Drone 2 Design:
Harness the power of the AEC Collection

Justin D. Ehart

CAD Manager, Civil Engineering & Surveying

WARE MALCOMB



AUTODESK. UNIVERSITY

Who Am I?

JUSTIN D. EHART

CAD MANAGER, CIVIL ENGINEERING & SURVEYING

WARE MALCOMB

- Education in Architecture
- 20+ Years in Civil Engineering & Land Surveying
- FAA Certified Part 107 Drone Pilot
- Avid Comic Book Collector

linkedin.com/in/andthisjustin



Where I Work

WARE MALCOMB

- Founded in 1972
- 24 offices throughout North America
- Specializing in:
  - Architecture
  - Planning
  - Interior Design
  - Branding
  - Civil Engineering
  - Building Measurement



Who Are You?

- I have never processed point cloud data
- I currently use Recap but I am looking to simply and speed things up
- The class I really wanted was already full.



From Drone 2 Design:

WHAT WE WILL COVER TODAY IN BITE-SIZED SECTIONS:

- Uses in Architecture, Engineering & Construction
- Processing Captured Drone Data in AutoDesk Recap Photo
- Cleaning Up Point Cloud in AutoDesk Recap Pro
- Create EG Surface From Point Cloud in AutoDesk Civil 3D
- Inserting Stitched Orthomosaic Photo into Civil 3D
- Creating Existing Base File in Civil 3D

If Time Allows – Bonus Content = I am nervous and flew through the slides

Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Aerial Photography/Video (most common)
- Capture Views To Optimize Design
- Façade Scanning
- Real Estate Uses

Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Aerial Photography/Video

Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Aerial Photography/Video



Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Aerial Photography/Video



Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Façade Scanning

Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Façade Scanning



Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Façade Scanning



Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Façade Scanning



Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Façade Scanning



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- As-Built Surveying
- Digital Terrain Models (DTM)
- Floodplain Documentation
- Stitched Orthomosaic Photos
- Topographic Maps

Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- As-Built Surveying

Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- As-Built Surveying



Uses in Architecture, Engineering & Construction

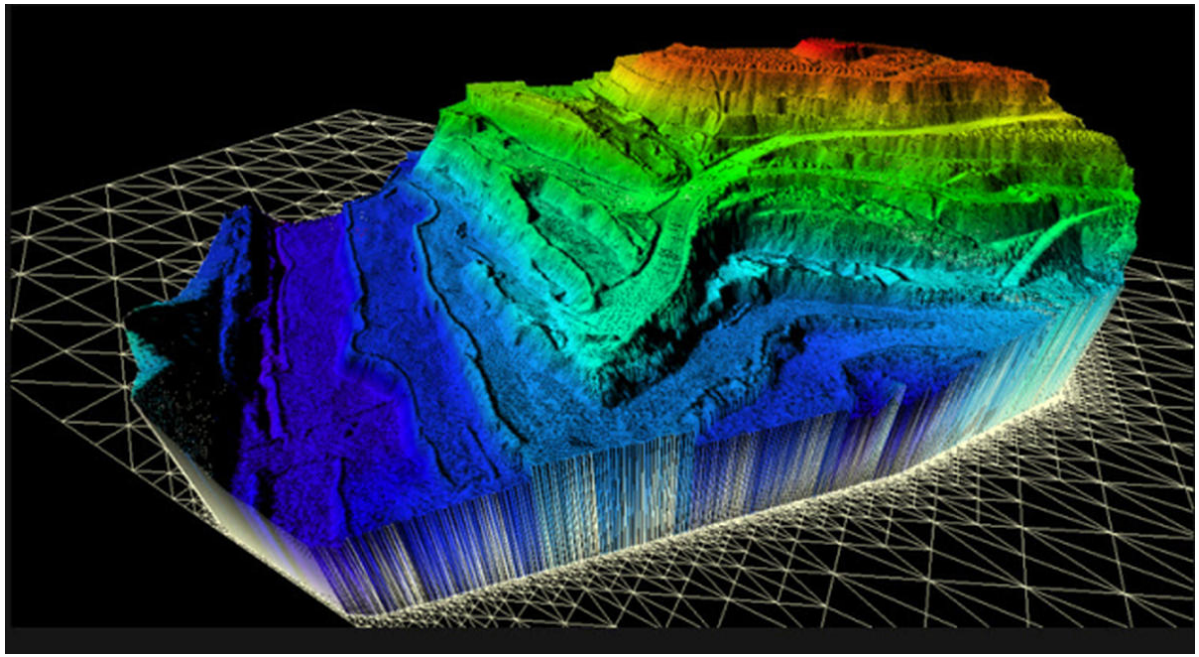
CIVIL ENGINEERING:

- Digital Terrain Models (DTM)

Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

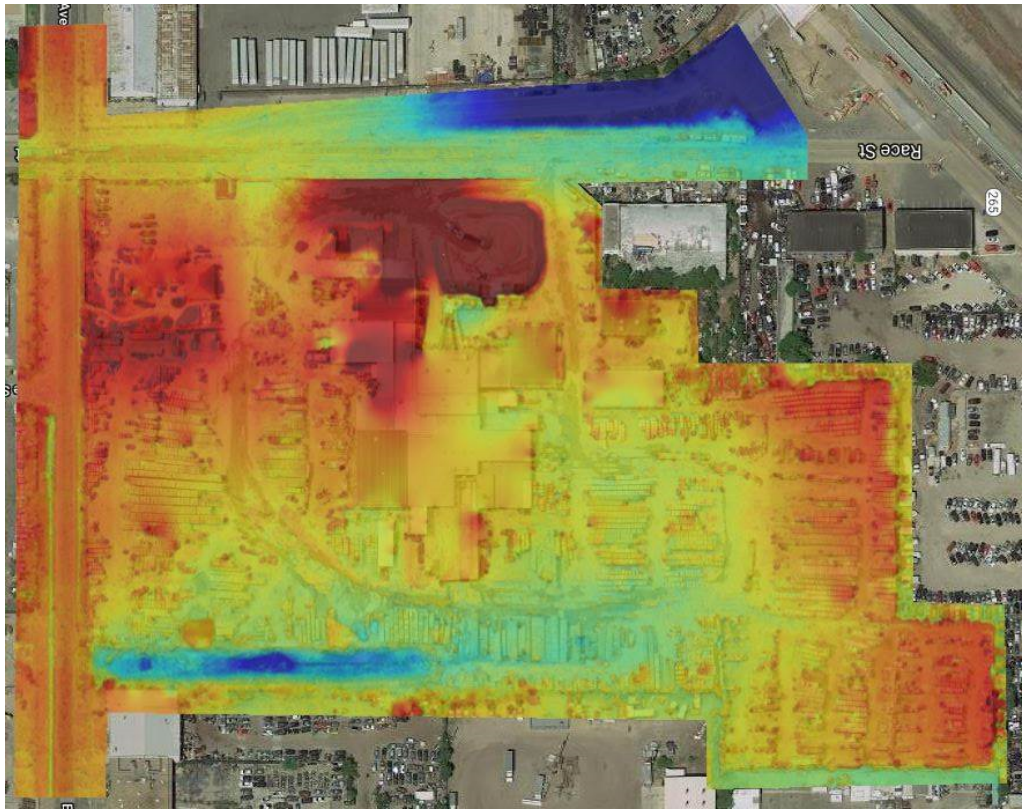
- Digital Terrain Models (DTM)



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Digital Terrain Models (DTM)



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Floodplain Documentation

Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Floodplain Documentation



Uses in Architecture, Engineering & Construction

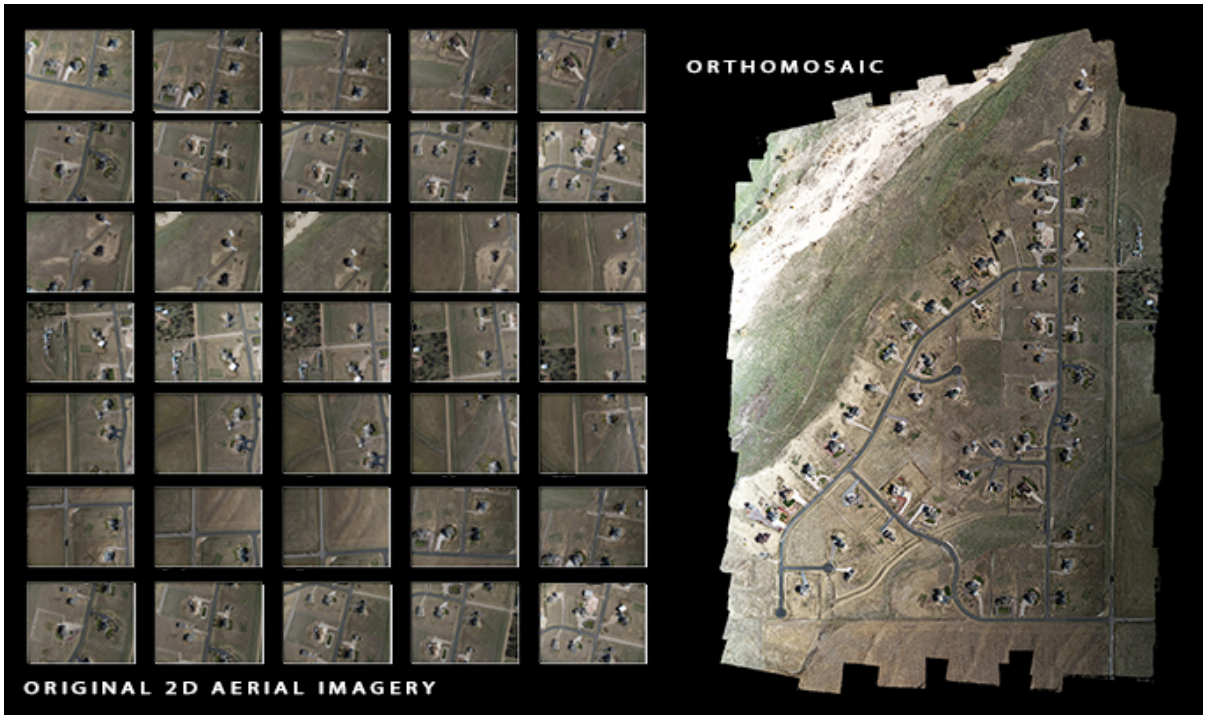
CIVIL ENGINEERING:

- Stitched Orthomosaic Photos

Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Stitched Orthomosaic Photos



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Stitched Orthomosaic Photos
  - 550 acres (222 ha)



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Stitched Orthomosaic Photos
  - 550 acres (222 ha)
  - How many photos?



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Stitched Orthomosaic Photos
  - 550 acres (222 ha)
  - 2,400 individual photos



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Stitched Orthomosaic Photos
  - 550 acres (222 ha)
  - 2,400 individual photos

- How long did it take to fly?





Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Stitched Orthomosaic Photos
  - 550 acres (222 ha)
  - 2,400 individual photos
  - 8 hours of flying



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Stitched Orthomosaic Photos
  - 550 acres (222 ha)
  - 2,400 individual photos
  - 8 hours of flying vs.
  - 10 days of traditional field surveying



Uses in Architecture, Engineering & Construction

CIVIL ENGINEERING:

- Stitched Orthomosaic Photos
  - 550 acres (222 ha)
  - 2,400 individual photos
  - 8 hours of flying vs.
  - ~~10 days of traditional field surveying~~





Uses in Architecture, Engineering & Construction

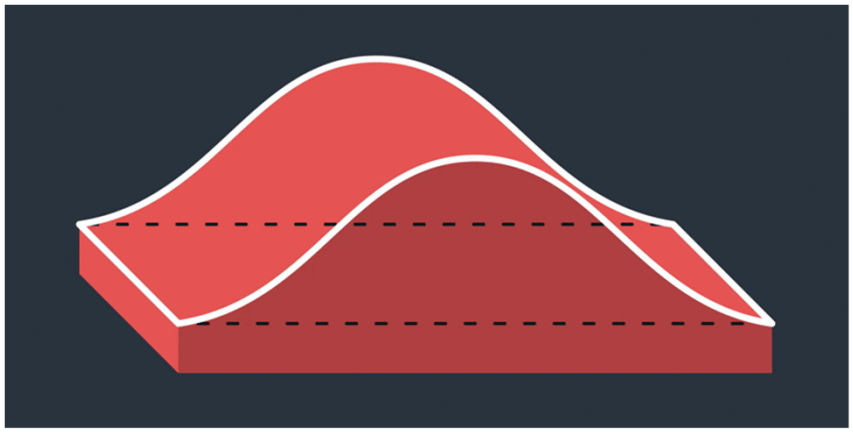
CONSTRUCTION:

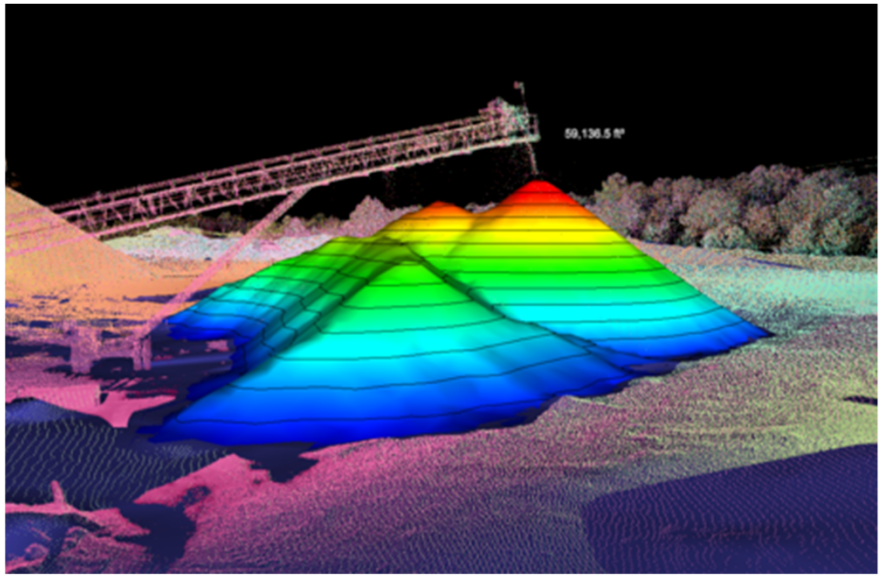
- Material/Stockpile Quantities(most common)
- Construction Progression Documentation

Uses in Architecture, Engineering & Construction

CONSTRUCTION:

- Material/Stockpile Quantities(most common)





Uses in Architecture, Engineering & Construction

CONSTRUCTION:

- Construction Progression Documentation

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ARCHITECTURE | PLANNING | INTERIORS
BRANDING | CIVIL ENGINEERING

Quick Review
Uses in Architecture, Engineering & Construction

ARCHITECTURE:

- Aerial Photography/Video, Façade Scanning & Real Estate Uses

CIVIL ENGINEERING & LAND SURVEYING:

- As-Built Surveying, Digital Terrain Models, Floodplain Documentation, Stitched Orthomosaic Photos, Topographic Maps

CONSTRUCTION:

- Material/Stockpile Quantities, Construction Progression Documentation

Quick Review
Uses in Architecture, Engineering & Construction

ANY QUESTIONS SO FAR?

From Drone 2 Design:

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- Creating Existing Base File in Civil 3D

If Time Allows – Bonus Content

Processing Captured Drone Data In Recap Photo

WHERE DO I BEGIN?

- Store Collected Photos On Network *(it all starts with the photos)*
- Have Ground Control Points (GCP's) Surveyed & In CSV File
- Request Access To Recap Photo From Your Company AutoDesk Account Admin

- Lets Do This…

Processing Captured Drone Data In Recap Photo

WHERE DO I BEGIN?

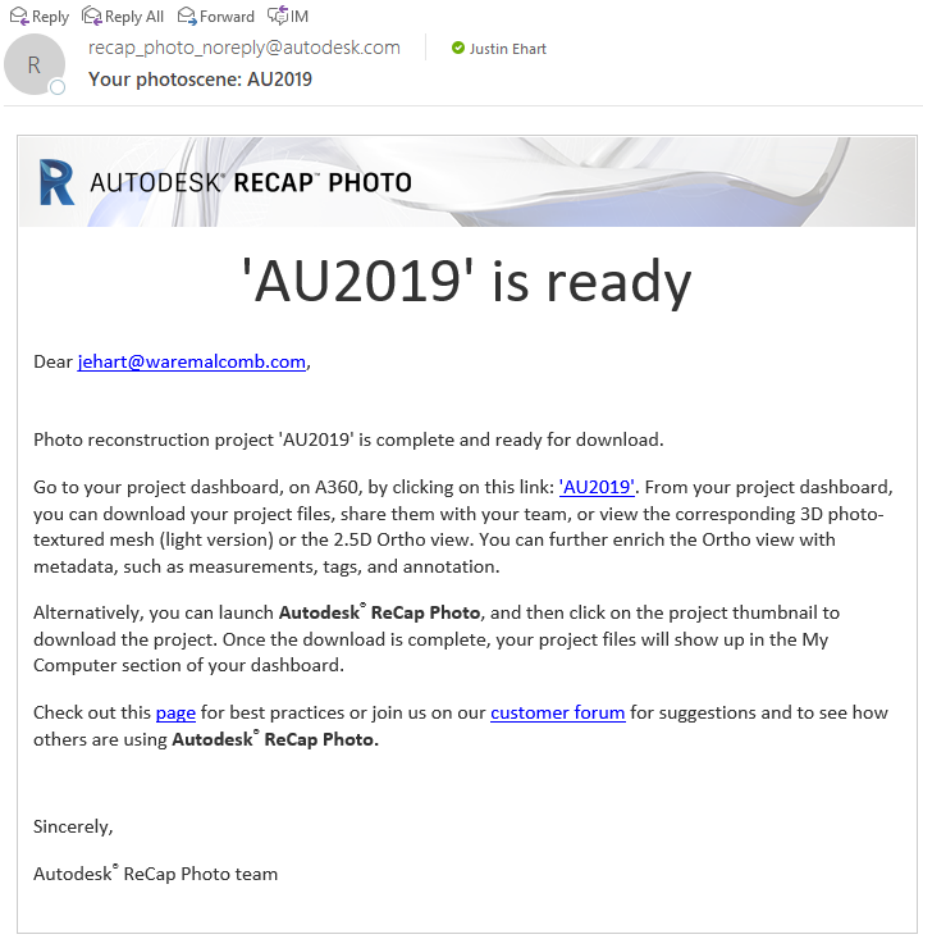
- Uploading Photos and GCPs to Recap



Processing Captured Drone Data In Recap Photo

WHERE DO I BEGIN?

- How will I know my project is ready to download? – Via automated email



Reply Reply All Forward IM

R recap_photo_noreply@autodesk.com Justin Ehart

Your photoscene: AU2019

AUTODESK® RECAP™ PHOTO

'AU2019' is ready

Dear jehart@waremalcomb.com,

Photo reconstruction project 'AU2019' is complete and ready for download.

Go to your project dashboard, on A360, by clicking on this link: 'AU2019'. From your project dashboard, you can download your project files, share them with your team, or view the corresponding 3D photo-textured mesh (light version) or the 2.5D Ortho view. You can further enrich the Ortho view with metadata, such as measurements, tags, and annotation.

Alternatively, you can launch **Autodesk® ReCap Photo**, and then click on the project thumbnail to download the project. Once the download is complete, your project files will show up in the My Computer section of your dashboard.

Check out this page for best practices or join us on our customer forum for suggestions and to see how others are using **Autodesk® ReCap Photo**.

Sincerely,

Autodesk® ReCap Photo team

Processing Captured Drone Data In Recap Photo

WHERE DO I BEGIN?

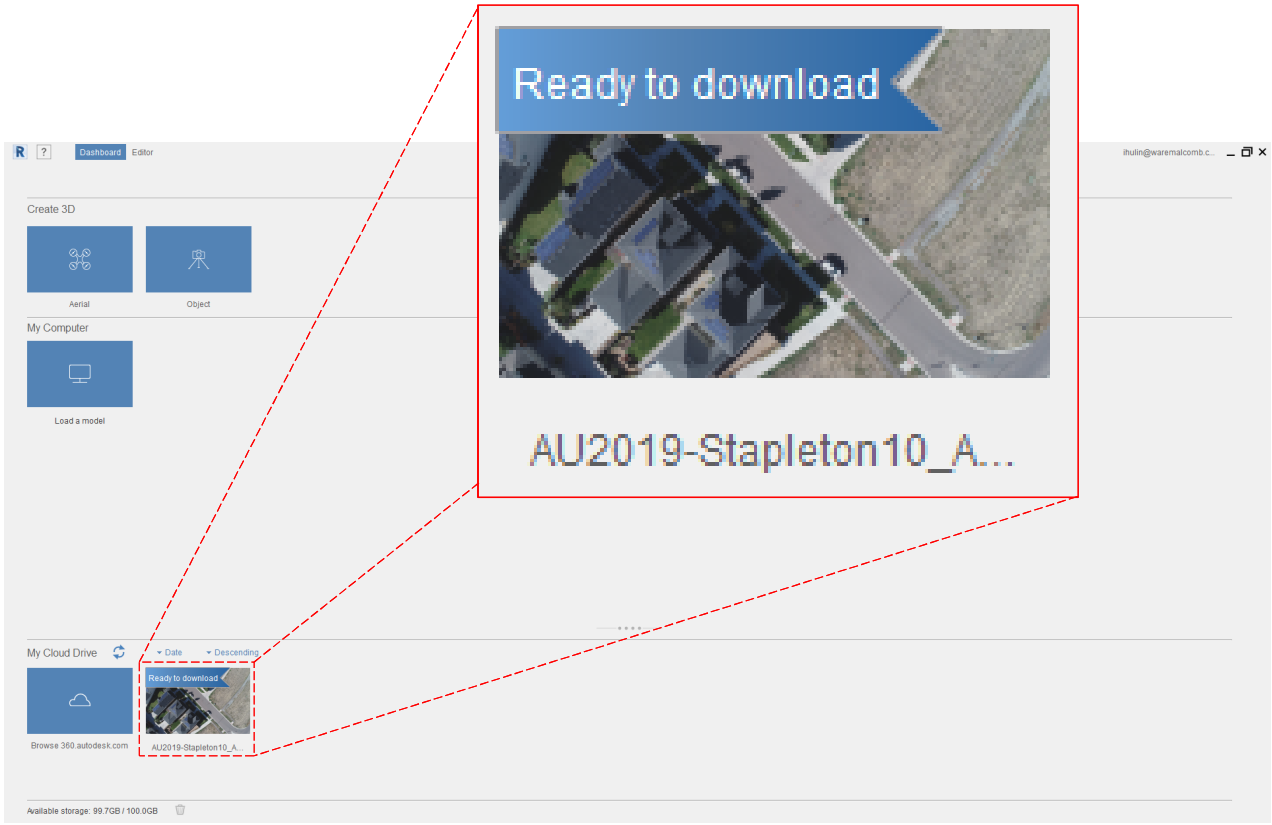
- How will I know my project is ready to download? - via ReCap GUI



Processing Captured Drone Data In Recap Photo

WHERE DO I BEGIN?

- How will I know my project is ready to download? - via ReCap GUI



Processing Captured Drone Data In Recap Photo

ONCE DOWNLOADED, WHAT FILES DO I GET?

- Project Name.RCM
- Project Name.RCS.zip
- Project Name.REPORT.zip
- Project Name.TIF.zip

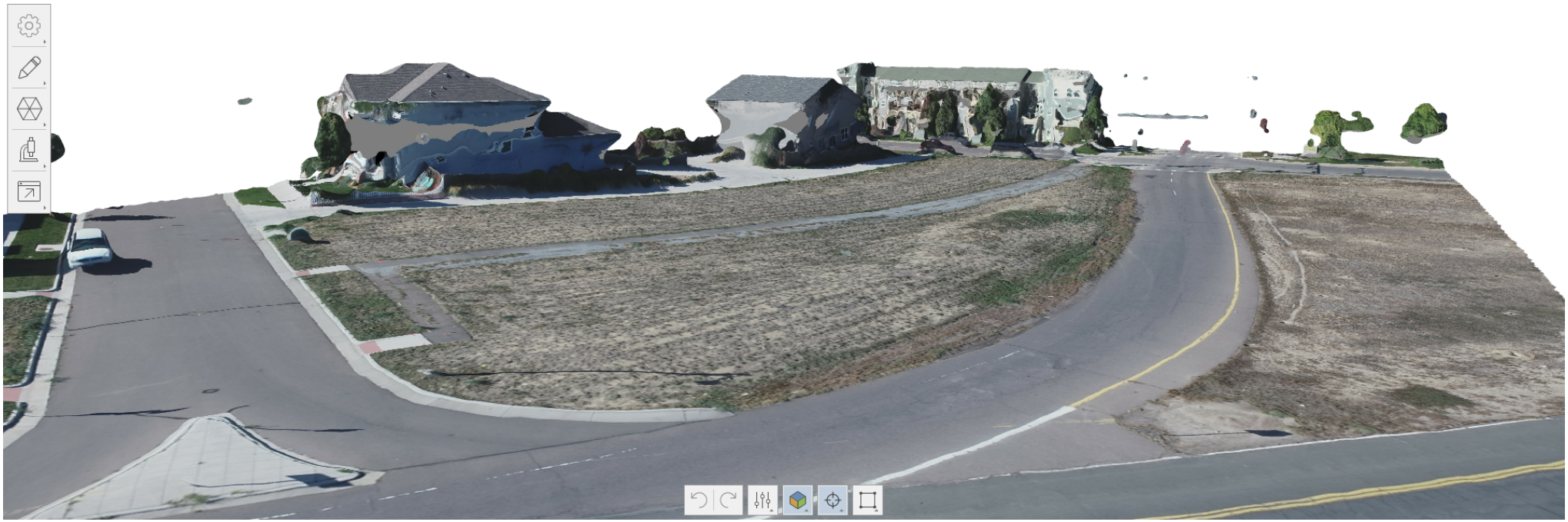
Processing Captured Drone Data In Recap Photo

ONCE DOWNLOADED, WHAT FILES DO I GET?

- Project Name.RCM (Recap Photo Mesh file)
- Project Name.RCS.zip (Recap Pro Point Cloud)
- Project Name.REPORT.zip (html report)
- Project Name.TIF.zip (stitched orthomosaic geotiff)

Processing Captured Drone Data In Recap Photo

RCM FILE… DOUBLE CLICK TO OPEN IN RECAP PHOTO



Processing Captured Drone Data In Recap Photo

HTML REPORT – DOUBLE CLICK TO OPEN

Project Report

Summary

Project:

AU2019-Stapleton10_Aurora

Date:

Sat Nov 17 03:41:14 2018

Number of Cameras:

1

Camera Model(s):

[0] DJI

Average Ground Sampling Distance (GSD):

1.000095 cm / 0.010001 m

Area Covered:

13222.123047 m sq / 0.013222 km sq

Processing Time:

26 minutes 14 seconds

Target Coordinate System:

CO83-CF

Orthophoto Dimensions:

9684 x 17480

Orthophoto Elevation Dimensions:

968 x 1747

3D Texturing Parameters - Texture Size:

8192 x 8192 (1)



Processing Captured Drone Data In Recap Photo

HTML REPORT – DOUBLE CLICK TO OPEN

Digital Elevation Model

Digital Elevation Model Resolution:

10.00 cm / px

Image Overlap

Overlapping images computed for each pixel of the orthomosaic. Red and yellow indicates poor overlaps that would generate poor results. Green indicates an overlap of more than 5 images for every pixel.



Effective Overlaps:

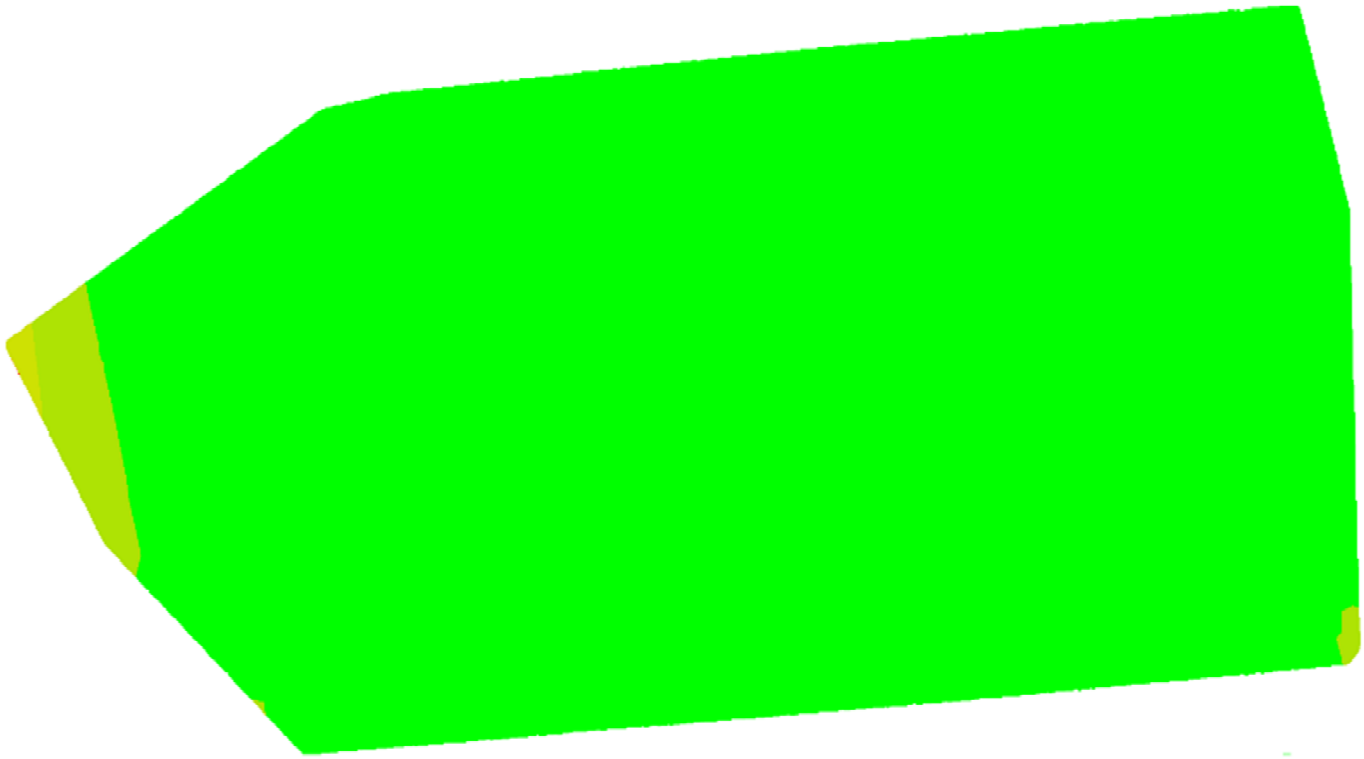
4.38 images per pair

Ground Control Points

Coordinate System:

LL84

User Input Control Points



Processing Captured Drone Data In Recap Photo

HTML REPORT – DOUBLE CLICK TO OPEN

Name	Valid	X	Y	Z	Calculated XY Error (m)*	Calculated Z Error (m)*
5	Yes	-110.519861159000	45.204921434400	1621.002794010000	< 0.020	< 0.020
4	Yes	-110.520141943000	45.205586246100	1622.093980190000	< 0.020	< 0.020
3	Yes	-110.520073232000	45.204913137900	1620.563881130000	< 0.020	< 0.020
1	Yes	-110.519851320000	45.204794934000	1620.505969010000	< 0.020	< 0.020
2	Yes	-110.520063015000	45.204786658200	1620.256032510000	< 0.020	< 0.020

Quick Review
Processing Captured Drone Data In Recap Photo

ANY QUESTIONS SO FAR?

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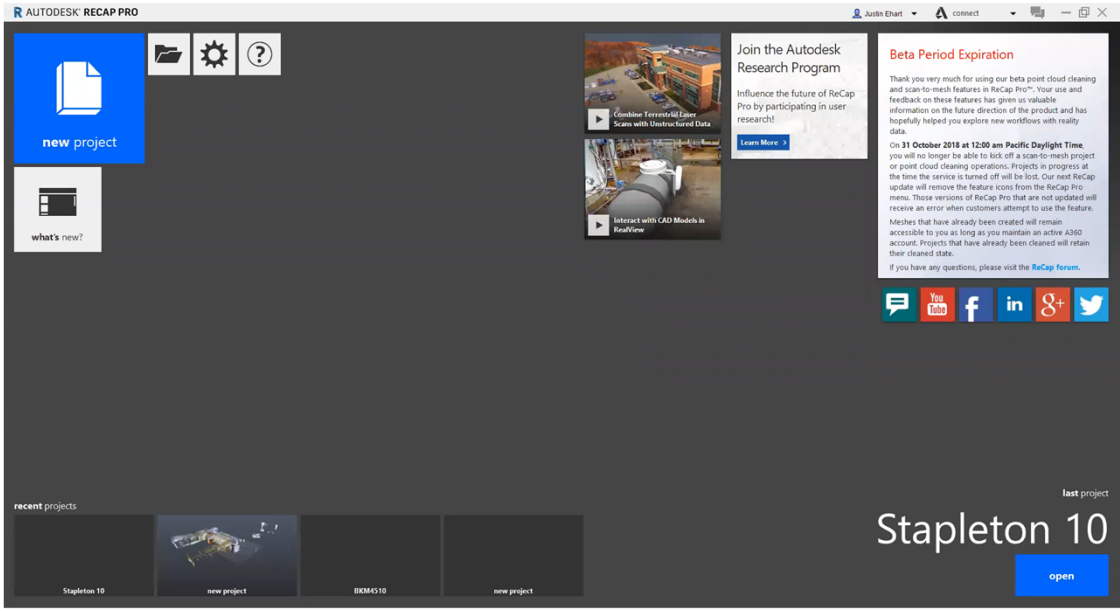
If Time Allows – Bonus Content

Cleaning Up Point Cloud Data In Recap Pro

WHERE DO I BEGIN?

- Access To Stored RCP File On The Network

- Lets Do This…



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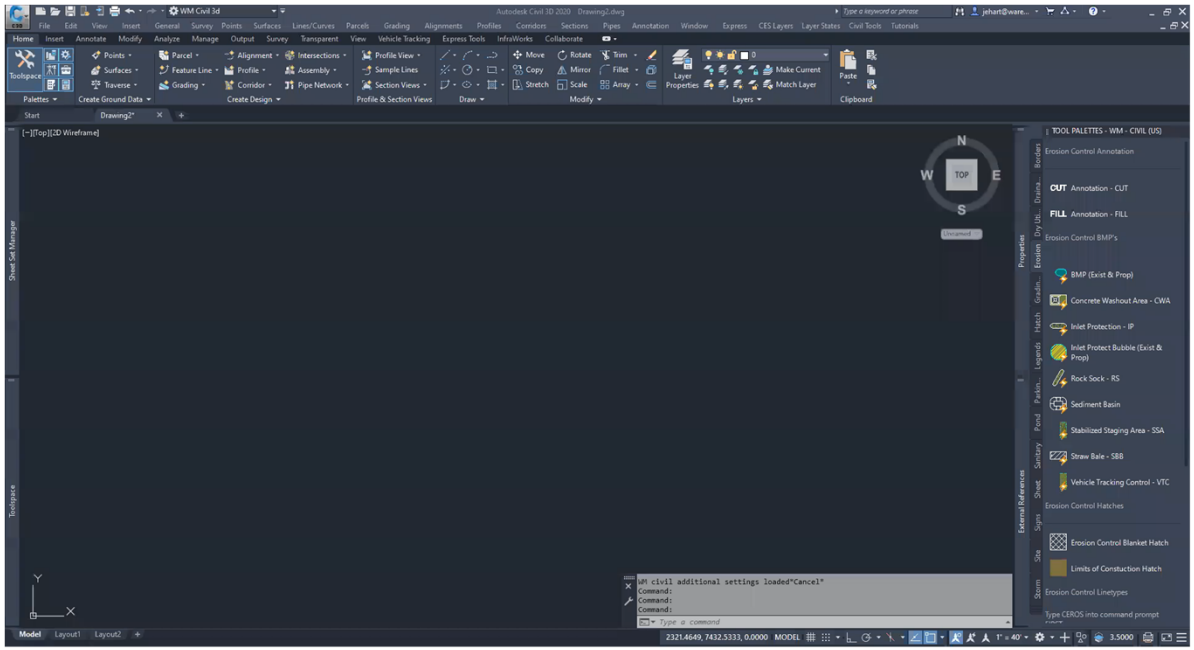
If Time Allows – Bonus Content

Create EG Surface From Point Cloud in AutoDesk Civil 3D

WHERE DO I BEGIN?

- Knowledge Of Where Point Cloud Is Stored On The Network.

- Lets Do This…



Quick Review
Create EG Surface From Point Cloud in AutoDesk Civil 3D

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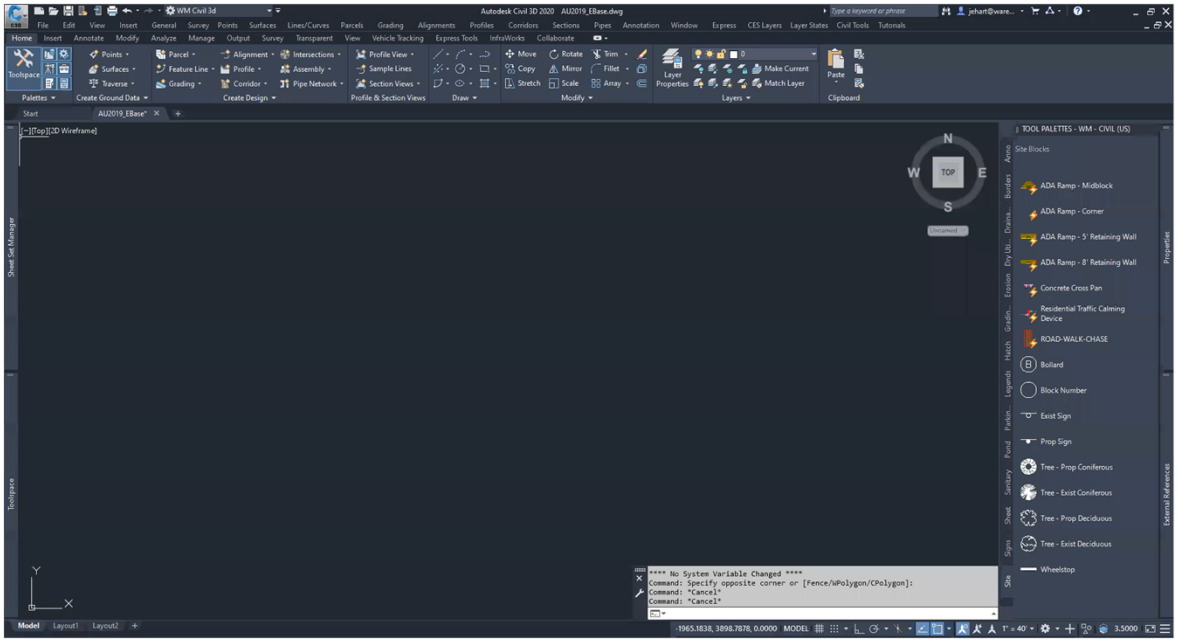
If Time Allows – Bonus Content

Inserting Stitched Orthomosaic Photo into Civil 3D

WHERE DO I BEGIN?

- Using **MAPIINSERT** Command (there are two I's in the command, that is not an error in my typing)

- Lets Do This…



Quick Review
Inserting Stitched Orthomosaic Photo into Civil 3D

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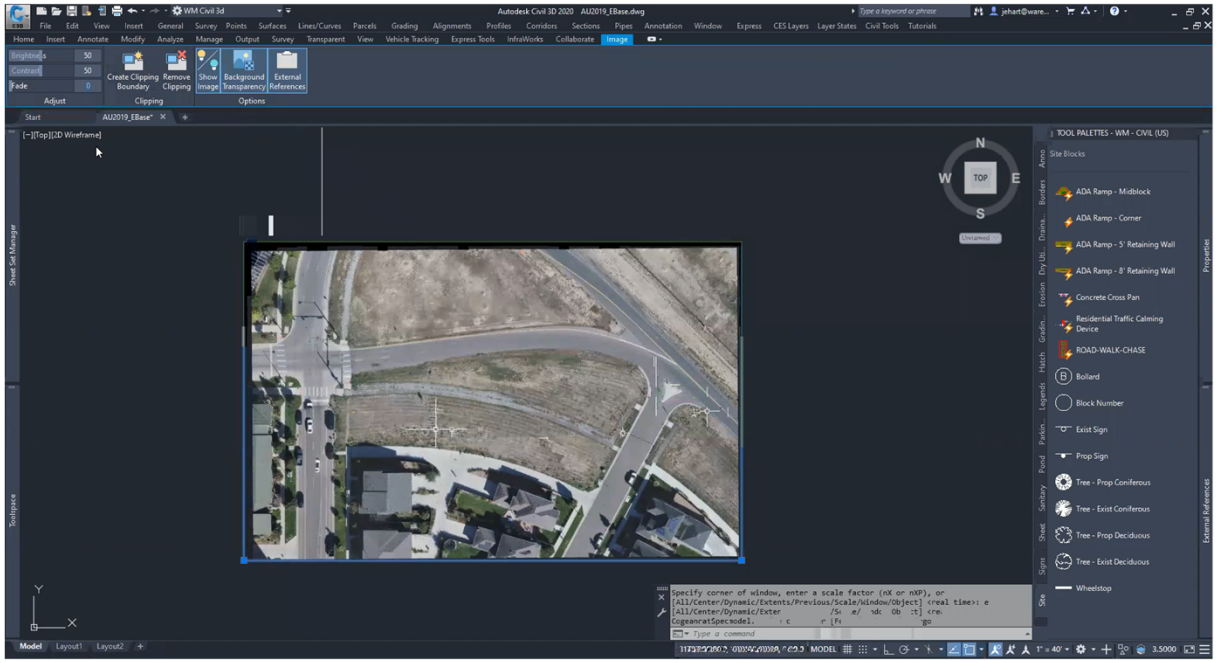
If Time Allows – Bonus Content

Creating Existing Base File in Civil 3D

WHERE DO I BEGIN?

- Layer Control – *A best practice is to keep all data collected via a Drone/UAS separate. VA-Layer (V is for Survey, A is for Aerial Data Collected)*
- Draw directly on aerial
- Lets Do This…



Quick Review
Creating Existing Base File in Civil 3D

ANY QUESTIONS SO FAR?

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If Time Allows – Bonus Content

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY:

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY:

- Uses in **Architecture**, Engineering & Construction

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY:

- Uses in **Architecture**, Engineering & Construction
  - ✓ Aerial Photography/Video (most common)
  - ✓ Façade Scanning

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY:

- Uses in Architecture, **Engineering** & Construction

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY:

- Uses in Architecture, **Engineering** & Construction
  - ✓ As-Built Surveying
  - ✓ Digital Terrain Models (DTM)
  - ✓ Floodplain Documentation
  - ✓ Stitched Orthomosaic Photos
  - ✓ Topographic Maps

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WHAT HAVE WE COVERED TODAY:

- Uses in Architecture, Engineering & **Construction**

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY:

- Uses in Architecture, Engineering & **Construction**
  - ✓ Material/Stockpile Quantities (most common)
  - ✓ Construction Progression Documentation

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY FOR RECAP PHOTO:

- Processing Captured Drone Photos in AutoDesk Recap Photo

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY FOR RECAP PHOTO:

- Processing Captured Drone Photos in AutoDesk Recap Photo
  - ✓ Start A Project
  - ✓ Upload Photos
  - ✓ Tag GCP's
  - ✓ Reviewed The Data Received From Recap Photo

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY WITH RECAP PRO:

- Cleaning Up Point Cloud in AutoDesk Recap Pro

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY WITH RECAP PRO:

- Cleaning Up Point Cloud in AutoDesk Recap Pro
  - ✓ Where to adjust/change units
  - ✓ Overview of some of the tools within the GUI
  - ✓ Covered the basics, this isn't a true lab (maybe next year)

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY WITH RECAP PRO:

- Created An EG Surface From Point Cloud in AutoDesk Civil 3D

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY WITH RECAP PRO:

- Created An EG Surface From Point Cloud in AutoDesk Civil 3D
  - ✓ Used the insert ribbon to attach the RCP file
  - ✓ Weeded the surface using tools
  - ✓ Very minimal clean-up

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY WITH CIVIL 3D:

- Inserting Stitched Orthomosaic Photo into Civil 3D

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY WITH CIVIL 3D:

- Inserting Stitched Orthomosaic Photo into Civil 3D
  - ✓ Use MAPIINSERT command
  - ✓ Adjust image background transparency and fade

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY WITH CIVIL 3D:

- Creating Existing Base File in Civil 3D

Review From Drone 2 Design Session:

WHAT HAVE WE COVERED TODAY WITH CIVIL 3D:

- Creating Existing Base File in Civil 3D
  - ✓ Maintain layer control for separate drone data collected
  - ✓ Ability to draw directly on top of our inserted image (geotiff)

Speaker Feedback:

Would be greatly appreciated

Drone 2 Design: Harness the power of the AEC Collection

Justin D. Ehart

CAD Manager, Civil Engineering & Surveying

WARE MALCOMB

AUTODESK. UNIVERSITY

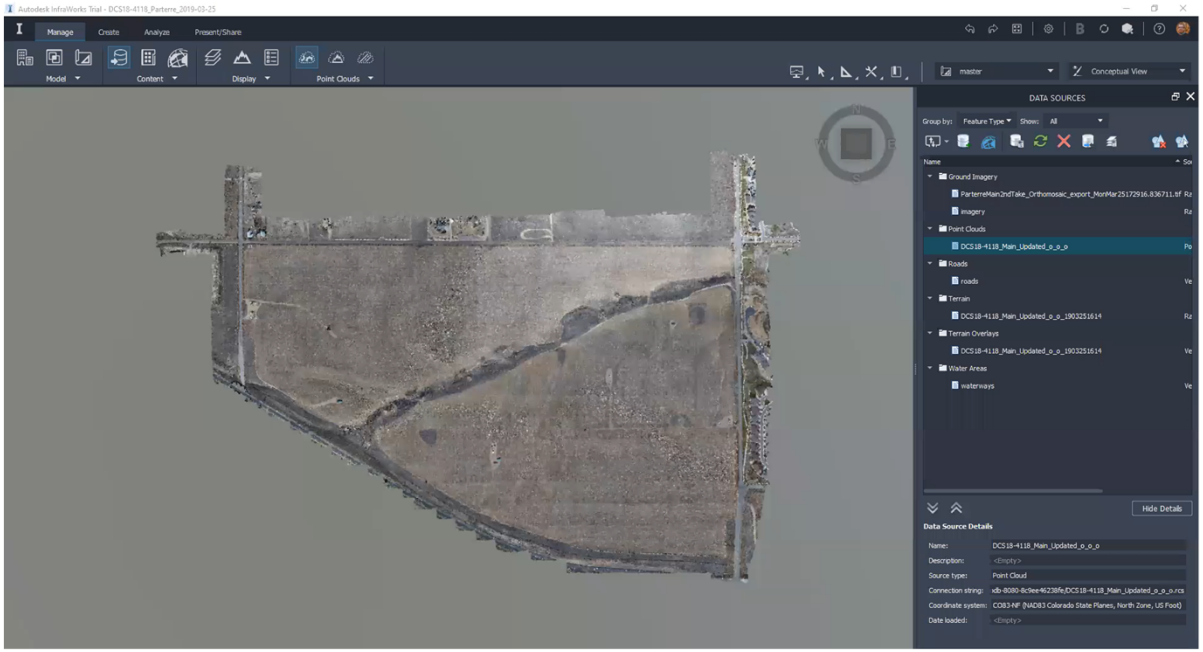


BONUS CONTENT # 1 - From Drone 2 Design:

BONUS CONTENT #1:

- Because I Was Nervous And Ran Through The Slides Too Fast

- **Classify point cloud data in Infraworks360**

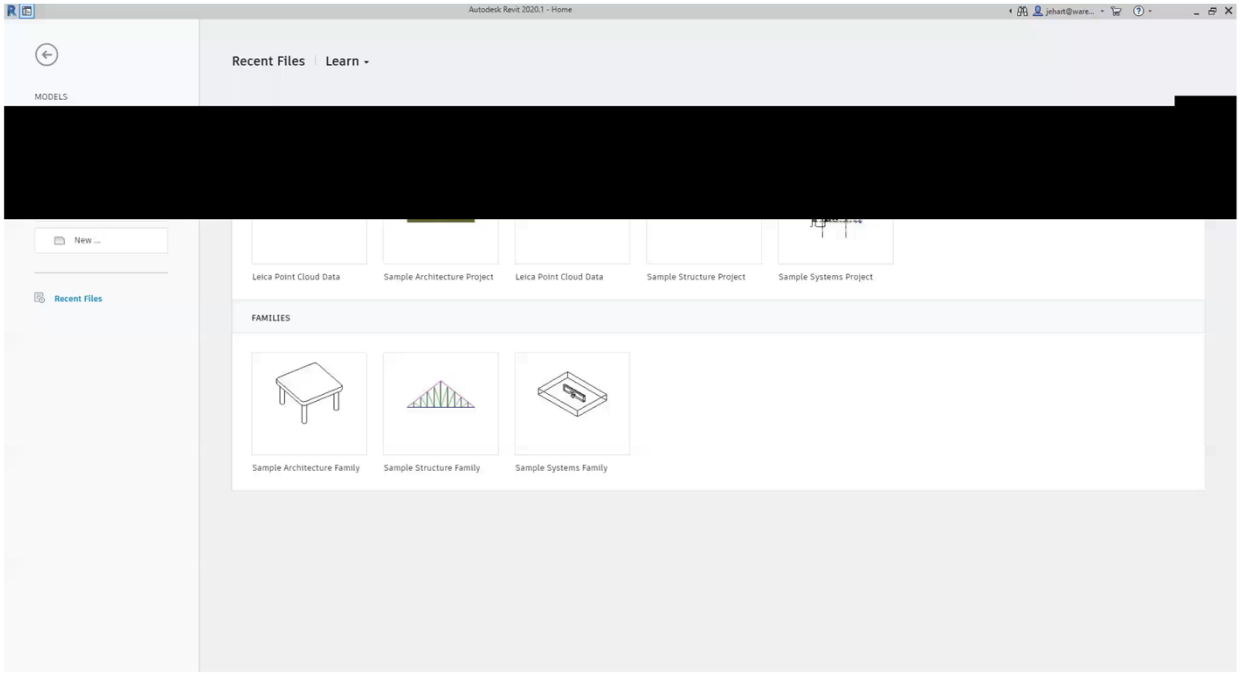


BONUS CONTENT # 2 - From Drone 2 Design:

BONUS CONTENT #2:

- Because I Was Nervous And Ran Through The Slides Too Fast

- **Insert A Topographic Point Cloud Into Revit**



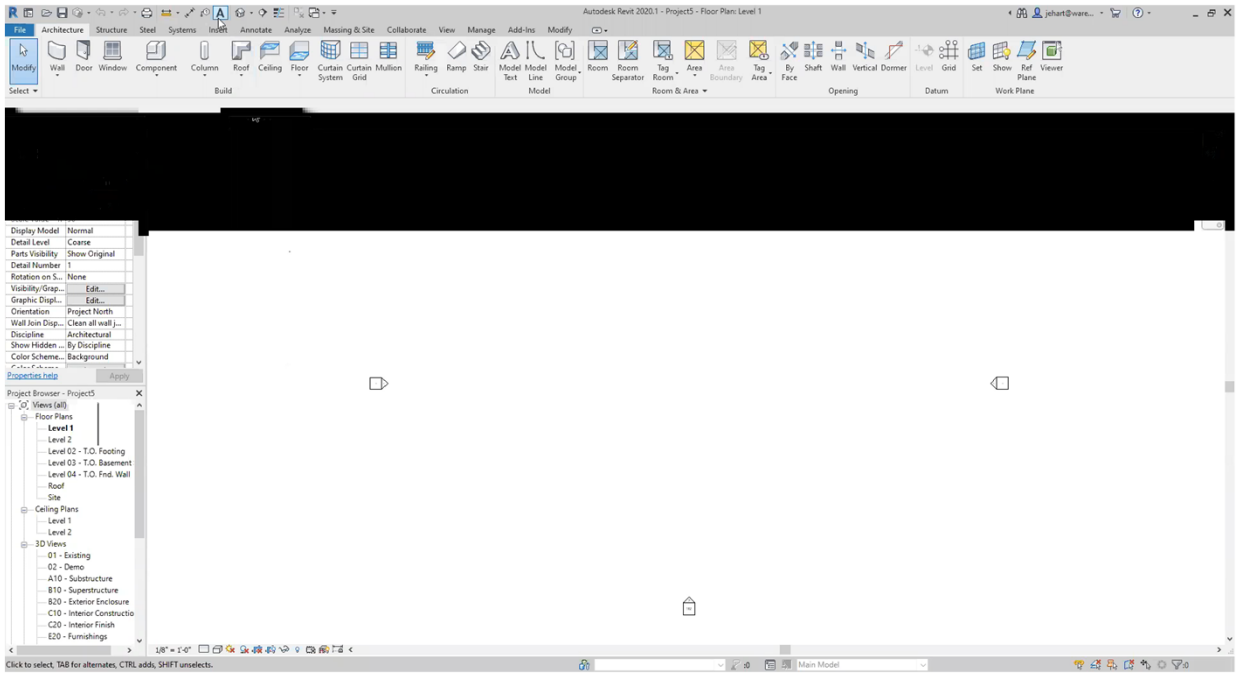
BONUS CONTENT # 3 - From Drone 2 Design:

BONUS CONTENT #3:

- WOW… I must have been really nervous and flown through the information.
- Note to self…

SLOW DOWN JUSTIN

- **Insert An Interior Scan Into Revit**



BONUS CONTENT #4 - From Drone 2 Design:

BONUS CONTENT #4:

- Justin you are so screwed, you are out of bonus content and there is probably 50 minutes left in the session.

BONUS CONTENT #4 - From Drone 2 Design:

BONUS CONTENT #4:

- Justin you are so screwed, you are out of bonus content and there is probably 50 minutes left in the session.

- **Good Luck!**
- **Enjoy the last little bit of AU 2019**
- **Safe travels when returning home**

Speaker Feedback:

Would be greatly appreciated

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