

Simple Technology Tools to Aid in More Effective Landfill Operations

Mississippi SWANA

Spring 2021

Jeffrey J. Breedlove, PE

- Consulting Civil Engineer
- BSCE Mississippi State University
- Practicing in Solid Waste industry since 1995
- Worked on 87 landfills in 13 states
- Worked on 16 of 19 permitted MSW landfills in Mississippi



Simple Technology Tools

- On-line Meeting, Video Conferencing
- GPS
- Google Earth
- Avenza Maps
- Spreadsheet/Excel
- Planimeter (paths, areas)
- Clinometer (slopes)
- Image Meter
- Smart Distance
- Smart Measure (Distance and Height)
- Drone

GPS. Just Do It!

- Landfill Operations
- Refuse Truck Tracking/Route Optimization
- Require for Contractors

[The Role of GPS in the Modern Landfill - Waste Advantage Magazine](#)



Video Conferencing

- Zoom
- MS Teams
- Join.me - annotation



The world's most detailed globe

Launch Earth





Matt Rd

Dixon Rd

Oketenokee Pkwy

Willie Dixon Rd

23

© 2021 Google

Google Earth

1668 ft

1985



Timeline slider showing dates from 1985 to 2019, with a marker at 2/1993.

02/1993



Mat Rd

Effie Ln

Dixon Rd

Okefenokee Pkwy

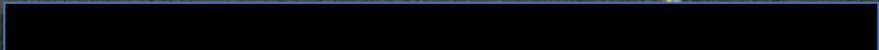
23

Willie Dixon Rd

Image U.S. Geological Survey

Google Earth

1668 ft





4/2016

04/2016

Matt Rd

Effel Ln

Dixon Rd

Oketenkoer Pkwy

23

Willie Dixon Rd

Image USDA Farm Service Agency

Google Earth

1668 ft





10/2016

10/2016



Image © 2021 Maxar Technologies

Google Earth

3/2017
1985 2018

03/2017

584 ft

Google Earth

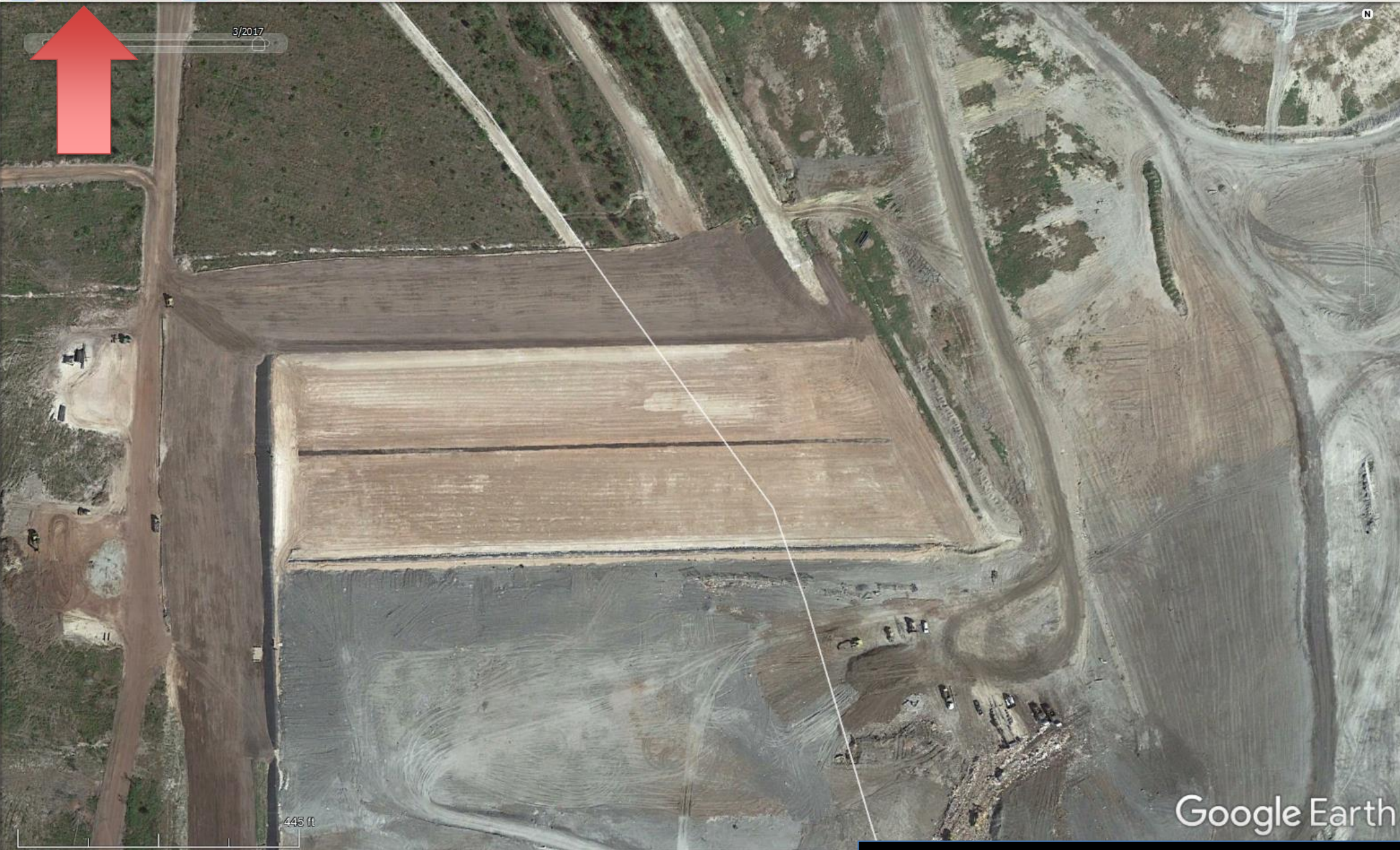
1985



3/2017



N



445 ft

Google Earth

1985

3/2017

N



7.61 acres

Google Earth - New Polygon

Name: Cell 5

Description	Style, Color	View	Altitude	Measurements
Perimeter:			2,719 Feet	
Area:			7.61 Acres	

OK Cancel

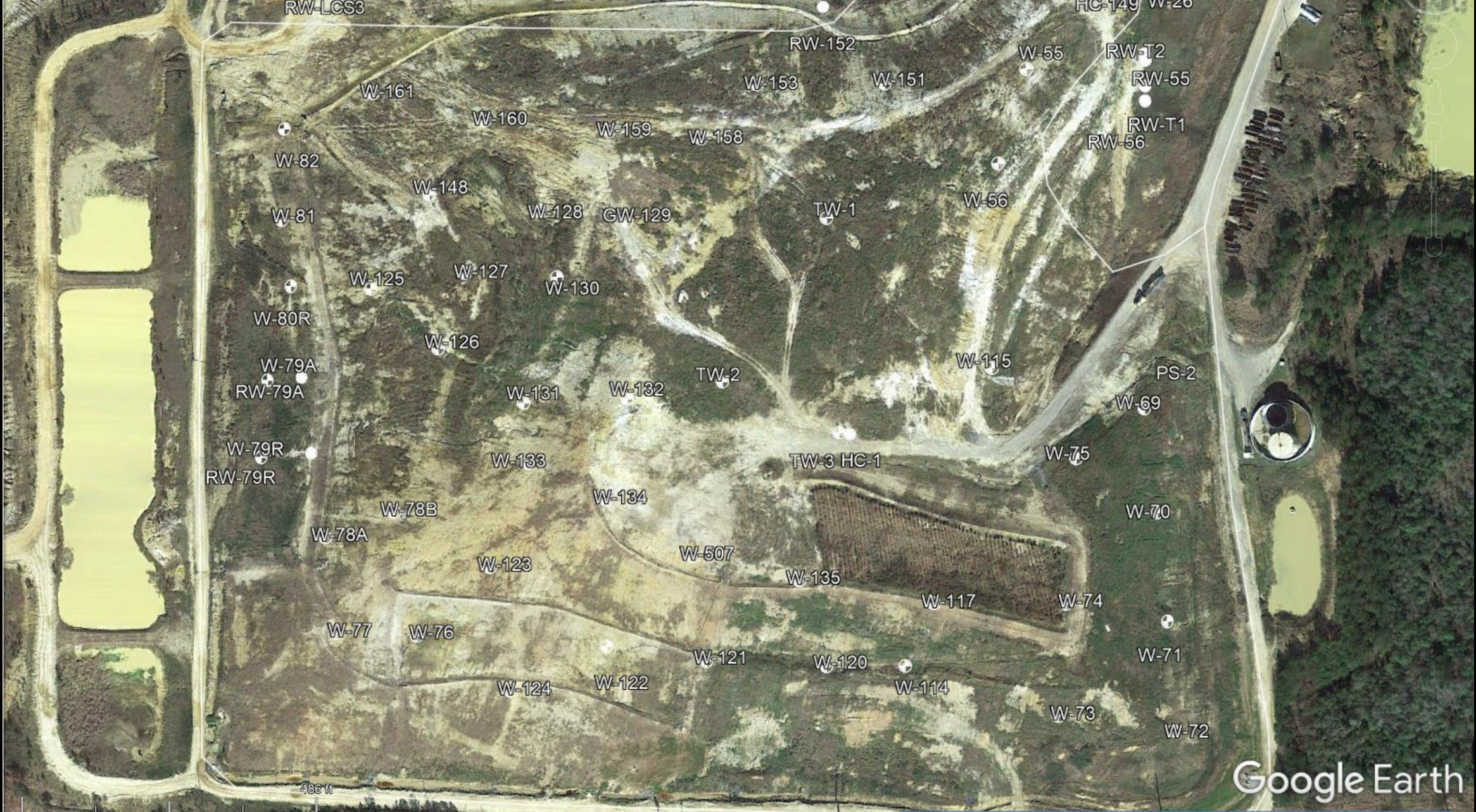
445 ft

Google Earth with KMZ/KML

- Overlay geo-referenced images
- Export CAD/AutoCAD designs to Google Earth
- Import Spreadsheet → KMZ (wells, points)
- Field Location with Design Overlay



3/2017
1985 2020

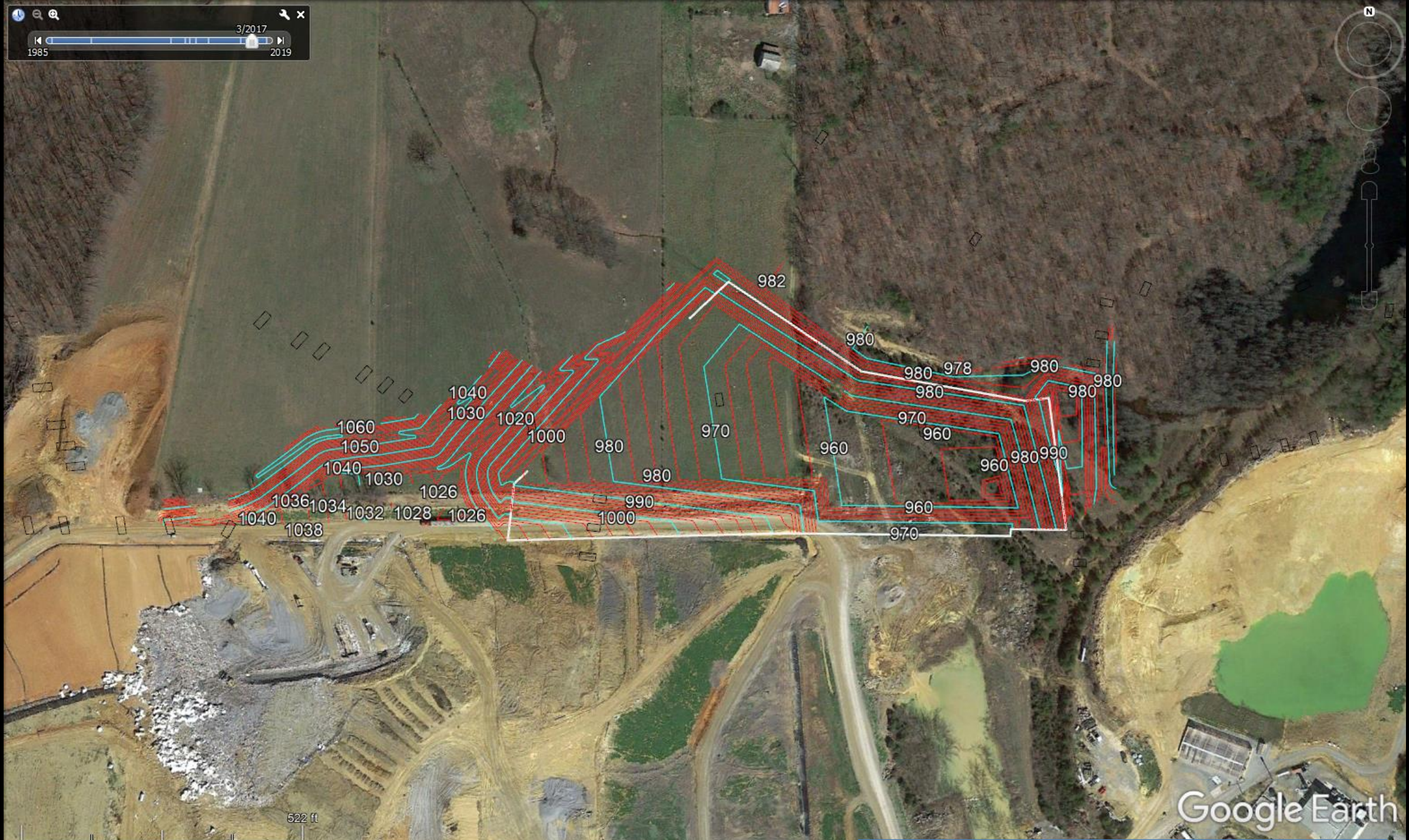


5/20/18
1985 2020



3/2017
1985 2019

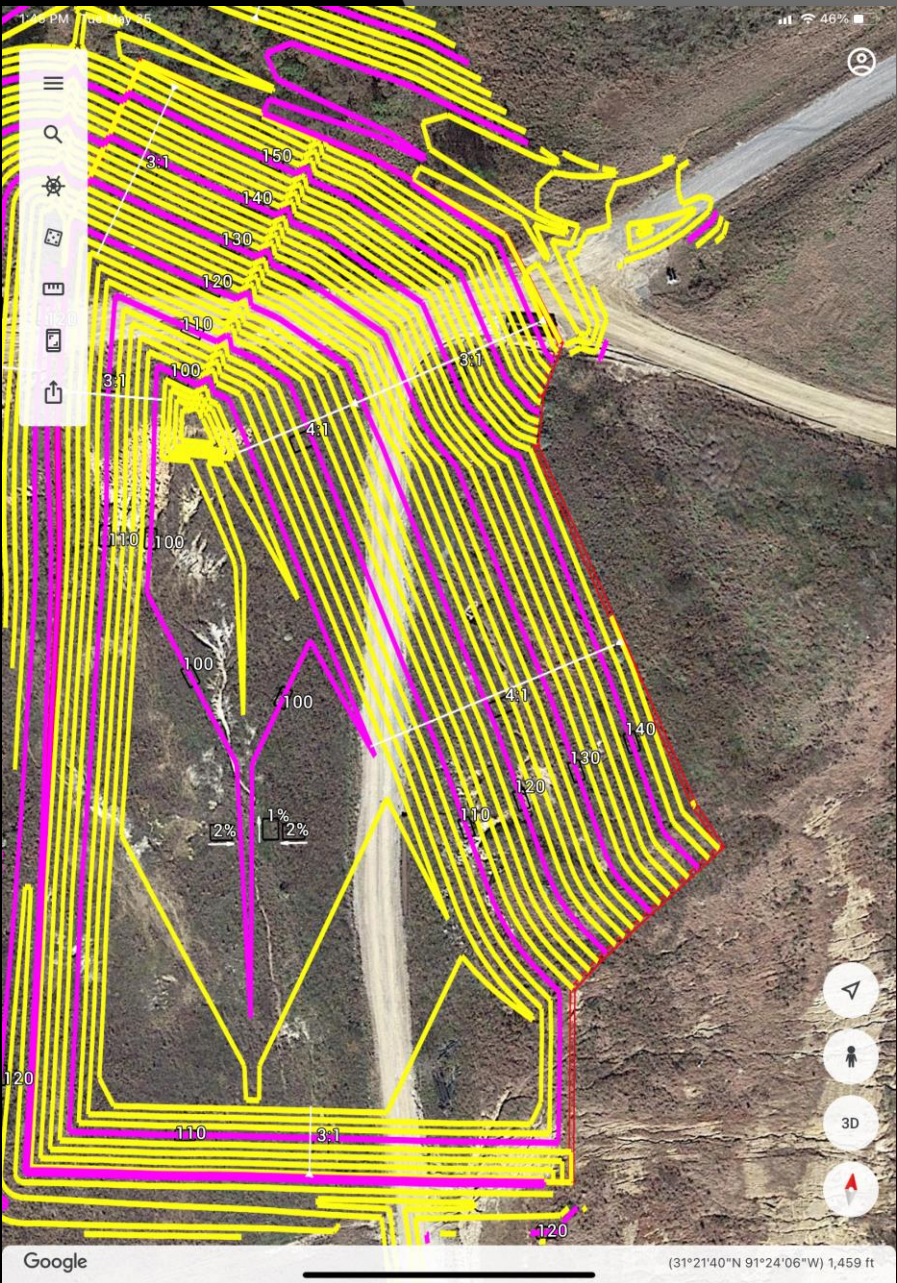
N



522 ft

Google Earth

1985



Google

(31°21'40"N 91°24'06"W) 1,459 ft

Avenza Maps



Avenza Maps: Offline Mapping 4+

GPS, Trails, Hiking, Offroad

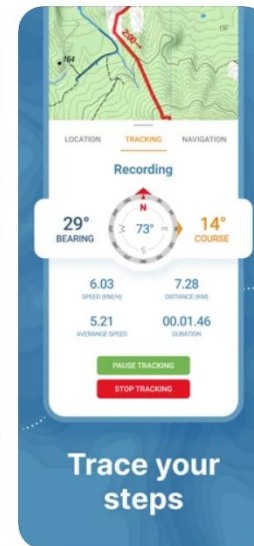
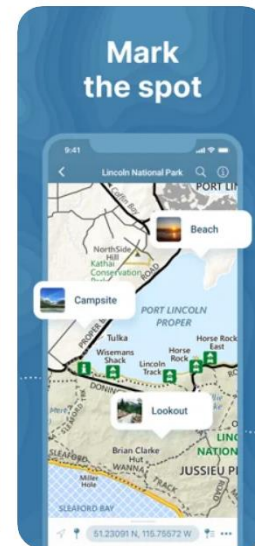
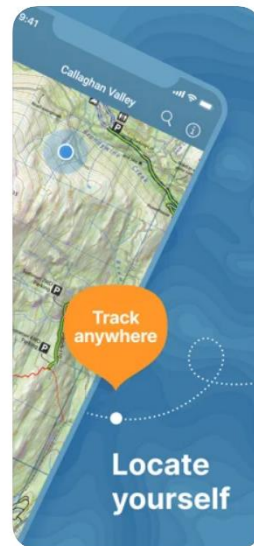
[Avenza Systems Inc.](#)

#20 in Navigation

★★★★★ 4.7 • 69.7K Ratings

Free · Offers In-App Purchases

Screenshots [iPhone](#) [iPad](#)





Get the app. Get the map.®

Engineering and Construction

Powerful Mobile Mapping Features



Works without a connection.

Avenza Maps™ works 100% offline. Locate yourself using only GPS. Collect data in remote areas without needing to rely on a network connection.



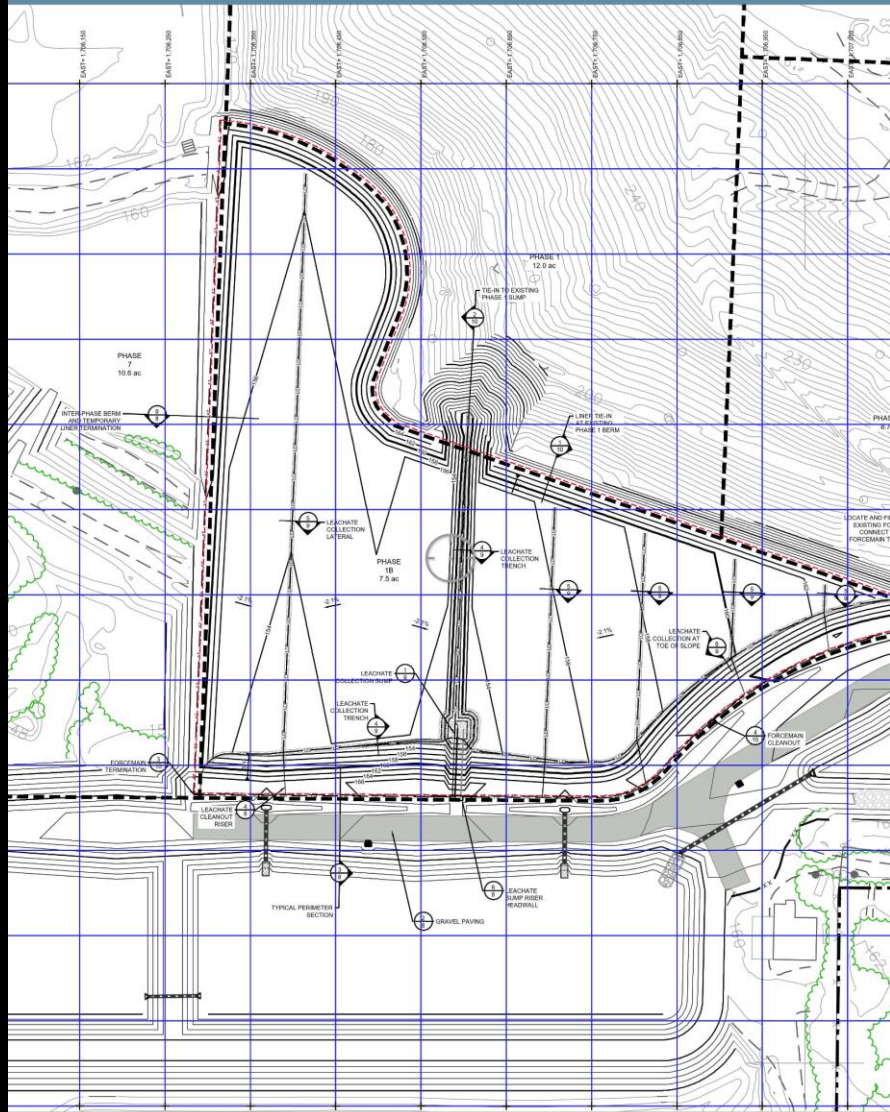
Import custom maps.

Use your own custom maps created with your own GIS data. You can import maps in many formats including PDF, GeoTIFF and JPG.



Locate yourself and collect data

Collect data and organize into custom schemas when out in the field. Export and share data to your teams to provide the most up-to-date sources.



30.91762, -85.43560

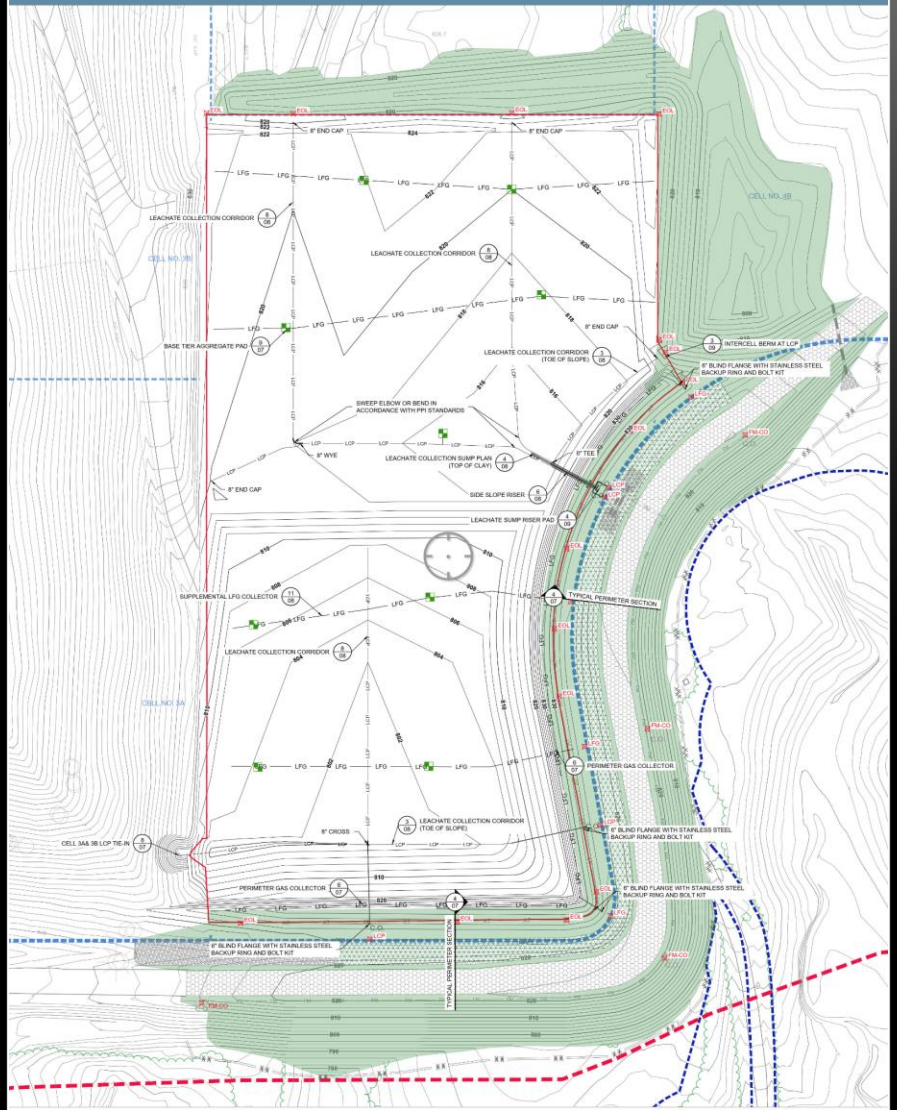




- Draw and Measure
- Record GPS Tracks
- Navigate to a Destination
- Find by Coordinates
- PRO** Plot GPS Average
- Monitor Geofences
- Open View In Google Maps
- Plot Photos

30.91762, -85.43560





Spreadsheets Baby!

- Asbestos Tracking Log
- Test Location/Tracking
- Seeps/Mitigation Tracking
- Compliance Logs



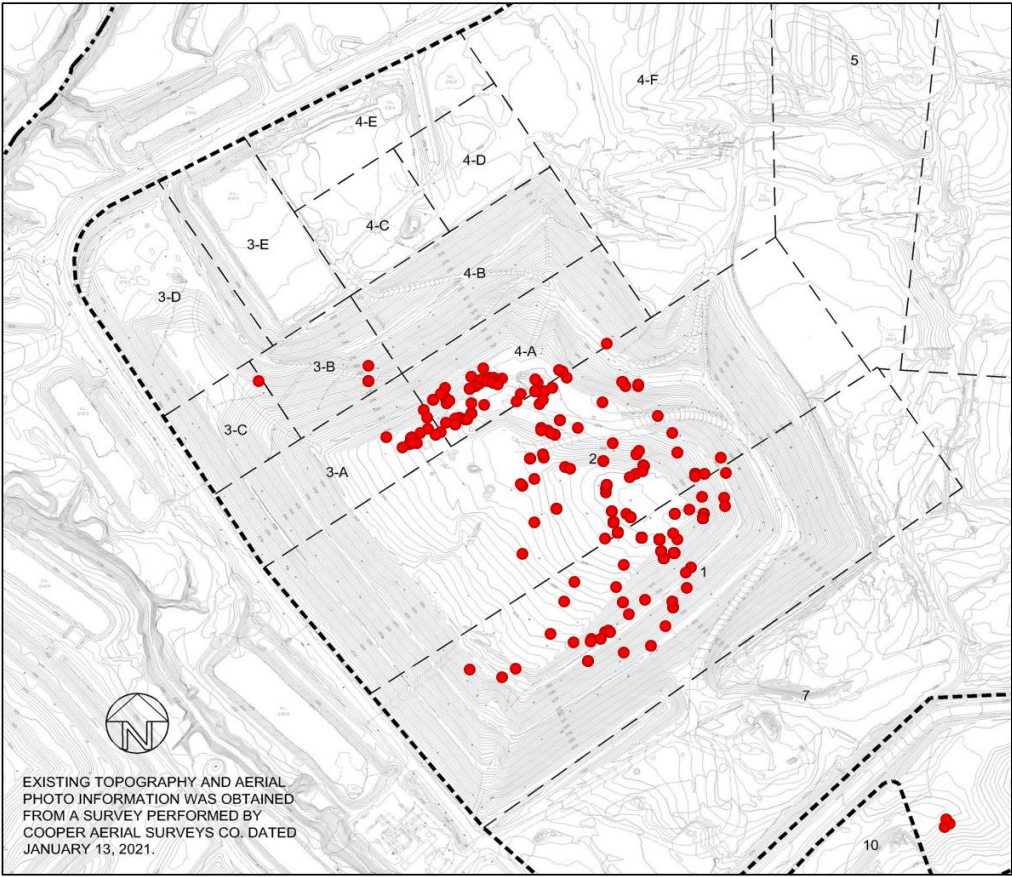
Asbestos Tracking Log

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	Asbestos Disposal Log													
2	Date	Customer Name	Manifest Number	Volume	Unit (Tons/CY/Drums)	Latitude (NAD83)			Longitude (NAD83)			Approximate Elevation (ft. MSL)	Northing (ft)	Easting (ft)
3						Degrees	Minutes	Seconds	Degrees	Minutes	Seconds			
4														
5	1/31/2021					35	19.00	36.4700	89	56.00	50.2700		385,372	791,333
6	1/31/2021					35	19.6078		89	56.8378			385,372	791,333
7	1/31/2021					35.3268			89.94730				385,372	791,333
8	The rows above are examples to demonstrate that the user should enter the data exactly as it appears on their unit's display. The software will automatically convert the blank or "zero" values to decimal parts of a degree. Note that the calculated decimal values are the same for various inputs. By example, if your unit reads 36 19.7867, enter 36 in the degrees and 19.7867 in the minutes and leave the seconds blank.													
9	ENTER ACTUAL DATA FOR THE SITE BELOW													
10														
11	1/9/2017	TRADEBE	2859493	20	CY	35.0000	19.5400		89.0000	56.7080		335.0	384,935	791,961
12	1/25/2017	REGIONS	1612203A5	30	CY	35.0000	19.4870		89.0000	56.7370		320.0	384,619	791,804
13	1/25/2017	REGIONS	012517A	30	CY	35.0000	19.4870		89.0000	56.7970		320.0	384,631	791,506
14	1/27/2017	SPECIALITY ABATEMENT	5650-5651	8	CY	35.0000	19.6020		89.0000	56.7080		340.0	385,310	791,977
15	1/27/2017	GENERAL CONSTRUCTION	3205423	20	CY	35.0000	19.6020		89.0000	56.7080		340.0	385,310	791,977
16	1/27/2017	SPECIALITY ABATEMENT	1075652	8	CY	35.0000	19.6020		89.0000	56.7080		340.0	385,310	791,977
17	1/27/2017	SPECIALITY ABATEMENT	1075655	8	CY	35.0000	19.6020		89.0000	56.7080		340.0	385,310	791,977
18	1/27/2017	SPECIALITY ABATEMENT	10785654-3	8	CY	35.0000	19.6020		89.0000	56.7080		340.0	385,310	791,977
19	2/7/2017	GENERAL CONSTRUCTION	3205425	3	CY	35.0000	19.6000		89.0000	56.7080		340.0	385,298	791,976
20	2/13/2017	TRADEBE	2859489	30	CY	35.0000	19.6000		89.0000	56.7540		340.0	385,307	791,748
21	4/5/2017	GENERAL CONSTRUCTION	3205409	3	CY	35.0000	19.4750		89.0000	56.7850		328.0	384,556	791,563
22	4/17/2017	TOP QAULTY ROOFING	4172017A	3	CY	35.0000	19.4750		89.0000	56.7850		328.0	384,556	791,563
23	5/11/2017	TRADEBE	2859490	25	CY	35.0000	19.6130		89.0000	56.6890		344.0	385,373	792,074
24	6/5/2017	GENERAL CONSTRUCTION	2698212	20	CY	35.0000	19.6020		89.0000	56.7010		345.0	385,309	792,011
25	6/20/2017	GENERAL CONSTRUCTION	3205415	20	CY	35.0000	19.4680		89.0000	56.8410		355.0	384,525	791,283
26	7/11/2017	TRADEBE	2769503	25	CY	35.0000	19.4900		89.0000	56.7830		335.0	384,647	791,577
27	7/14/2017	AUSTIN INSTALLATION	2631274	24	CY	35.0000	19.5940		89.0000	56.8330		345.0	385,287	791,354
28	7/25/2017	SHELBY COUNTY SCHOOL	3888	40	CY	35.0000	19.4920		89.0000	56.8150		350.0	384,665	791,418
29	7/31/2017	MLGW	3213502	40	CY	35.0000	19.4880		89.0000	56.7840		340.0	384,635	791,571



Asbestos Tracking Log

Asbestos Locations



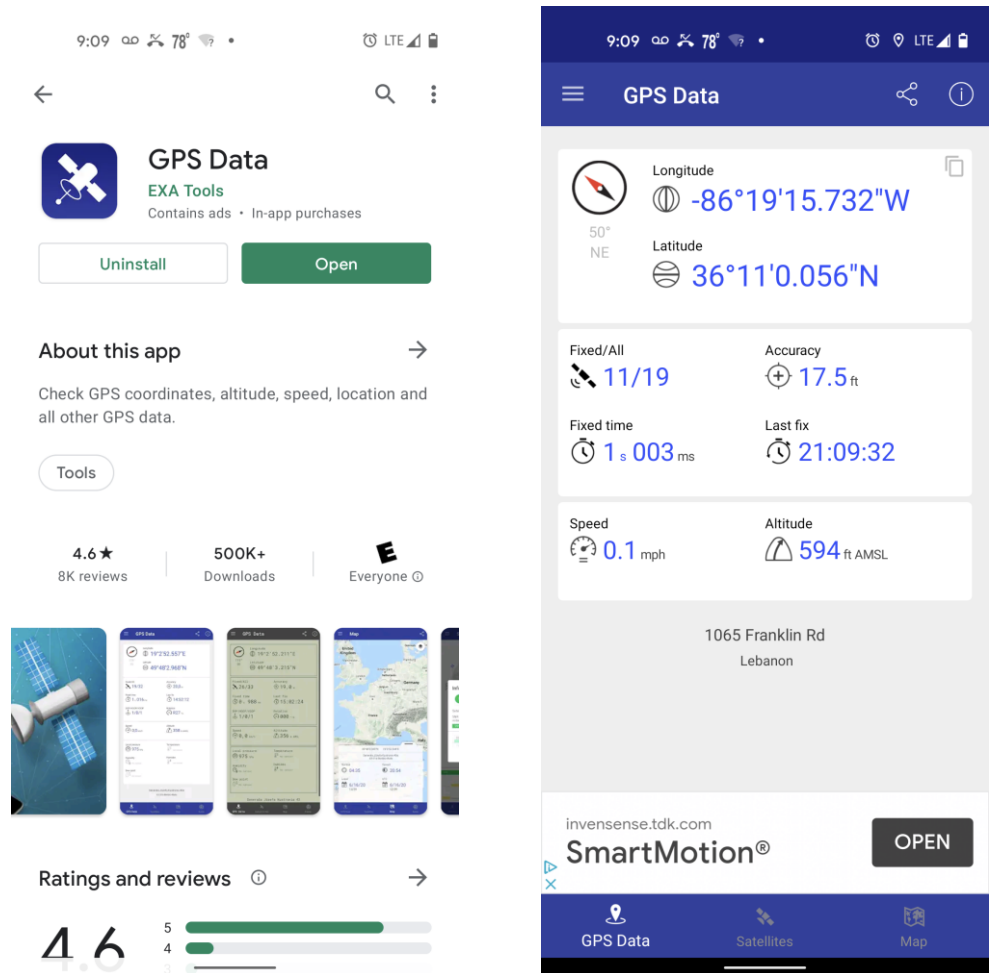
EXISTING TOPOGRAPHY AND AERIAL PHOTO INFORMATION WAS OBTAINED FROM A SURVEY PERFORMED BY COOPER AERIAL SURVEYS CO. DATED JANUARY 13, 2021.



● Approximate Locations (use surveyed coordinates to locate in the field)



GPS App – Know Your Location



Track

- Sampling/Monitoring Points
- Seeps, Discharges
- Gas Wells, Valves
- Asbestos Loads
- Problems



Planimeter — Measure Land Area 4+

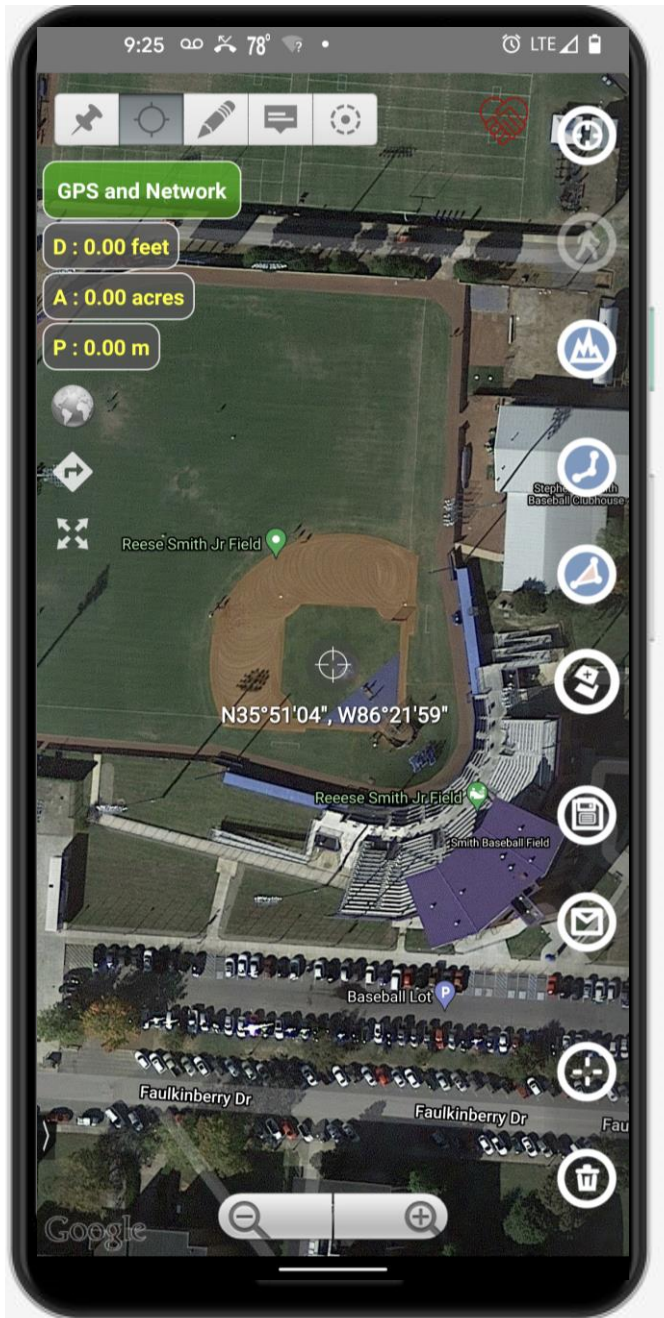
Measure map area and distance

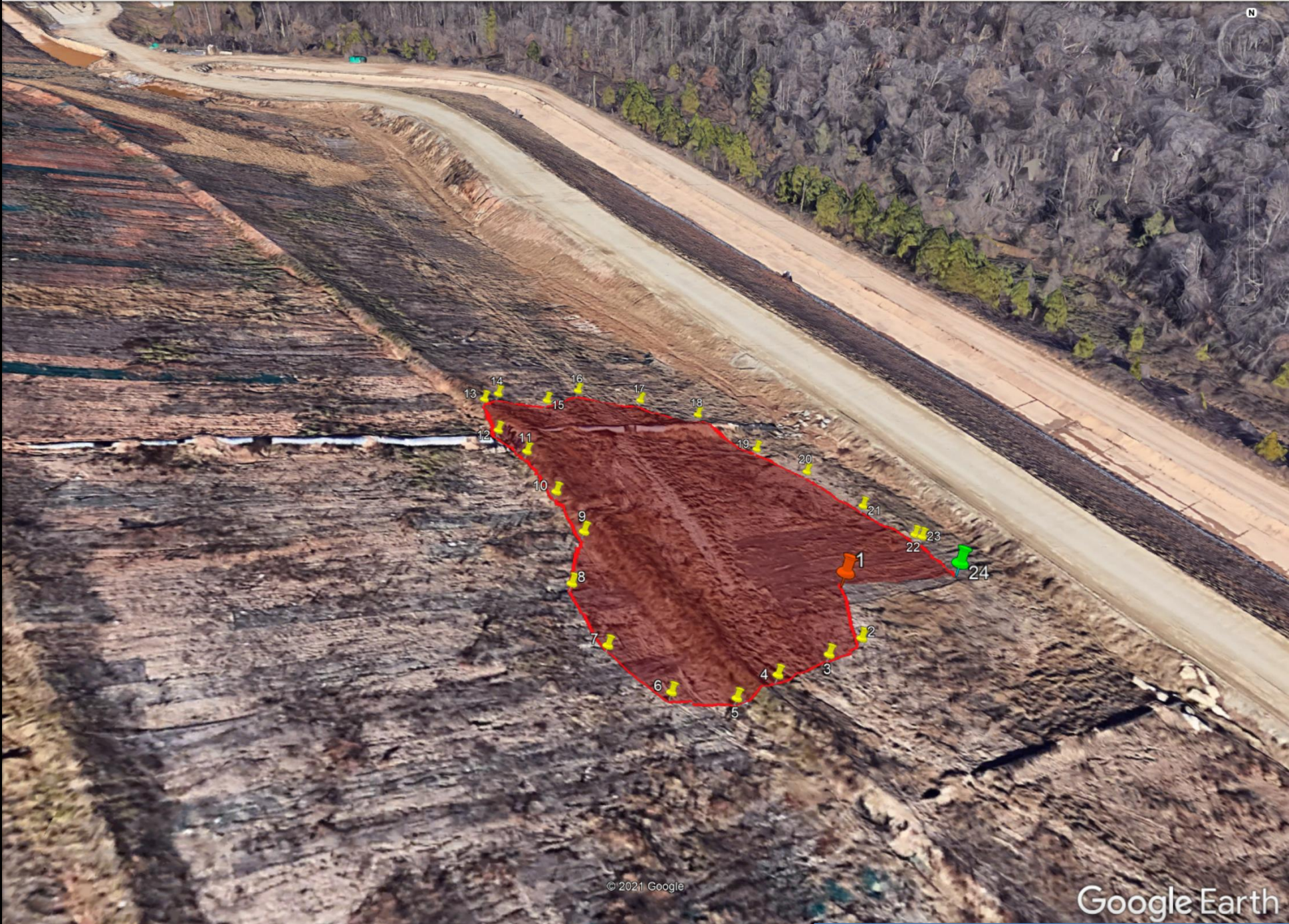
Core Signals

#17 in Productivity

★★★★★ 4.7 • 1.5K Ratings

\$7.99



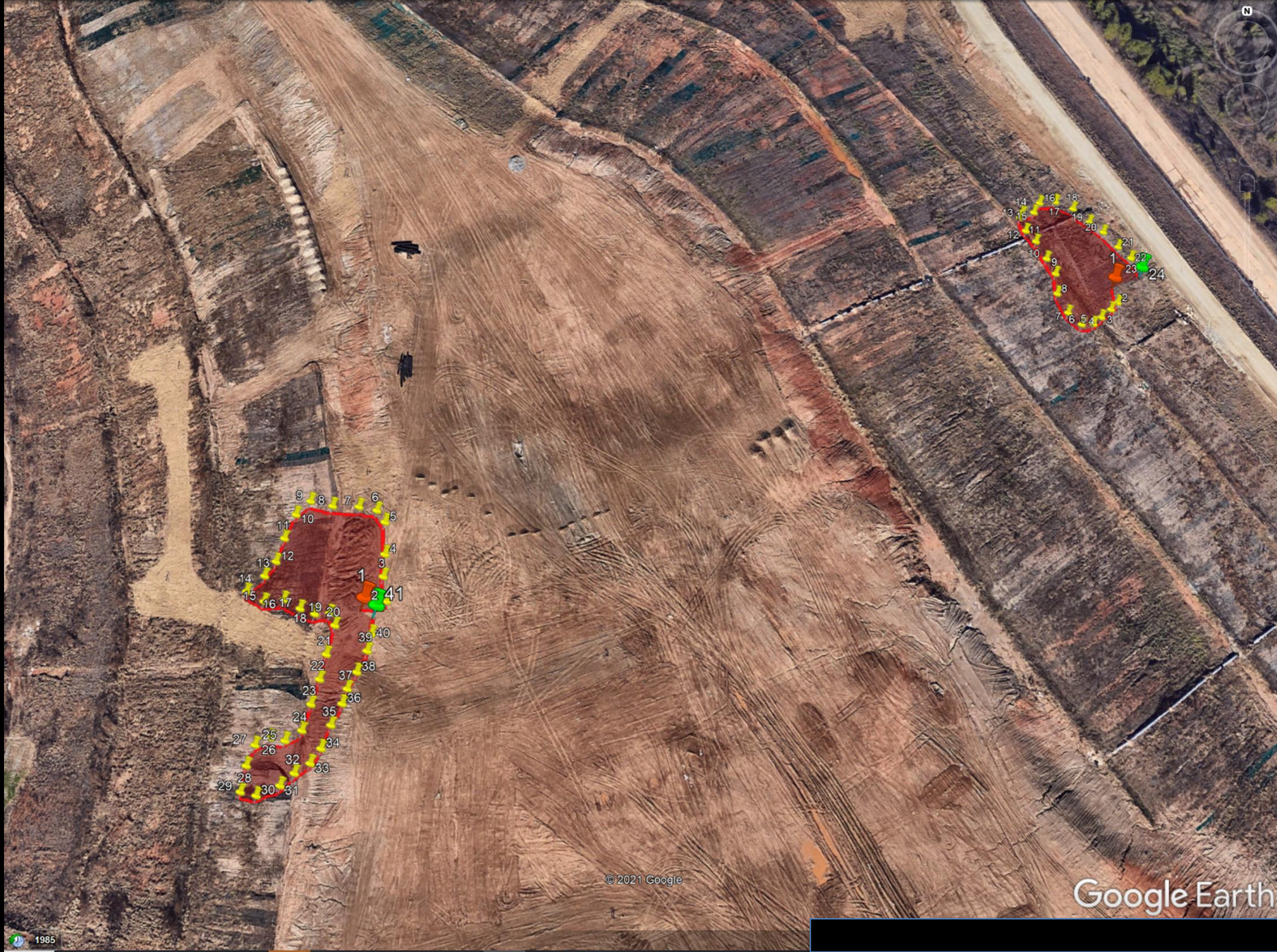


© 2021 Google

Google Earth

1985





© 2021 Google

Google Earth

1985



Clinometer + bubble level 4+

+ slope finder (3 in 1)

Peter Breitling

Designed for iPad

#35 in Utilities

★★★★★ 4.3 • 31 Ratings

\$1.99 · Offers In-App Purchases



H:1V

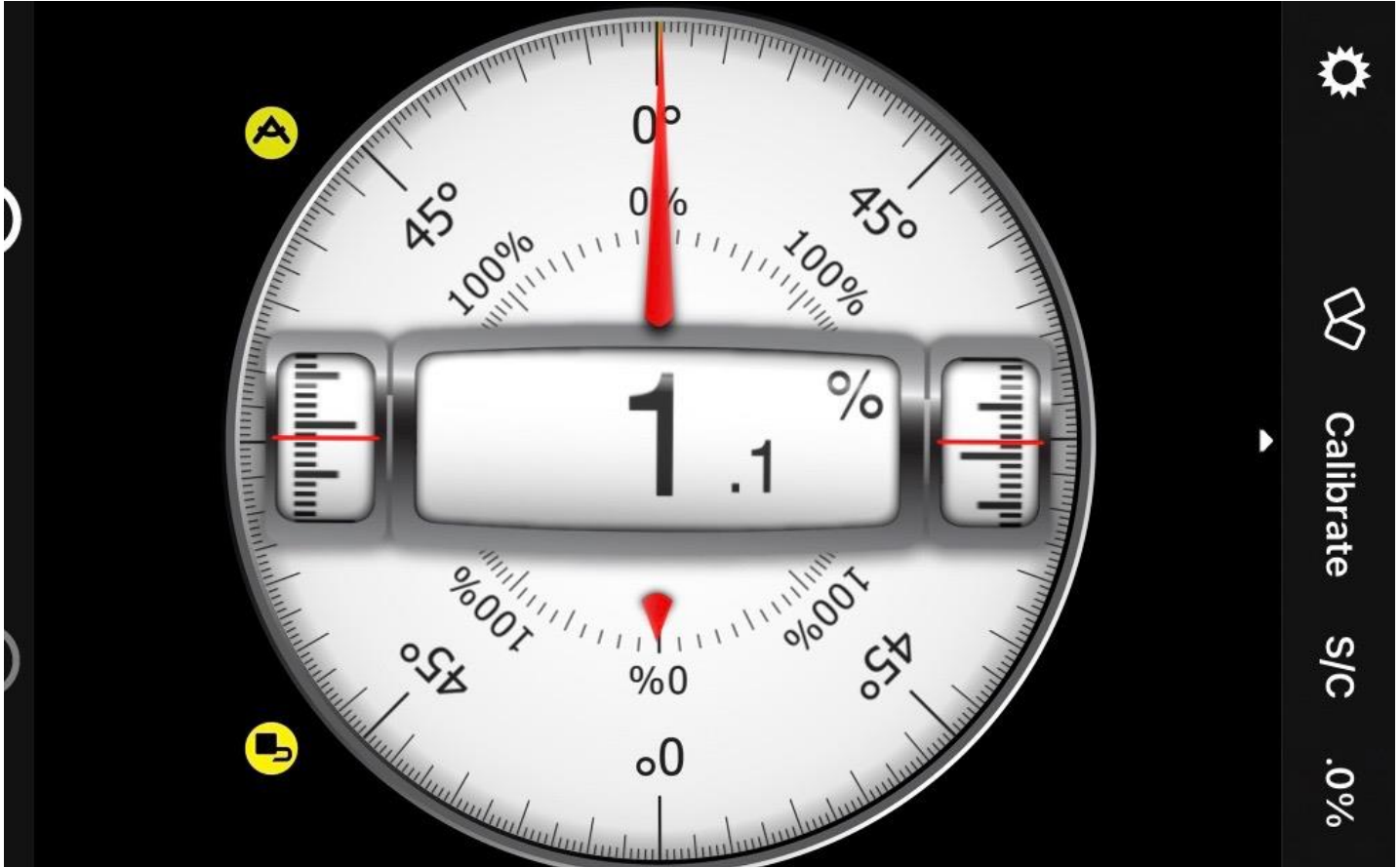
S/C



4:38

Clinometer









Smart Distance Pro

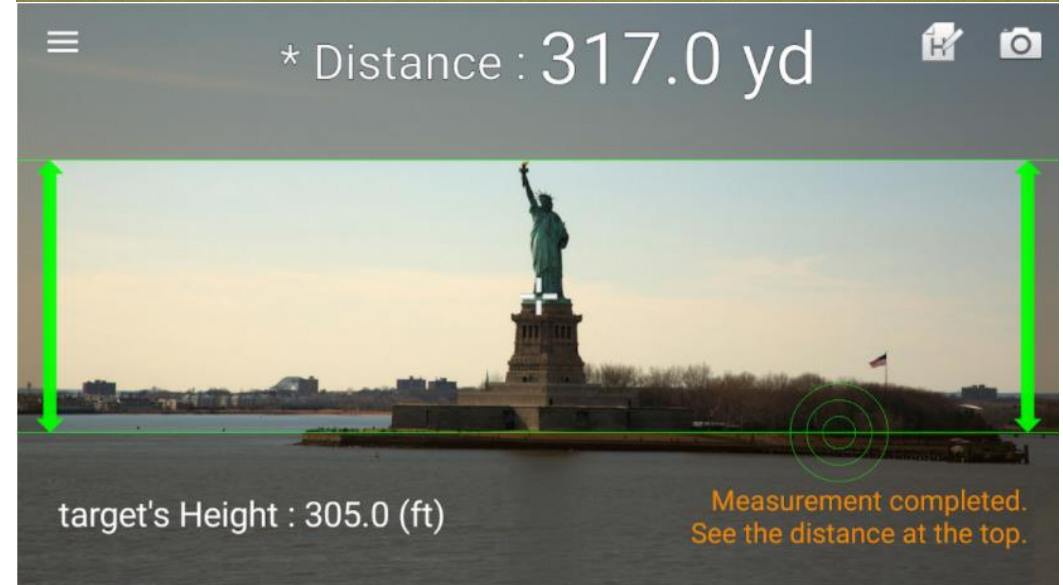
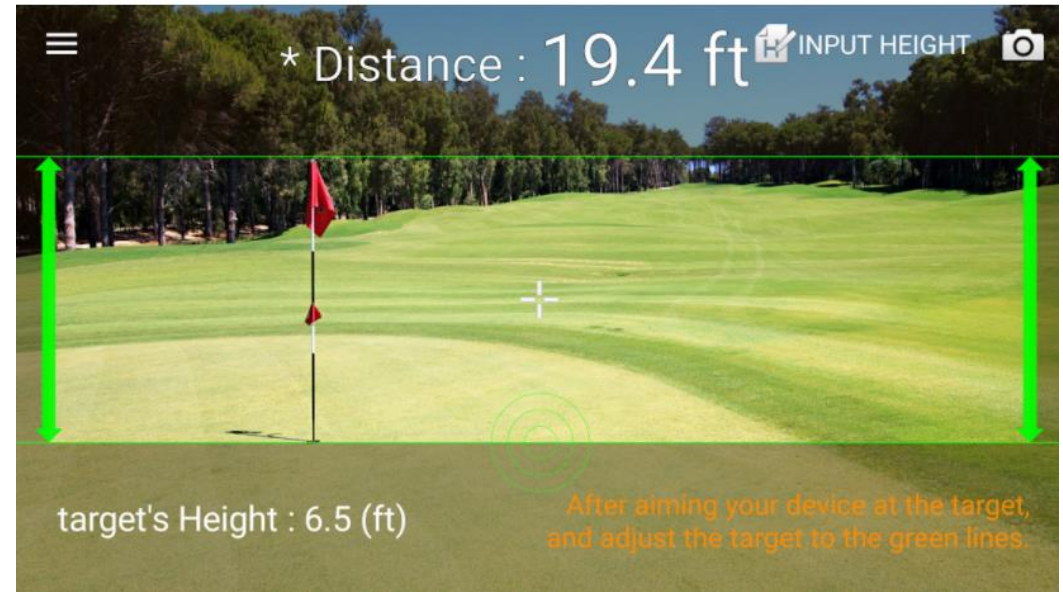
Smart Tools co. Tools

Everyone

Add to Wishlist

★★★★★ 509

\$1.50 Buy





Smart Measure

Smart Tools co. Tools

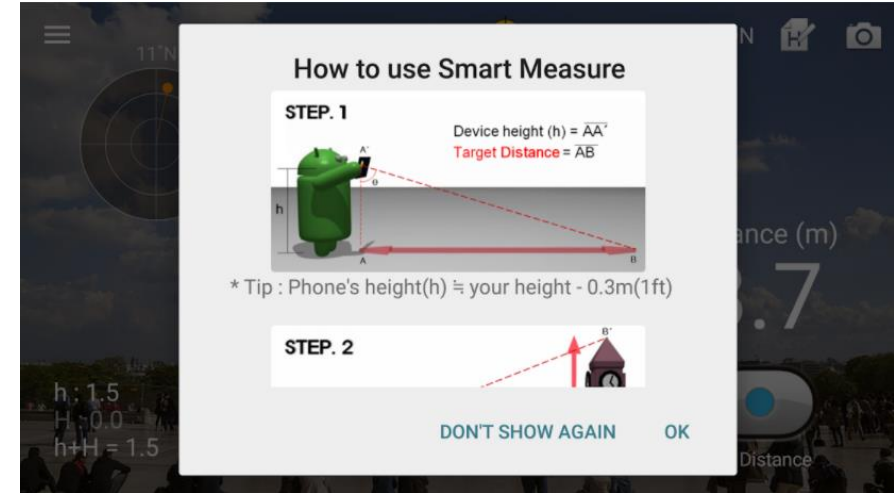
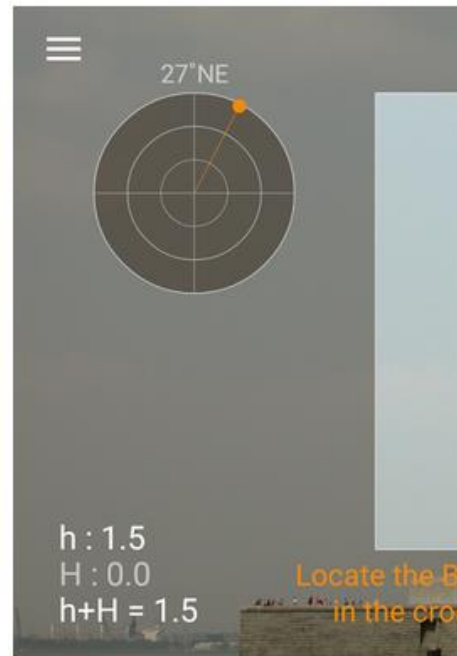
★★★★★ 138,833

Everyone

Contains Ads

Add to Wishlist

Install



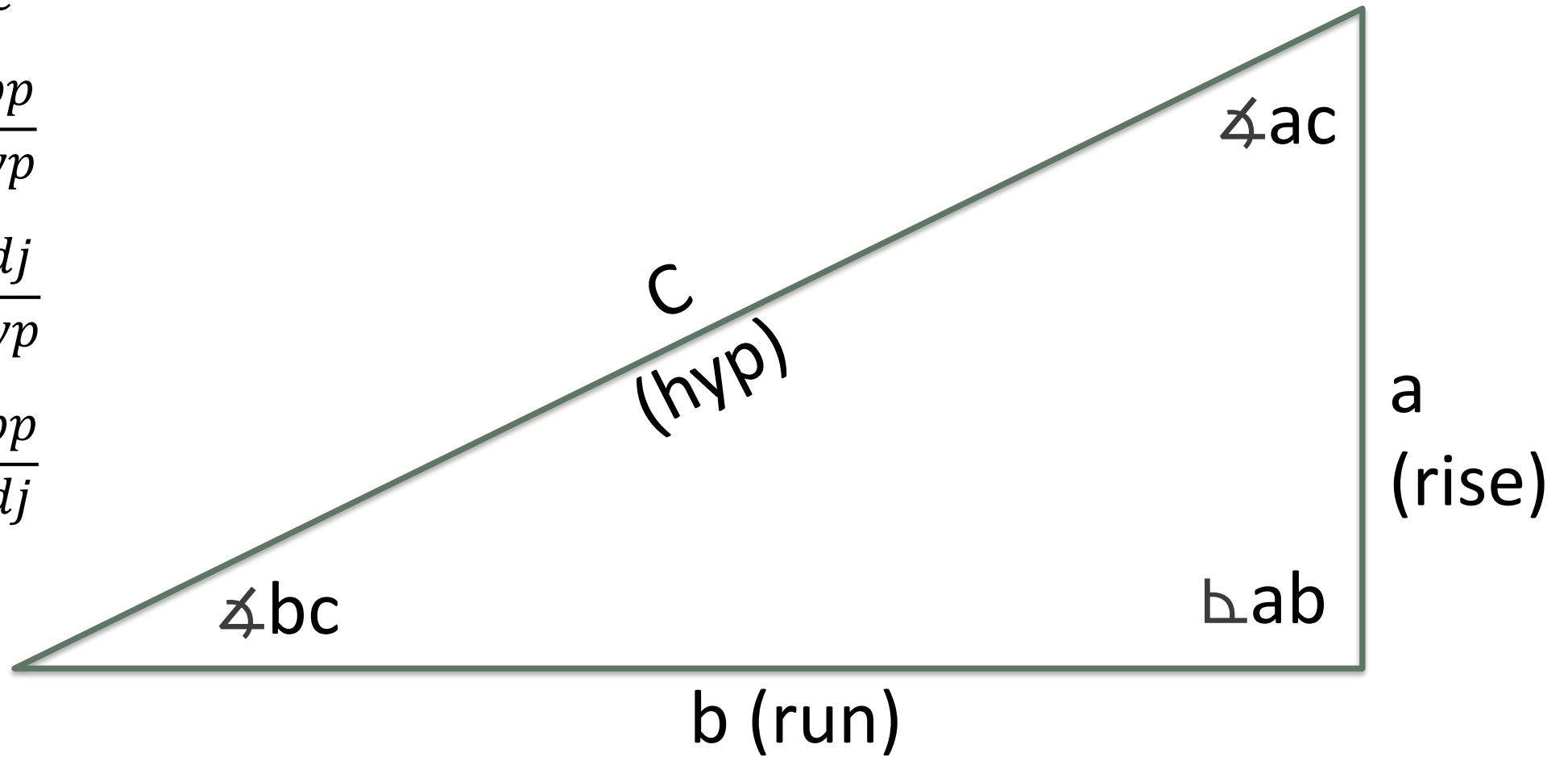
Math Baby!

$$a^2 + b^2 = c^2$$

$$\sin \theta = \frac{Opp}{Hyp}$$

$$\cos \theta = \frac{Adj}{Hyp}$$

$$\tan \theta = \frac{Opp}{Adj}$$

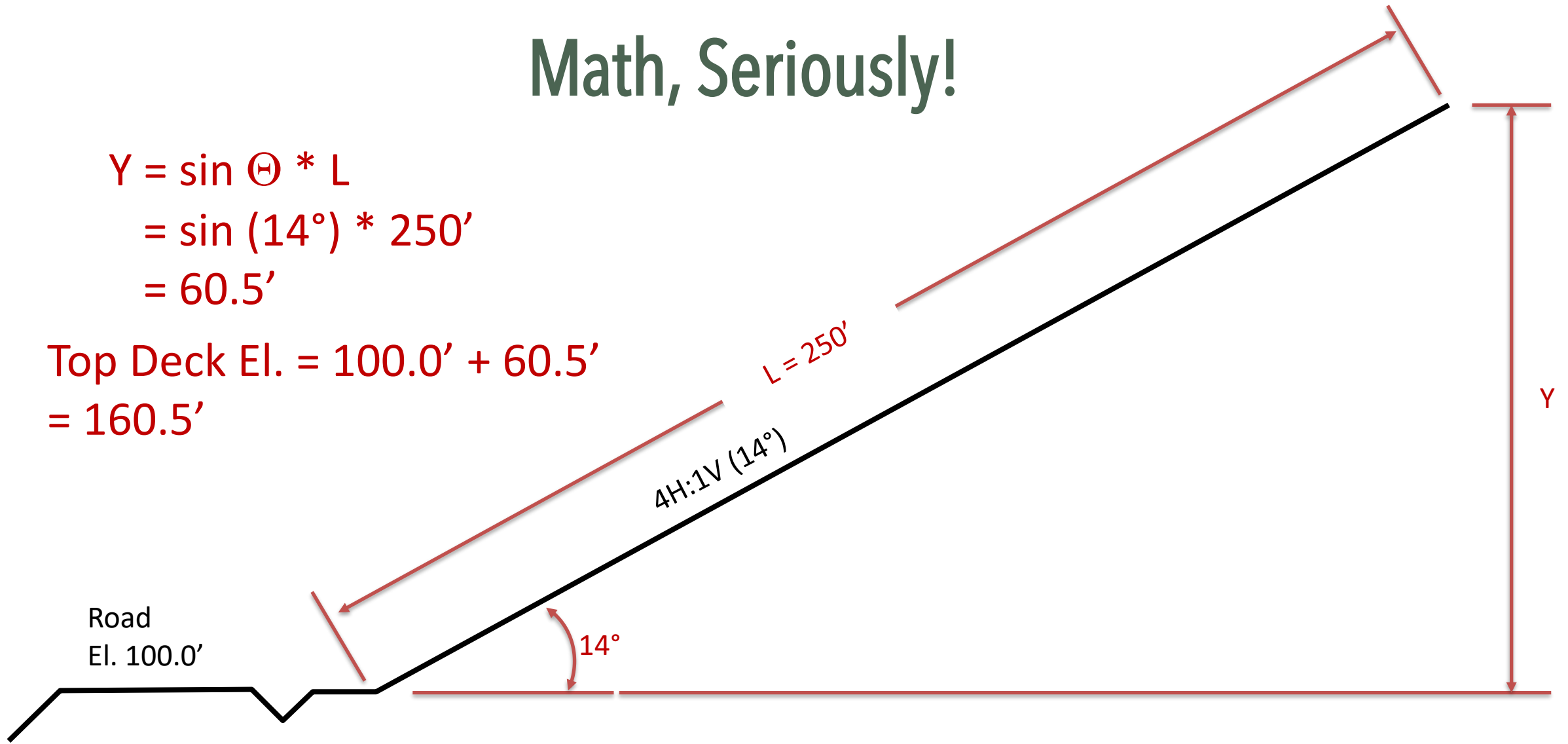




Math, Seriously!

$$\begin{aligned} Y &= \sin \Theta * L \\ &= \sin (14^\circ) * 250' \\ &= 60.5' \end{aligned}$$

$$\begin{aligned} \text{Top Deck El.} &= 100.0' + 60.5' \\ &= 160.5' \end{aligned}$$



Drones



DJI Mavic Mini

- 249g - No Registration Required
- Great photos
 - Documentation of Workface and Daily Cover
 - Construction Progress
 - Stormwater Quality
 - Seep Locations



Prepared by:

Jeffrey J. Breedlove, PE

Please call me or email if you have any questions.

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