BYOD with Collector
Achieving GNSS RTK Mapping & Offsets

Presenter: Mike George, DDSI

Presented at: GeoConX 2018
Dallas, TX
Novemeber 7th, 2018

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Oil & Gas Industry

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Commercial & Residential

- **LAND SURVEY PLATS**
- **ZONE LOT AMENDMENTS**
- **CONSTRUCTION STAKING**

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Agenda

- Technology Employed
- Case Study
- Applying High-Accuracy Tech
- Pulling it together with GIS
- High-Accuracy Technology Trends

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Technology Employed

- **GIS:** ArcGIS Online, Esri ArcMap, ArcGIS Pro & AutoCAD Civil 3D
- **RTK GNSS:** Eos GNSS Arrow Gold & Trimble R8
- **Real Time Correction:** Virtual Reference Station (VRS)
- **Laser Rangefinder:** LTI TruPulse 200X
- **Data Collectors:** iPad Mini 4 (iOS), Samsung S9+ (Android), Toughpad (Windows)
- **Mobile Apps:** Esri's Collector & Eos Tools Pro
- **UAV:** DJI Phantom 4 Pro

Case Study – Site Modification

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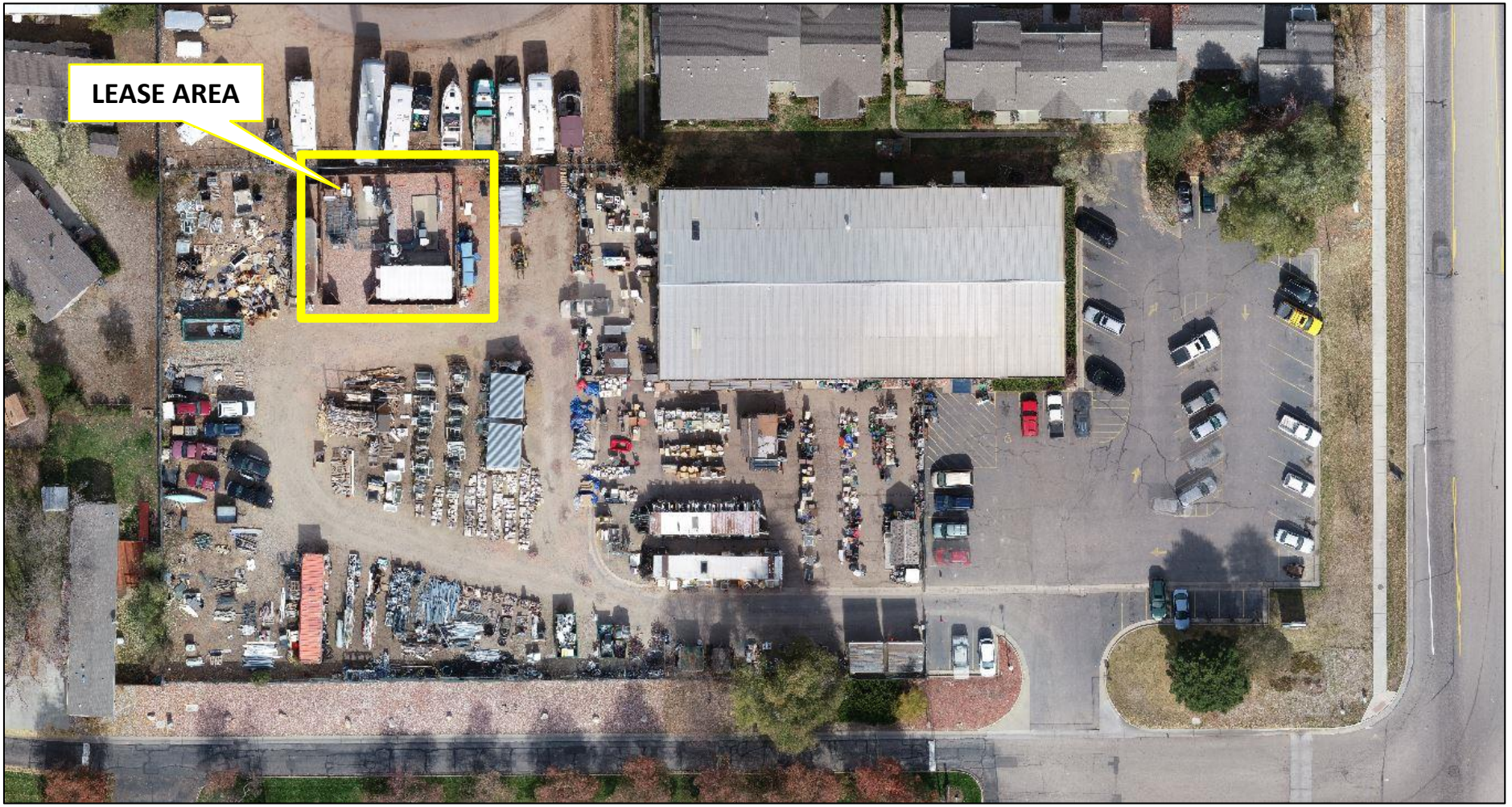
Property Overview



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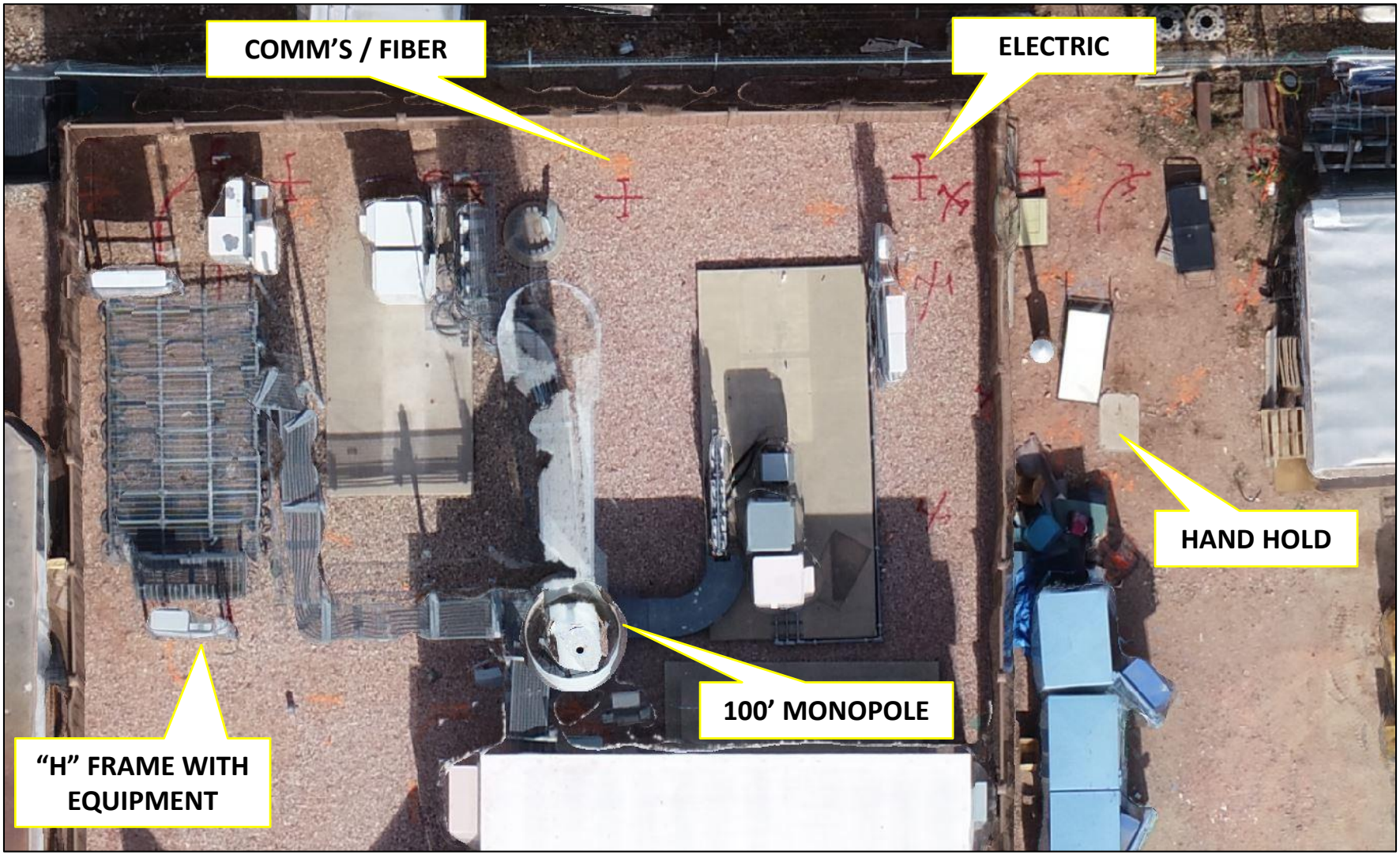
Private Utility Locates



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Dense Tree Cover

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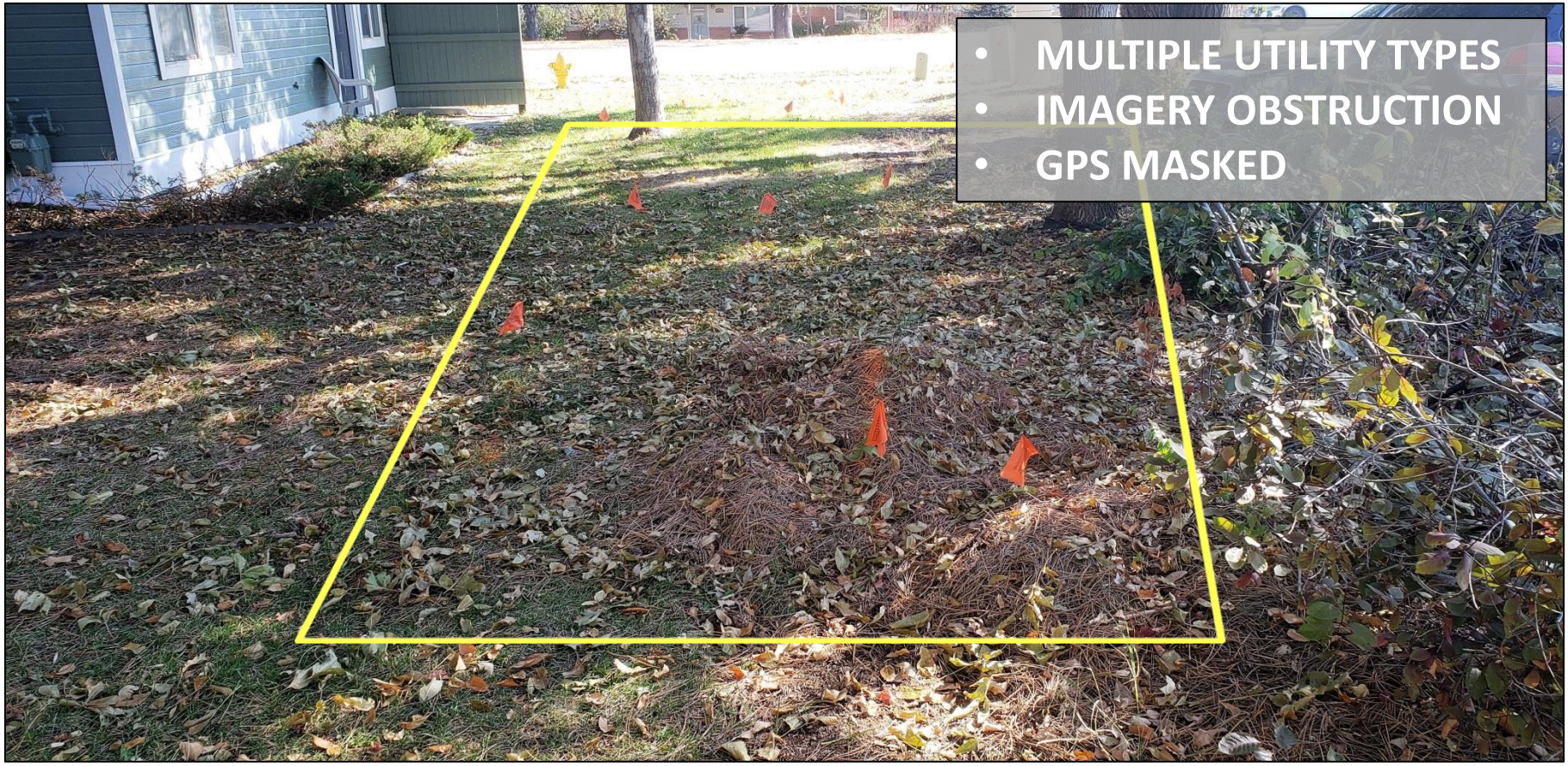
Multiple Locates



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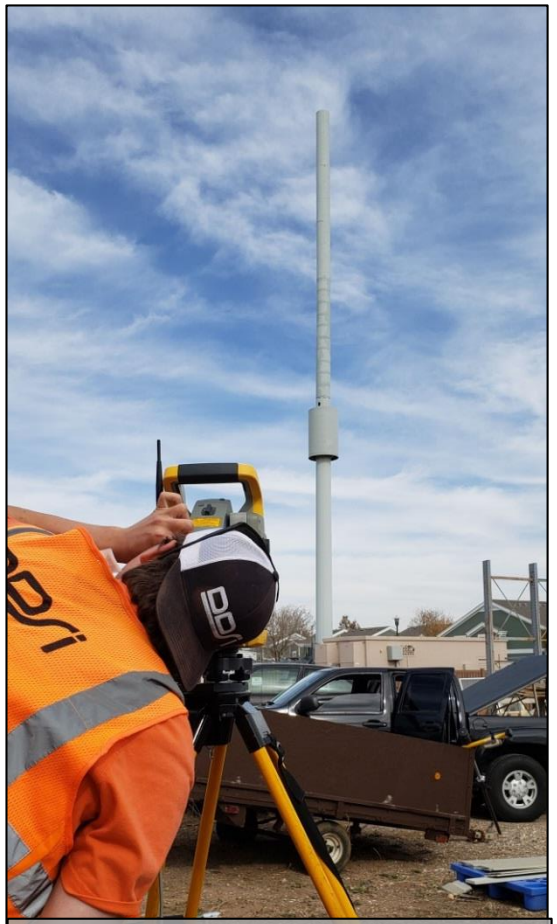
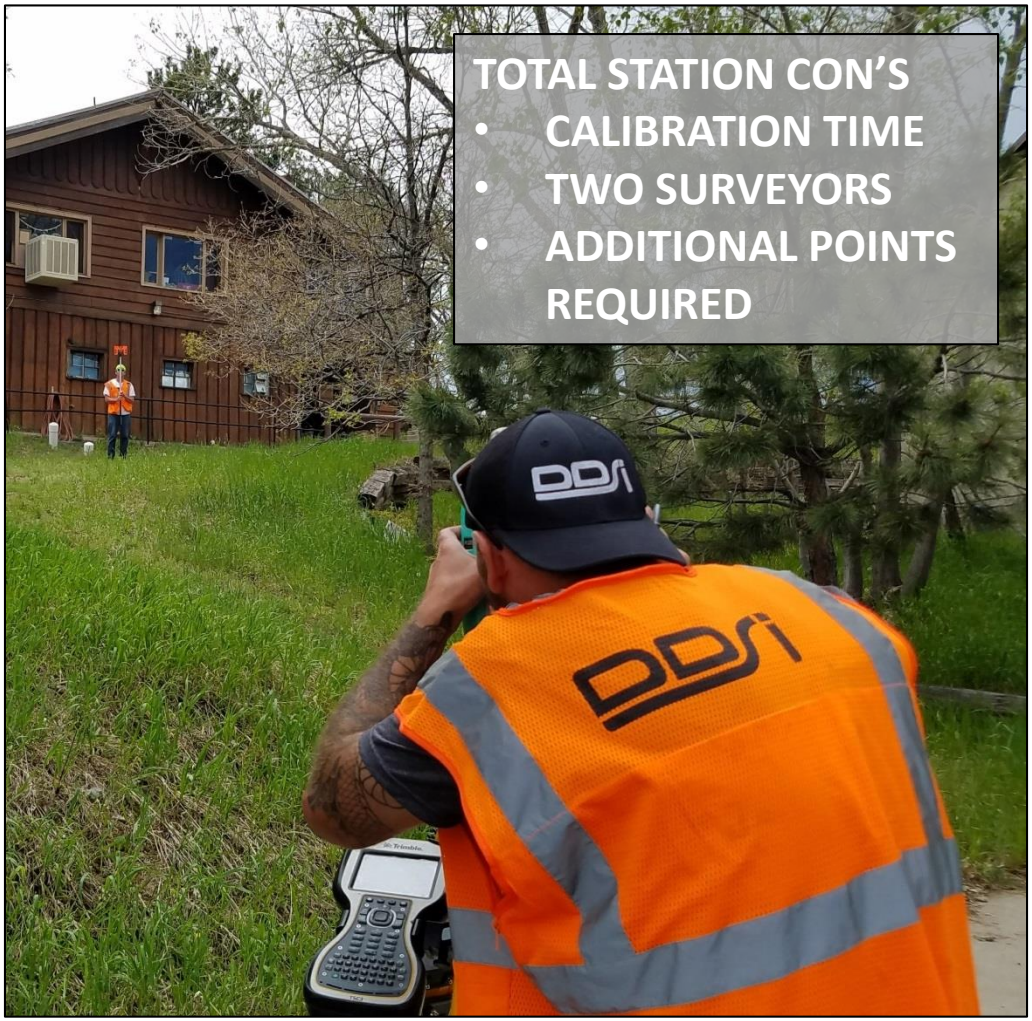
Total Station – Pro's & Con's



TOTAL STATION PRO'S
- HIGHLY ACCURATE
- CAN POST PROCESS



TOTAL STATION CON'S
- CALIBRATION TIME
- TWO SURVEYORS
- ADDITIONAL POINTS REQUIRED

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GNSS Laser Offset Routine

DESIGN
DRAFTING
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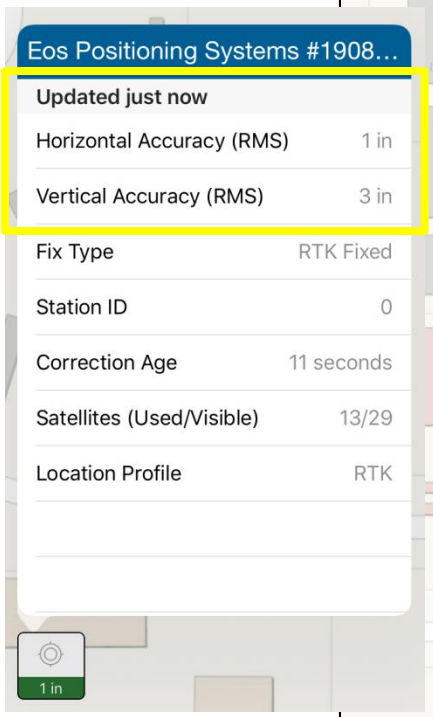
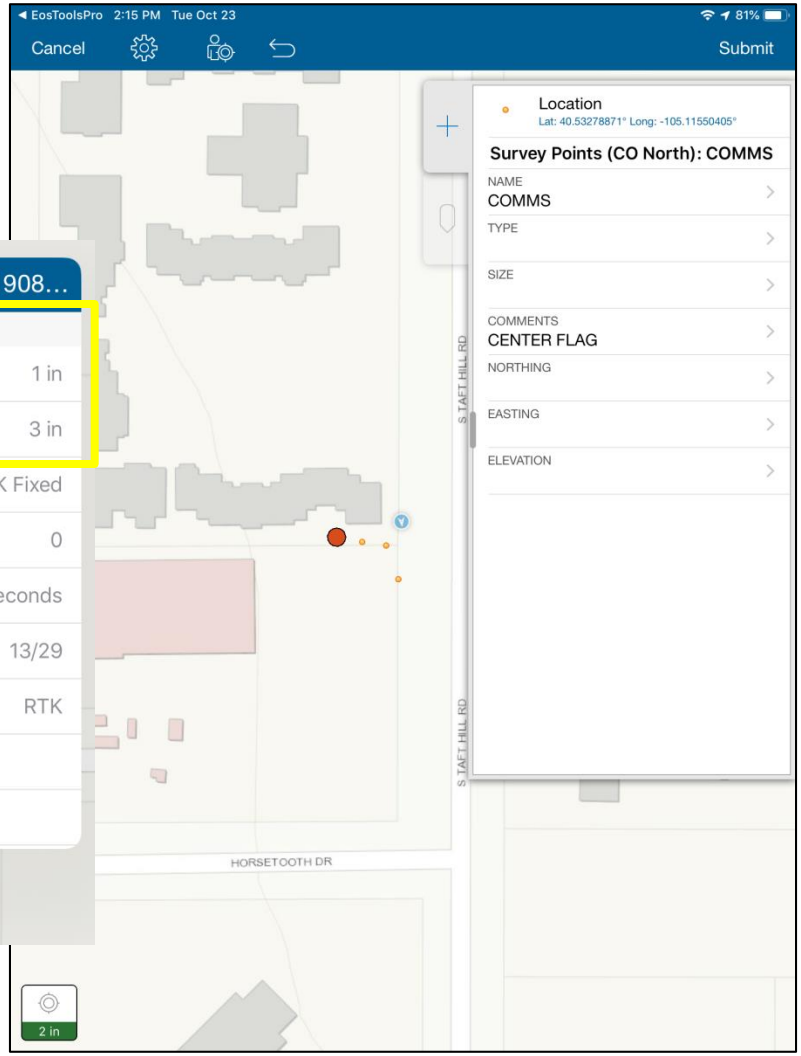
Esri's Collector / Eos GNSS RTK / LTI TruPulse 200X

50 MILES FROM VRS BASE STATION





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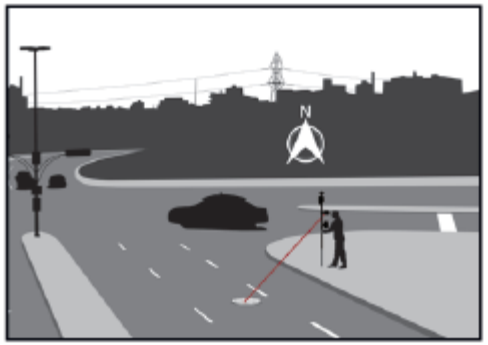
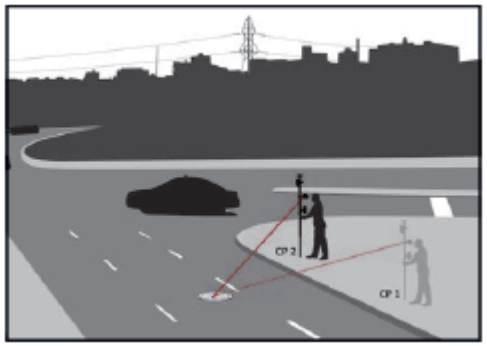
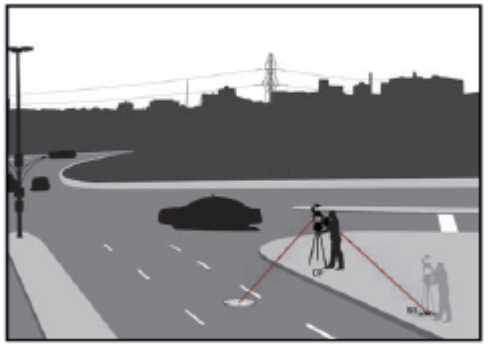
Supported Laser Offset Workflows: Eos Tools Pro







- **Range-Azimuth:** Standard laser offset using TruPulse 360.
- **Range-Range:** Triangulation TruPulse 200X via Bluetooth
- **Range-Azimuth-Backsight:** TruPulse 200X / TruAngle via Bluetooth.

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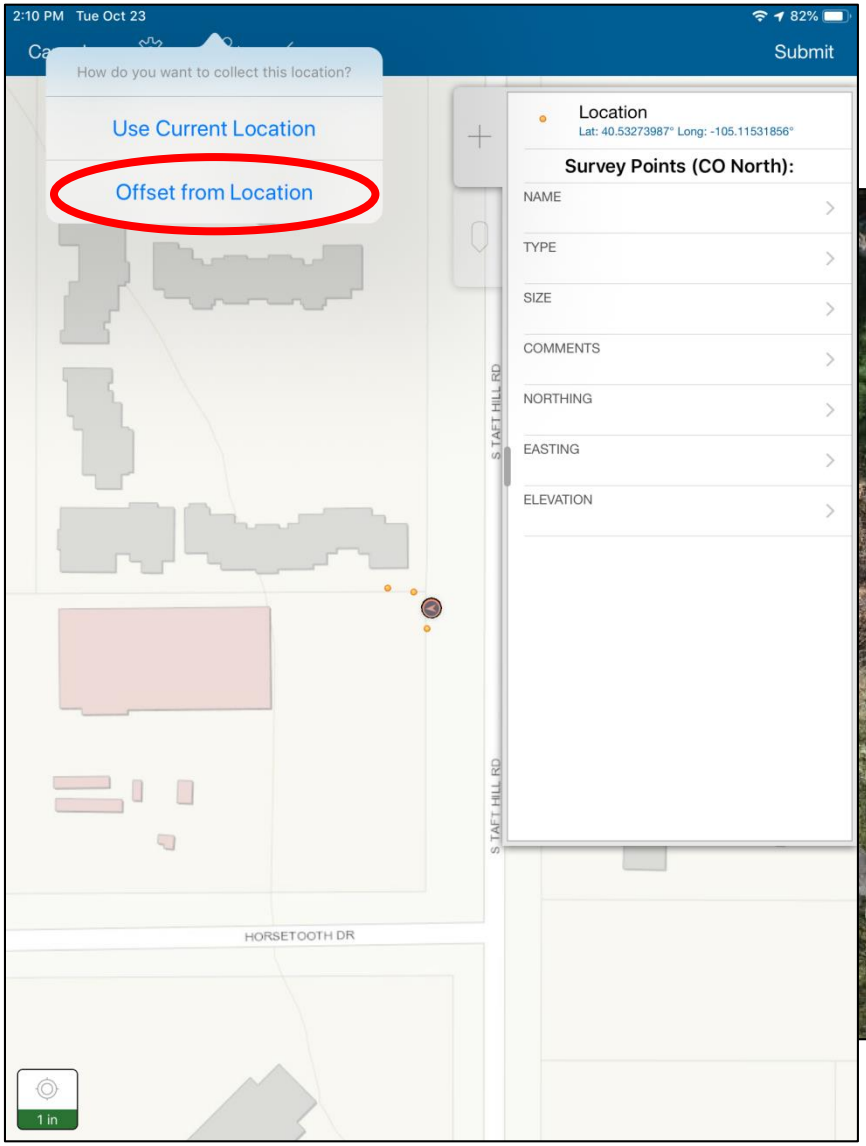
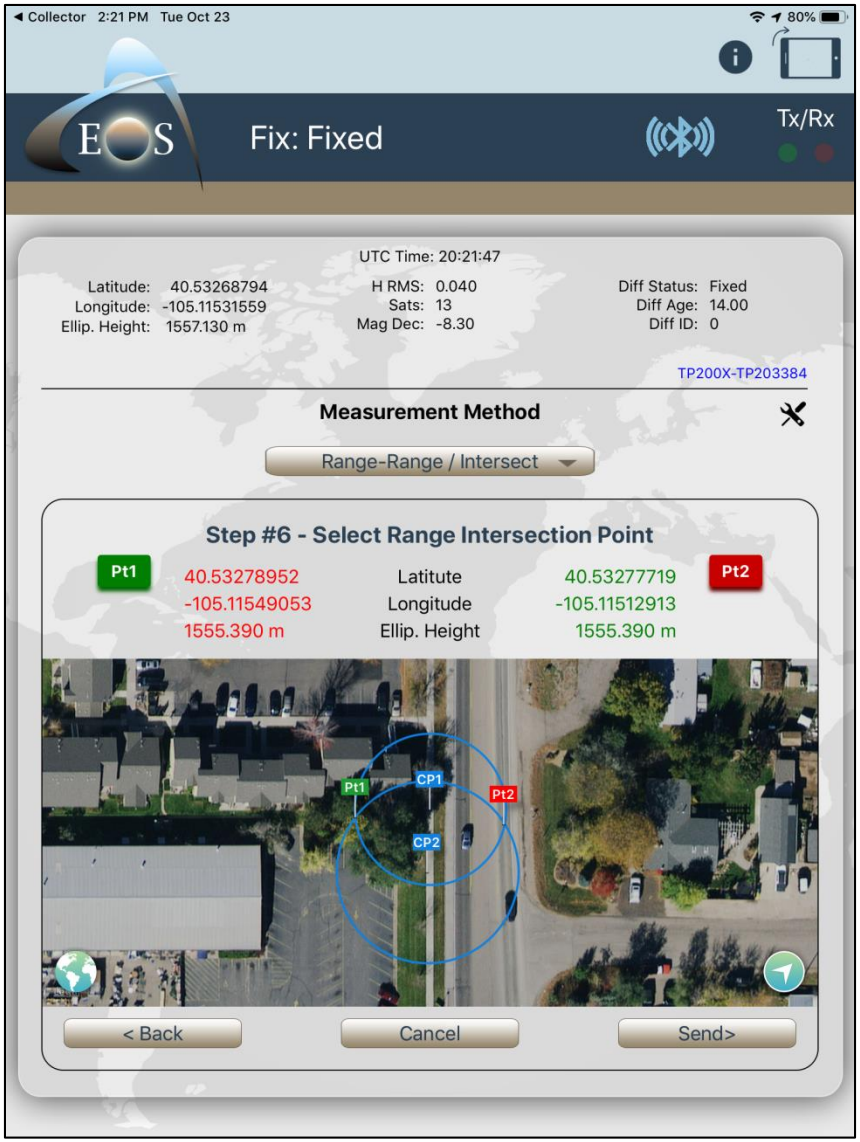
Range / Range Intersect Routine

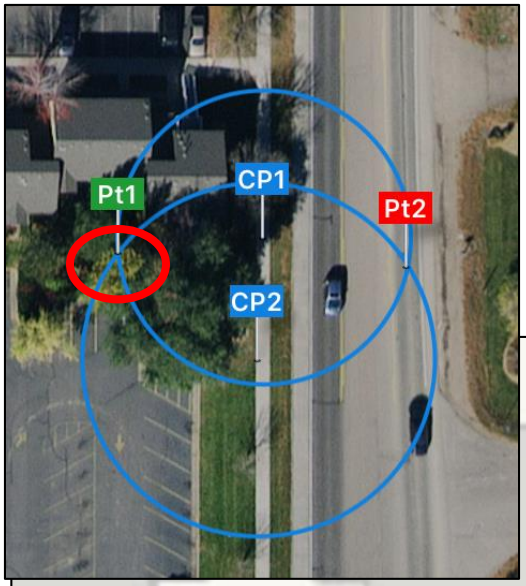


- OUT OF THE BOX OFFSET FUNCTIONALITY
- QUICKLY ACQUIRE POINTS
- BACKSIGHT / CHECK POINTS NOT REQUIRED

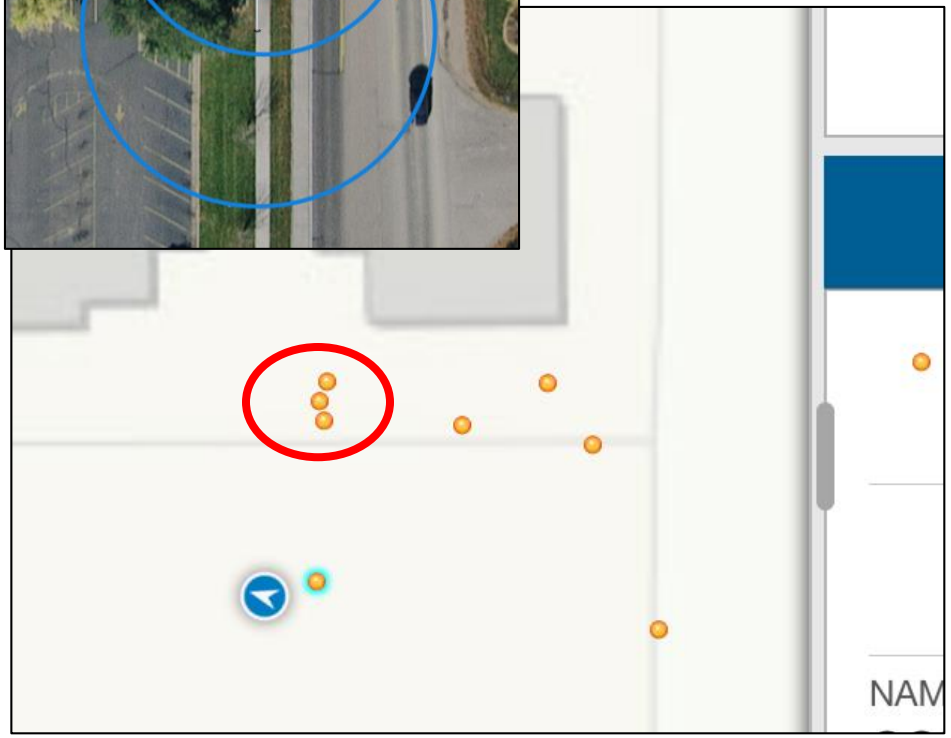
DESIGN DRAFTING SURVEYING

Eos Tools Pro





- IMMEDIATE DATA QC
- SAVE TIME
- ONE MAN OPERATION
- HIGHLY ACCURATE



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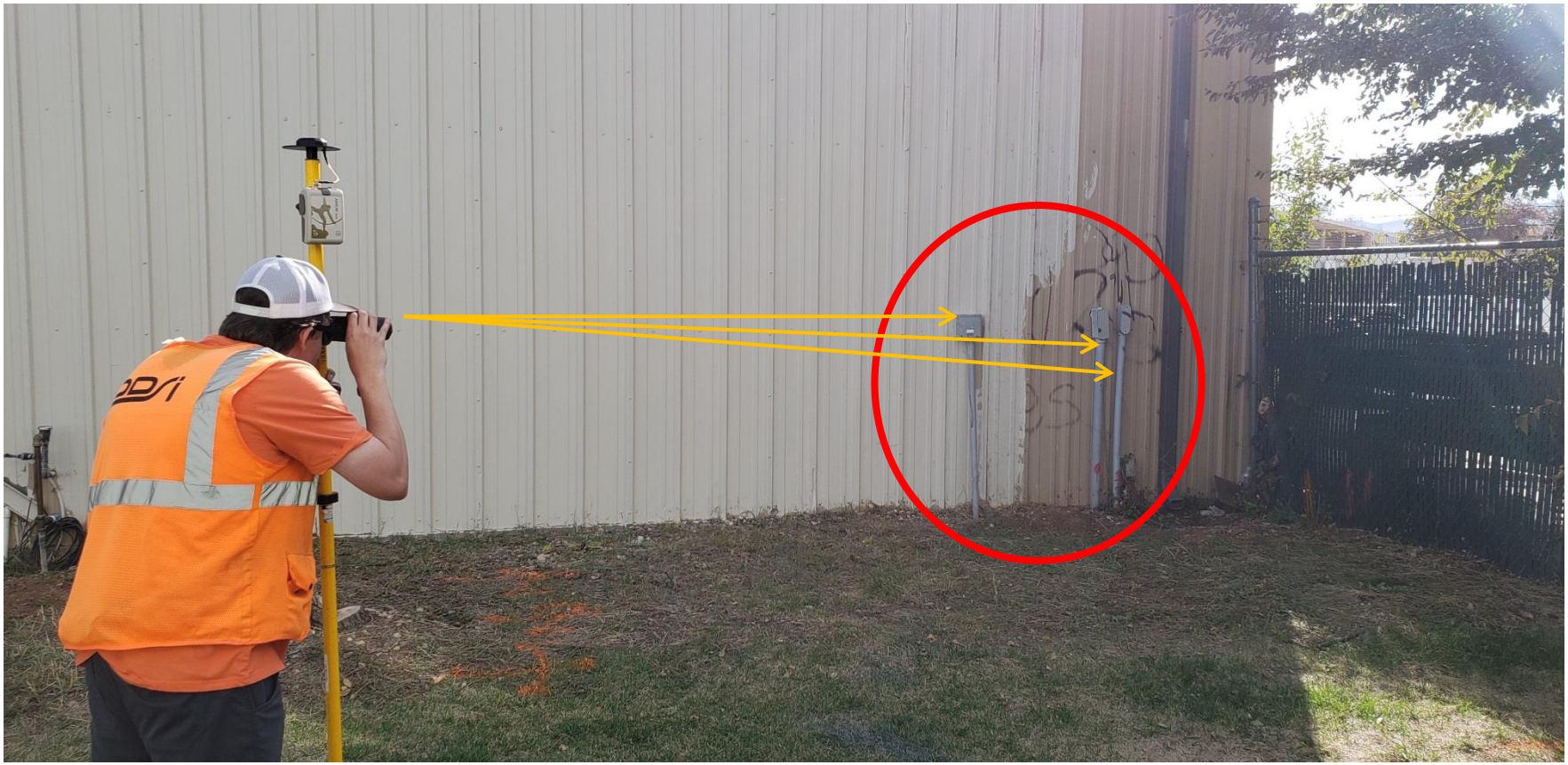
Utility Building Attachments

- GPS MULTIPATH ERRORS
- TAPING MEASUREMENTS OR TOTAL STATION
- OFFSET SAVES TIME
- ACCURACY PROVIDES USE ON ALL ASSETS



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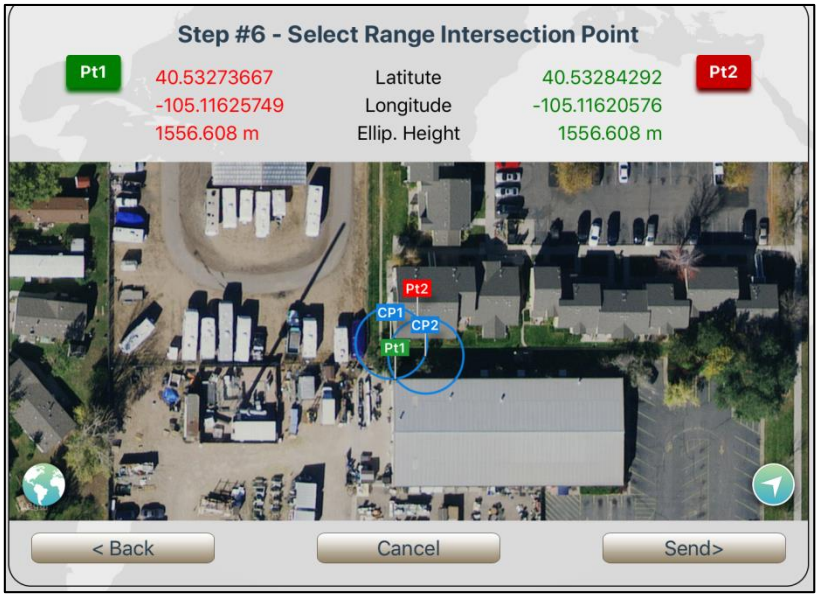
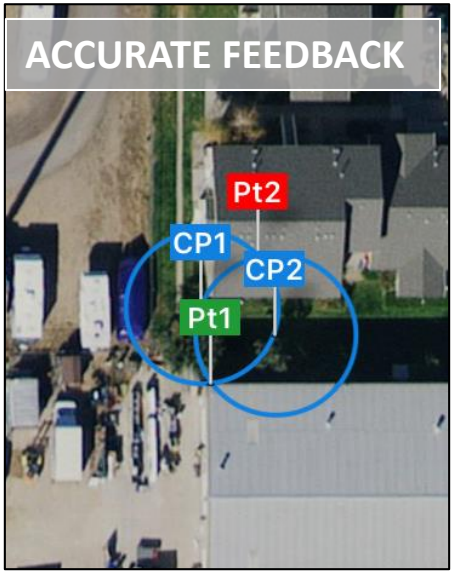
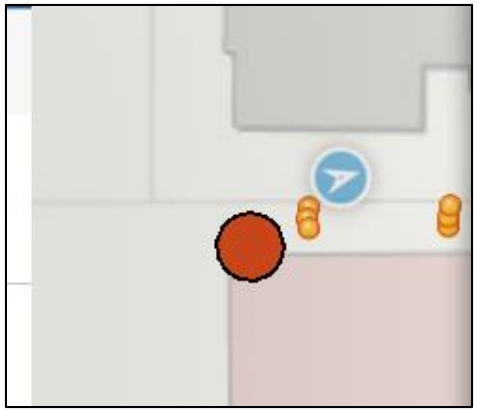
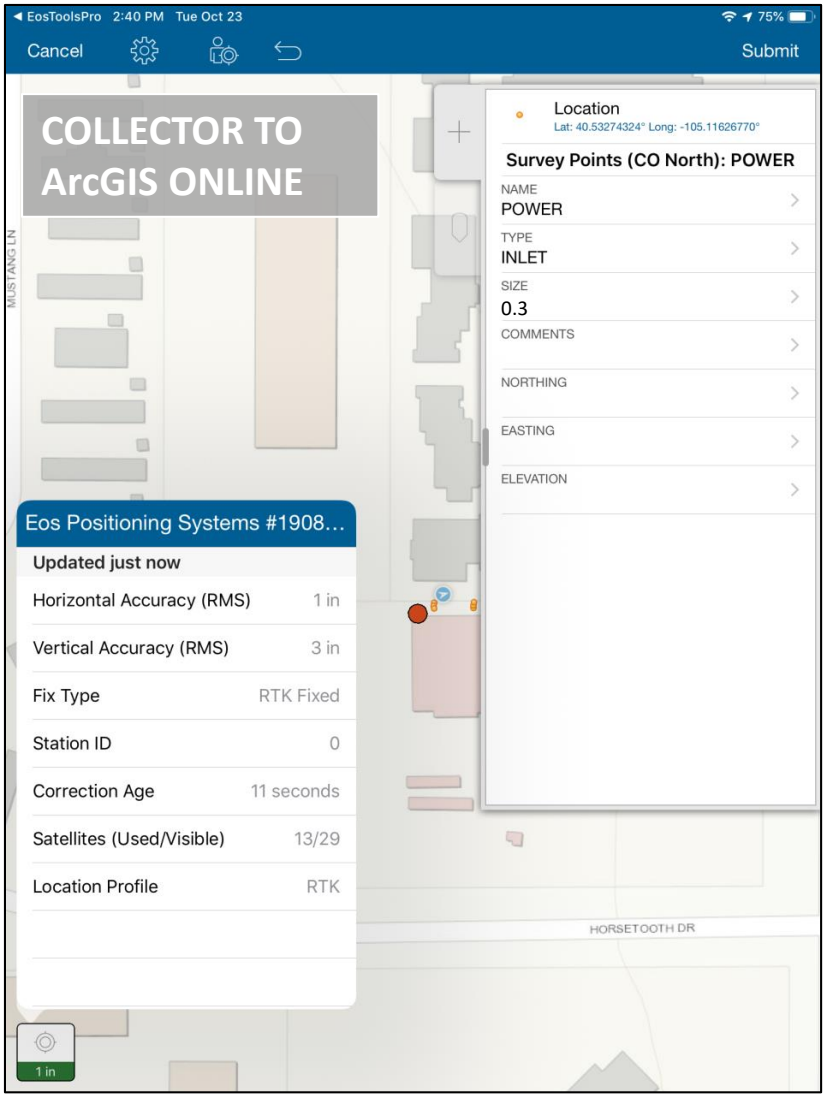
Utility Building Attachments









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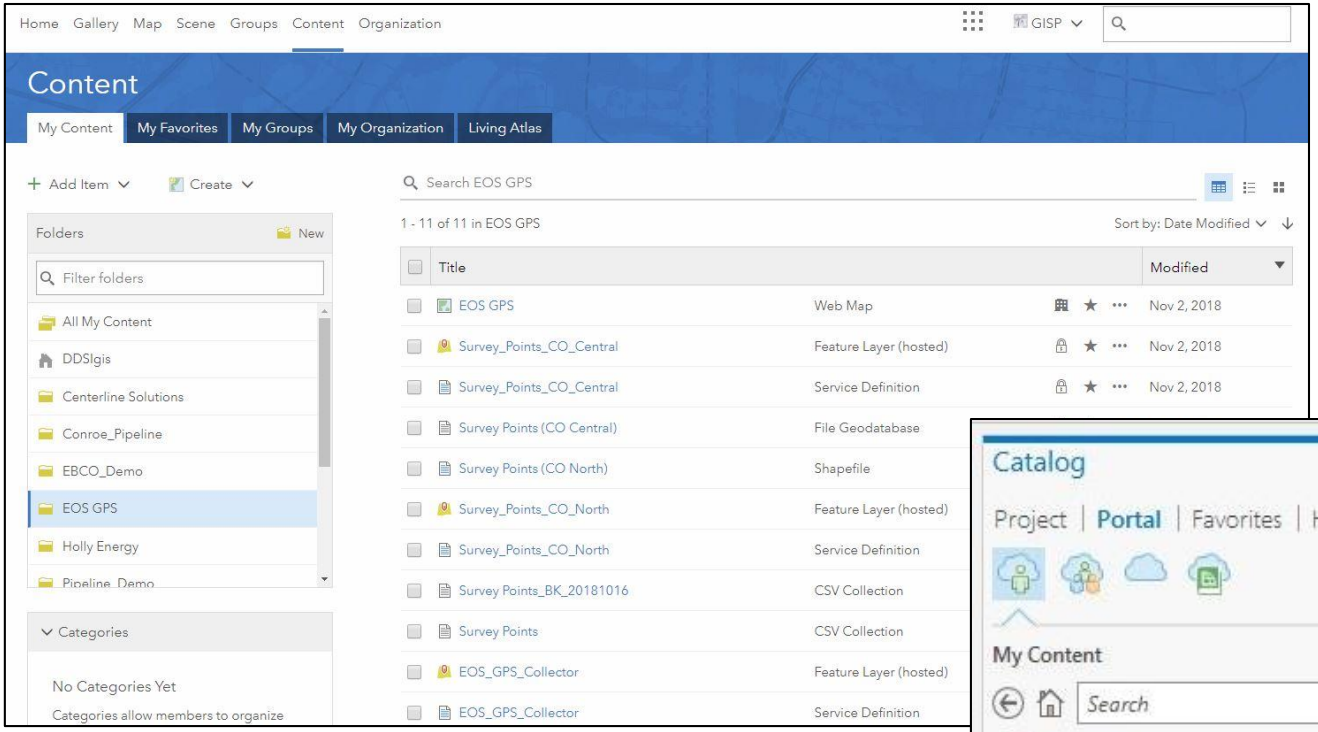
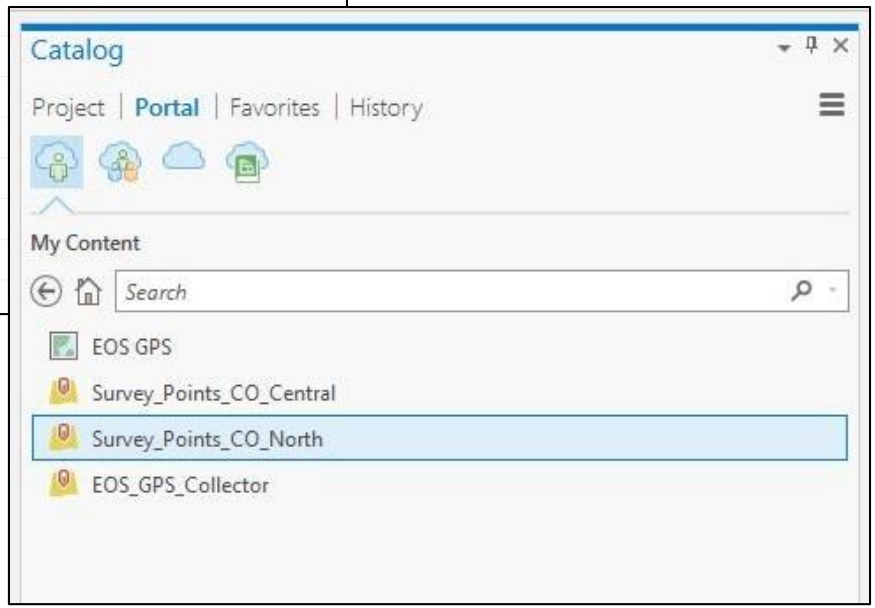
ArcGIS Online & Portal





- **DIRECTLY IMPORT TO PRO / ArcMAP**
- **ETL MULTIPLE DATA TYPES**
- **FGDB, SHAPEFILE, CSV, ACCESS .mdb**
- **BEGIN DRAFTING PROCESS WITH NO TRANSFORMATION**

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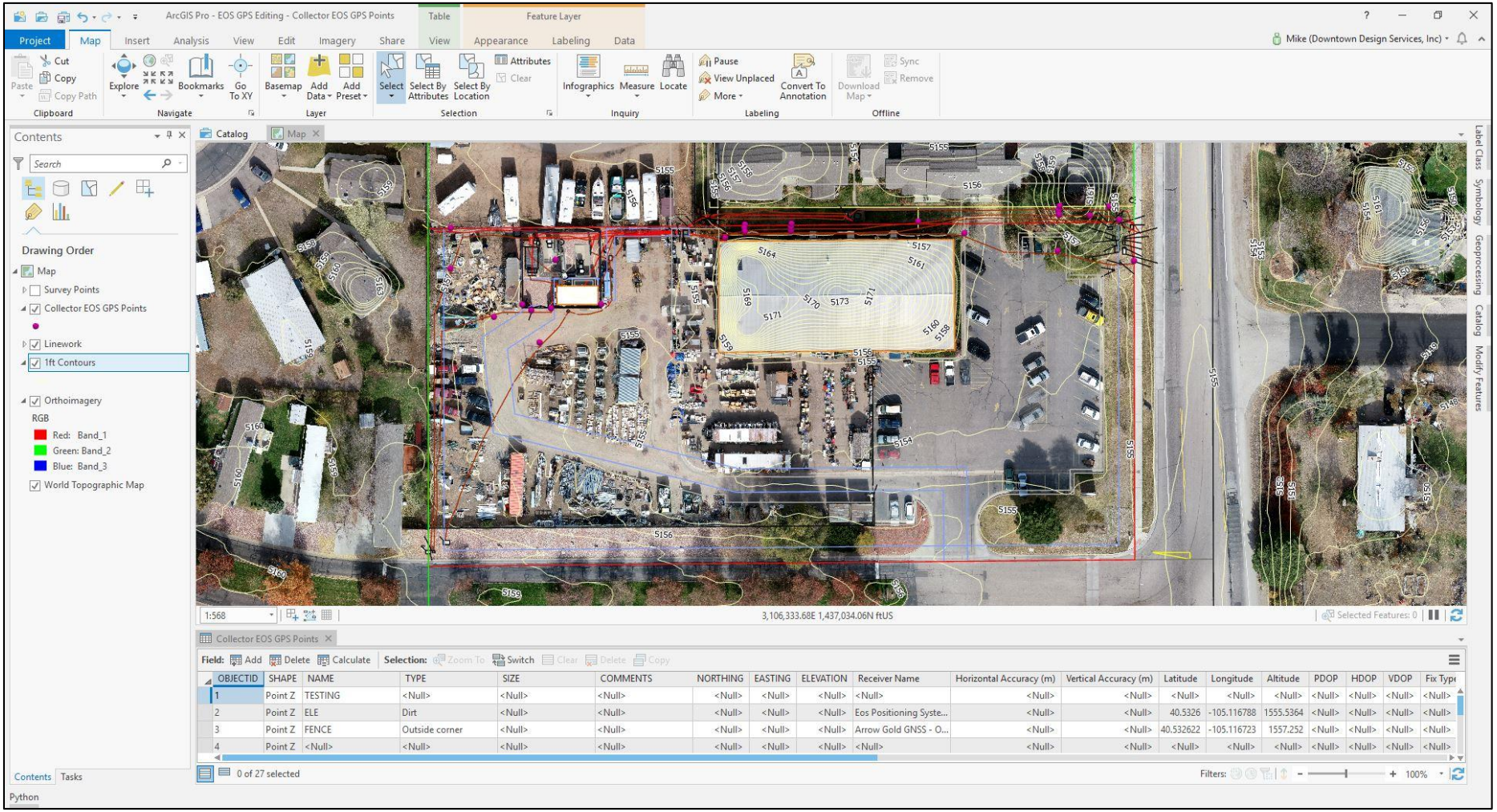
ArcGIS Pro Integration



ArcGIS Pro Integration

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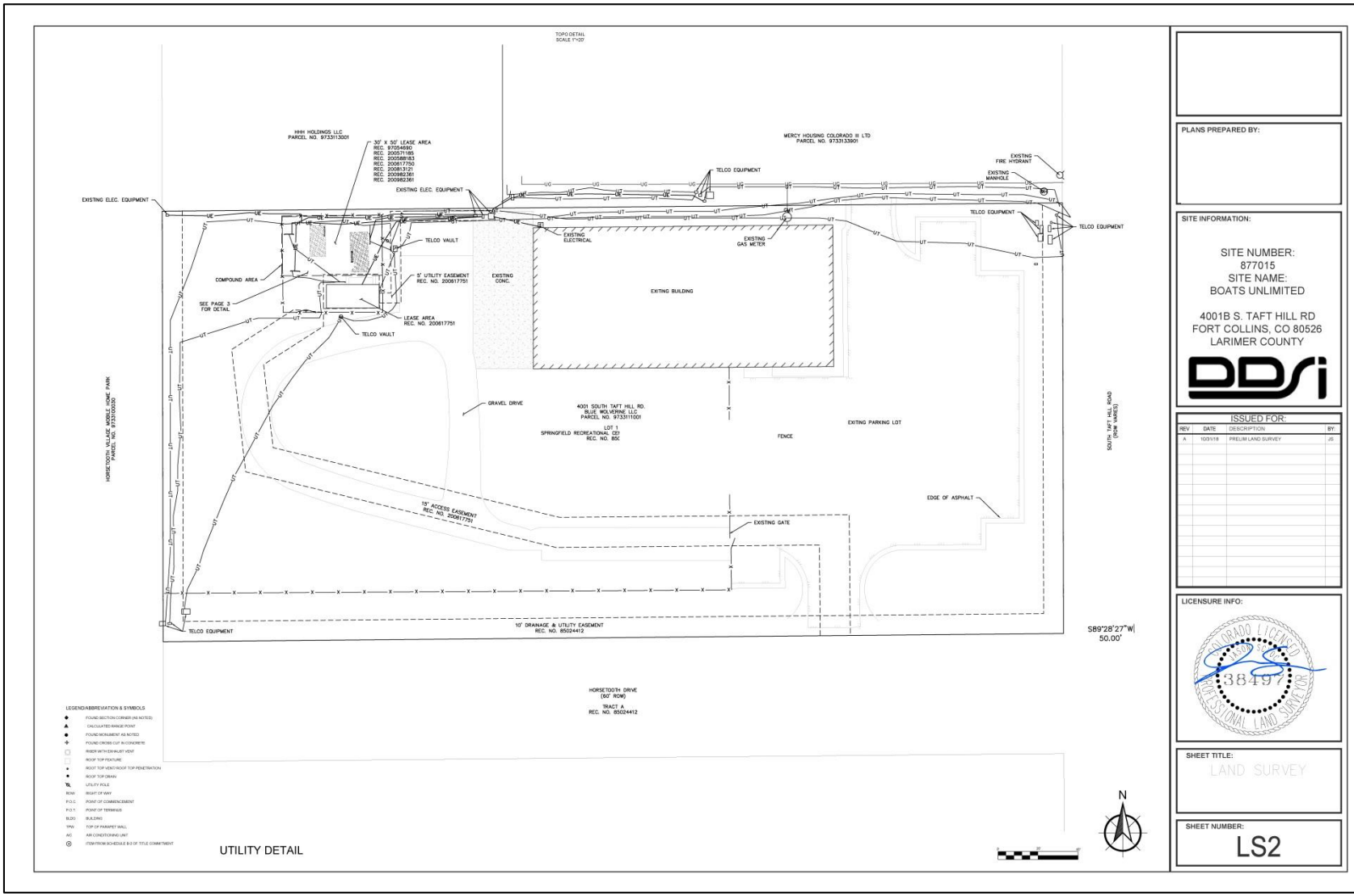
Deliverable – Site Drawing



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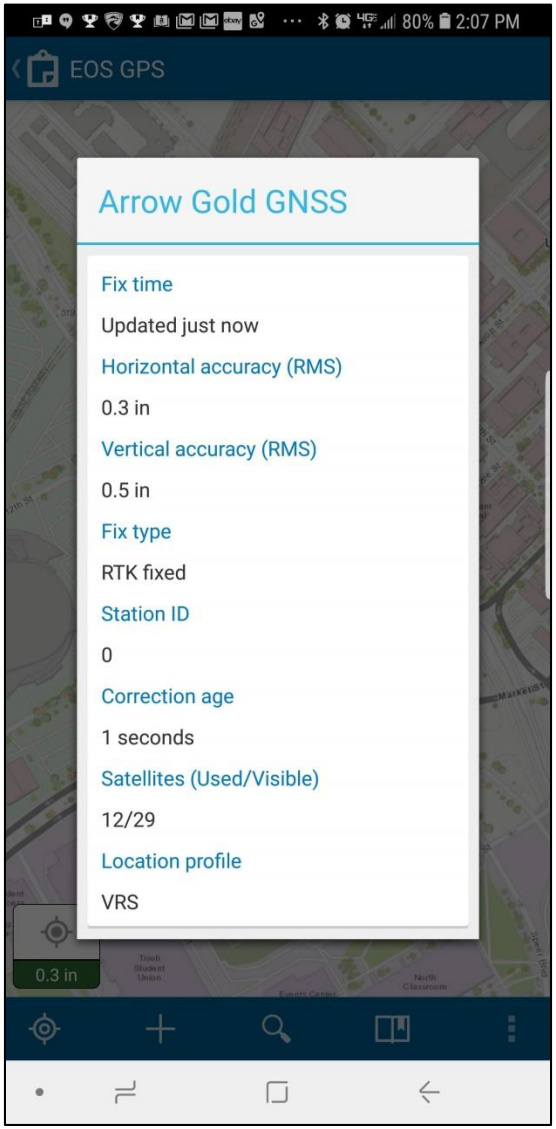
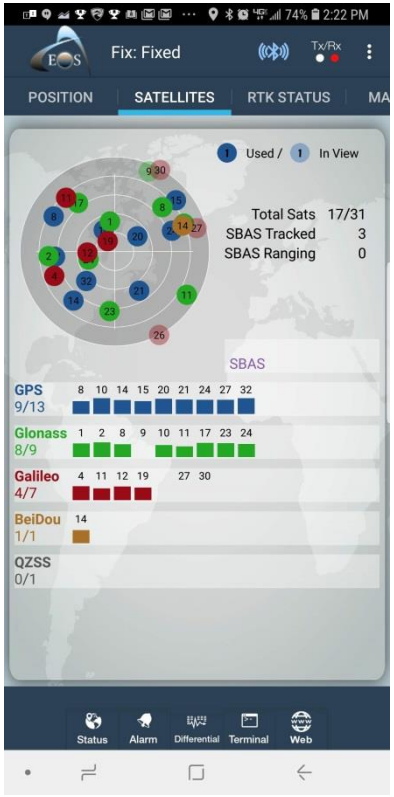
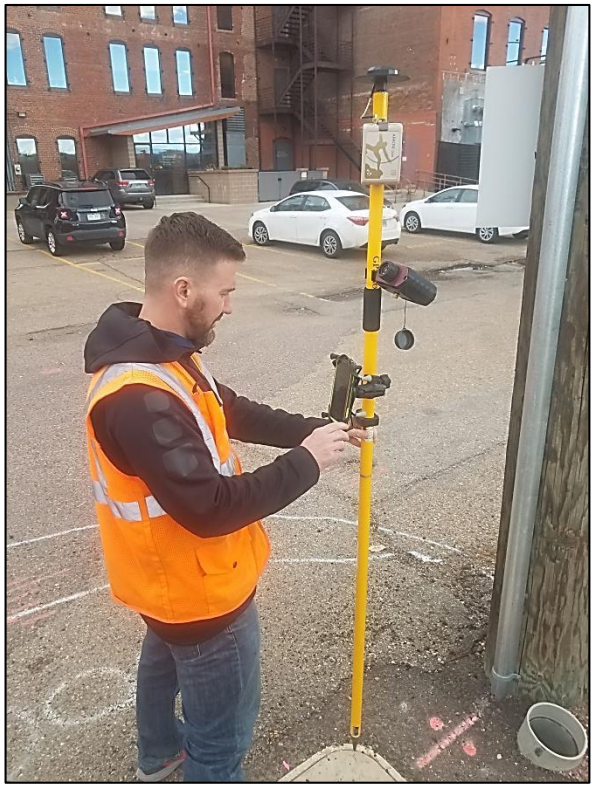
GNSS & Offset Metadata



- 30m FROM RTK BASE
- VIRTUAL REFERENCE STATION – OPENLY FACING
- Horizontal - 0.3in = 0.763cm
- Vertical – 0.5 = 1.27cm





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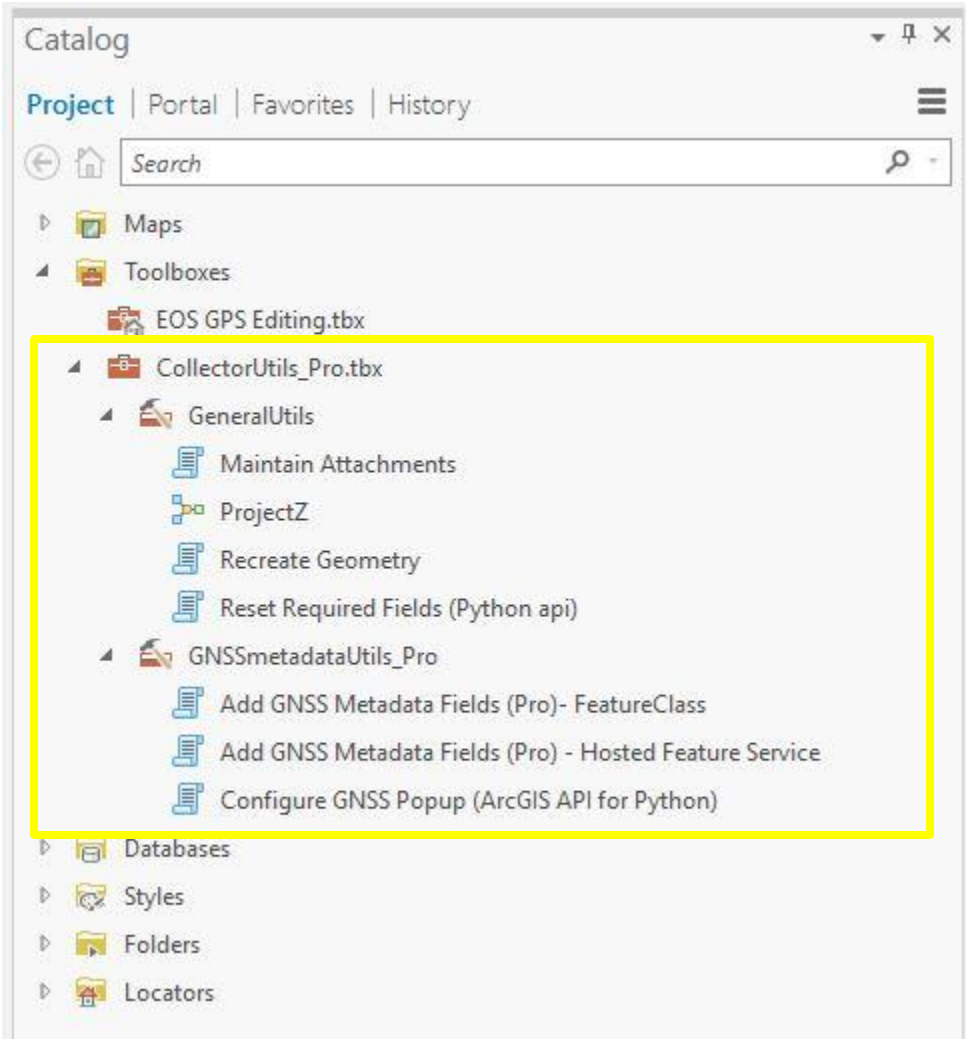
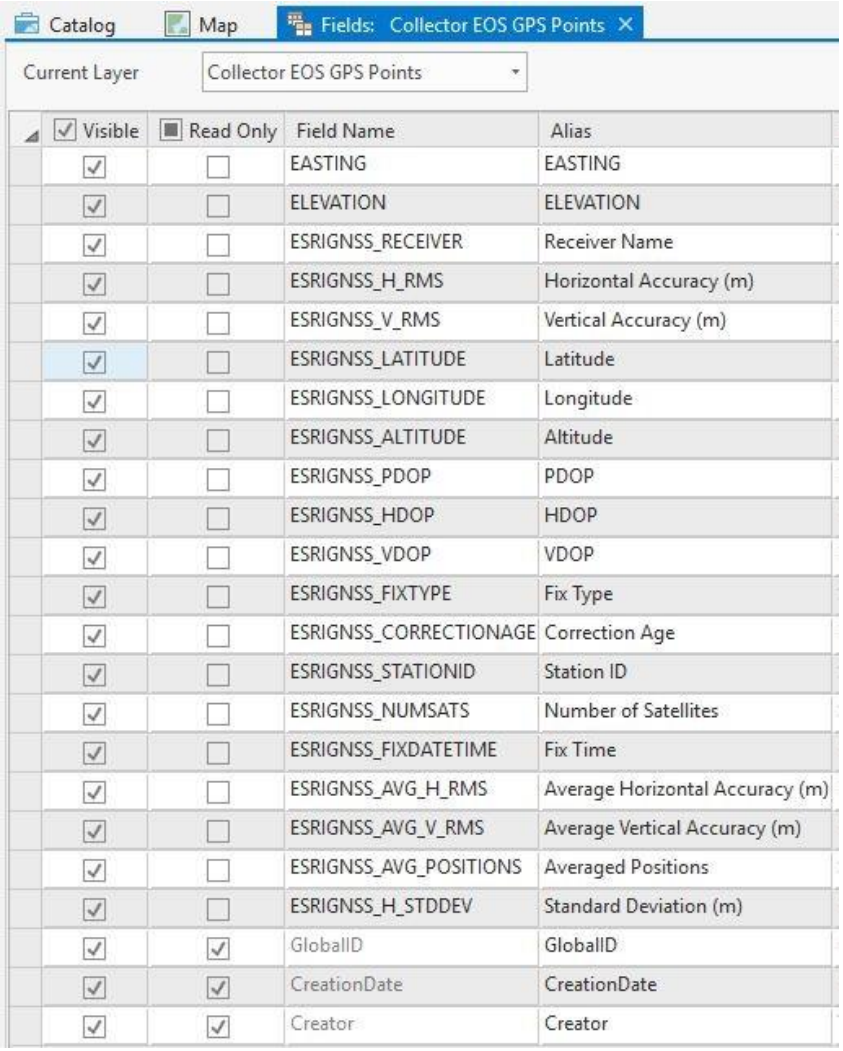
GNSS & Offset Metadata





Visible	Read Only	Field Name	Alias
☑	☐	EASTING	EASTING
☑	☐	ELEVATION	ELEVATION
☑	☐	ESRIGNSS_RECEIVER	Receiver Name
☑	☐	ESRIGNSS_H_RMS	Horizontal Accuracy (m)
☑	☐	ESRIGNSS_V_RMS	Vertical Accuracy (m)
☑	☐	ESRIGNSS_LATITUDE	Latitude
☑	☐	ESRIGNSS_LONGITUDE	Longitude
☑	☐	ESRIGNSS_ALTITUDE	Altitude
☑	☐	ESRIGNSS_PDOP	PDOP
☑	☐	ESRIGNSS_HDOP	HDOP
☑	☐	ESRIGNSS_VDOP	VDOP
☑	☐	ESRIGNSS_FIXTYPE	Fix Type
☑	☐	ESRIGNSS_CORRECTIONAGE	Correction Age
☑	☐	ESRIGNSS_STATIONID	Station ID
☑	☐	ESRIGNSS_NUMSATS	Number of Satellites
☑	☐	ESRIGNSS_FIXDATETIME	Fix Time
☑	☐	ESRIGNSS_AVG_H_RMS	Average Horizontal Accuracy (m)
☑	☐	ESRIGNSS_AVG_V_RMS	Average Vertical Accuracy (m)
☑	☐	ESRIGNSS_AVG_POSITIONS	Averaged Positions
☑	☐	ESRIGNSS_H_STDDEV	Standard Deviation (m)
☑	☑	GlobalID	GlobalID
☑	☑	CreationDate	CreationDate
☑	☑	Creator	Creator

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Technology Trends

RTK GNSS: Use your iPhone/iPad/Android for centimeter accuracy data collection. Inexpensive RTK.
Mobile Apps: Increased customization across all OS
Laser Rangefinder: Higher accuracy (mm range) indoors/outdoors
UAV: Better sensors on inexpensive UAVs (RGB cameras, lidar, thermal, NDVI, NIR, etc.)
GIS: Improved map sharing/web mapping

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Recap

- Tight budgets require little room for error
- Don’t know what tools will be necessary until onsite
- Field challenges (urban corridor, dense vegetation, etc)
- BYOD & Apps to problem solve on the fly
- RTK Laser Mapping acquiring high accurate points
- Final deliverable on time

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