

GPS Receivers & Google Earth Software Tools to Support Closed, Illegal and Abandoned Site Investigations

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GPS & Google Earth

- Google Earth is Interactive 3D Map Software of the World
- Aerial Photogrammetry from 2003 Color Aerial Photos (1m resolution), e.g. you can clearly see a 1 meter object on the ground
- “Geo-referenced”, e.g. aerial photos referenced with Latitude and Longitude Grid
- Includes “Layer Info”: Geology, Roads, Hotels, Restaurants, etc
- GPS Latitude & Longitude = Google Latitude & Longitude (based on WGS 84)
- Commercial Grade Handheld GPS Receivers for Navigation are inexpensive, accurate and easy to use (submeter survey grade equipment available)
- What does this mean? You can locate and map points in Google (and annotate Latitude & Longitude) or go to field and take GPS Latitude & Longitude and verify in Google Earth, e.g. location of gas monitoring wells, flare station, illegal disposal area, flare station, continuous gas monitoring sensors, etc.



GPS & Google Earth

- CIA Site Investigation Applications
 - Review site and adjacent land-uses
 - Review site access
 - Locate existing gas control system and gas monitoring wells
 - Layout proposed drilling, trenching and sample locations
 - Layout proposed gas monitoring wells
 - Overlay and Georeference Historical Aerial Photos and USGS Topographic maps and perform horizontal extents and parcel interference analysis
 - Determine Area of Disposal Site
 - Perform preliminary watershed analysis for vicinity of the site
 - Verify field measurements and sample locations
 - Visualize Terrain and Topography
 - Review Land-uses and Site Access



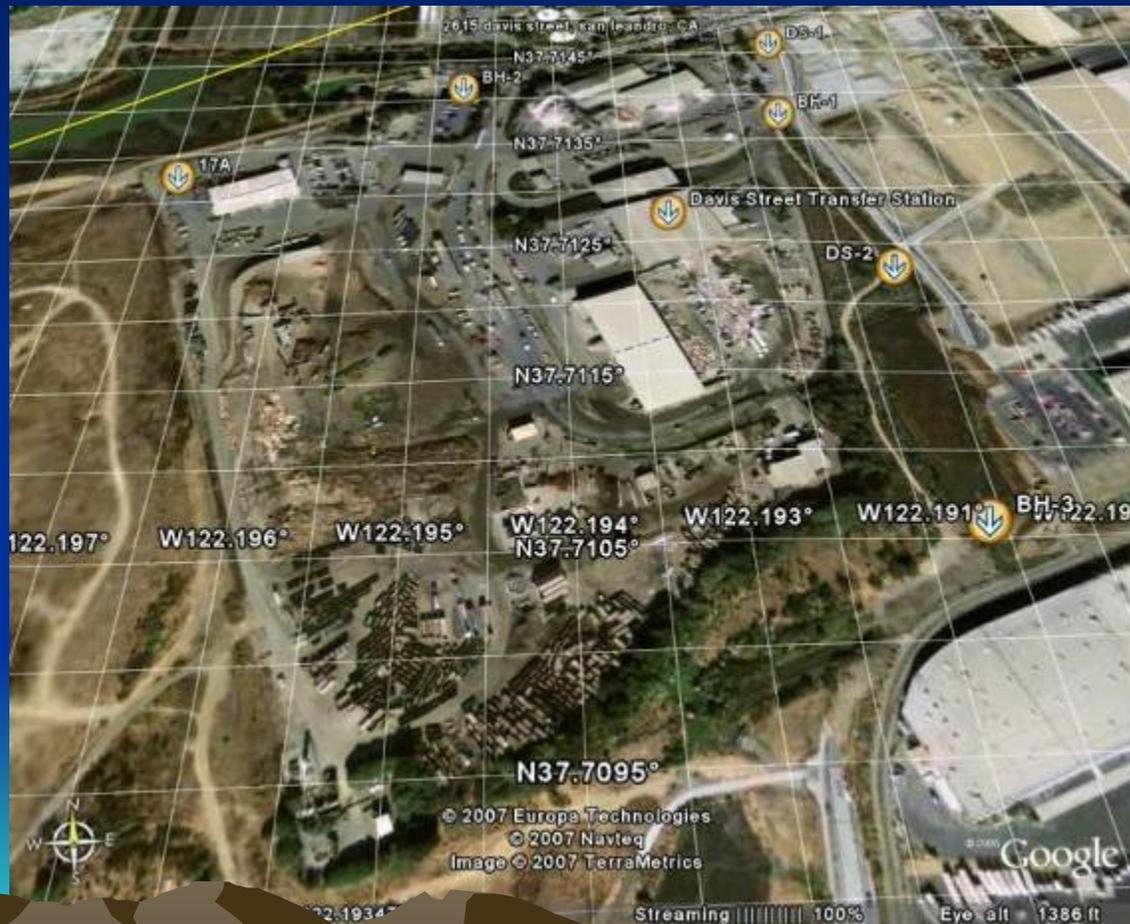
CIA Investigation Applications

- Review Site Access and Adjacent Land-uses



CIA Investigation Applications

- Locate Existing Gas Monitoring Wells



CIA Investigation Applications

- Layout Gas Monitoring Well Locations



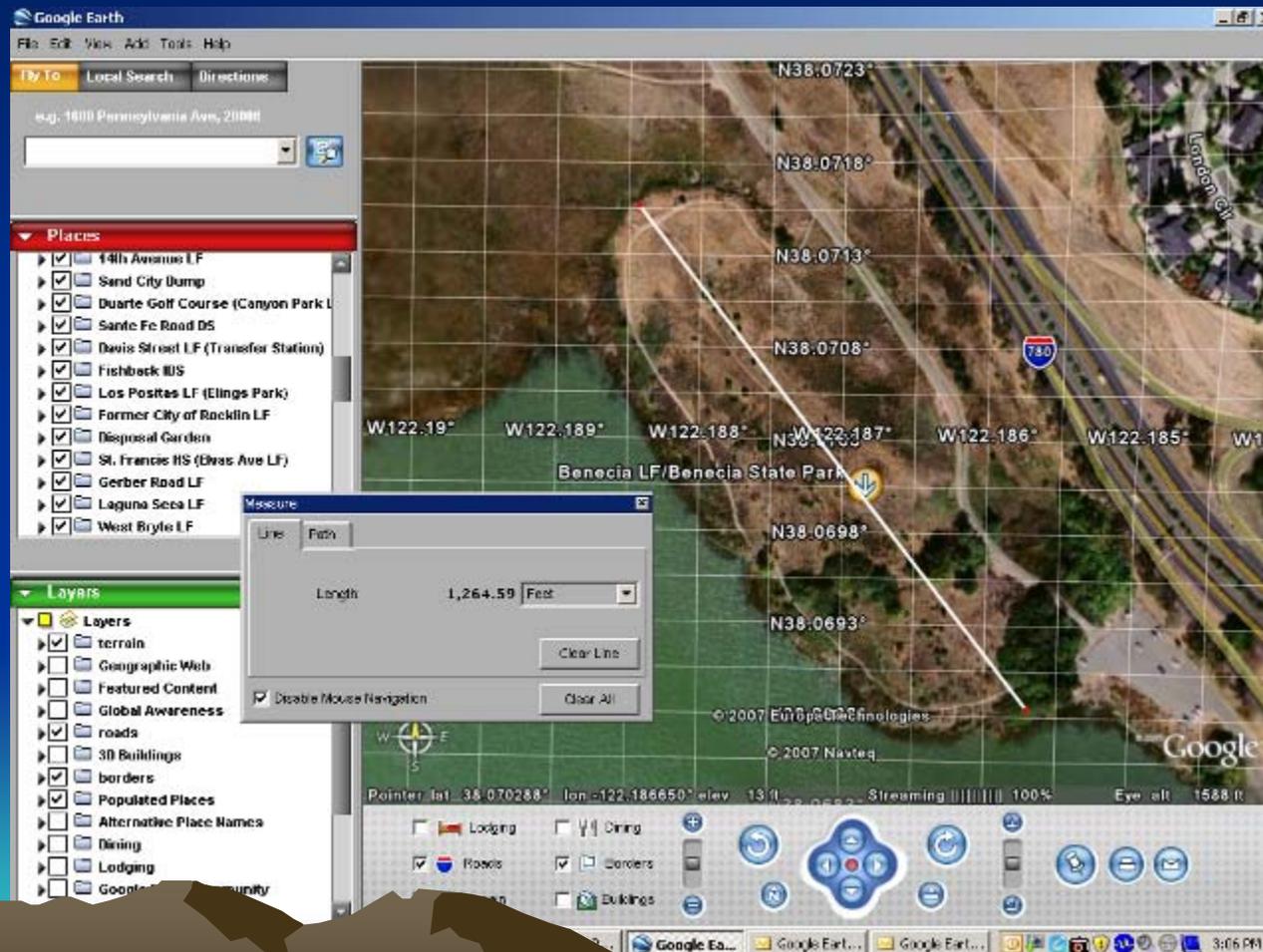
CIA Investigation Applications

- Perform Historical Aerial Photo Analysis (Georeference Aerials)



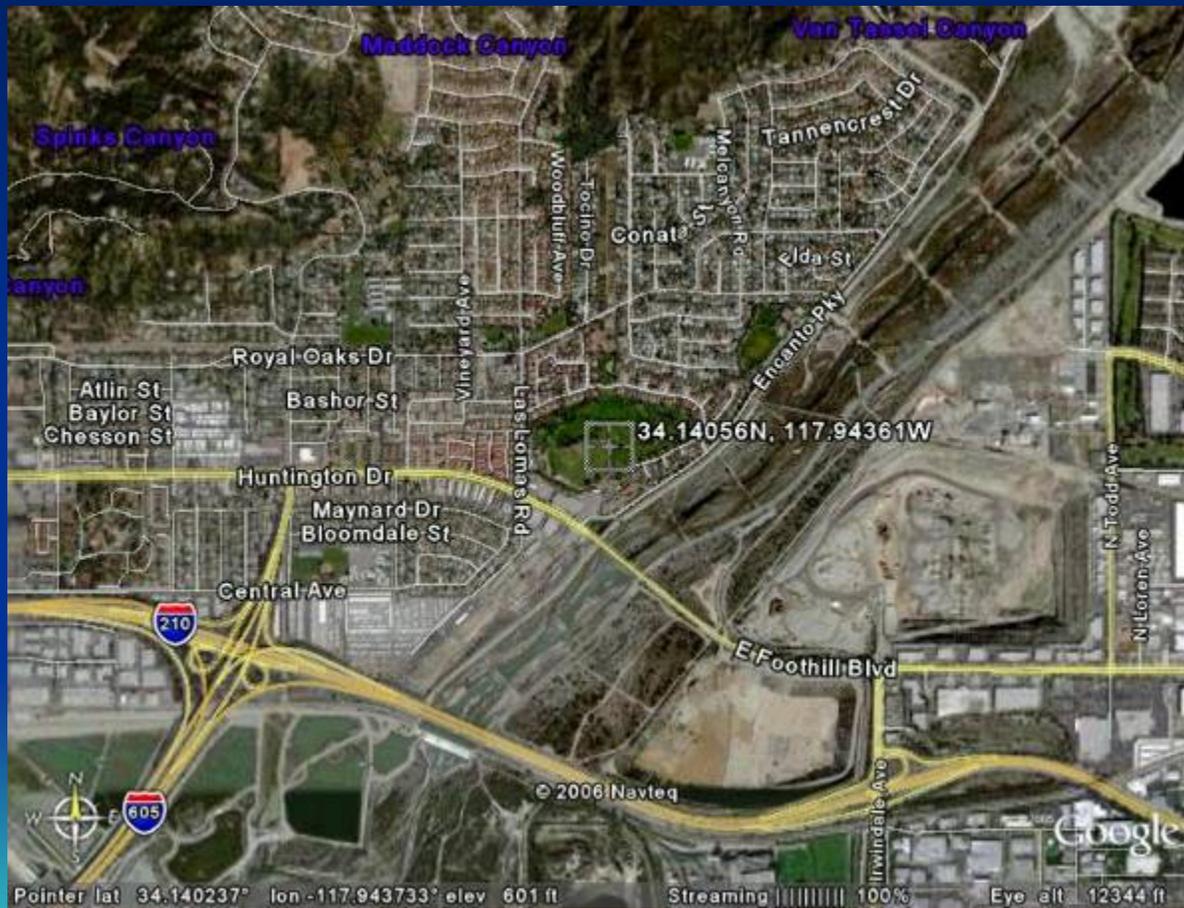
CIA Investigation Applications

- Measure well spacing, distance to structures, disposal area



CIA Investigation Application

- Site Location Map



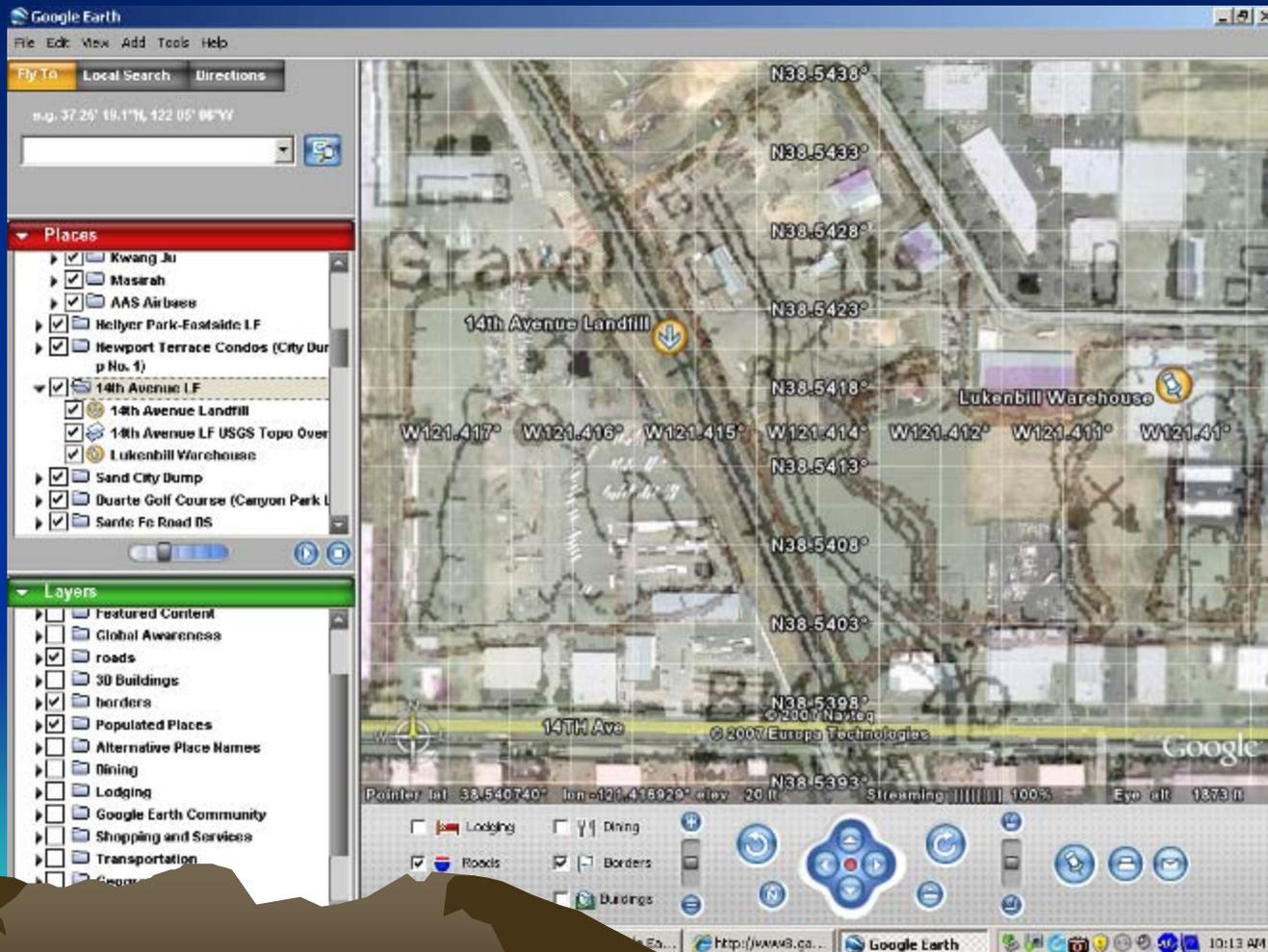
CIA Investigation Applications

- Visualize terrain, topography, elevations



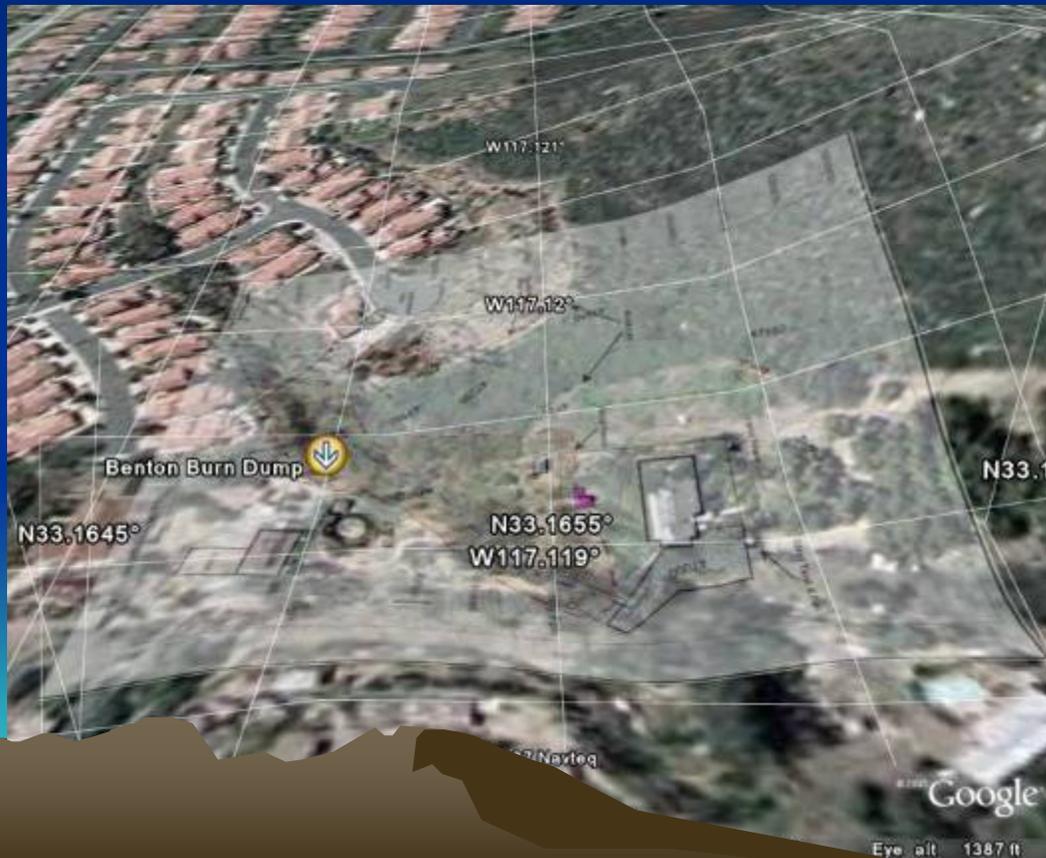
CIA Investigation Applications

- Overlay USGS Topographic Maps



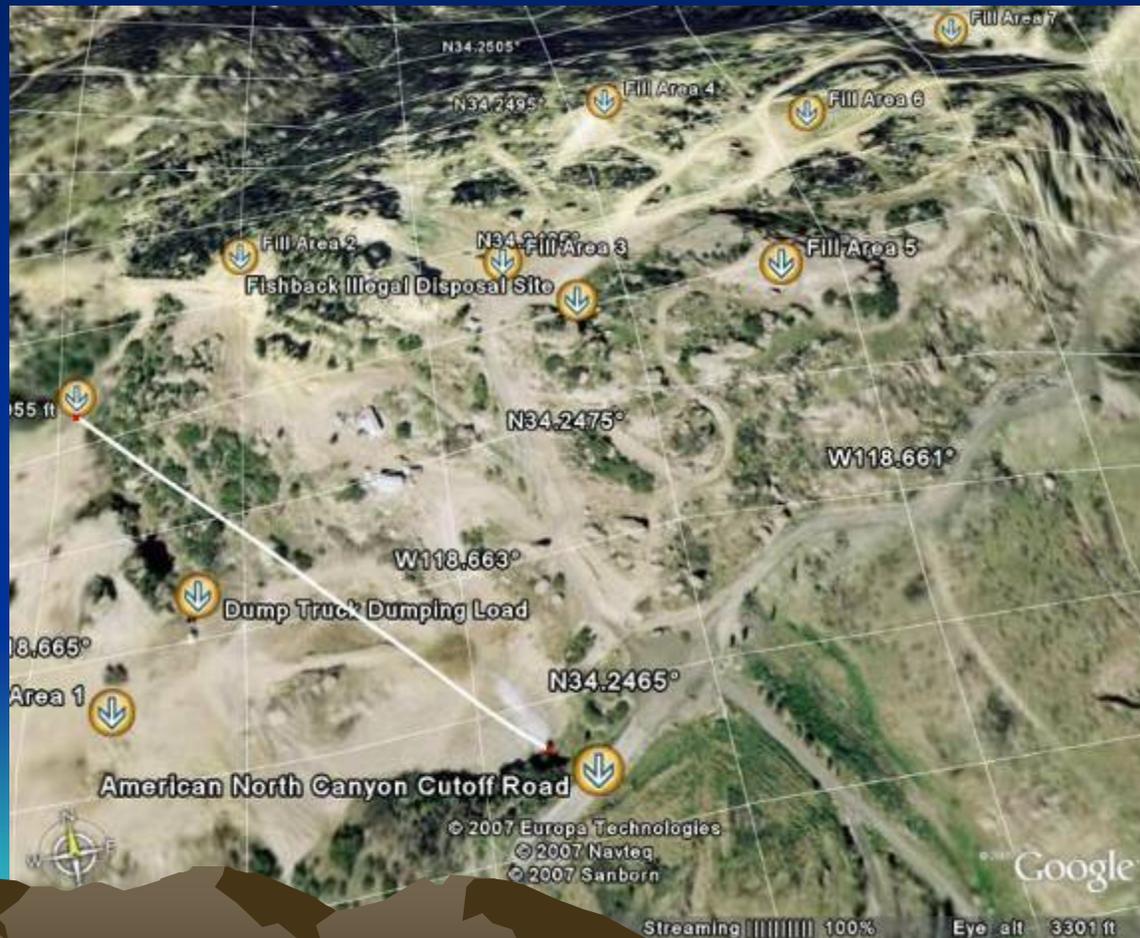
CIA Investigation Applications

- Overlay Geophysical Survey Data



CIA Investigation Applications

- Visual Topographic Features



CIA Investigation Applications

- Locate and Show Construction Drawings/Geophysical Surveys



Using Basic Google Earth Tools

- Downloading Google Earth Software (Free)
 - Web: <http://earth.google.com/download-earth.html>
- Google Earth Users Guide:
http://earth.google.com/userguide/v4/ug_toc.html
- Window Views and Panel Settings
- Turning on/off Lat & Lon Grid
- Determining relative elevations
- On-screen Navigation Tools (zoom in and out, pan, tilting view angle (oblique), rotate view, orient north)
- Information layers
- Making and labeling place marks
- Sending View Images (making JPEG)
- Sending Locations (.kmz)
- Measuring Distances
- Creating Overlays



Google Earth

- For a PhD in Google Earth visit the following:
- http://earth.google.com/userguide/v4/ug_toc.html



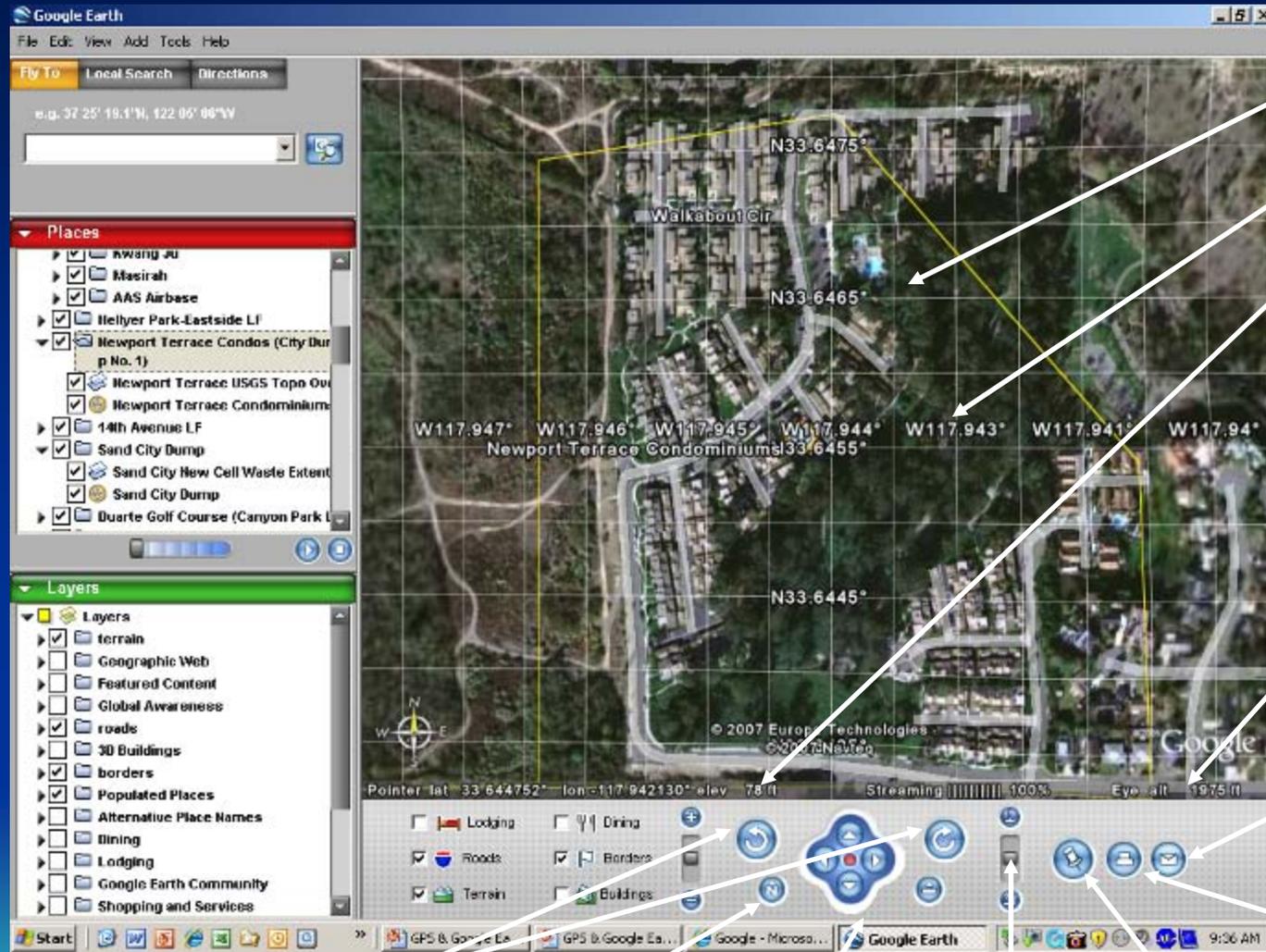
The screenshot shows a Microsoft Internet Explorer browser window displaying the Google Earth User Guide. The address bar shows the URL <http://earth.google.com/userguide/v4/>. The page title is "Introduction - Google Earth User Guide". The main content area is titled "Introduction" and features a blue and white globe icon. The text reads: "This user guide describes Google Earth Version 4.1 and later. Welcome to Google Earth! Once you [download](#) and [install](#) Google Earth, your computer becomes a window to anywhere on the planet, allowing you to view high-resolution aerial and satellite imagery, elevation terrain, road and street labels, business listings, and more. See [Five Cool, Easy Things You Can Do in Google Earth](#). You can [view a printable version of this user guide](#) (free [Adobe Reader](#) required)."

Below the introduction, there are two columns of links. The left column is titled "Use the following topics to learn Google Earth basics - navigating the globe, searching, printing, and more:" and includes links such as "Getting to know Google Earth", "New features in Version 4.1", "Navigating in Google Earth", "Finding places and directions", "Marking places on the earth", "Showing or hiding points of interest", "Tilting and viewing hilly terrain", and "Sight seeing". The right column is titled "For other topics in this documentation, see the table of contents (left) or check out these important topics:" and includes links such as "Making movies with Google Earth", "Using layers", "Using places", "Managing search results", "Measuring distances and areas", "Drawing paths and polygons", "Using image overlays", and "Using GPS devices with Google Earth".

At the bottom of the page, there is a section titled "Getting to Know Google Earth" which states: "The following diagram describes some of the features available in the main window of Google Earth:" followed by a row of 12 numbered icons (1 through 12) representing various features.

The browser window also shows a search bar on the left side of the page, a "Table of Contents" section with various links, and a taskbar at the bottom of the screen with the Start button and several open applications.

Google Earth Window



Latitude (N or S)

Longitude (E or W)

Ground Elevation

Eye Elevation/
Altitude MSL

Send Image (jpeg)

Print Image

Placemark/Label

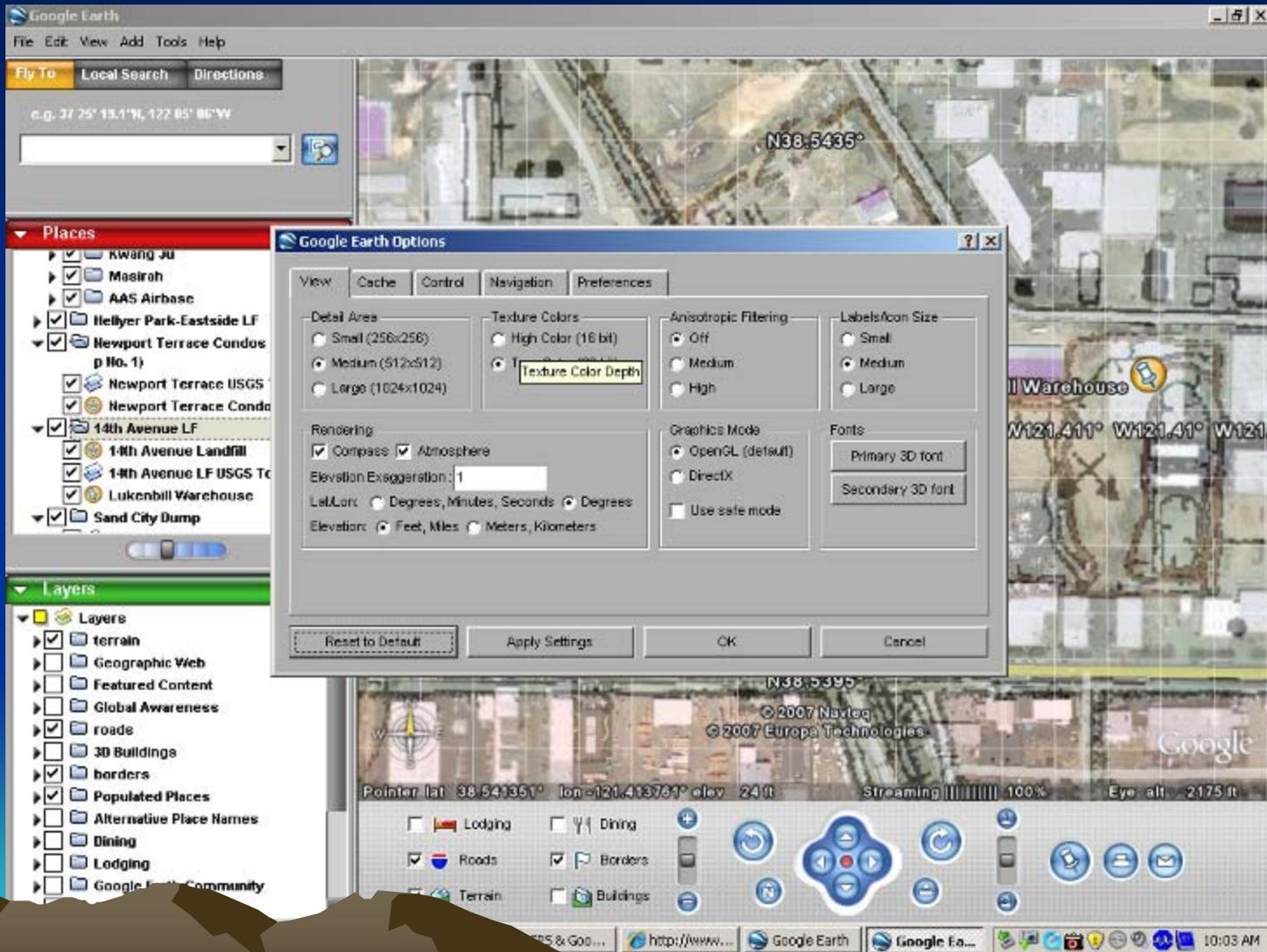
Rotate View Real Time/
Clockwise/Counter

Orient View North

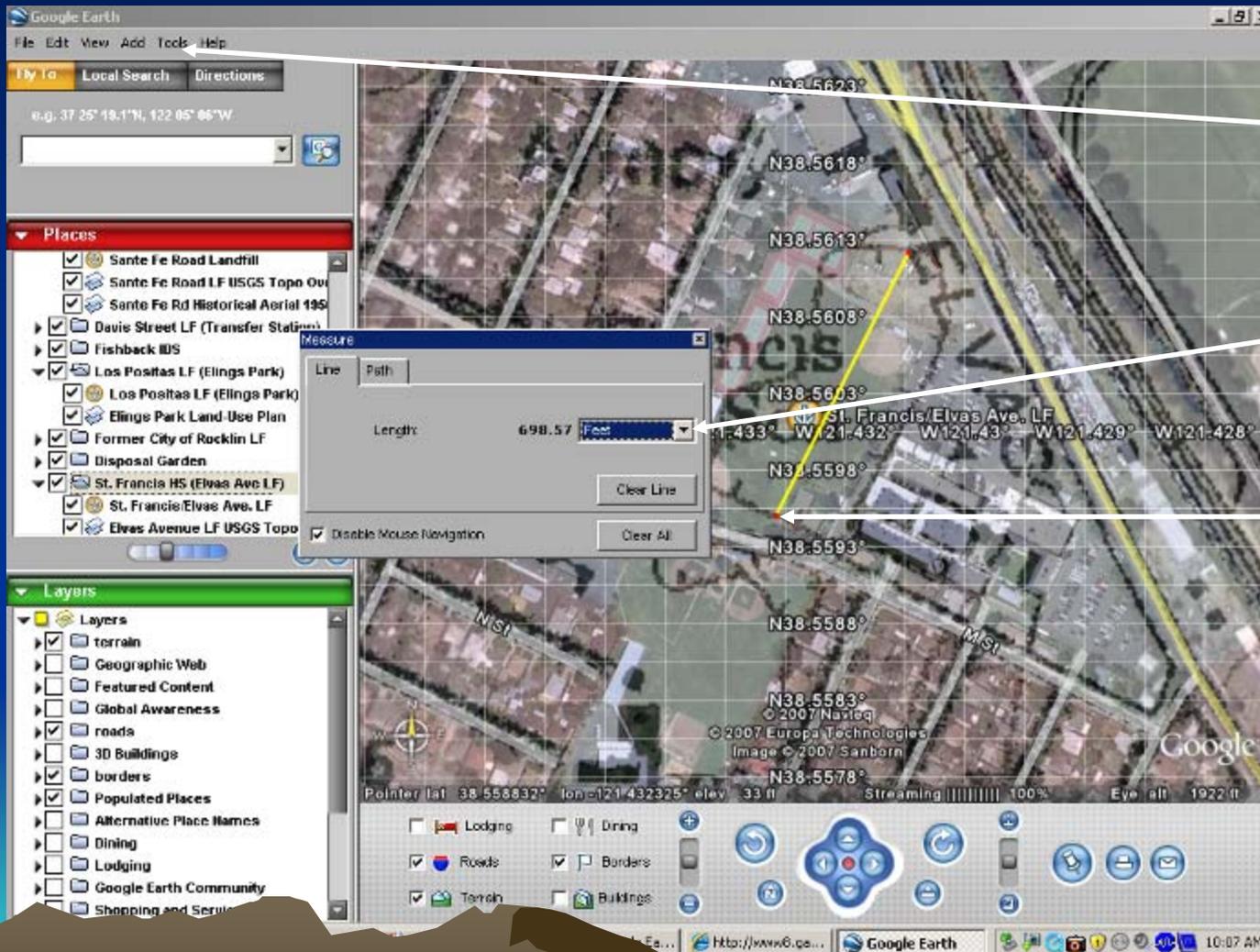
Navigation Buttons

Tilt View from 90 deg

Google Earth Options



Google Earth Measure Tool



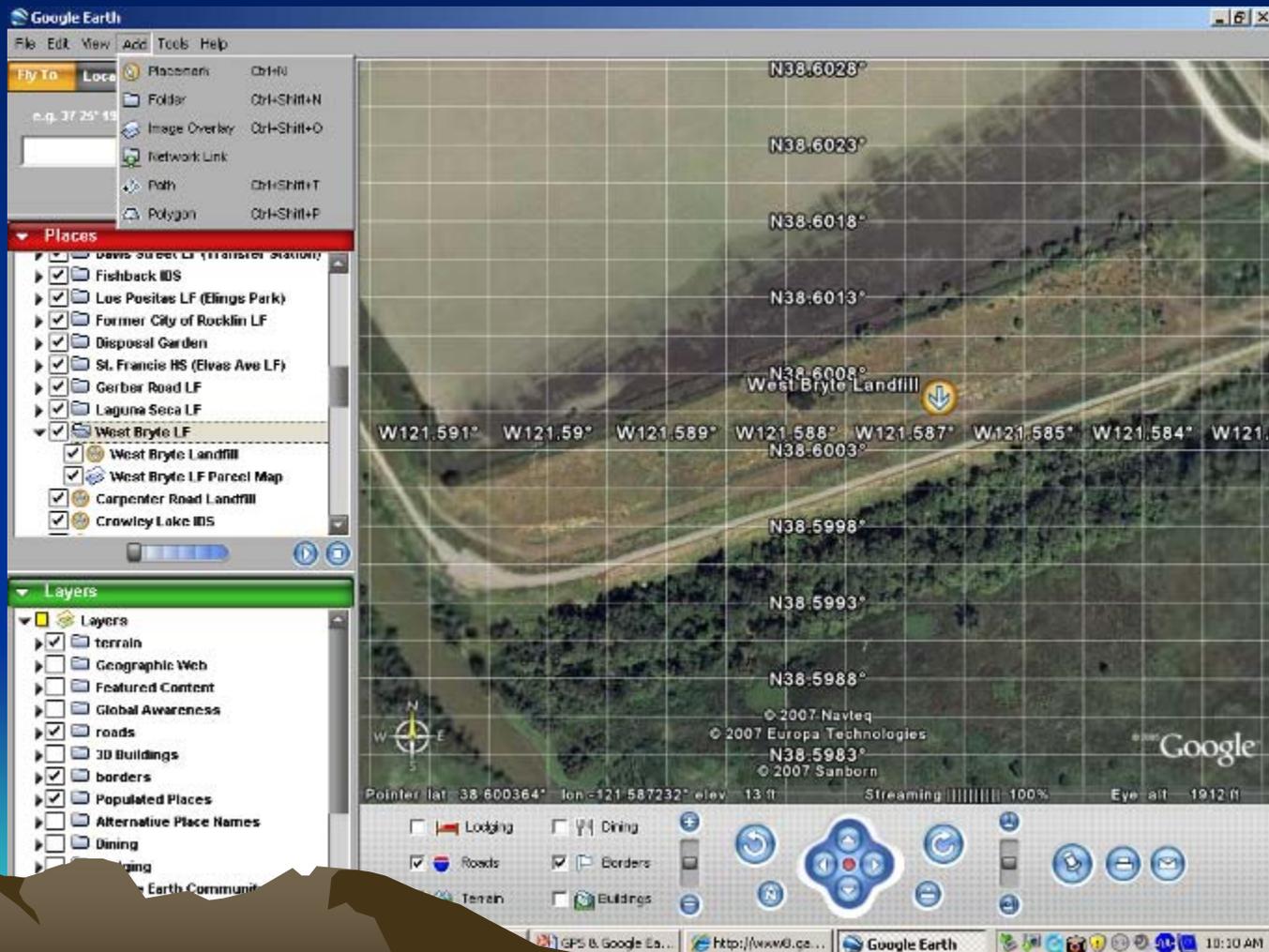
Tools> Measure

Select Units

Put cursor on
Start point>click>
End point>click

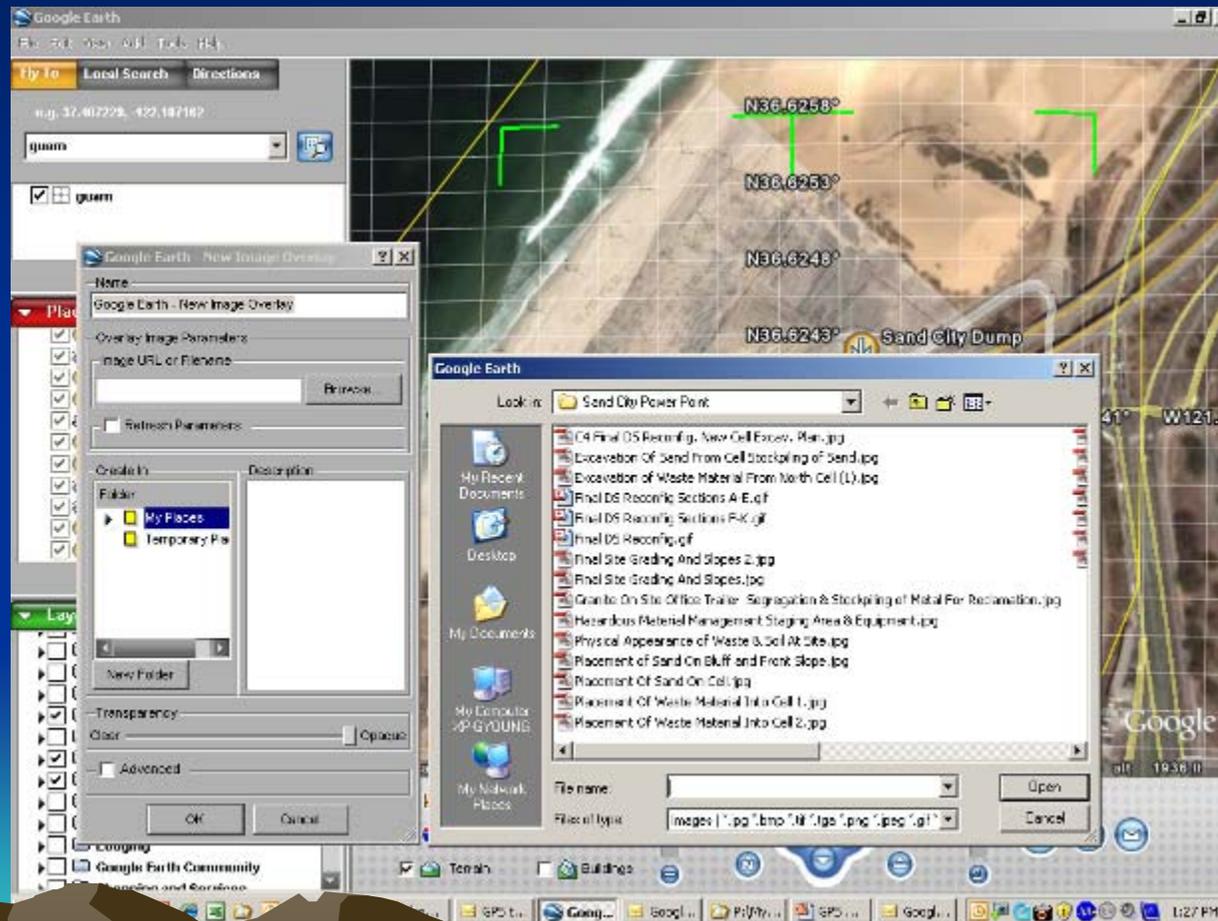
Google Earth Toolbar

Add: Placemark, Folder, Image Overlay, Network Link, Path & Polygon



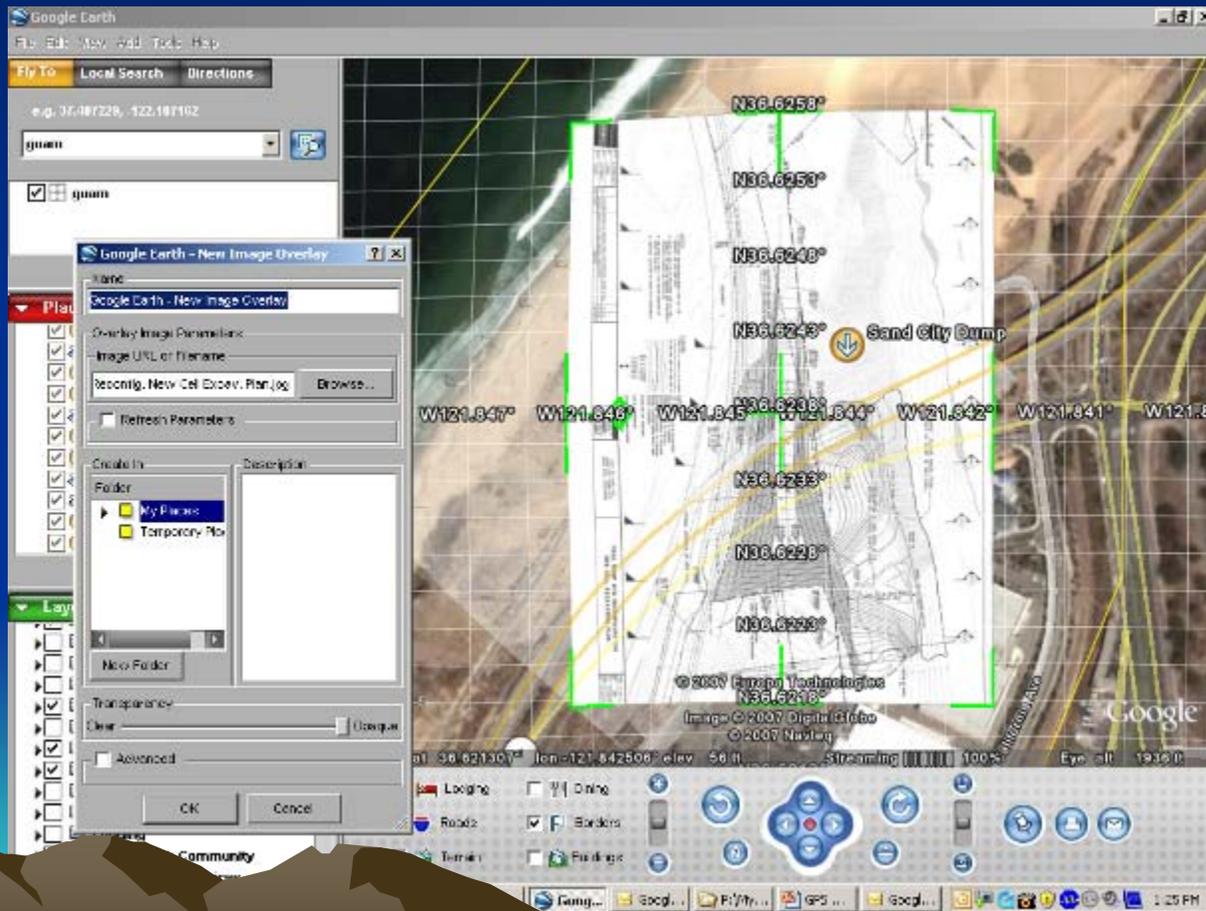
Google Earth Tools: Image Overlay

Click-on Add; Image Overlay; Browse for file; Click OK to insert



Google Earth Tool: Image Overlay

Once image inserted; adjust scale of image using green cursors to the current view's scale, e.g. by "lining up" landmarks, roads, structures, etc.

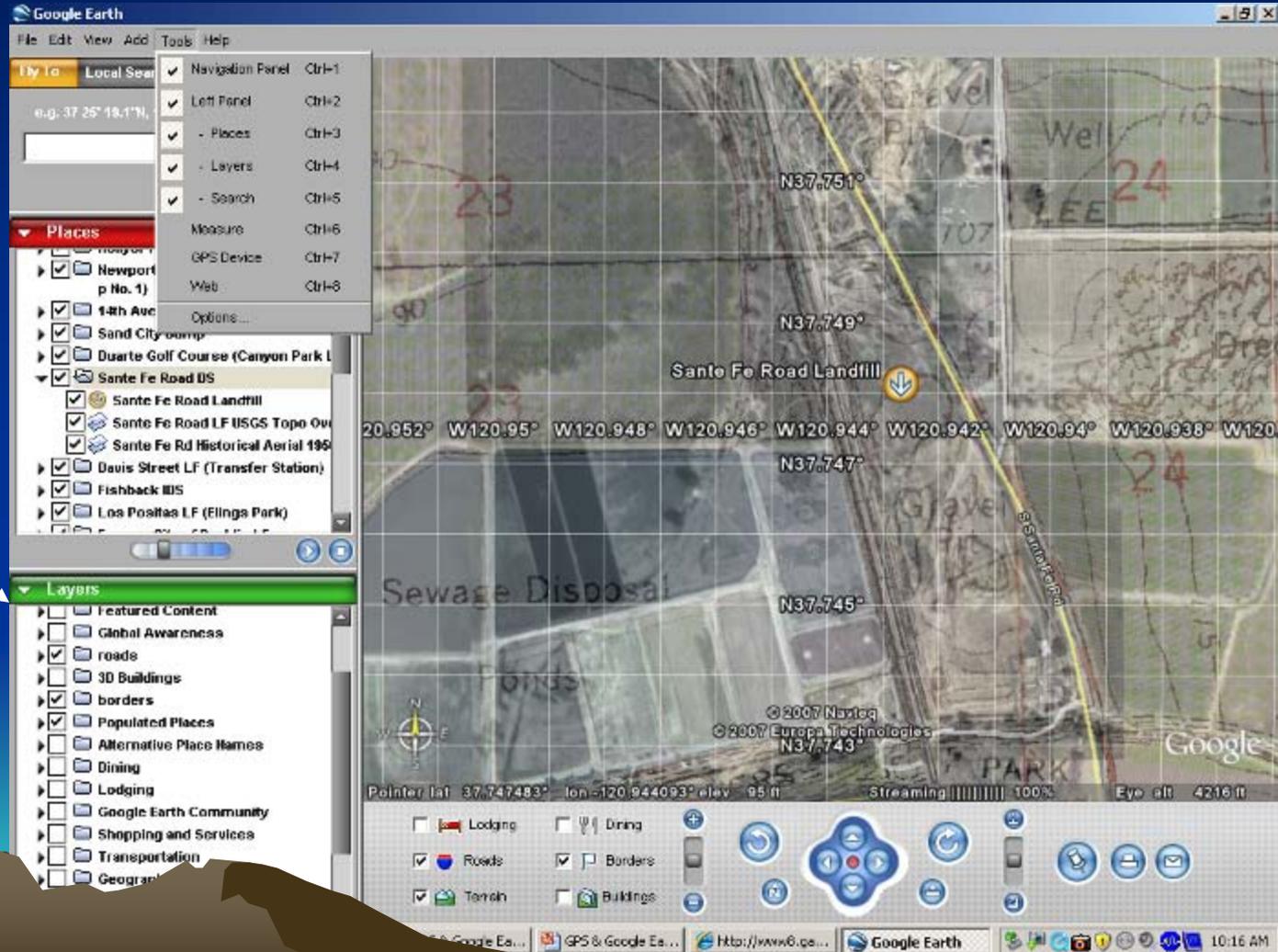


Google Earth Toolbar

Tools: Navigation Panel, Left Panel, Places, Layers, Search, Measure

Places

Layers

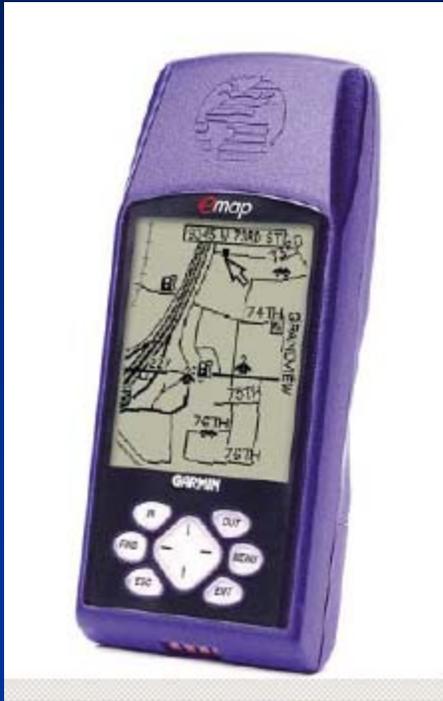


Google Earth Exercise

- Locate and placemark the 14th Avenue Disposal Site in Sacramento (location is NW of Power Inn and 14th Avenue)
- Locate and placemark the Sacramento City Landfill (Business 80/American River)
- Determine the approximate area (in acres) of Kiefer Landfill?



Handheld GPS Receivers



Handheld GPS Receivers

- Commercial Grade Navigation Receivers
- Used for Recreation (boating, biking, etc)
- Accuracy to 15 feet (5m); depends on number of satellite signal strength
- Survey-grade GPS units have submeter accuracy (Trimble GPS 5800)
- Provides latitude and longitude data and elevation relative to mean sea level (MSL)



Handheld GPS Receivers

- Application to CIA Investigations
- Provide basic navigation information for getting to and from sites (locate disposal sites installation, cities, etc.
- Provide location (lat & lon) and elevation data for field survey of disposal area, gas monitoring well locations, trench locations, etc
- Detailed map info can be uploaded for specific locations (counties, cities, etc)



Handheld GPS Receivers

- Review GPS Unit DVD Training Video



GPS Receivers

- Basic Commands
- On-Off/Basic Menu Screen
- Menu Options
- Latitude, Longitude and Elevation
- Marking locations (or way points)
- Downloading location data



Handheld GPS Exercise

- Collect GPS data (Lat & Lon) for the following:
 - NE corner of Cal-EPA Building
 - Area of the Cal-EPA tower?
 - Distance from Cal-EPA front door to Starbucks?
- Come back and manually load points to Google Earth and pull up aerial with latitude & longitude grid; placemark and label locations and email image, find areas and distances



GPS & Google Earth

- Allows you to locate existing disposal site characteristics; if you can scan drawing or image (historical aerial photos) you can “geo-reference” drawing in Google Earth and obtain Latitude and Longitude data for location (and then use handheld GPS to find).



GPS & Google Earth

- Georeference of Historical Aerial

