ITE 2016 Western District Annual Meeting

The Catwalk Reconstruction Project

July 13, 2016
Contents/Agora

Project Overview/History
Data Collection
Data Processing
Data Usage
Construction Staking
Post-Construction Photos
Questions
Innovative Minds

- CAD Center (Pam, Leslie)
- Images Plus (Jeff)
- Spatial Data (Krist, Juan R., Dennis)
- Survey (Steve, Tim)
- Water Resources (Kareem, Scott)
- T&T (Tandy)
- Structures (James)
Project Background / Overview

- Mining Access: 1893
- Catwalk Trail Built: 1930
- Reconstructed: 2008
- Whitewater-Baldy Complex Fire: May 2012
- Burned Area Emergency Response: June 2012
- Historic Flood Waters/Catwalk Trail Closed: September 2013
- Funding Acquisition: November 2013 – August 2015
- AUI/BHI DB Team Began: August 2015
- Design Completed: Christmas 2015
- Construction Completed: May 27, 2016
Project History
CCC Walls and Stairs
2008 Catwalk Reconstruction
Whitewater Baldy Fire

Legend
- City/Town
- Historic fires
- Uncontrolled Fire Edge
- Completed Line
- Completed Dozer Line
- Line Break Completed

Public Information Map
Whitewater-Baldy Complex
NM-GNF-000143
270,778 acres - June 8, 2012
Whitewater Baldy Fire
Whitewater Baldy Fire
Post-Flood Photos
Post-Flood Photos
Post-Flood Photos
Project Objectives

▲ Emergency Relief for Federally Owned Roads (ERFO) Funding
  ▲ Assists federal agencies with the repair or reconstruction of tribal transportation facilities, federal lands transportation facilities, and other federally owned roads that are open to public travel, which are found to have suffered serious damage by a natural disaster over a wide area or by a catastrophic failure.

▲ Replace in kind

▲ Forest Service guidelines utilized to determine accessibility
  ▲ Catwalk - Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG) (2013)
  ▲ At-Grade Trail - Forest Service Trail Accessibility Guidelines (FSTAG) (2013)

▲ RFP Required Catwalk to Clear 25-year Water Surface plus 1’ Freeboard
Project Map

Catwalk Trail Reconstruction Project
Whitewater Creek
Glenwood, NM
Nooks and Crannies

Data Acquisition
Data Processing

▲ Viewing

▲ ERDAS IMAGINE 2015-Hexagon geospatial software
  ▲ Used for several informal reviews of the data
  ▲ Has ability to step through point cloud along an alignment
Data Processing

▲ Viewing
▲ FME – 3D view of classified point cloud data
Data Processing

- Void Solid of Entire Canyon
  - 240,484 vertices and 480,988 faces

- Canyon solid cut into 6 cut sections
- Solids made water tight
- Time to use the data…
Hydraulics

▲ 360° LiDAR photogrammetric scans
▲ 43 cross sections

▲ ERDAS IMAGINE
▲ Reducing point cloud data
Hydraulics

Point Cloud data view in Excel

HEC-RAS modeling of overhanging canyon walls
- Improved owner review confidence
Catwalk Alignments

- What – No Surface?!?!
- What can we do with a LiDAR Point Cloud?
Catwalk Alignments

▲ 3D Solids
  ▲ Created 3D Solid from mesh
  ▲ Recognizable object in C3D
Catwalk Alignments

- Time to get to work
  - 3D Solids
  - Water Surface Elevation + 1’
  - Used intensity view of raster image as “planimetrics” since we didn’t have a traditional topo
Issues with the “traditional” workflow...
C3D Corridor Section Editor
Catwalk Framing

▲ How to locate the wall at the elevation of the trail surface?
▲ Used visual programming in tandem with building information modeling to process the data
▲ Depending on the data, each processing request required 4 to 30 hours

Dynamo Algorithm
Catwalk Framing

Import the 3D solid

Remove unnecessary data
Catwalk Framing

Import the 3D surface

Intersect the geometries
Catwalk Framing

Export to CAD

Layout Framing
Catwalk Framing

Determine required outrigger beam lengths

Manually measured each location in C3D section editor
Construction Staking Photos

- In air
- Access constrained
- Critical
- Remote Design Build availability
Construction Staking Photos
Closing Thoughts

▲ Lessons Learned
  ▲ You don’t know what you don’t know
  ▲ What defines a surface?
▲ LiDAR is a complex beast
  ▲ Care in understanding
    ▲ What You Want
    ▲ How You Want It
    ▲ How You Get It
    ▲ And How You Use and Manipulate It
▲ Tool exploration
  ▲ Expertise to use it
  ▲ Combination of tools and processes
  ▲ Combination of collaborative teamwork by the groups usually segregated by normal collection/design process.
Software Toolbox
▲ 11 different tools

AUTODESK® AUTOCADE® CIVIL 3D®

REVIT

Dynamo

Ps

Photoshop CC

LightWave

FME Desktop Oracle Edition (Floating)
FME (Pl) 2015.1.0.0 (20150715 - Build 2015 - V0502)

VRMesh Reverse

VRMesh 0.5.1 - Reverse (Registered), 17-Oct-2014
Copyright 2003-2014, VRMeshCo Company
Website: http://www.vrmesh.com
Contact: info@vrmesh.com

HEC-RAS
River Analysis System
Version 4.1.0 Jan 2010
Developed by the
U.S. Army Corps of Engineers
Hydrologic Engineering Center
600 Spenard Road, Davis, CA 95616
www.hec.usace.army.mil

The HEC-RAS executable code is public domain software that is developed by the Hydrologic Engineering Center for the U.S. Army Corps of Engineers. This software can be downloaded for free and used freely by non-Civil Engineer personnel. The software is maintained by the Hydrologic Engineering Center and will continue to be maintained by the Hydrologic Engineering Center. The software is provided as is with no warranty of any kind. The user is responsible for all documented changes in program errors. Documented errors are bugs in the software due to programming rather than model problems due to user input.

OK
Post-Construction Photos
Post-Construction Photos
Post-Construction Photos
Post-Construction Photos

[Images of post-construction photos showing a new bridge structure over a natural canyon with rocks and a flowing stream.]
Questions