/July 2010

Revisiting the Schultz Fire



Burn Severity Map

- Most of the fire was a high severity burn
- Upper watersheds dominated by steep slopes (>45% slopes)
- Burn area drains directly into residential areas with little drainage infrastructure

Revisiting the Schultz Flooding

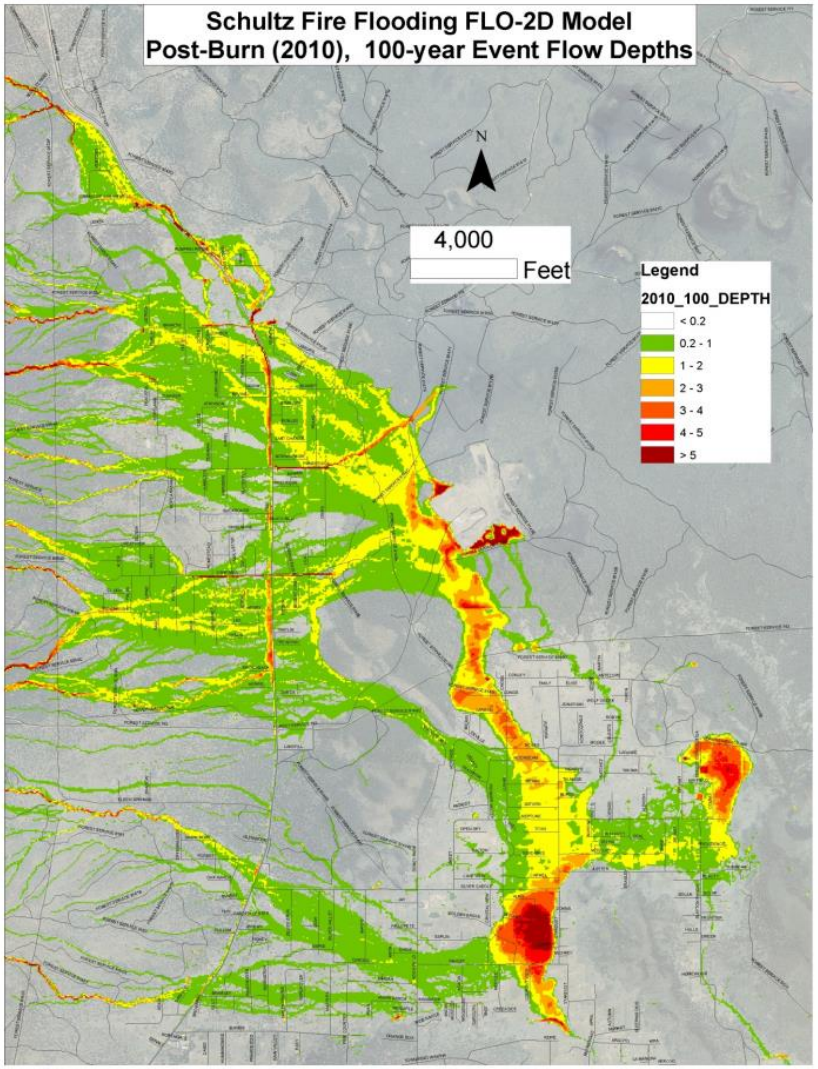
The fire was immediately followed by one of the wettest monsoon seasons on record.

COCONINO COUNTY ARIZONA

Revisiting the Schultz Flooding

Revisiting the Schultz Flooding

Several watersheds draining into the residential areas caused repeated flooding



Mitigation - Funding

Funding obtained from the NRCS ~ $9 Million

Funding obtained from the USFS ~ $1.1 Million

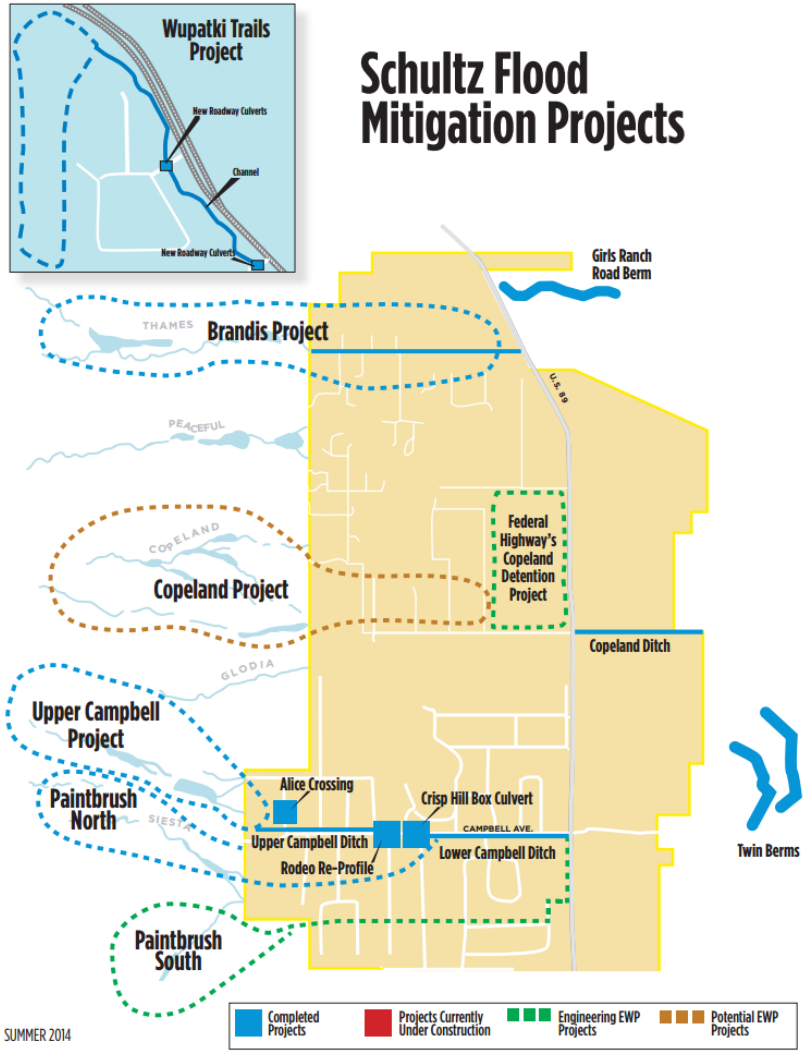
Funding Obtained from FEMA ~ $2 Million

Funding Obtained from FHWA ~ $6 Million

Flood Control District funding ~ $12 Million

Total funding ~ $30 Million

Mitigation – Flood Corridors



Improvement Project in Flood Corridors

- Wupatki Trails completed in July 2013
- Brandis completed in July 2013
- Upper Campbell completed in July 2014
- North Paintbrush completed in July 2014
- South Paintbrush completion in July 2015
- Copeland Detention completion July 2015
- Lower Campbell completion July 2015

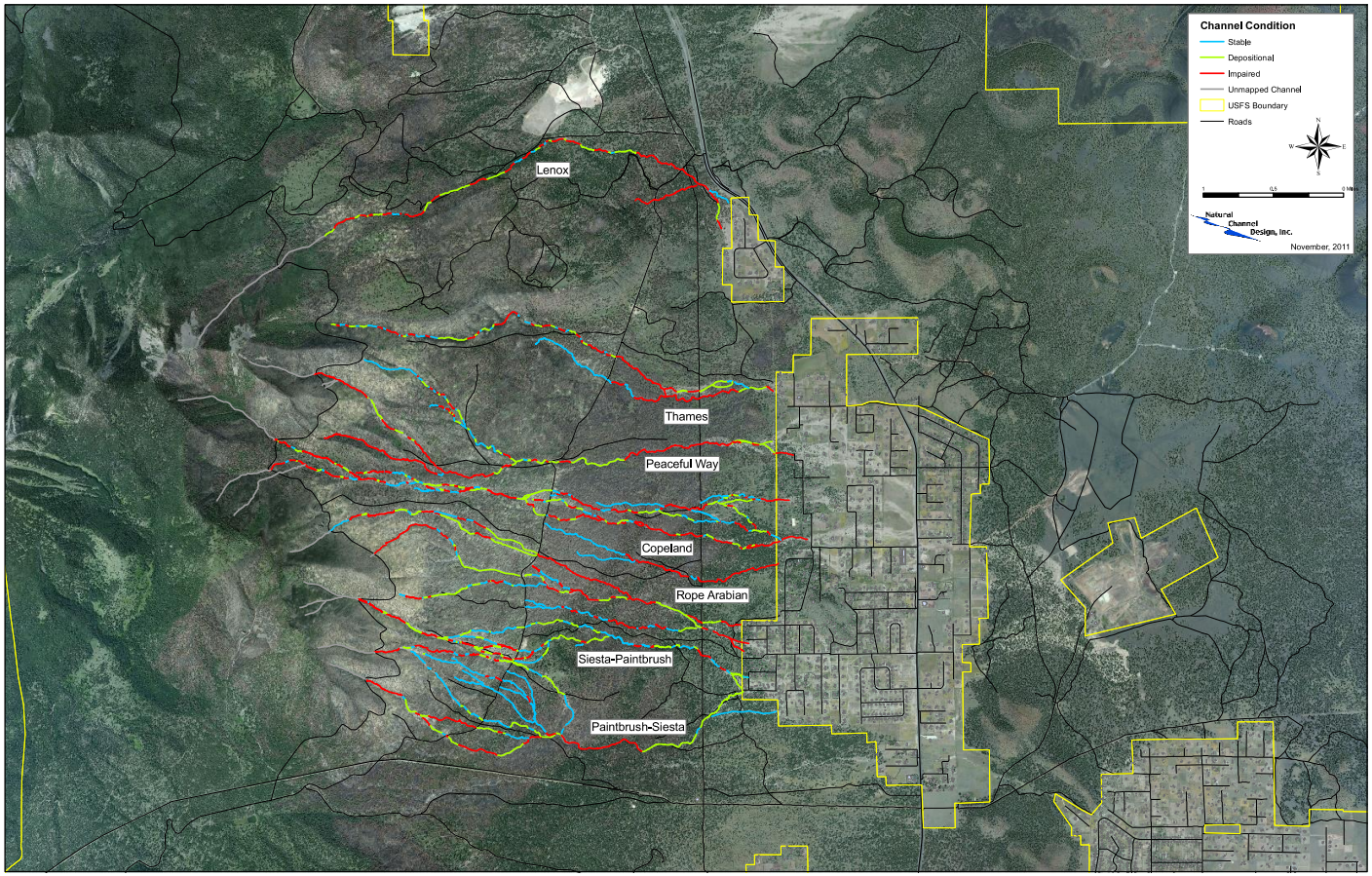
Mitigation – Approach

Integrated Design

- Watershed Restoration On-Forest (Coconino National Forest) and Off-Forest Conveyance Through the Neighborhood to Highway 89
- On-Forest Measures Contingent on Neighborhood Measures and Vice-Versa
- No Adverse Impacts

Mitigation – On-Forest

ASSESSMENT OF SEDIMENT SOURCES & TRANSPORT

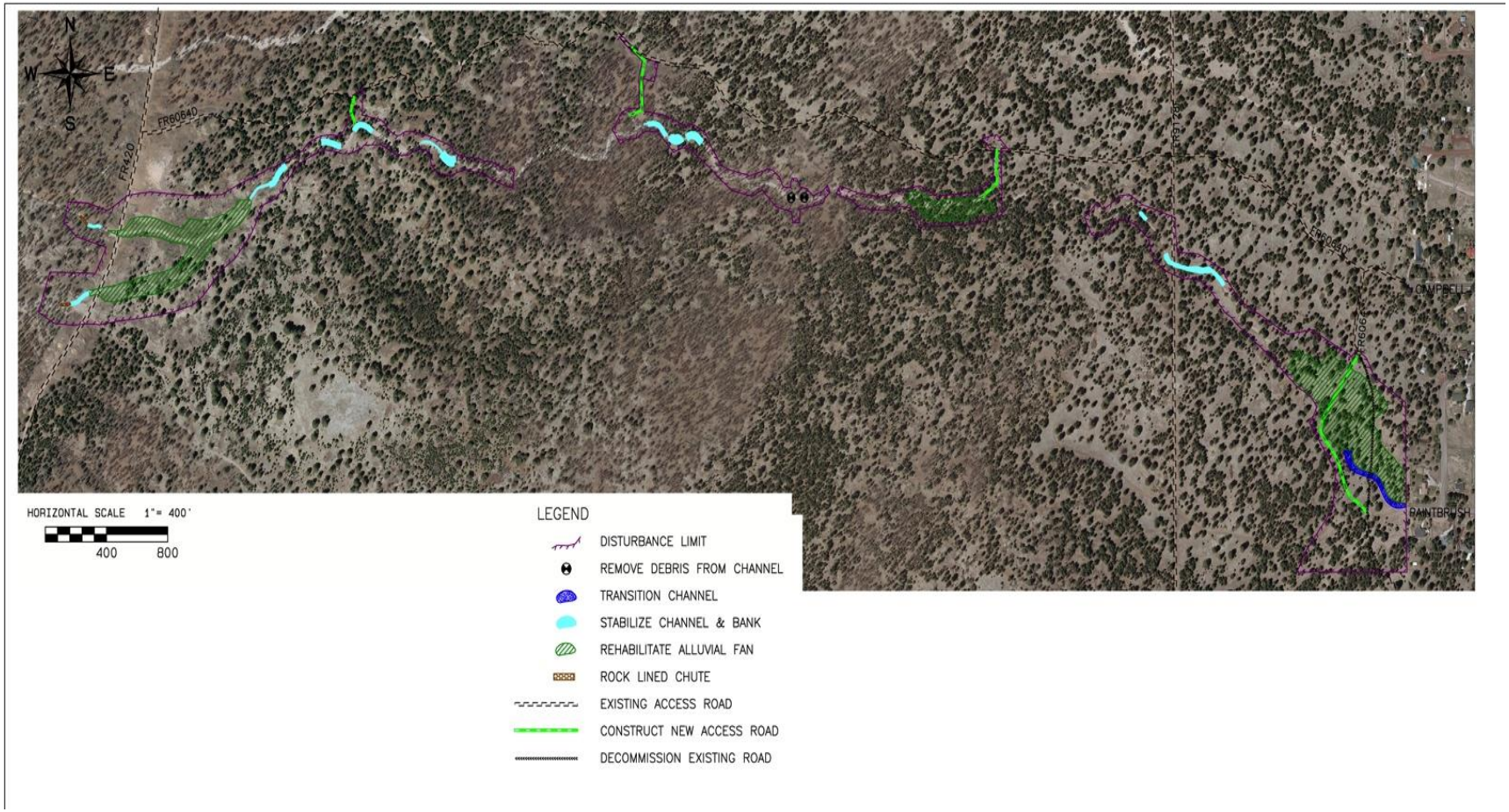


~85-90% of total sediment source is from channel banks

Alluvial fan formations provided opportunity to promote deposition

Mitigation – On-Forest

TYPICAL ON-FOREST RESTORATION



Mitigation – On-Forest

KEY ELEMENTS

- NEPA Clearance obtained for all Corridors early in the process
- Use native materials harvested from the forest (trees, mulch and rock)

Mitigation – On-Forest

KEY ELEMENTS

- Alluvial Fan Restoration; Retain as many trees as possible but ensure full value of the Fan Restorations

Restored Alluvial Fan in the Lennox Watershed – Wupatki Trails Project

Mitigation – On-Forest

Log Sills across the fans prevent head-cutting and keep the flows spread out

Mitigation – On-Forest

Restored Alluvial Fan in the Thames Watershed – Brandis Project

Mitigation – On-Forest

KEY ELEMENTS

- In-Channel Improvements; Restore damaged channels to a “natural”, stable condition

Mitigation – On-Forest

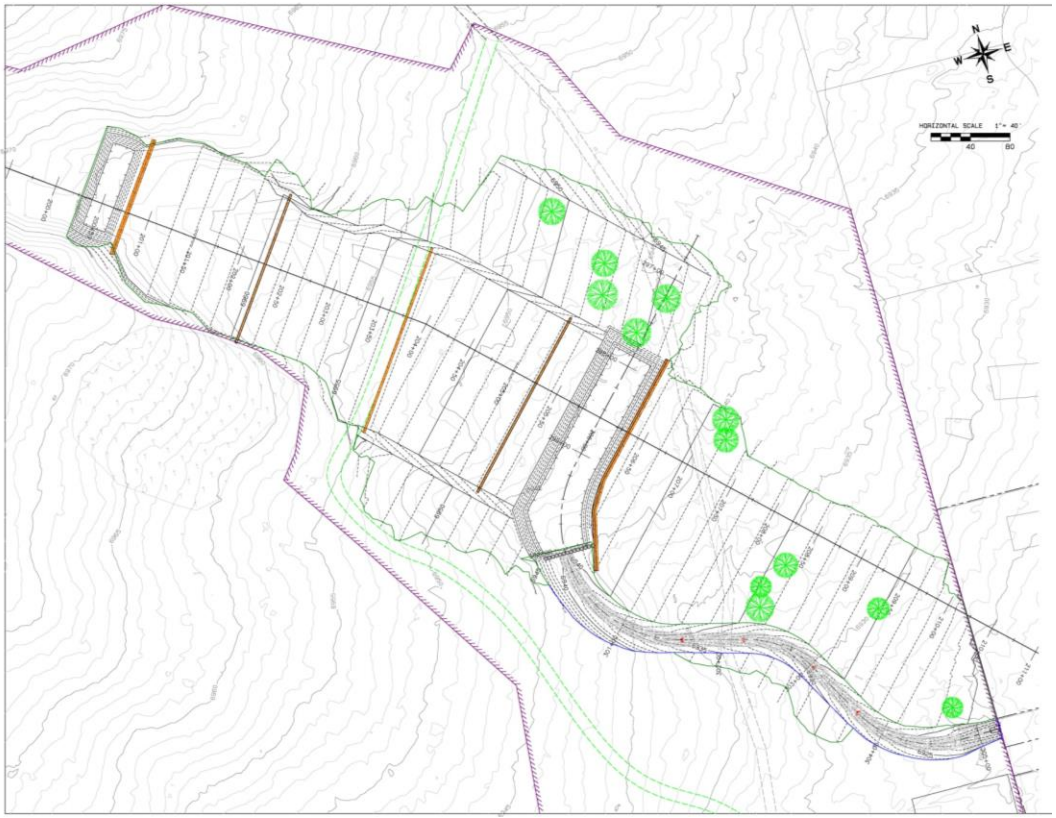
KEY ELEMENTS

- All disturbed areas are ripped, seeded and mulched

Mitigation – On-Forest

KEY ELEMENTS

- Design storm runoff collects in the Terminal Trench at the end of the last fan and flows out through the Transition Channel into the neighborhood improvements



Mitigation – On-Forest

Terminal Trench – Constructed with Forest materials

Mitigation – On-Forest

Transition Channel exiting the Terminal Trench

Mitigation – On-Forest

Transition Channel through the forest entering the neighborhood

Mitigation – On-Forest

Transition Channel joining the neighborhood improvements

Mitigation – On-Forest

Lennox-Wupatki Alluvial Fan and Terminal Trench ~ 1 Year after construction

Mitigation – Off-Forest

Greatest Challenges

- Little grade to work with in the north-south orientation
- Most existing streets (ROW and Easements) are in a north-south orientation
- Easements (by donation only) needed for improvements throughout the neighborhoods
- Mortgage Releases from lien holders required for all properties with mortgages
- Major coordination efforts needed to develop acceptable and obtainable alignments through the neighborhoods (gaining trust)
- Major utility relocations and coordination (hundreds)
- Maximize the use of NRCS EWP fund eligible improvements
- Minimize future maintenance needs & costs
- NO ADVERSE IMPACTS

Mitigation – Off-Forest

Typical Neighborhood Improvement Alignment - South Paintbrush

Mitigation – Off-Forest

Typical Neighborhood Improvement – Turf Reinforcement Mat (TRM) Channel

Mitigation – Off-Forest

TRM Channel ~ 1 month after construction

Mitigation – Off-Forest

TRM Channel ~ 1 year after construction

Mitigation – Off-Forest

Typical Neighborhood Improvement - Gabion Channel with a Concrete Bottom

Mitigation – Off-Forest

Typical Neighborhood Improvement - Gabion Channel with a Concrete Bottom

Mitigation – Off-Forest

Typical Neighborhood Improvement – Storm Drain

Mitigation – Off-Forest

Typical Neighborhood Improvement – Driveway Box Culverts and TRM Channel

Mitigation – Off-Forest

Typical Neighborhood Improvement – Detention

No Adverse Impact Criteria (NAI)

"An Approach by which the Action of Any Community or Property Owner, Public or Private, will Not Adversely Affect the Property Rights of Others"

- Floodplain Management Initiative Developed by the Association of State Flood Plain Managers
- Does Not Mean No Development
- Means that Any Adverse Impact that is or would be Caused by a Project – or the Cumulative Impact of Projects – Must be Mitigated

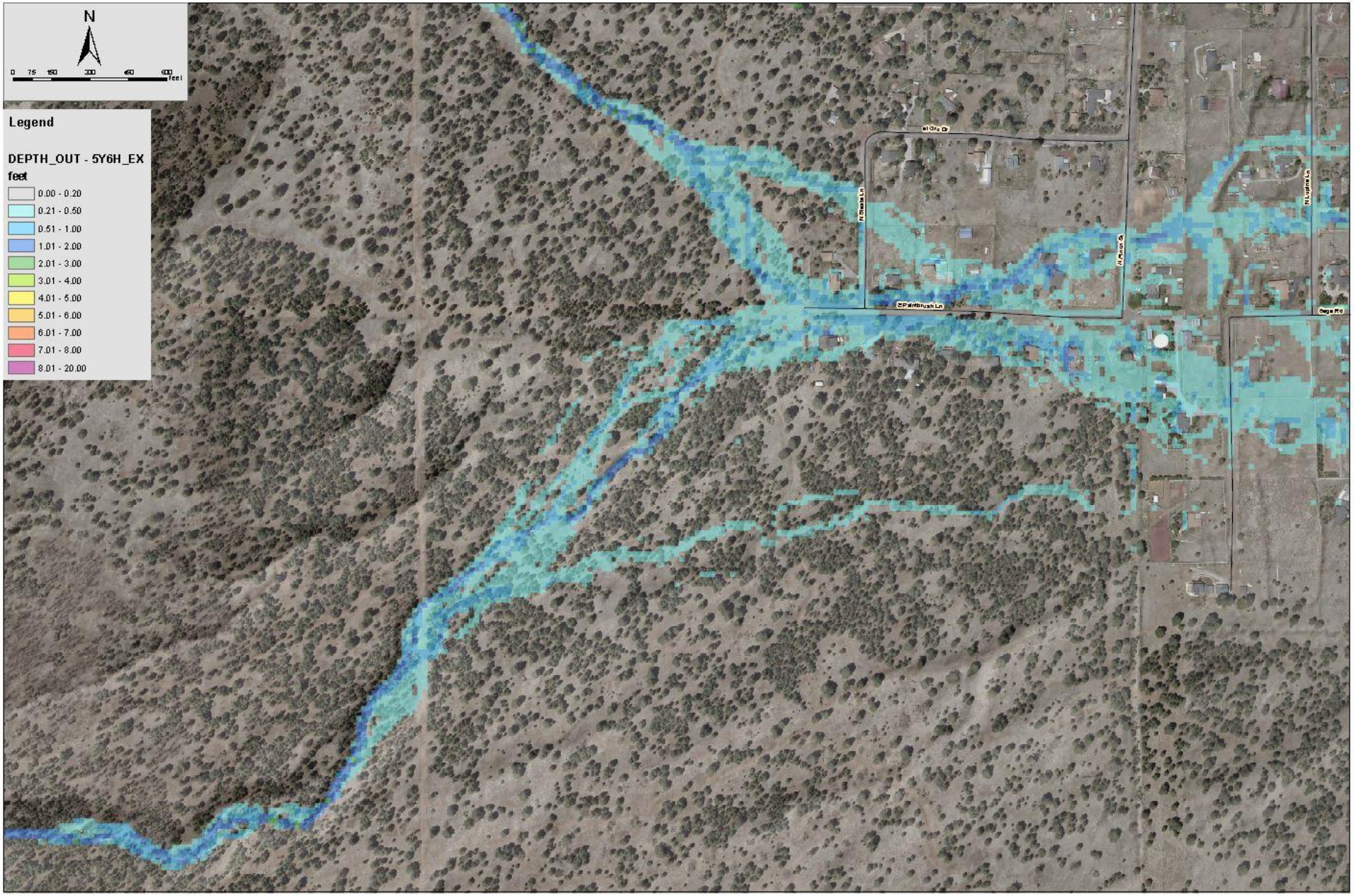
No Adverse Impact Criteria (NAI)

- Board of Supervisors Adopted NAI Criteria for County Projects in the Schultz Flood Area Only, on April 2, 2013
  - Does Not Apply to Private Property Owners or Work in Other Parts of the County, Only County Mitigation Projects in the Schultz Area
  - Criteria Based on FLO-2D Modeling of Differences Between Pre- and Post-Mitigation Water Depths and Velocities

No Adverse Impact Criteria (NAI)

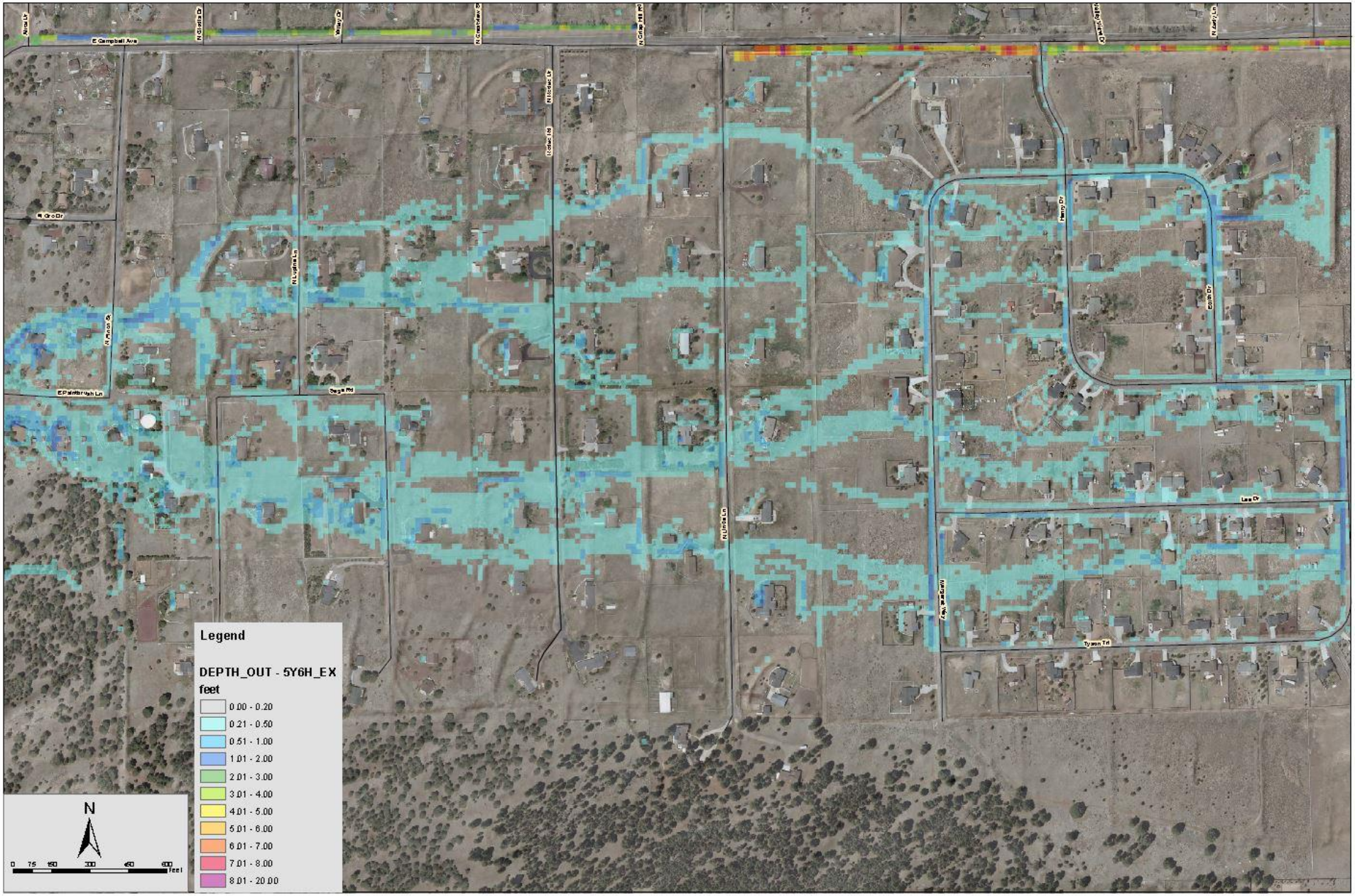
- Water Depth
  - No More than .1 Foot increase at 5 Year Storm
  - No More than .5 Foot Increase at 10 Year Storm
  - No More than 1 Foot Increase at 100 Year Storm

- Water Velocity
  - No Increase Less than 1 Foot/Second or 10% of the Pre-Project Condition

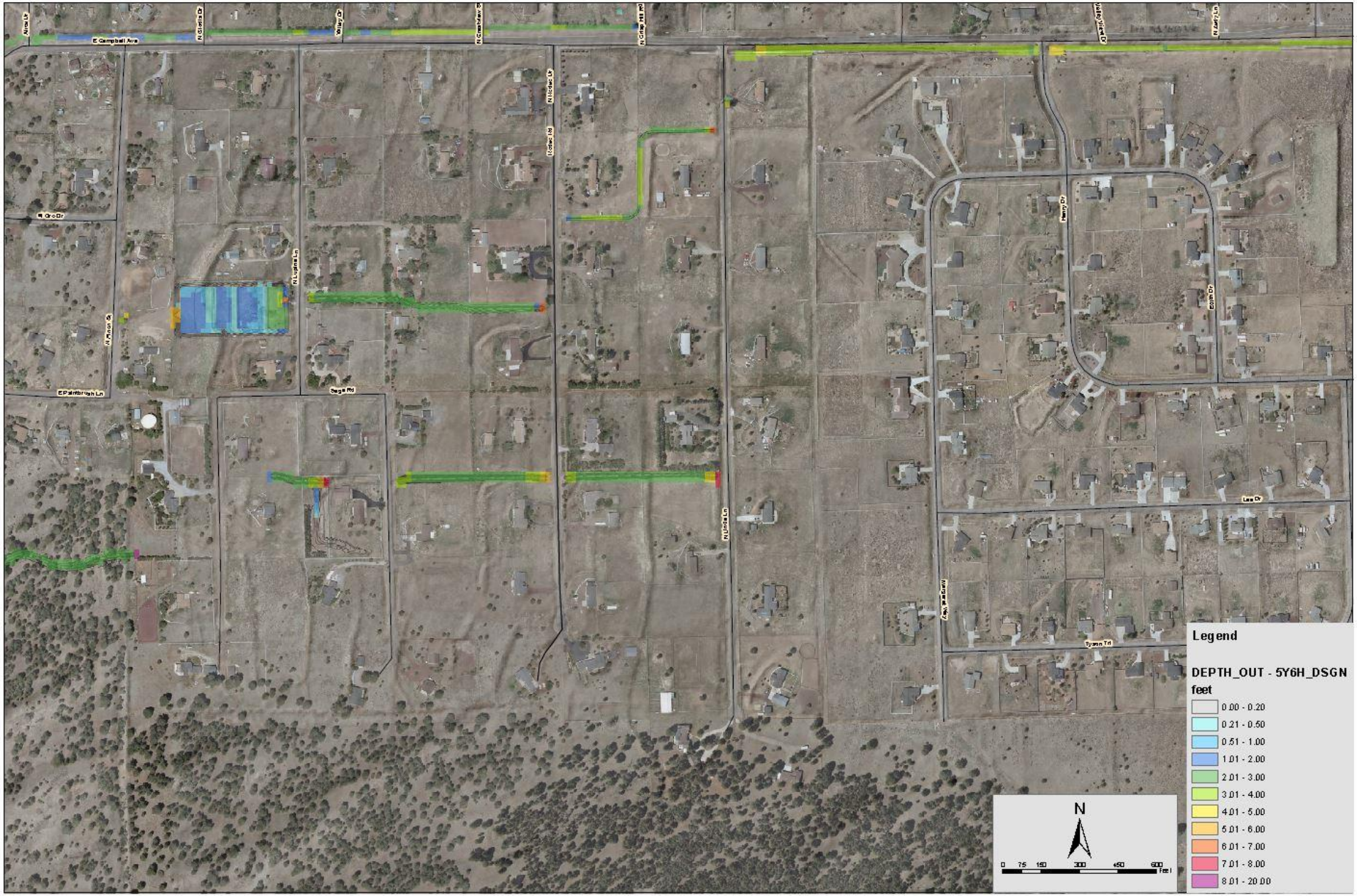


5 yr./6 hr. Storm – Ex. Condition - West

5 yr./6 hr. Storm – Prop. Condition - West

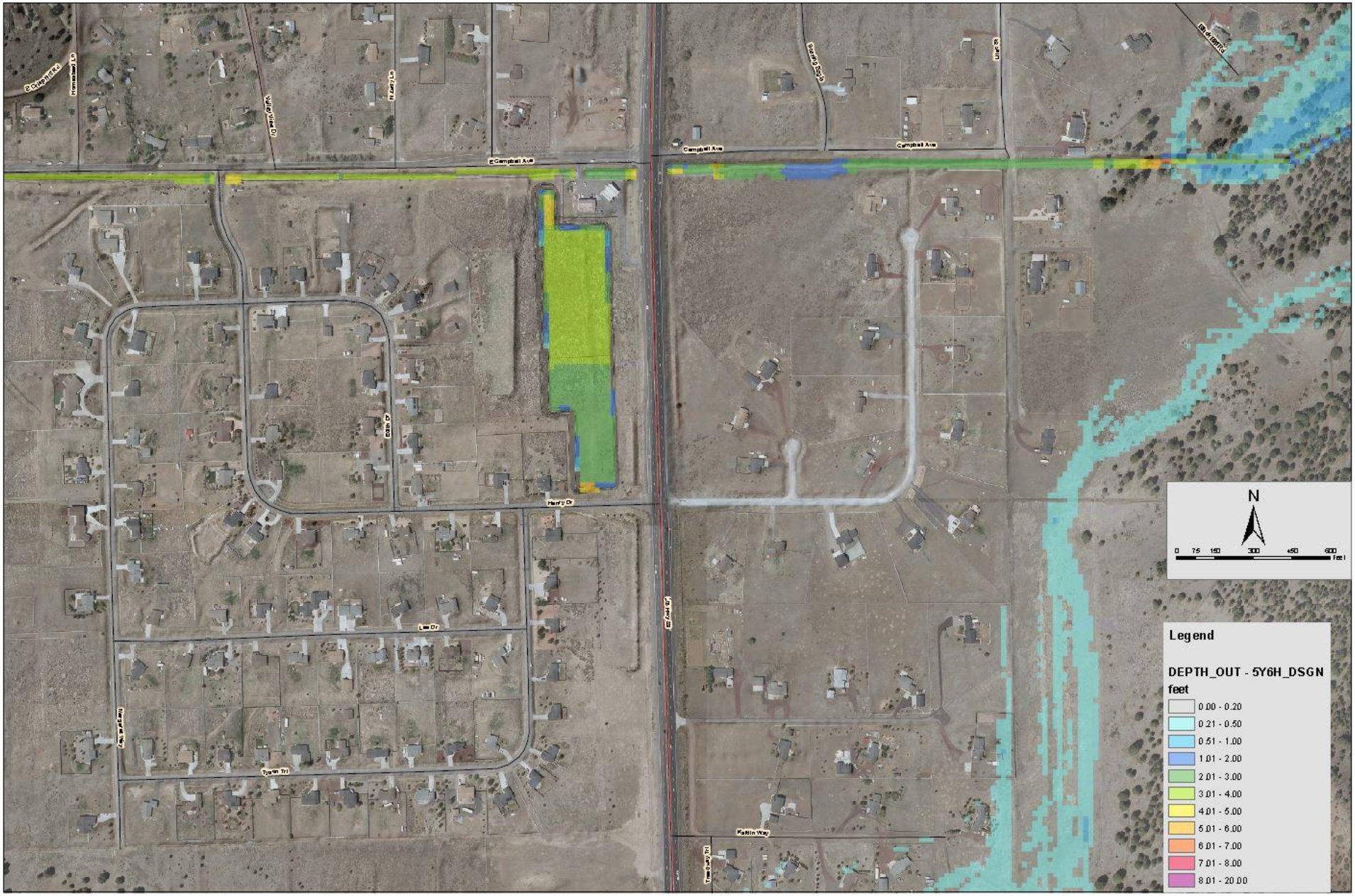


5 yr./6 hr. Storm – Ex. Condition - Mid

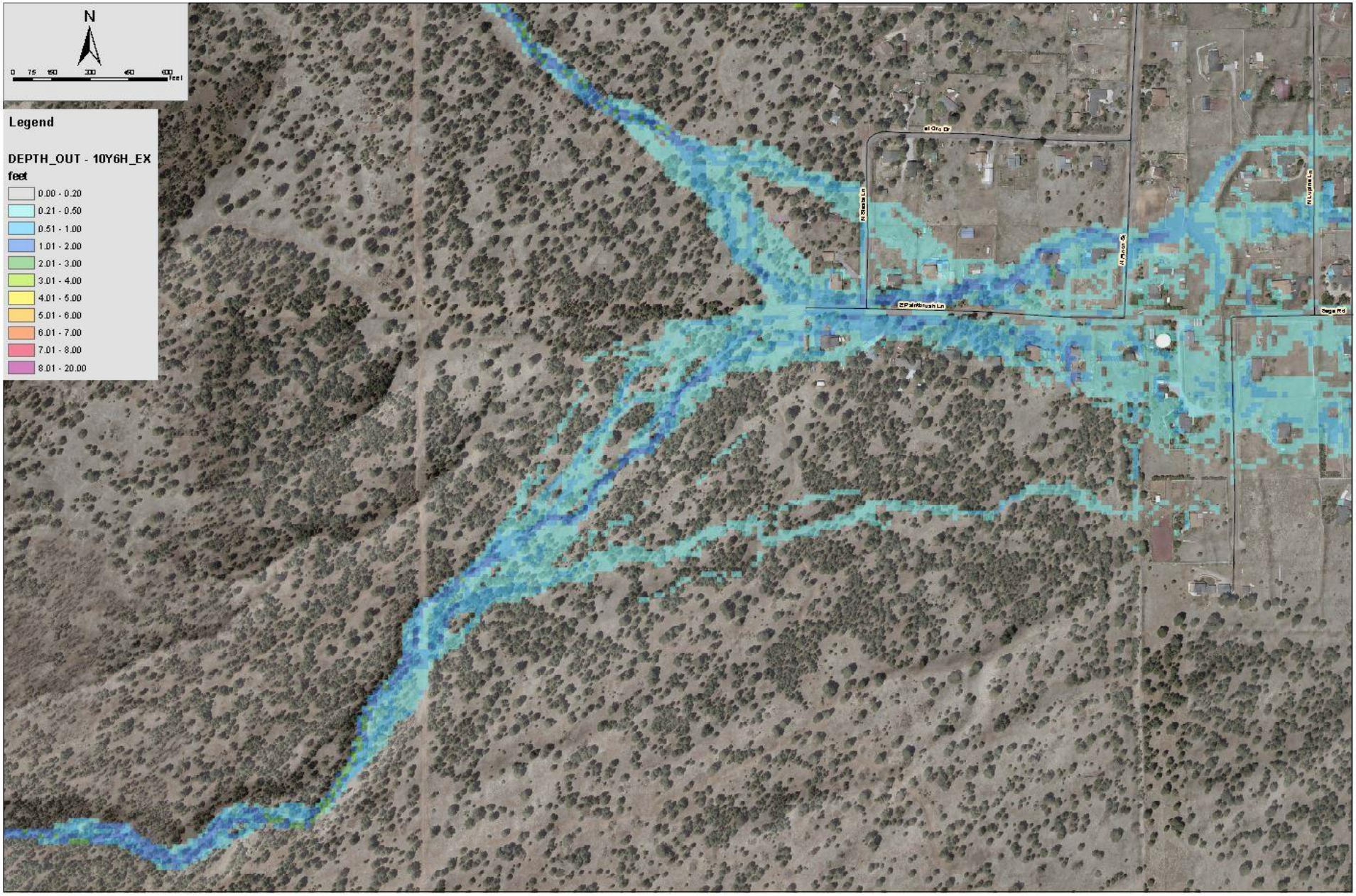


5 yr./6 hr. Storm – Prop. Condition - Mid

5 yr./6 hr. Storm – Ex. Condition - East

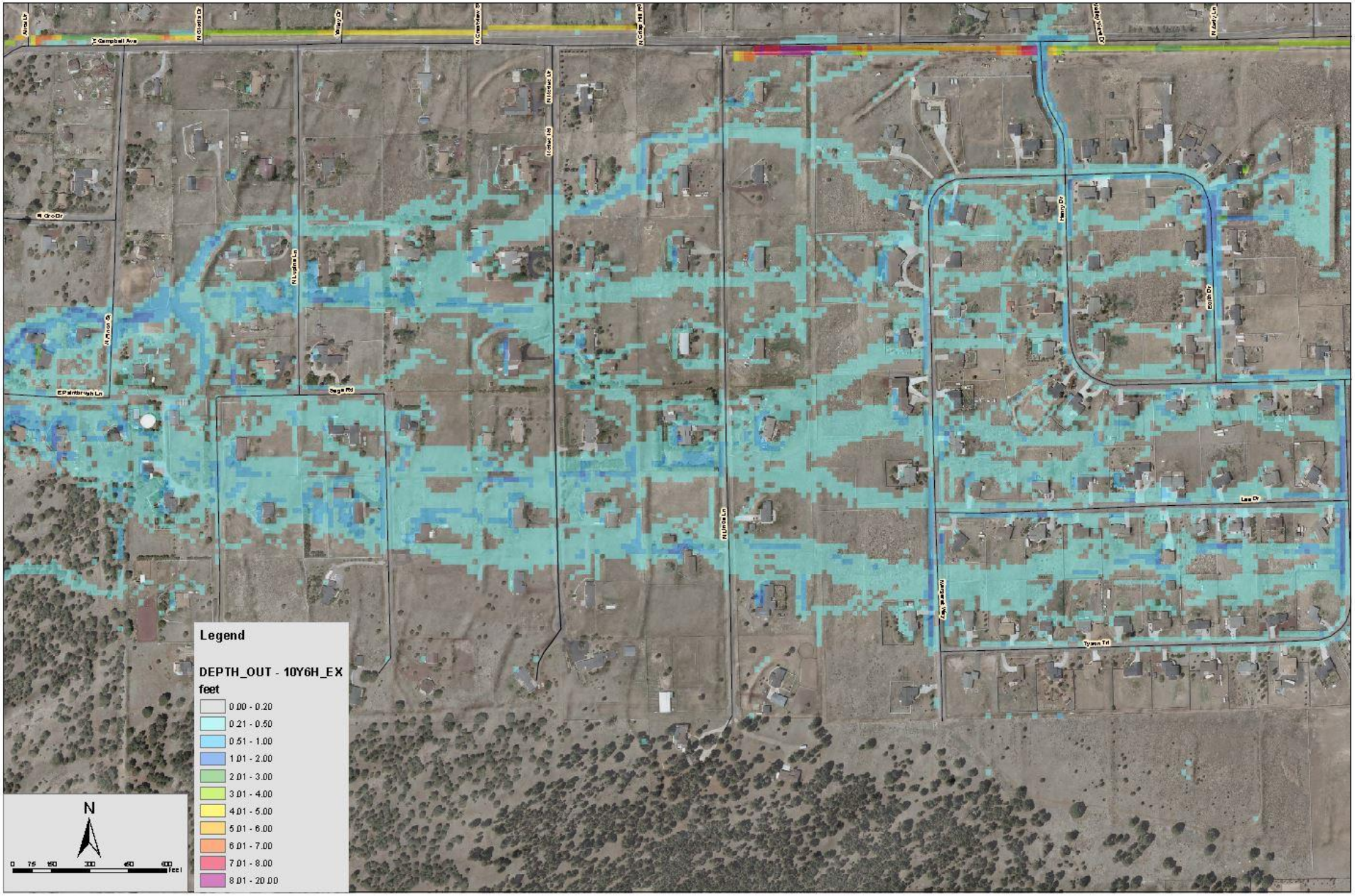


5 yr./6 hr. Storm – Prop. Condition - East

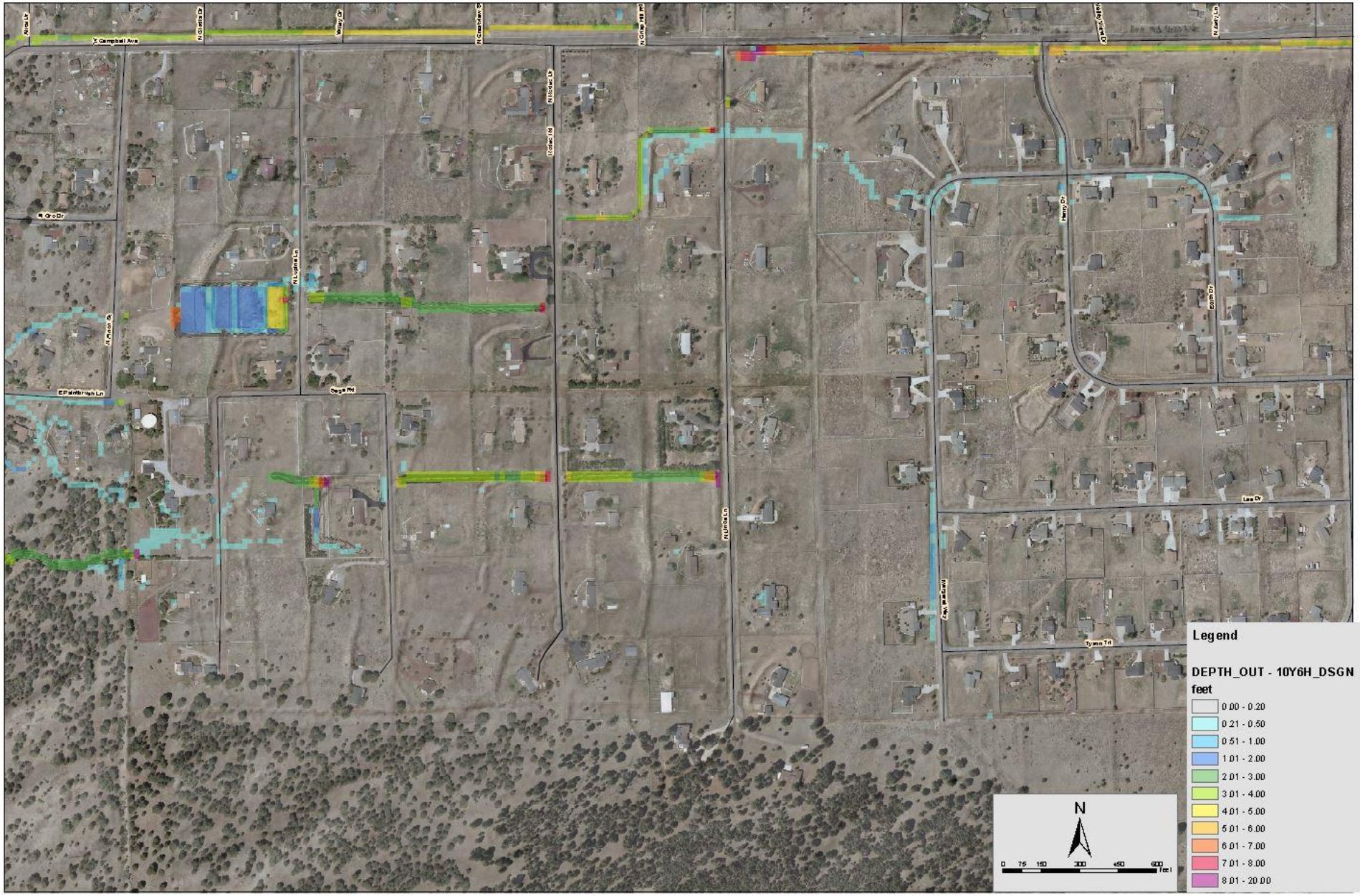


10 yr./6 hr. Storm – Ex. Condition - West

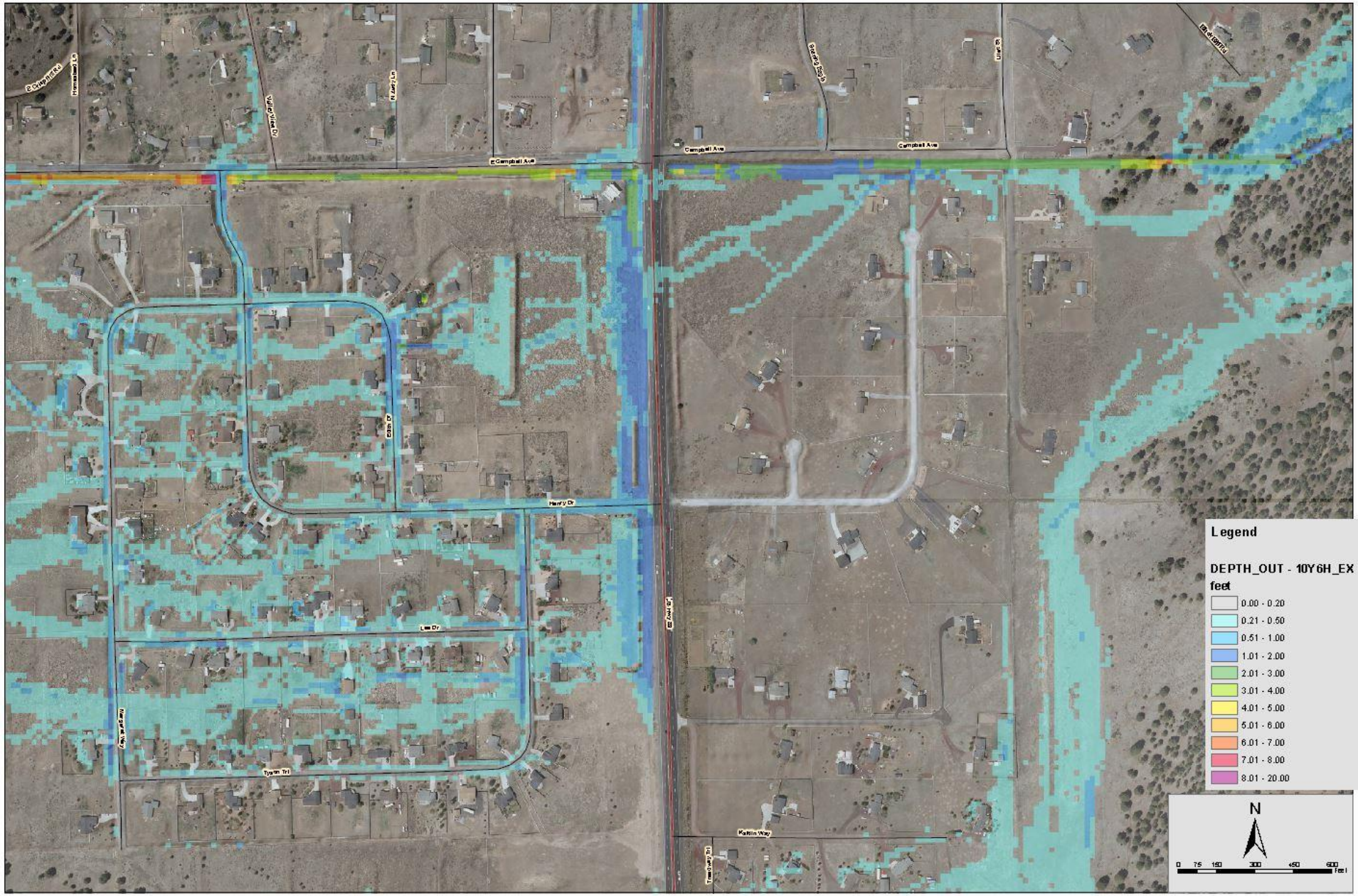
10 yr./6 hr. Storm – Prop. Condition - West



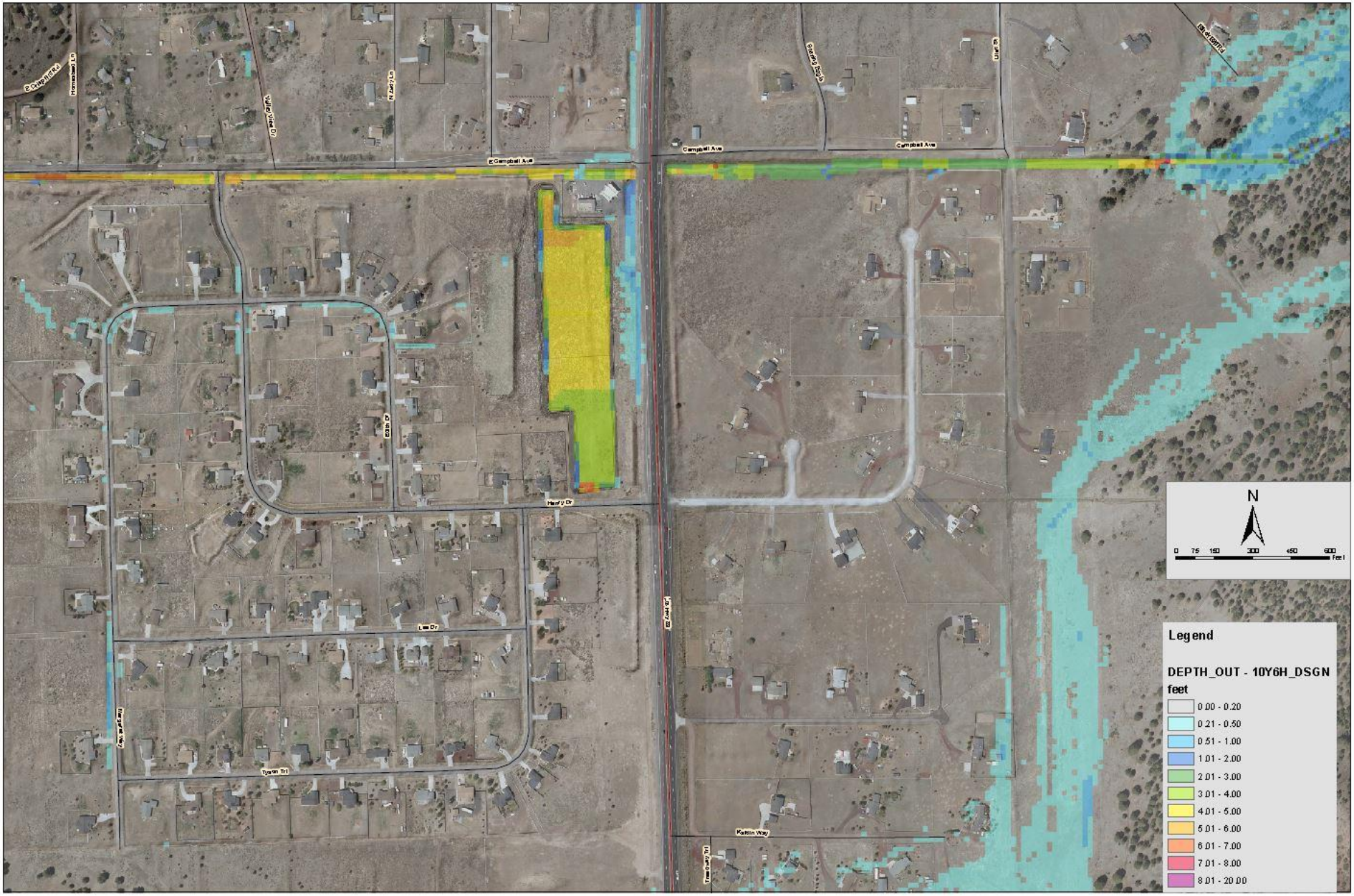
10 yr./6 hr. Storm – Ex. Condition - Mid



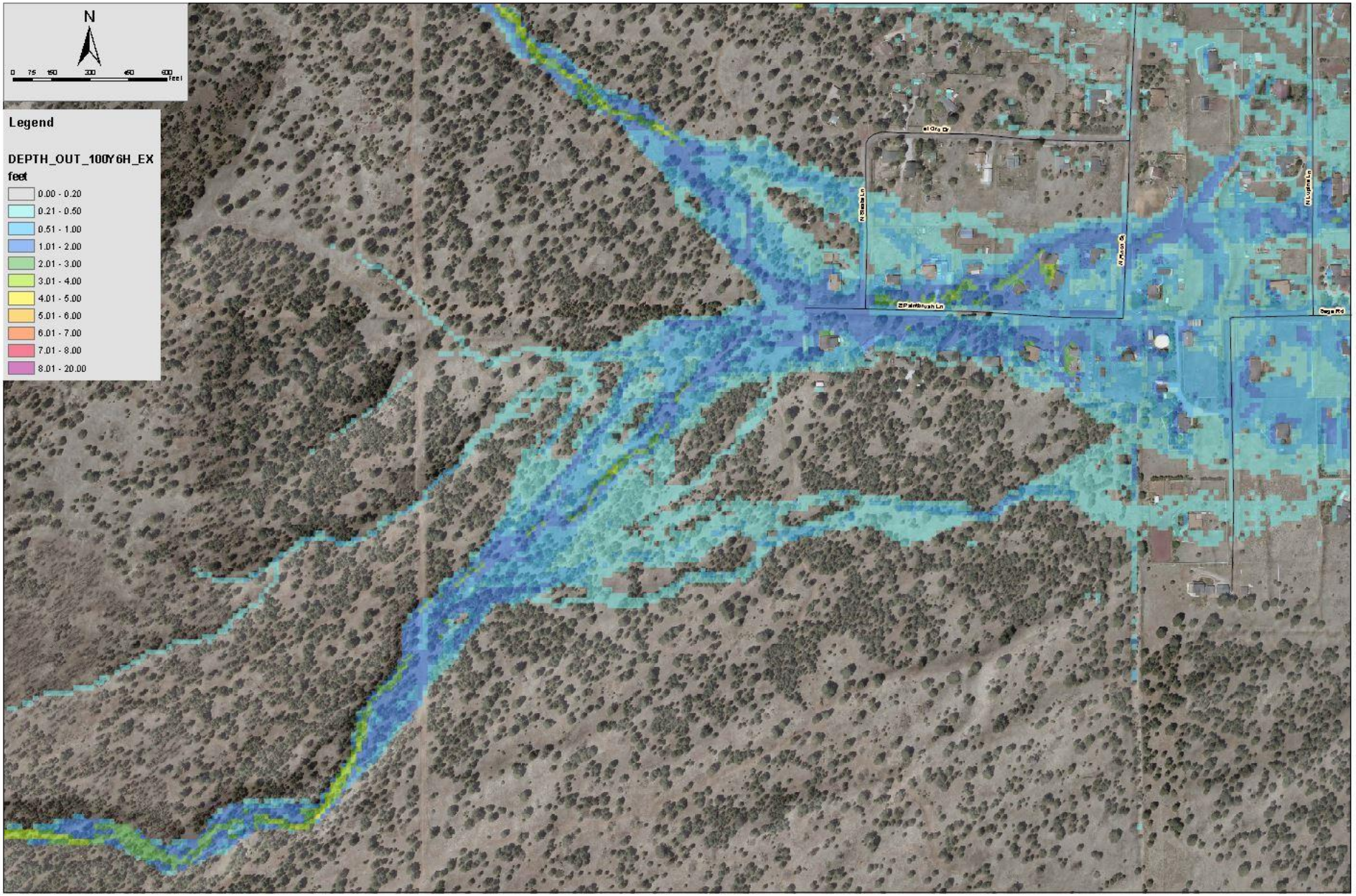
10 yr./6 hr. Storm – Prop. Condition - Mid



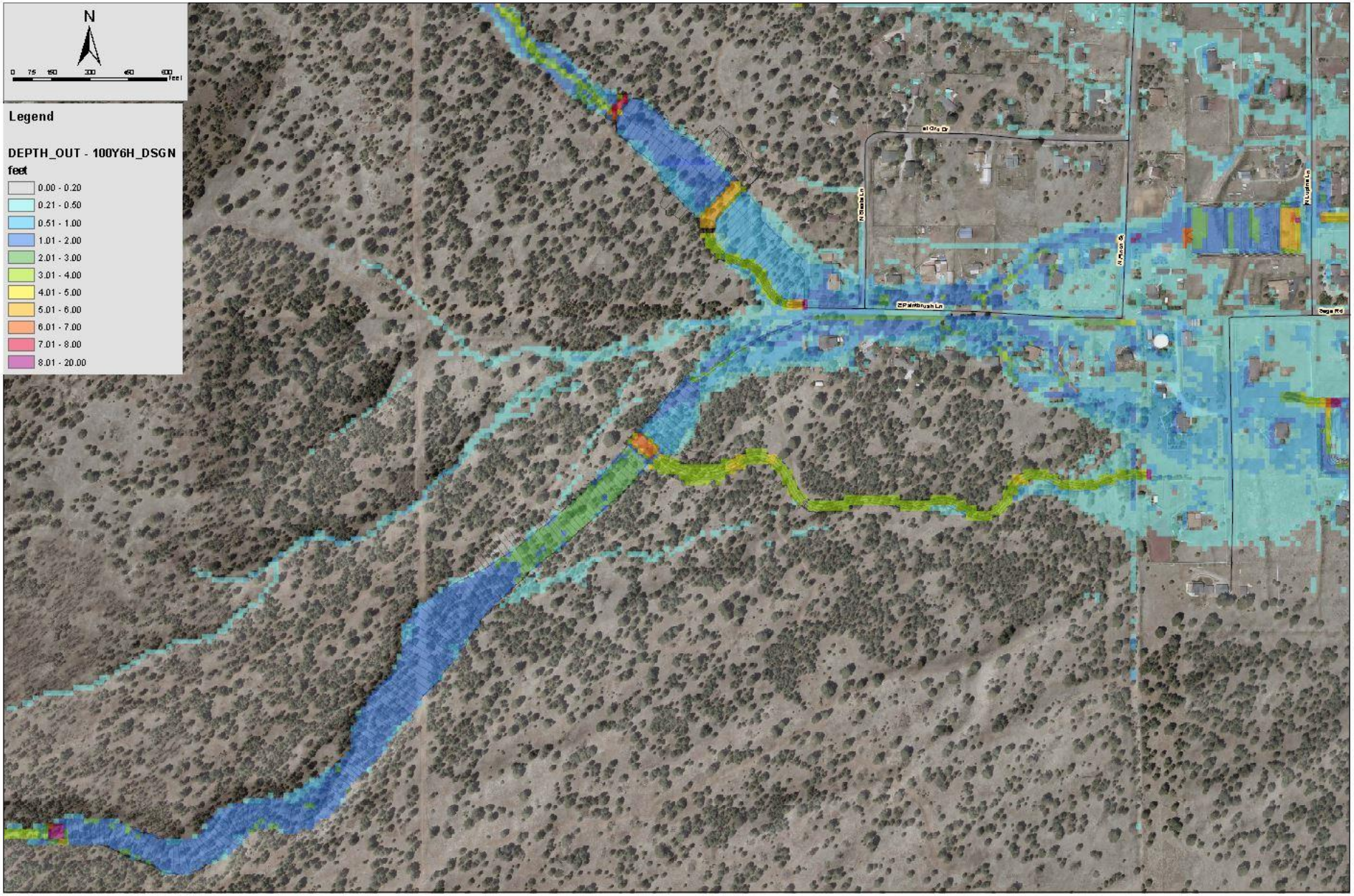
10 yr./6 hr. Storm – Ex. Condition - East



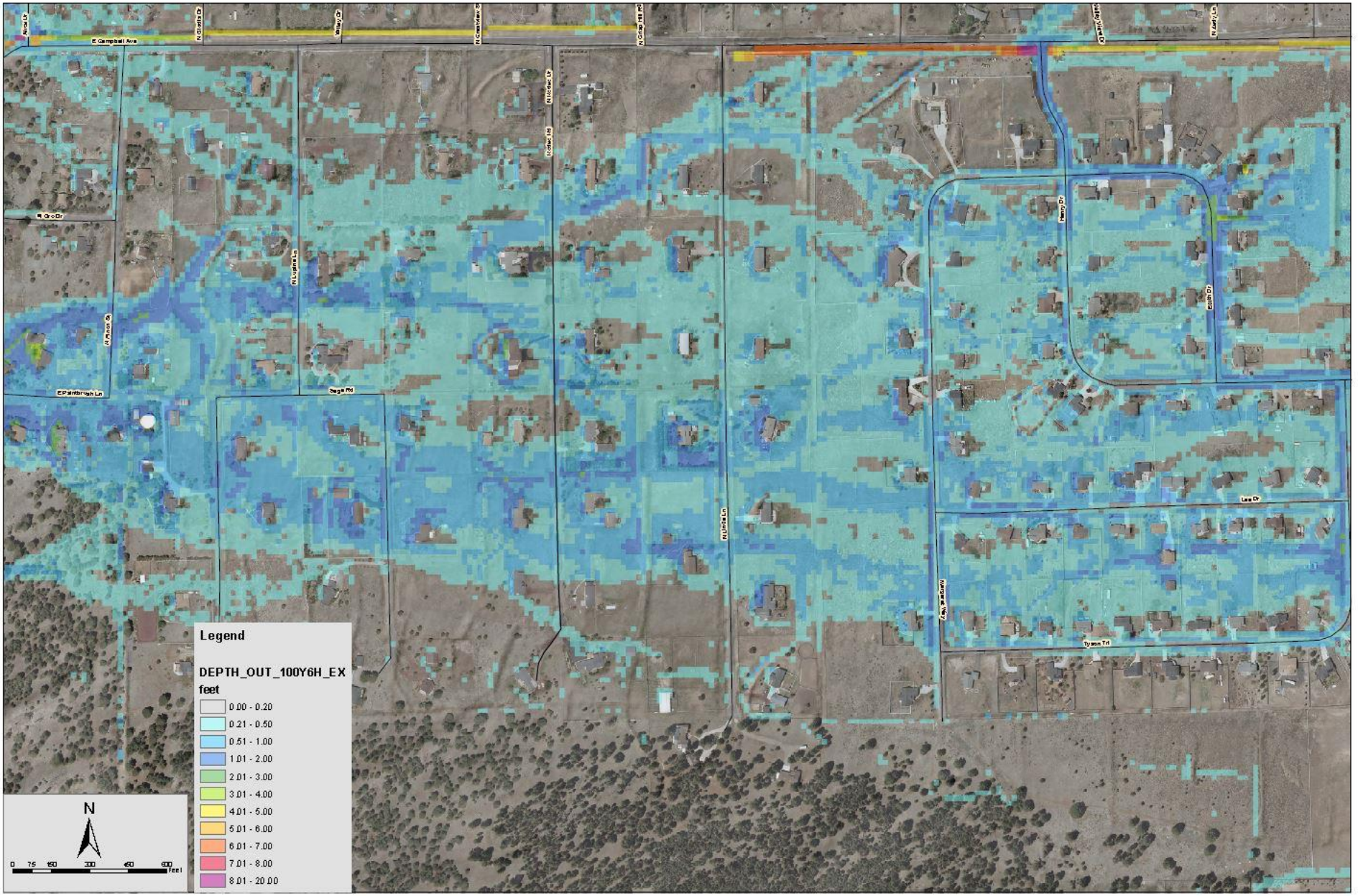
10 yr./6 hr. Storm – Prop. Condition - East



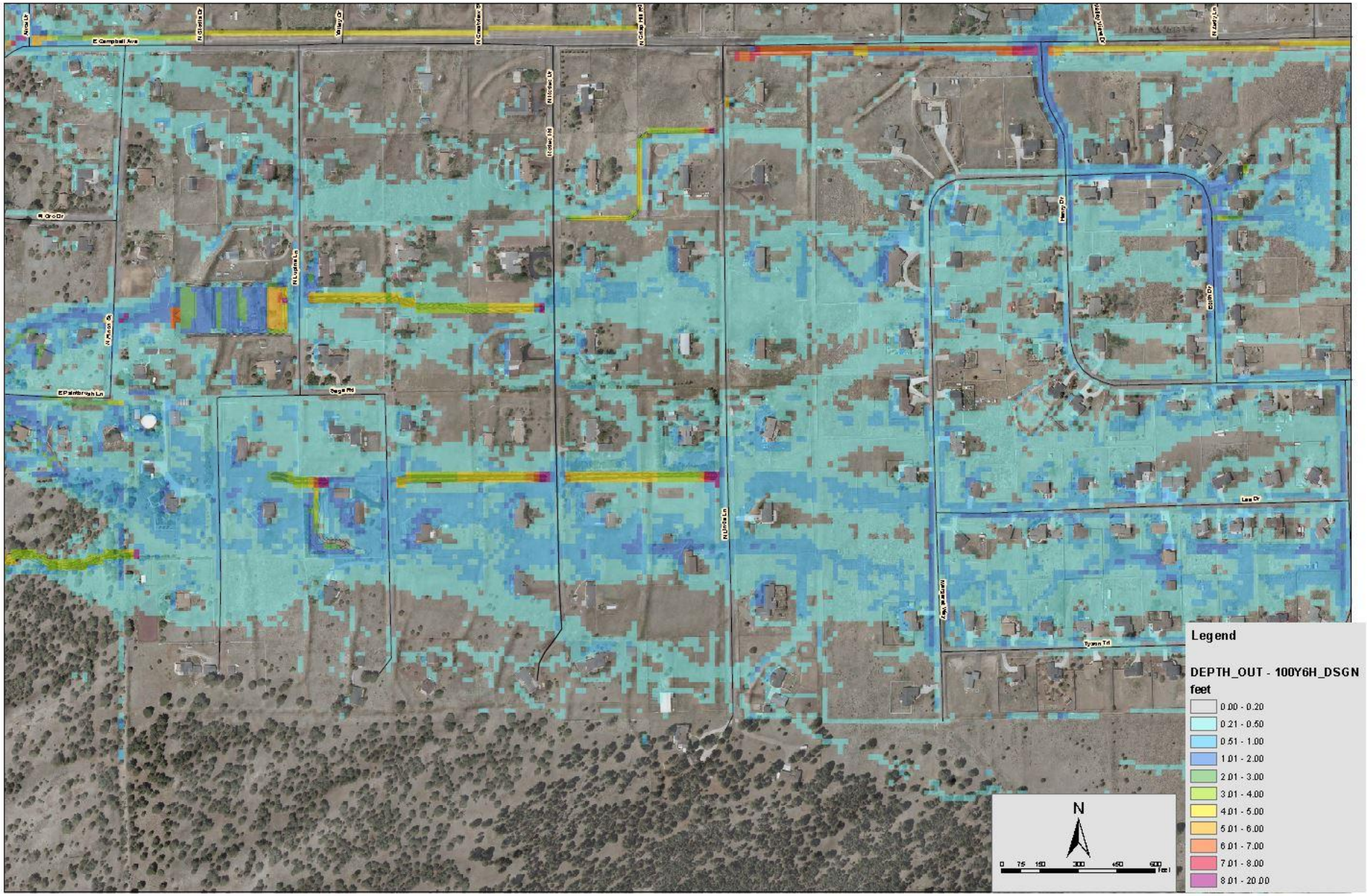
100 yr./6 hr. Storm – Ex. Condition - East



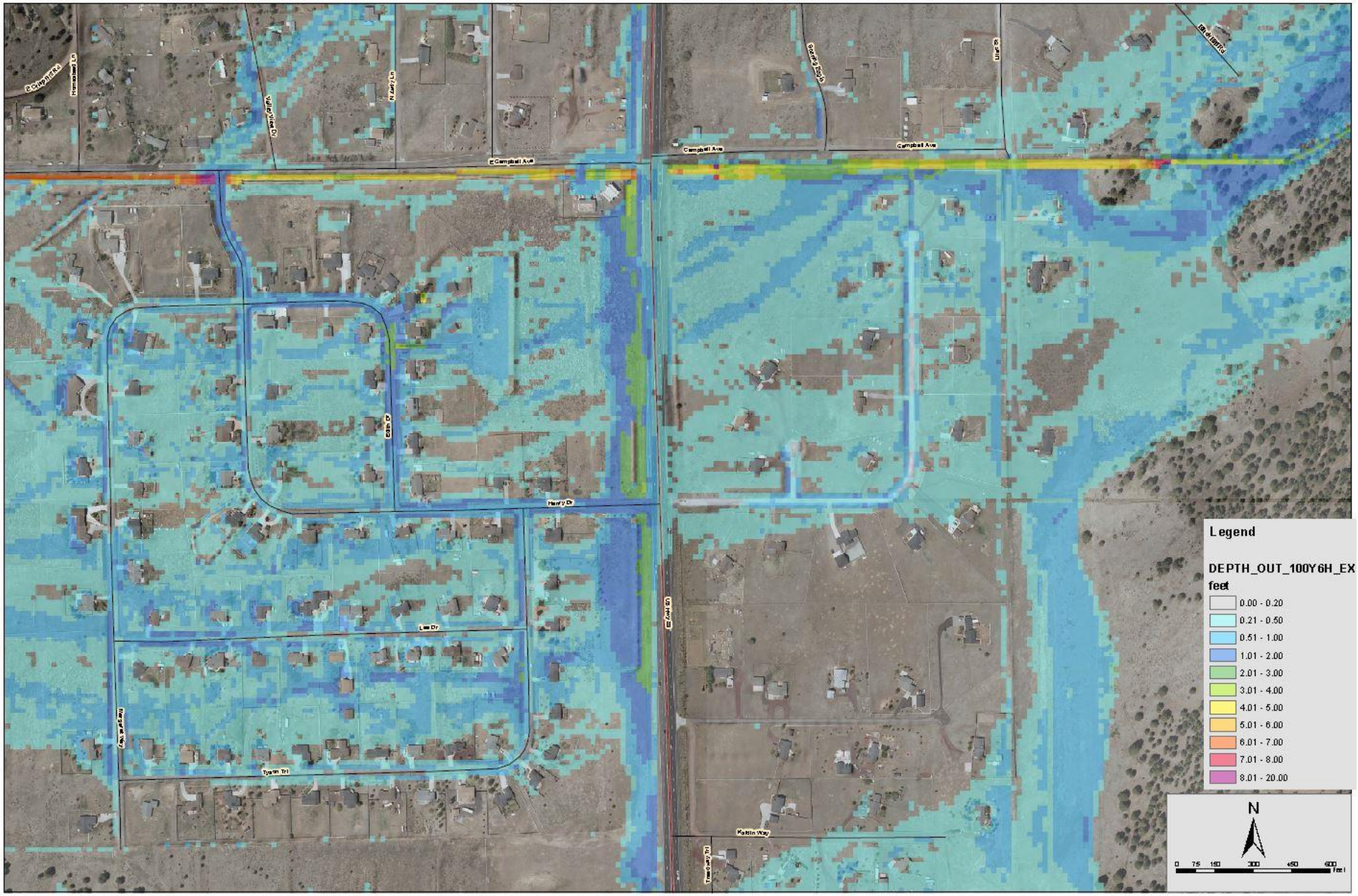
100 yr./6 hr. Storm – Prop. Cond. - East



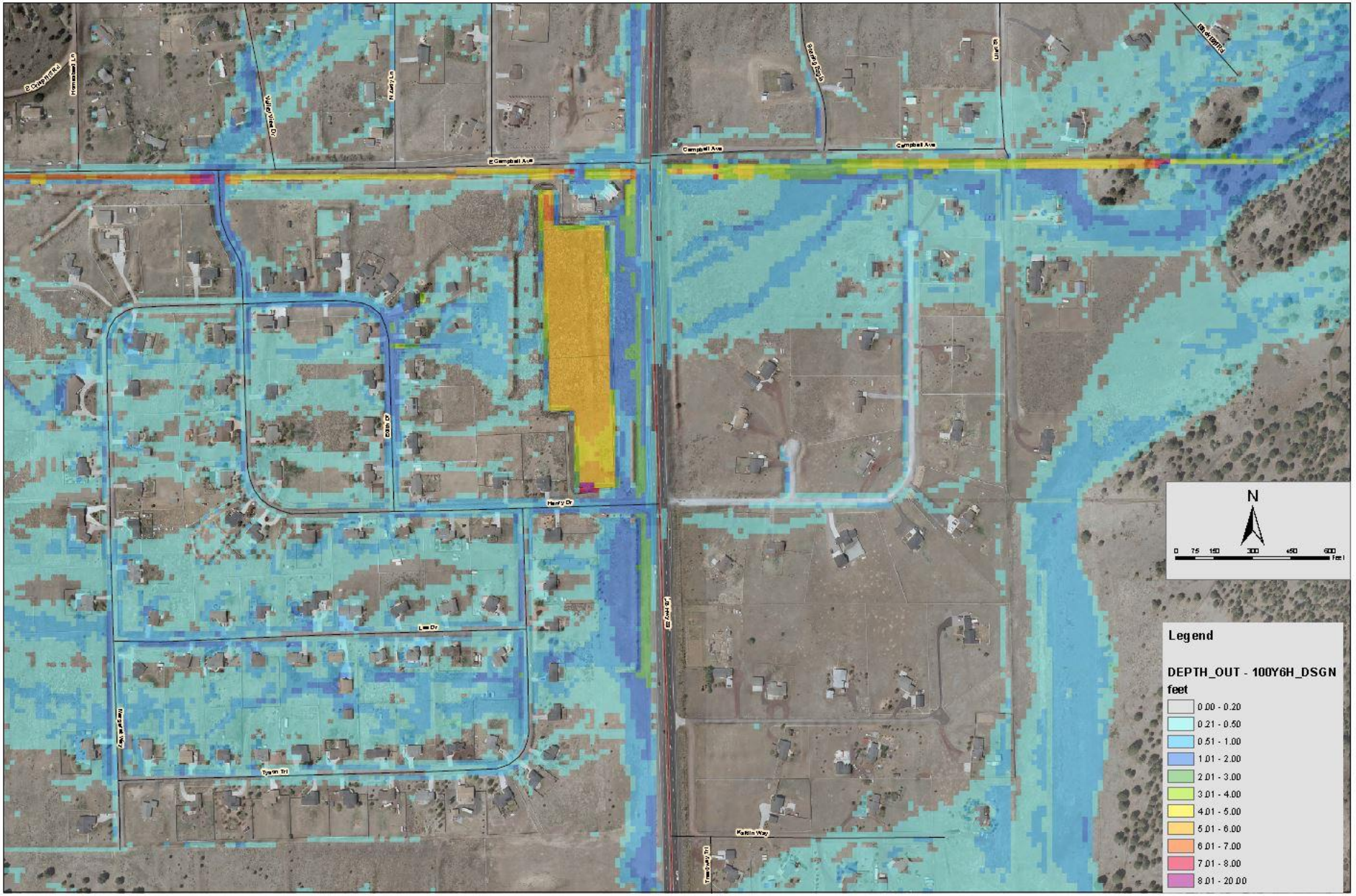
100 yr./6 hr. Storm – Ex. Cond. - Mid



100 yr./6 hr. Storm – Prop. Cond. - Mid



100 yr./6 hr. Storm – Ex. Cond. - East



100 yr./6 hr. Storm – Prop. Cond. - East

Adverse Impact Conclusions

- No Adverse Impacts at the 5, 10 or 100 Year Storms
- Important Reduction in Flood Impacts Resulting from Five Year Design Storm Measures from Forest Boundary and Downstream
- Through time the watersheds will continue to heal and generate less runoff, thus improving the effectiveness of the projects

Resources

- Schultz Flood Hotline: (928) 679-8390
- Schultz Flood Email: schultzfloodmitigation@coconino.az.gov
- Schultz Flood Website: www.coconino.az.gov/schultzfloodinformation

COCONINO COUNTY ARIZONA

Questions

Restore. Revive. Renew.
Through Partnership

SCHULTZ COMMUNITY RECOVERY