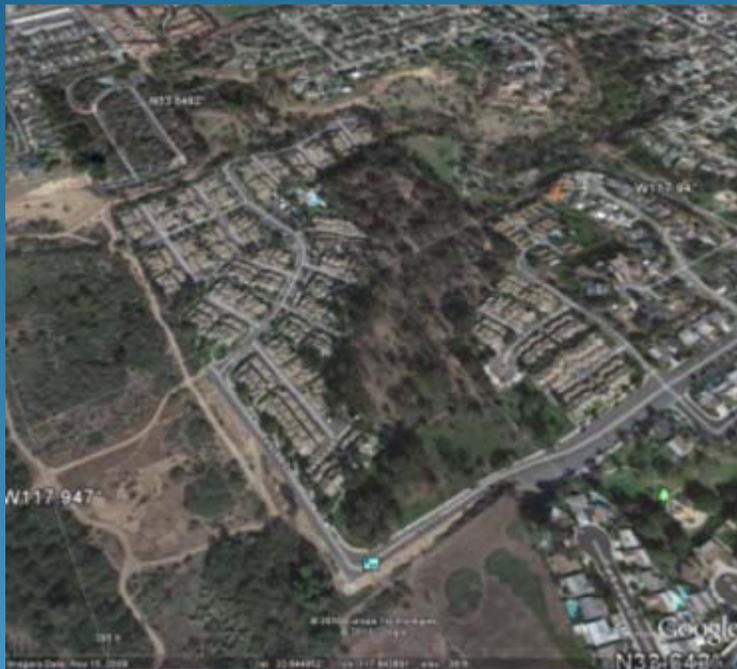




These materials were developed by CalRecycle staff to address specific technical training areas and are posted as reference documents for the local government and CalRecycle staff who work on closed, illegal and abandoned disposal sites. They are for reference only and not intended as regulatory guidance.

If you require assistance in obtaining access to the presentations or have questions regarding the information, call the Public Affairs Office at (916) 341-6300 or Glenn Young at (916) 341-6696.

Using Google Earth for Historical Aerial Photo Analysis & Interference Studies



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Department of Resources Recycling and Recovery



Overlaying Historical Aerials in Google Earth

- Overview/Introduction
- Using Google Earth Overlay Tool
- Importing Historical Aerial Photograph
- Scaling and Orienting Historical Aerial Photograph
- Google Earth Features to Analyze Historical Aerials
- Case Examples



Overlaying Historical Aerials in Google Earth

Overview/Background

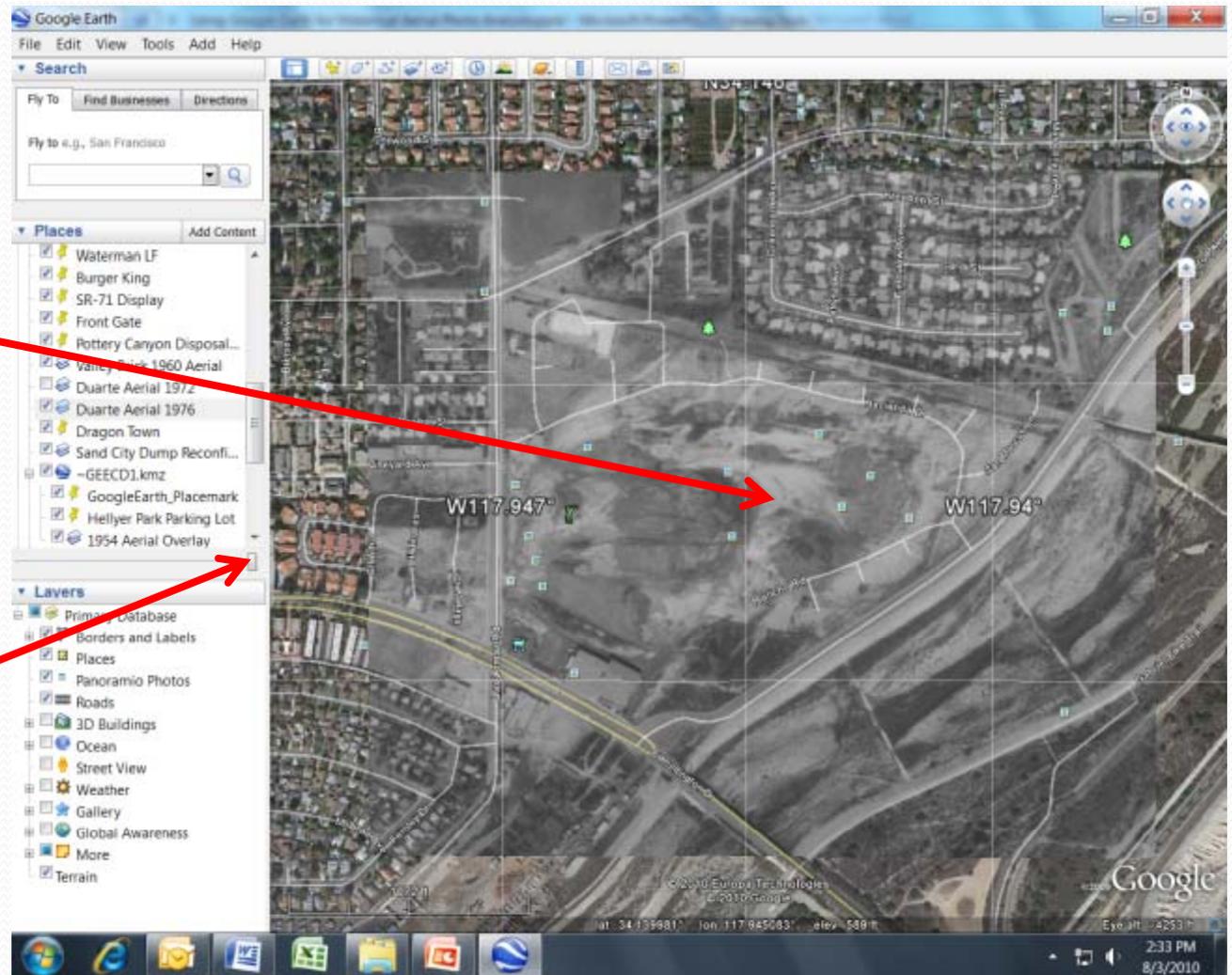
- Historical aerial photographs can be used to support landfill and disposal site investigations (particularly investigation of the areal or lateral extents of the site).
- Historical aerial photos provide “snapshot” in time of potential areal boundaries of former landfills and disposal sites.
- Using Google Earth and “Overlay Tool” can allow user to scale historic aerial photograph and locate or “geo-reference” (reference to latitude and longitude) site features such as waste operations boundaries, pit boundaries, or former topographic features (excavations, ravines, canyons, etc.).
- For landfill investigations, historic aerials should be obtained for pre-disposal conditions, during disposal operations period and post-disposal period.
- Many repositories of historical aerial photographs exist within federal and state government agencies such as USGS (mapping), Federal Highway Administration, Department of Forestry, Department of Interior, US Army Corps of Engineers, California Department of Transportation, California Department of Water Resources, California UC Library System (Berkeley, Santa Barbara, Santa Cruz, etc.). Private collections are another source for historical aerials.
- Online historic aerial photographs are also available, such as www.historicaerials.com.
- Most historic aerials taken for mapping purposes should be of adequate resolution and quality to use with Google Earth to compare past and present conditions of the site.
- Overlaying historical aerial photographs in Google Earth can allow user to determine the location of landfill boundaries with respect to current site features such as homes, buildings, roads, utilities, etc.

Overlaying Historical Aerials in Google Earth

Example of Historic Aerial Photograph of Disposal Site Overlaid in Google Earth

1972 historical aerial photograph of former disposal site overlain on current Google Earth Aerial Image Map.

Opaqueness slide bar allows user to transition from current view to historical view to compare landfill horizontal area boundary location and current structures, land-uses, development, etc.

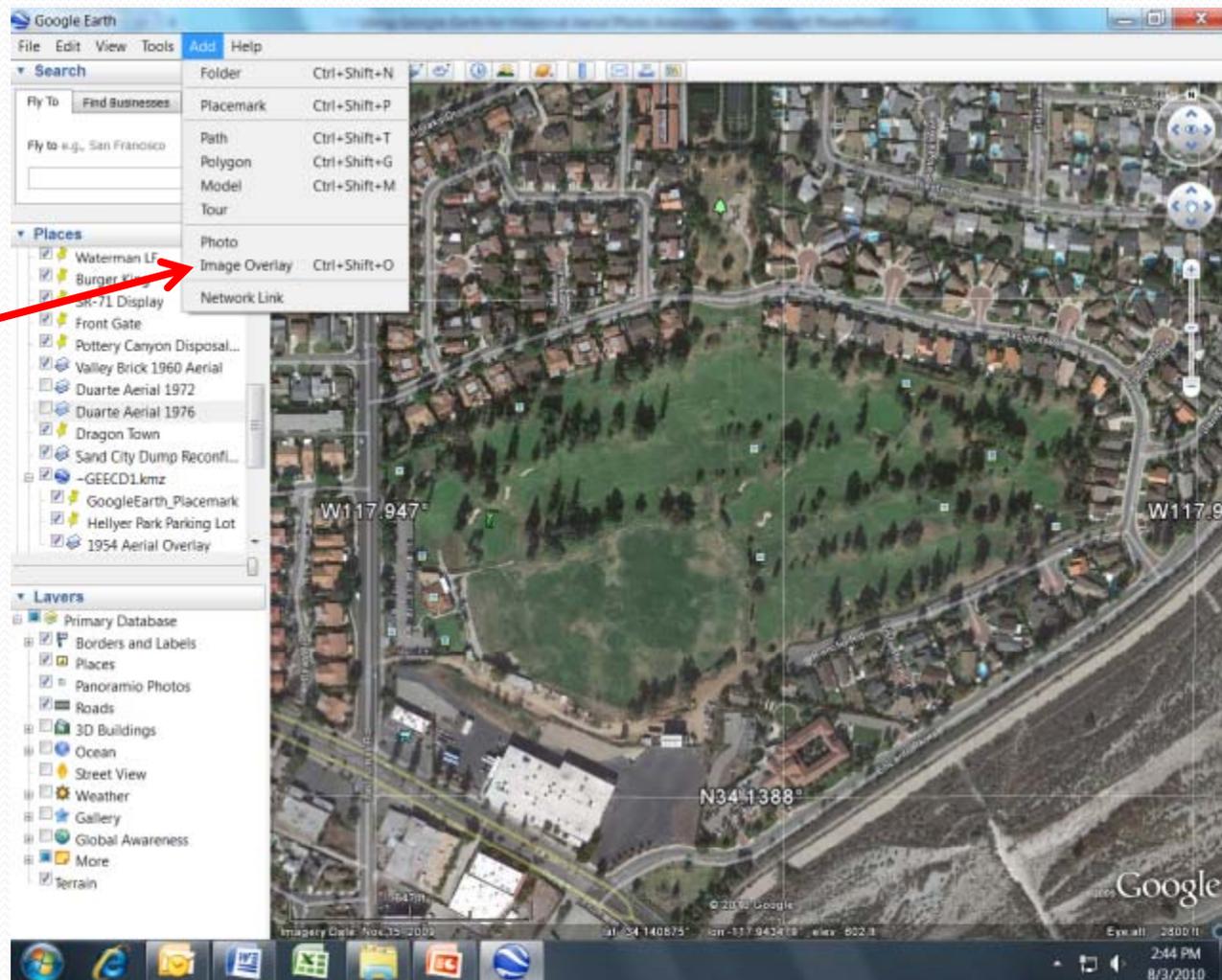


Overlaying Historical Aerials in Google Earth

Importing Aerial Images Into Google Earth

Adding an Image Overlay

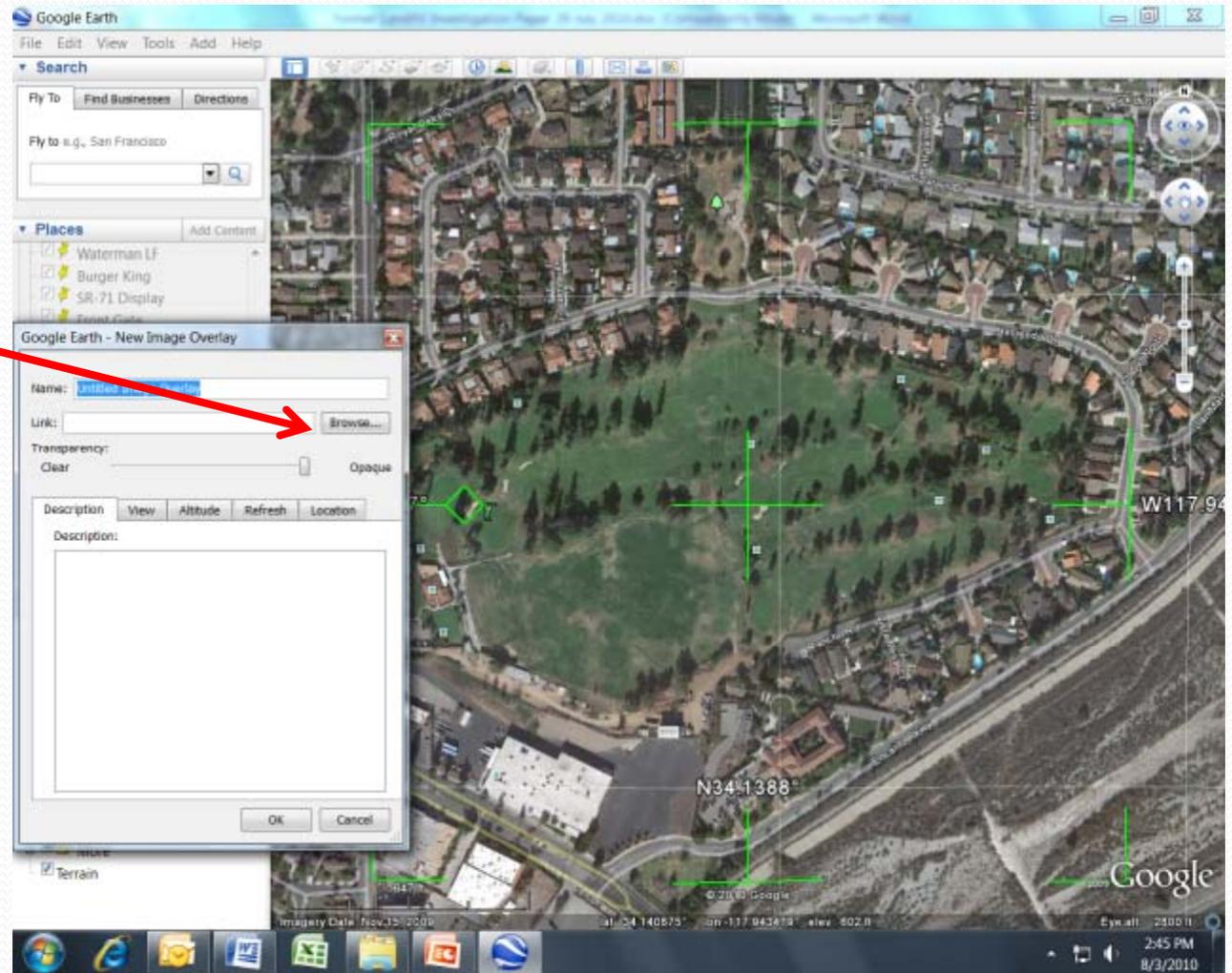
Click on Add > Image Overlay



Overlaying Historical Aerials in Google Earth

Importing Aerial Images Into Google Earth

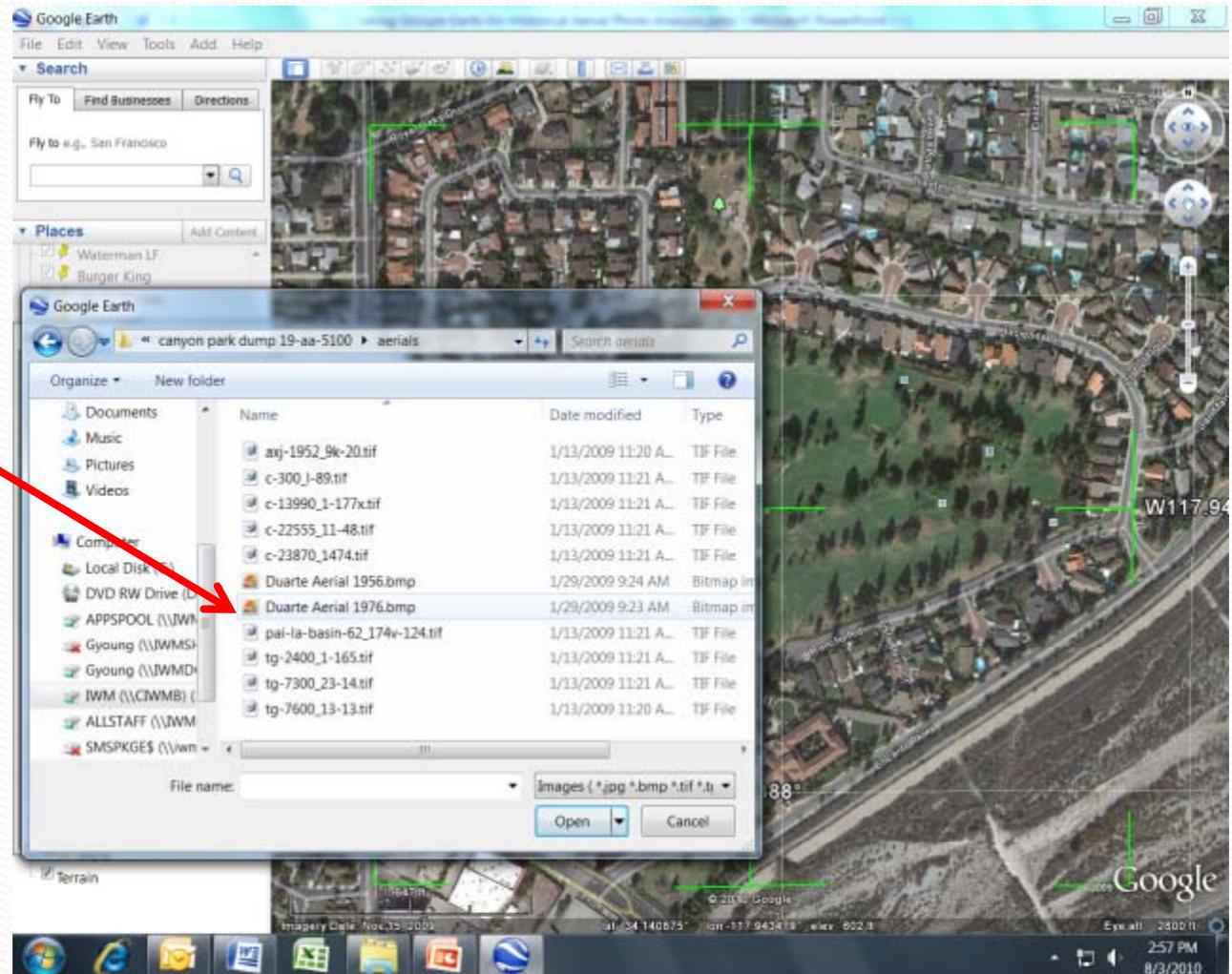
Browse for
Historical Aerial
Photograph image file,
e.g. JPEG, BMP file etc.



Overlaying Historical Aerials in Google Earth

Importing Aerial Images Into Google Earth

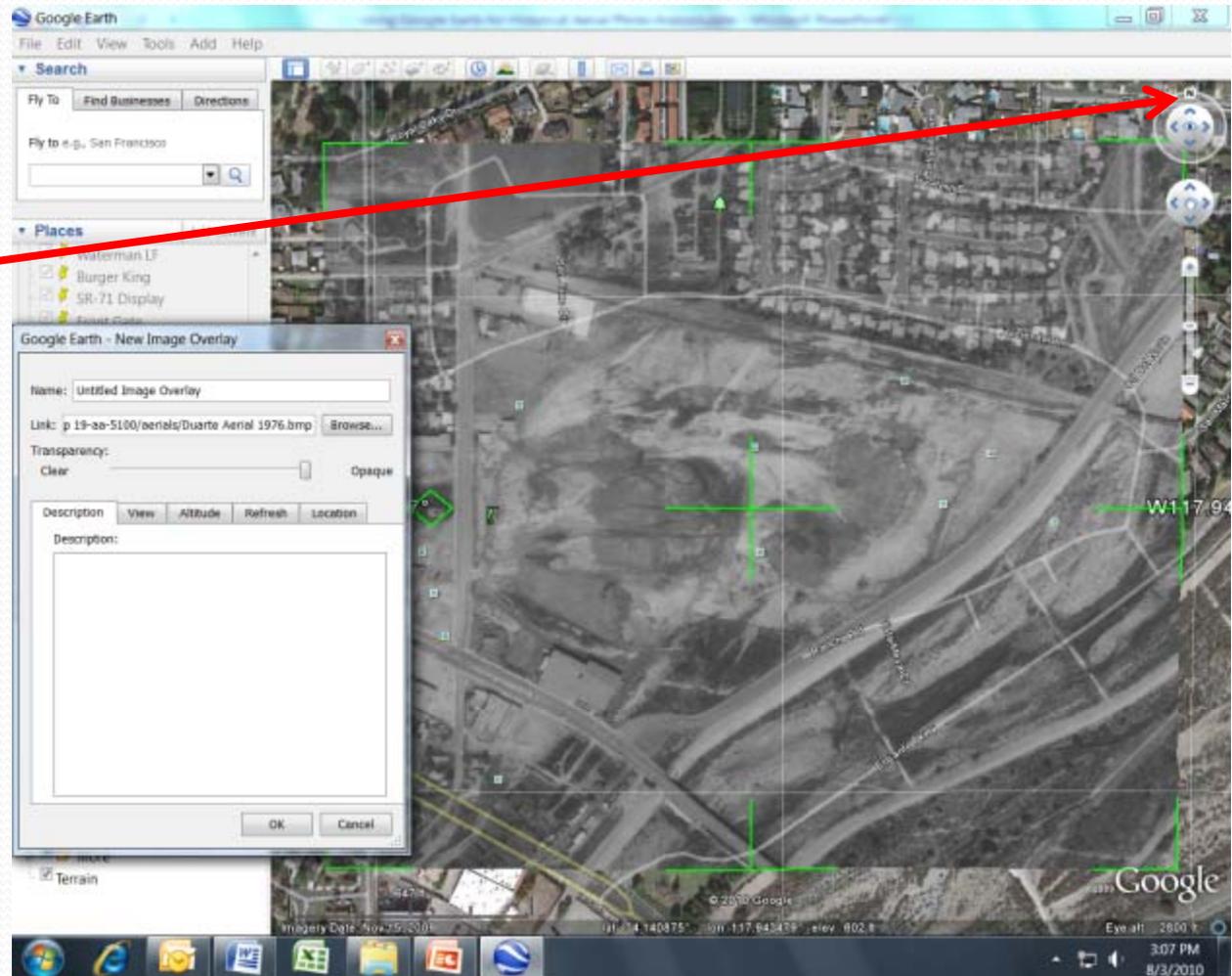
Open Historical Aerial Photograph File, in example: <Duarte Aerial 1976.bmp > file From Drop Down Menu Folder



Overlaying Historical Aerials in Google Earth

Scaling and Orienting Imported Aerial Images Into Google Earth

Ensure that the historical aerial image file is oriented north prior to importing into Google Earth (which should already be in north oriented view), also current view in Google Earth should have location and resolution similar to historical aerial photo location and resolution – this will reduce some of the effort in adjusting the scale and orientation of the imported historical aerial Image to match the Google Earth aerial map image.



Overlaying Historical Aerials in Google Earth

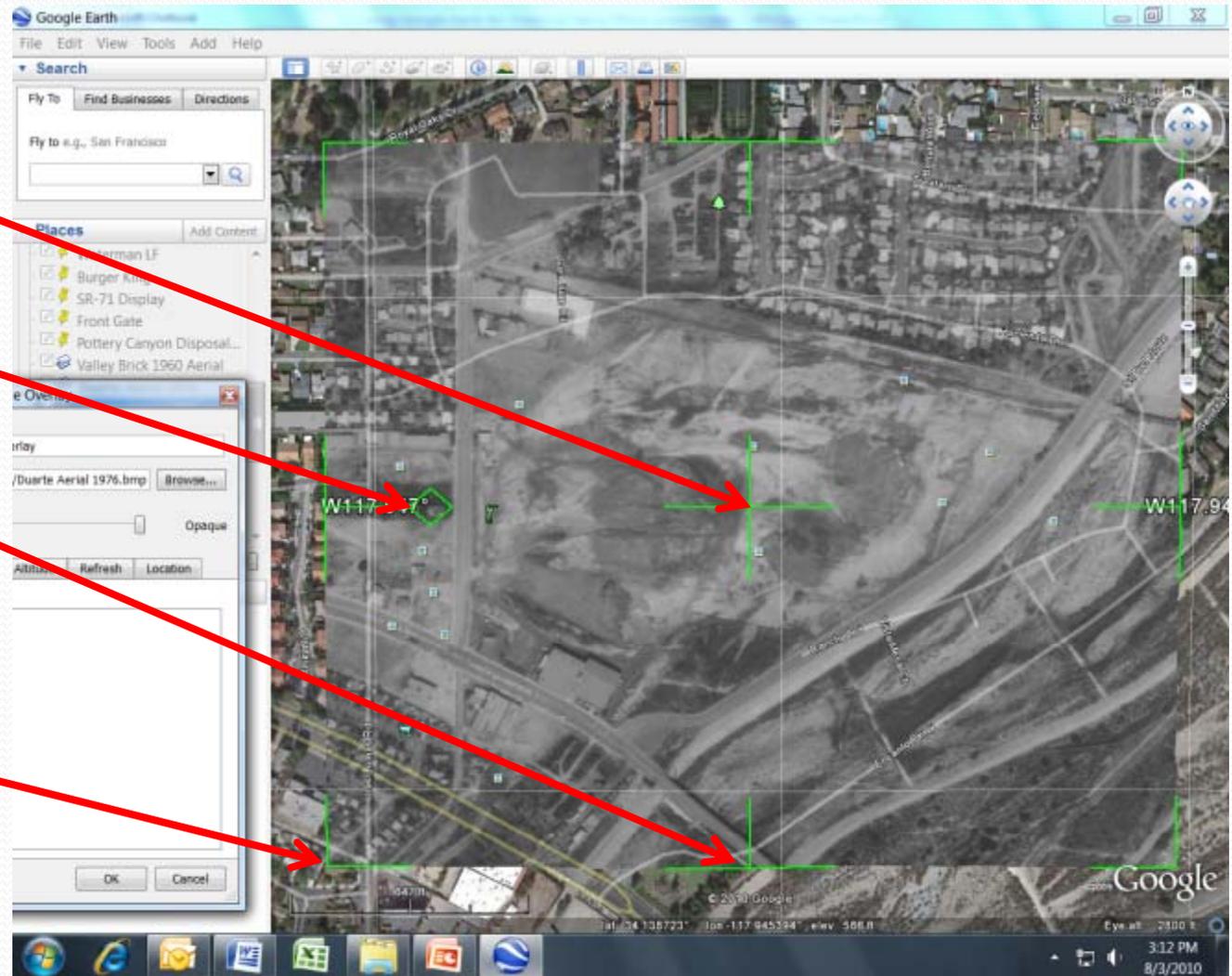
Scaling and Orienting Imported Aerial Images Into Google Earth

Use green cross-hair to **move & reposition** entire overlaid image.

Use green diamond to **rotate** historical aerial image.

Use green side indicator to **increase or decrease the scale** of the historical aerial image in N-S or E-W direction.

Use green corner indicator with shift key to **proportionately increase or decrease the scale** of the historical aerial image.

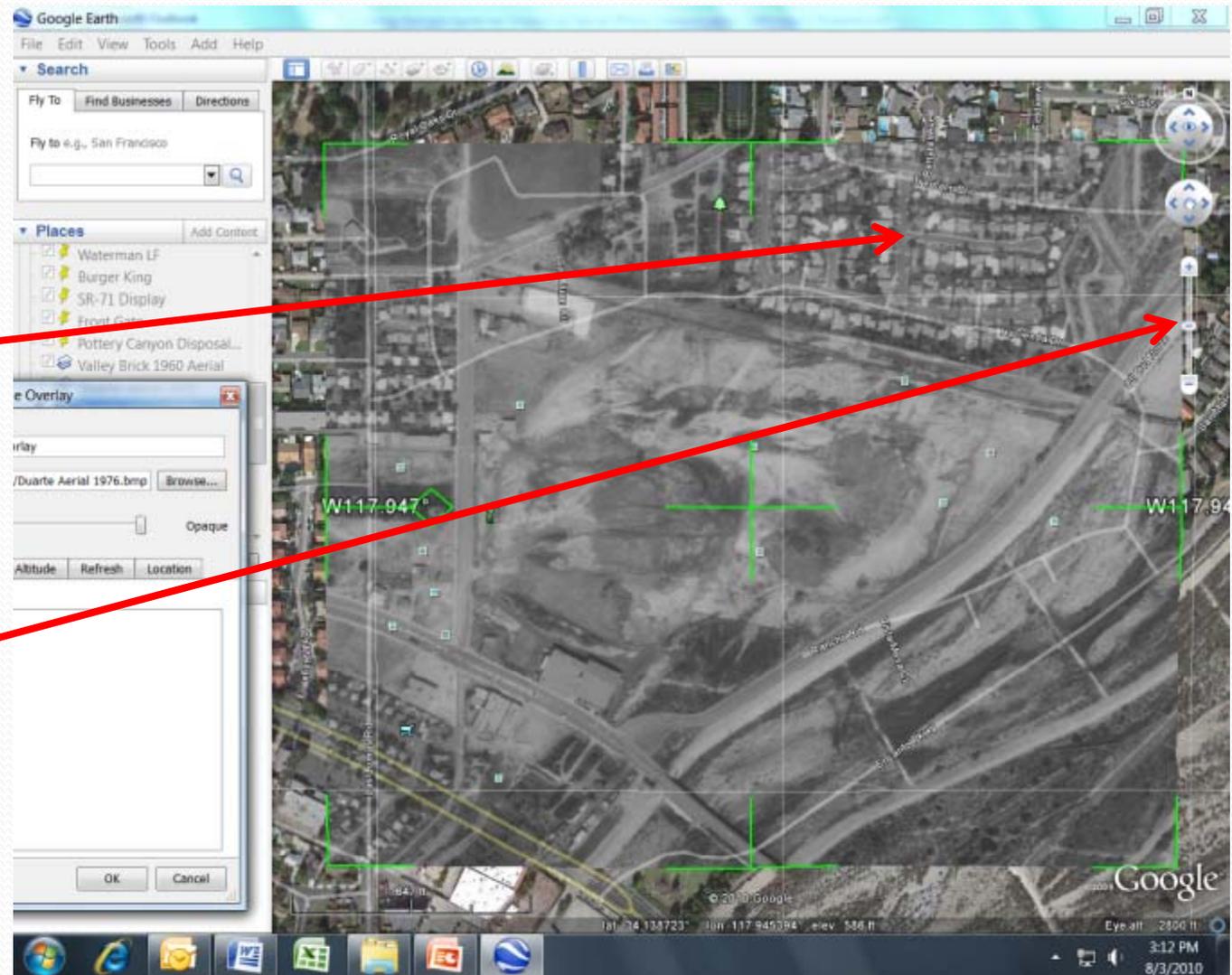


Overlaying Historical Aerials in Google Earth

Scaling and Orienting Imported Aerial Images Into Google Earth

Use benchmarks such as homes and streets to adjust historical aerial photo scale to the current Google Earth aerial image view.

Use the **zoom** function to increase resolution and check alignment of streets, buildings, trees or other benchmarks common to historical aerial image and current aerial image.



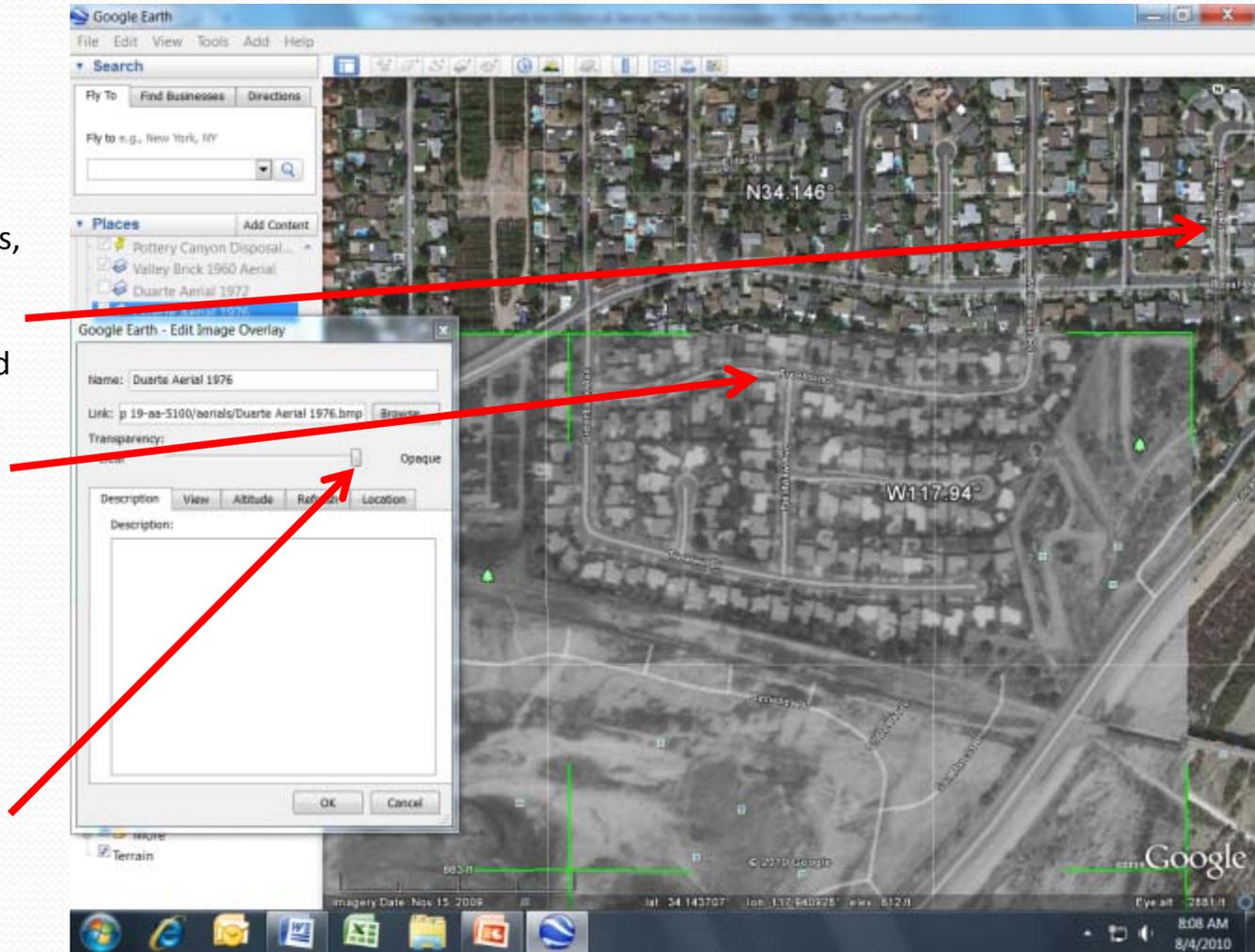
Overlaying Historical Aerials in Google Earth

Scaling and Orienting Imported Aerial Images Into Google Earth

Use the **zoom function** to increase resolution and check alignment of streets, buildings, trees or other benchmarks common to historical aerial image and current aerial image.

The Google Earth aerial map image will show white lines representing streets and street names.

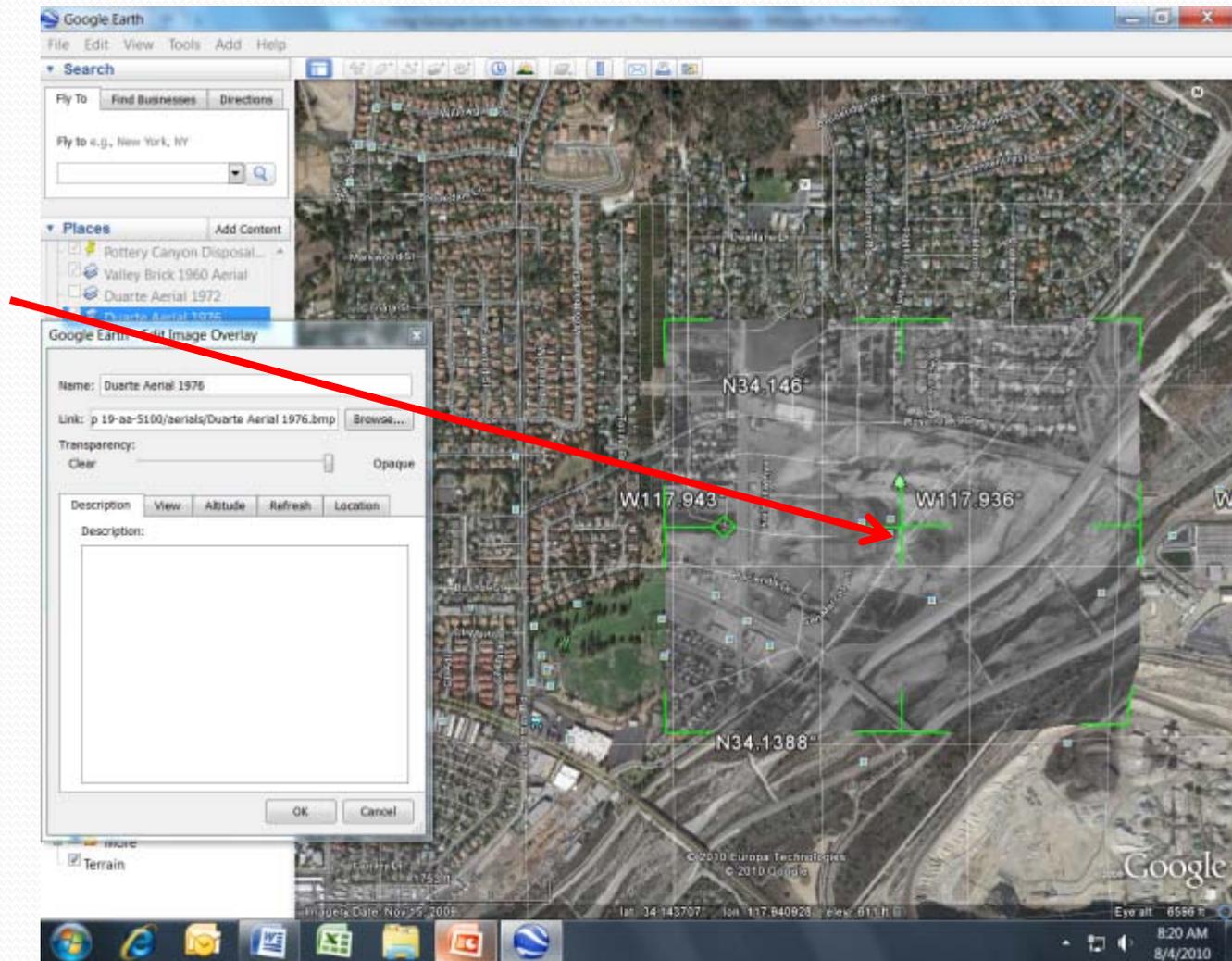
Using the **opaqueness slide bar** while adjusting the historical aerial image size will allow user to scale historical image to current image.



Overlaying Historical Aerials in Google Earth

Example for moving imported image

To move (translational) imported historical aerial photo image, click on green cross-hair and move to coinciding location in the current Google Earth aerial map view.

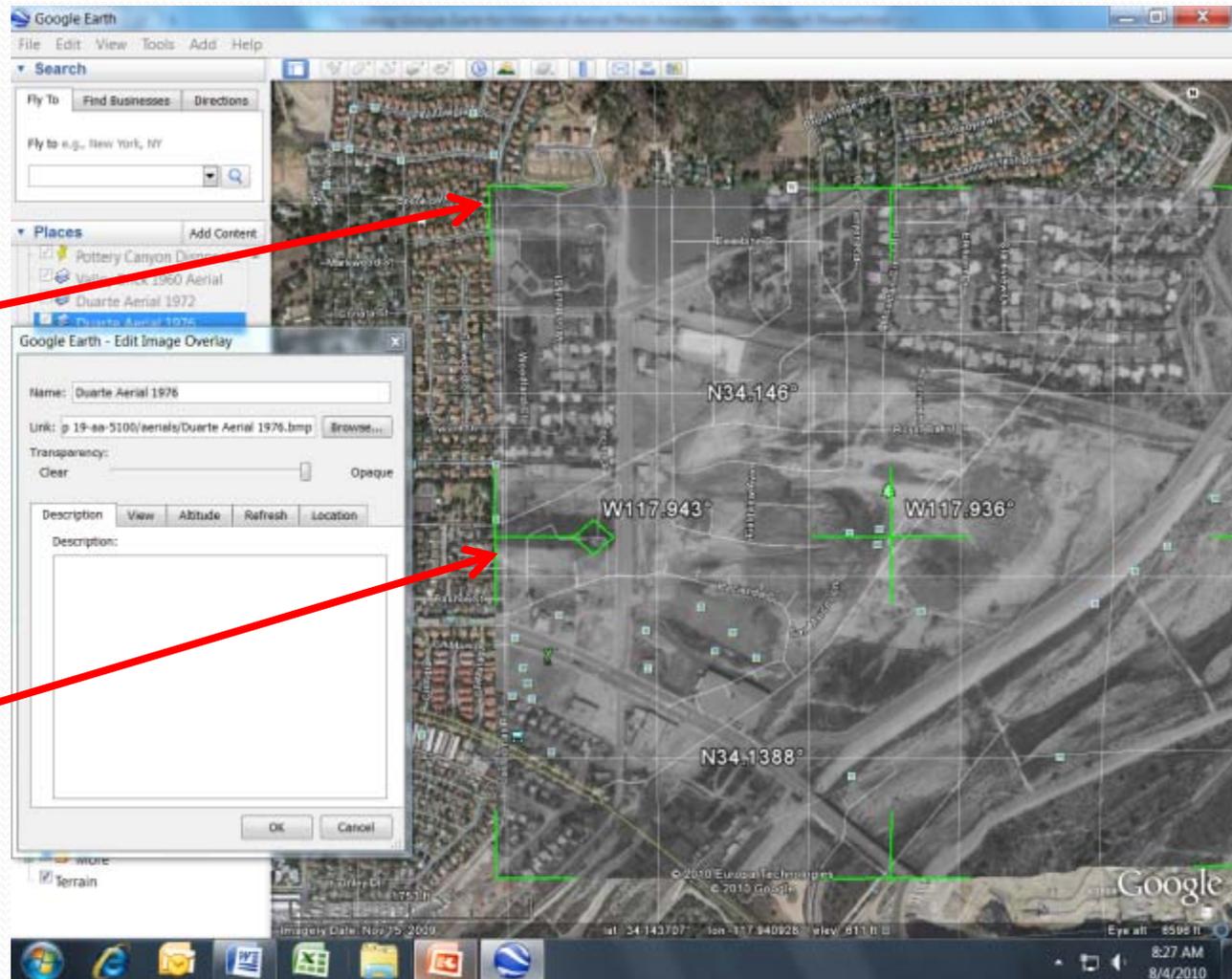


Overlaying Historical Aerials in Google Earth

Example for adjusting scale/size of imported image

To adjust the scale/size of image, relative to the current Google Earth Aerial Map view, click on the green corner indicator and press the shift key to proportionally increase or decrease the size of the imported historical aerial photograph.

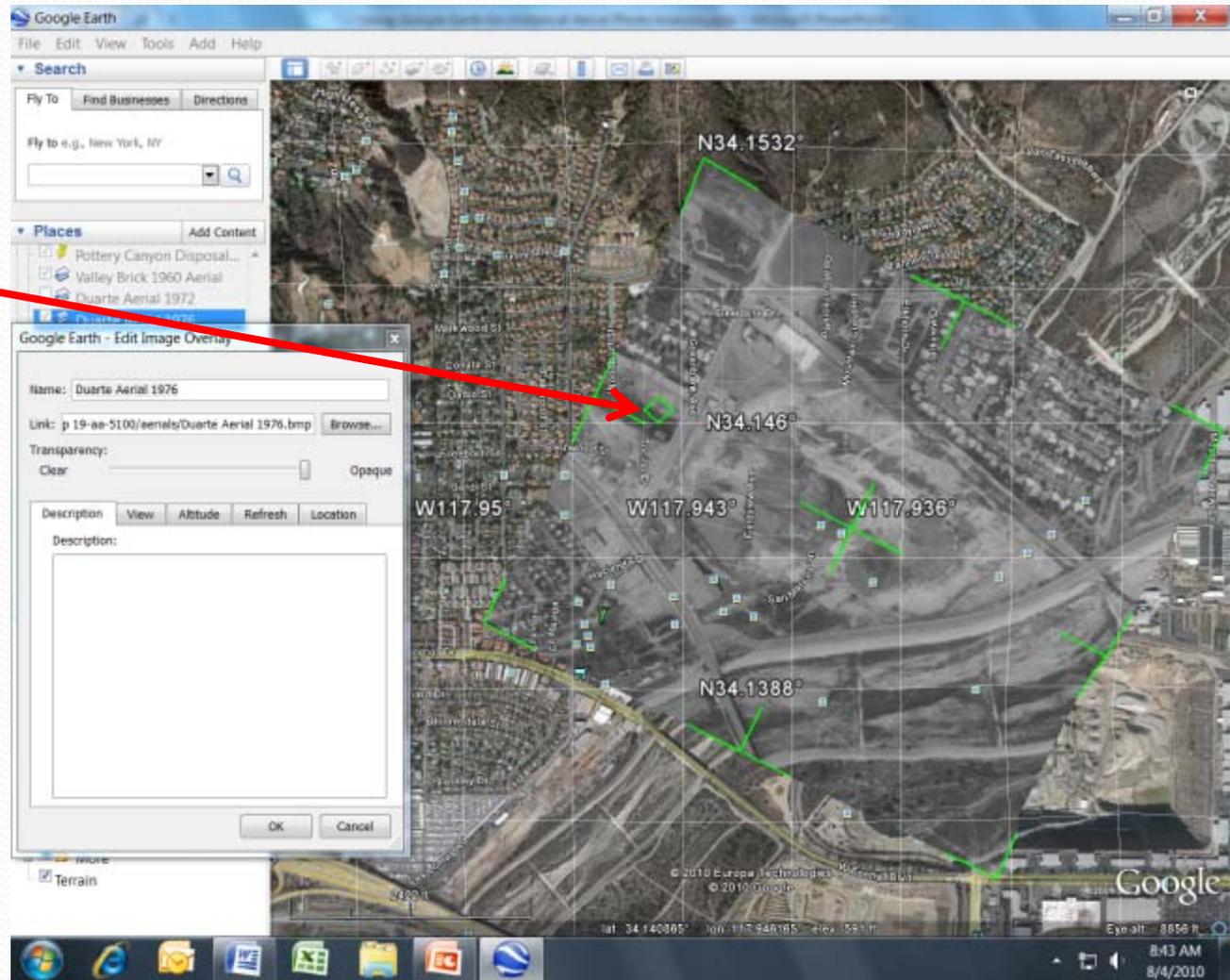
If the image is distorted, e.g. in north-south or east-west directions – use the green side indicator to increase or decrease the scale in the N-S or E-W orientation.



Overlaying Historical Aerials in Google Earth

Example for rotating imported image

To rotate the imported historical aerial photograph image, click on the green diamond and rotate the image to match current Google Earth aerial image view orientation.



Overlaying Historical Aerials in Google Earth

Google Earth features for analyzing landfill & disposal site boundaries

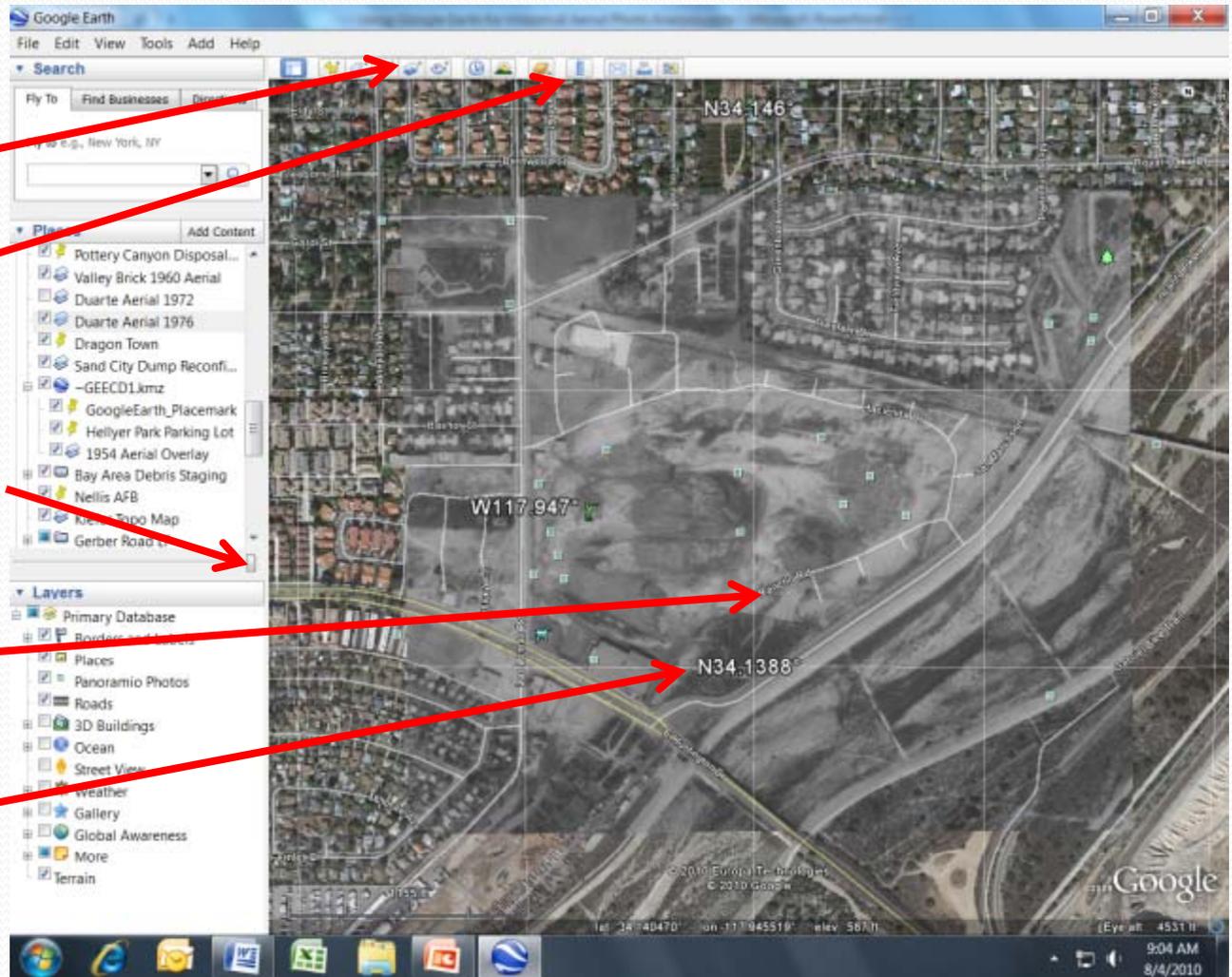
Polygon Tool; measure bounded areas.

Measurement Tool; measure boundary distances.

Transparency – Opaqueness Slide Bar; compare historic & current boundary features.

Street Names and Road indication lines; reference boundary locations.

Latitude & Longitude Grid Lines; locating position of boundaries, a.k.a Geo-Referencing.



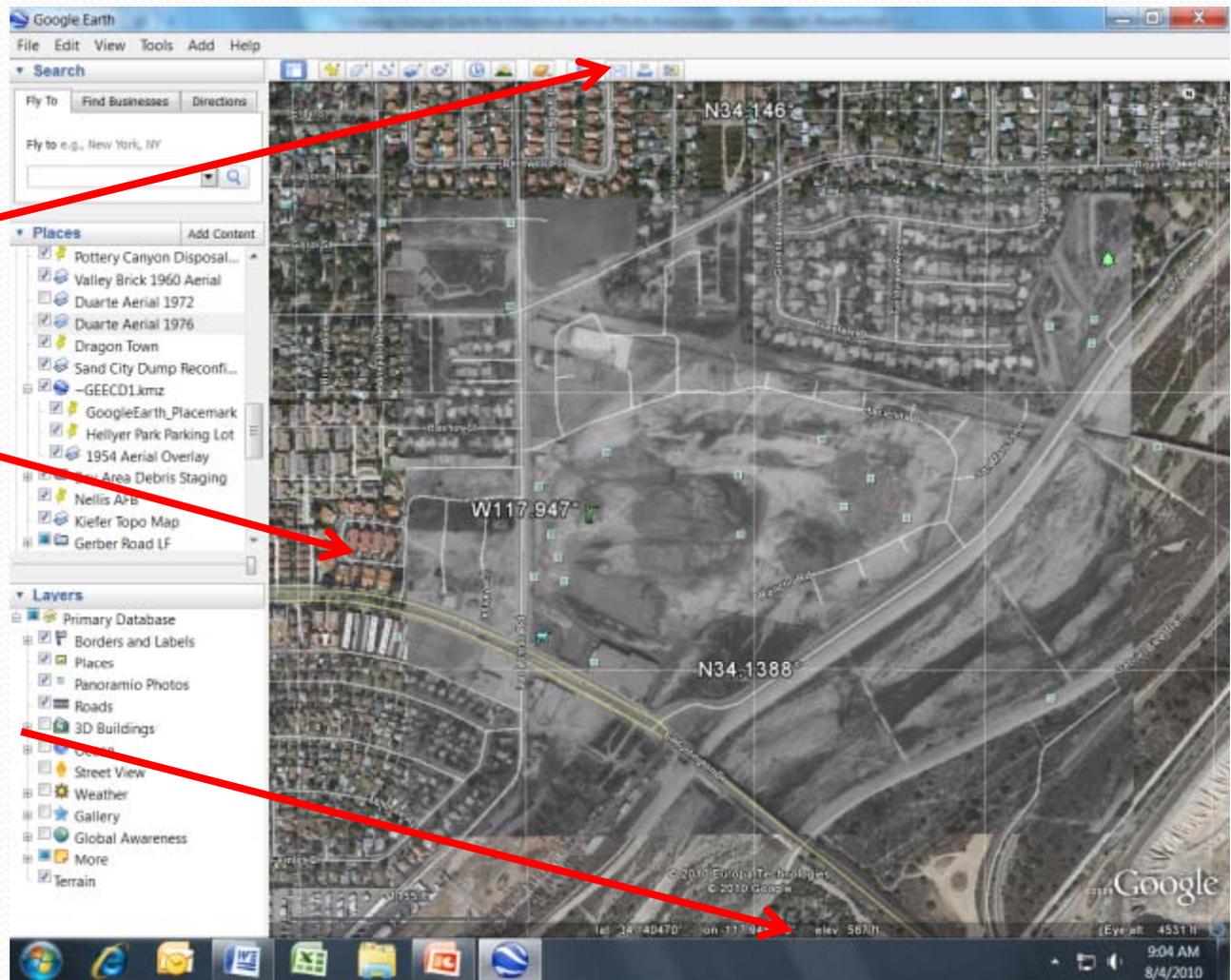
Overlaying Historical Aerials in Google Earth

Google Earth features for analyzing landfill & disposal site boundaries

E-mail Overlaid Image

Google Earth Aerial Photograph Map Imagery; shows relatively current land-uses (residential, commercial), streets, roads, railroads, waterways, structures, etc.

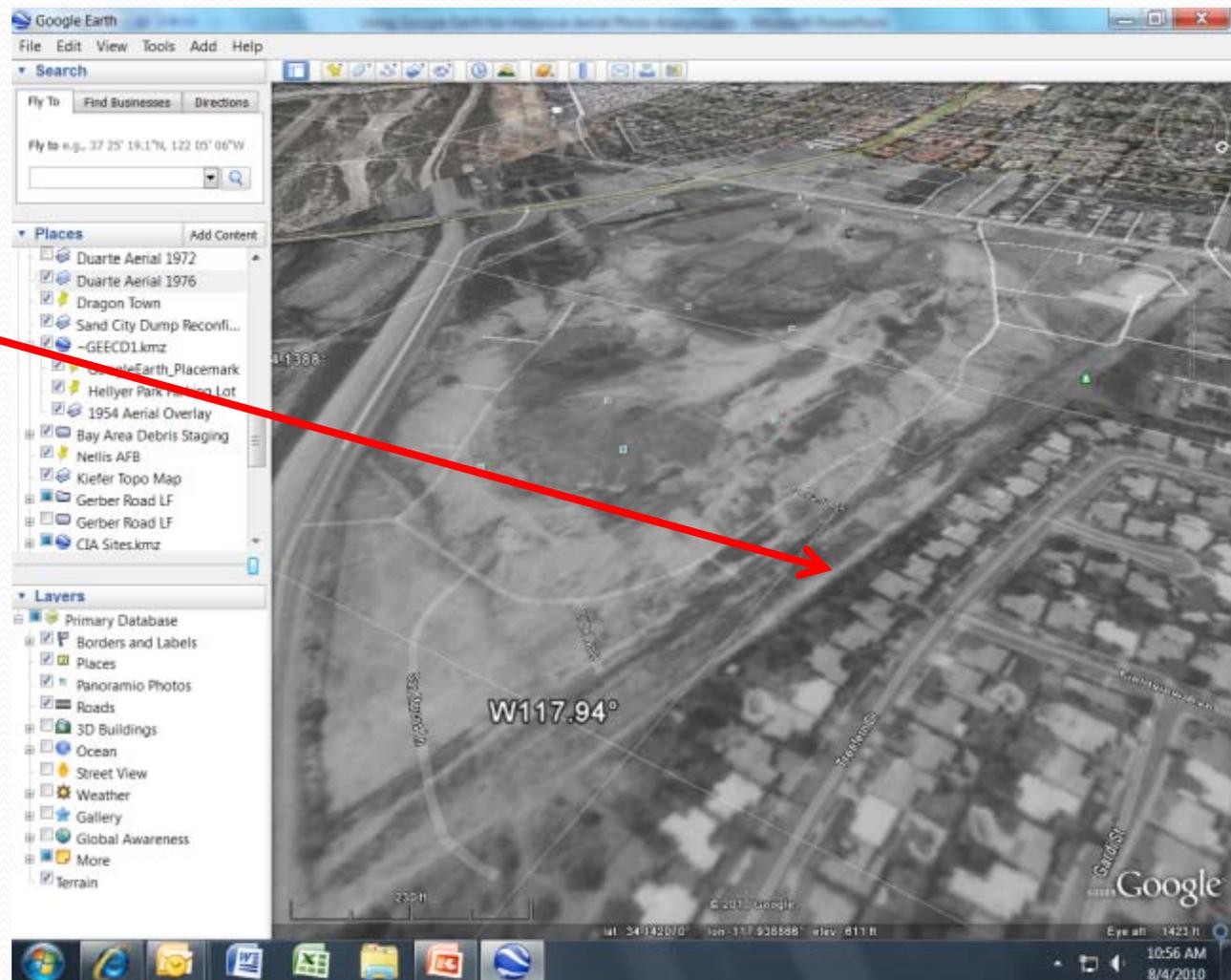
Elevation relative to sea level – show approximate elevation of landfill boundary locations.



Overlaying Historical Aerials in Google Earth

Google Earth features for analyzing landfill & disposal site boundaries

Resolution (zoom) function, oblique angle views, and view orientation dial, allow user to perform “virtual” site walk around historical landfill and disposal site boundary to study current location of structures, streets and other development with respect to landfill.





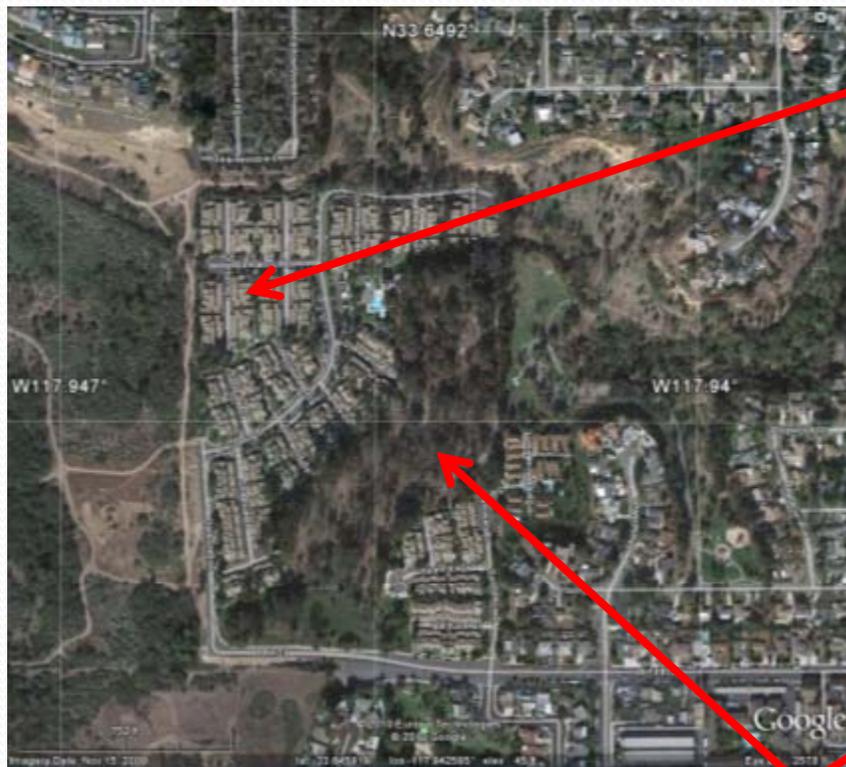
Overlaying Historical Aerials in Google Earth

- Google Earth Historical Aerial Overlay Case Studies:
 - Newport Terrace Condominiums – Newport Beach
 - Hellyer-Eastside Landfill – Santa Clara
 - 14th Avenue Landfill - Sacramento
 - La Veta Disposal Station (344 Jennifer Lane) – Orange
 - Valley Brick Disposal Site – City of Los Angeles
 - City of Roseville Landfill – PG&E Substation

Overlaying Historical Aerials in Google Earth

Case Study: Newport Terrace Condominiums

“Rubble Fill Area”; Condominiums constructed on 10 ft of engineered fill over 10-15 feet of rubble fill.



City of Newport Dump
Main Disposal Area;
Developed into Park Area

Overlaying Historical Aerials in Google Earth

Case Study: Newport Terrace Condominiums



Oblique view of Newport Terrace Condominiums looking northwest; Image can be rotated and oblique angle increased and decreased; zoom-in and out allow viewing of specific boundary/development details.

Overlaying Historical Aerials in Google Earth

Case Study: Newport Terrace Condominiums

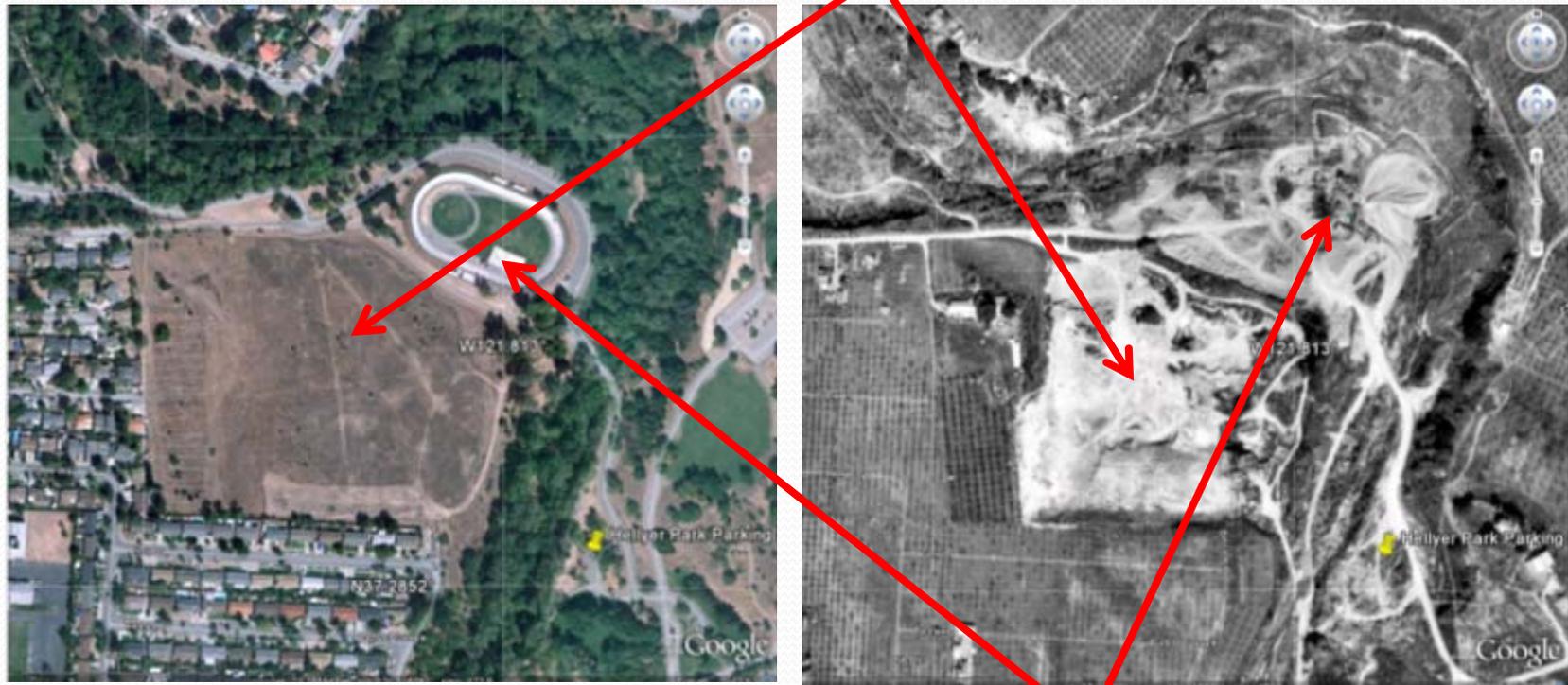
By using opacity or transparency function, and view orientations, the boundaries of former disposal sites can be studied in relation to current development.



Overlaying Historical Aerials in Google Earth

Case Study: Hellyer-Eastside Landfill

Landfill Area; Area of Excavation & Land Disturbance



Note excavation and mining operation locations;
Velodrome constructed on portion of former mining
area and landfill.

Overlaying Historical Aerials in Google Earth

Case Study: Hellyer-Eastside Landfill



Oblique view of Hellyer-Eastside Landfill looking northwest;
Note disturbed areas compared to current land use.

Overlaying Historical Aerials in Google Earth

Case Study: 14th Avenue Landfill



Former Gravel Mining Pit and Landfill; Commercial Building Developments.

Overlaying Historical Aerials in Google Earth

Case Study: 14th Avenue Landfill



Oblique view of 14th Avenue Landfill looking northeast; Note excavation pit boundaries with respect to commercial development.

Overlaying Historical Aerials in Google Earth

Case Study: 14th Avenue Landfill

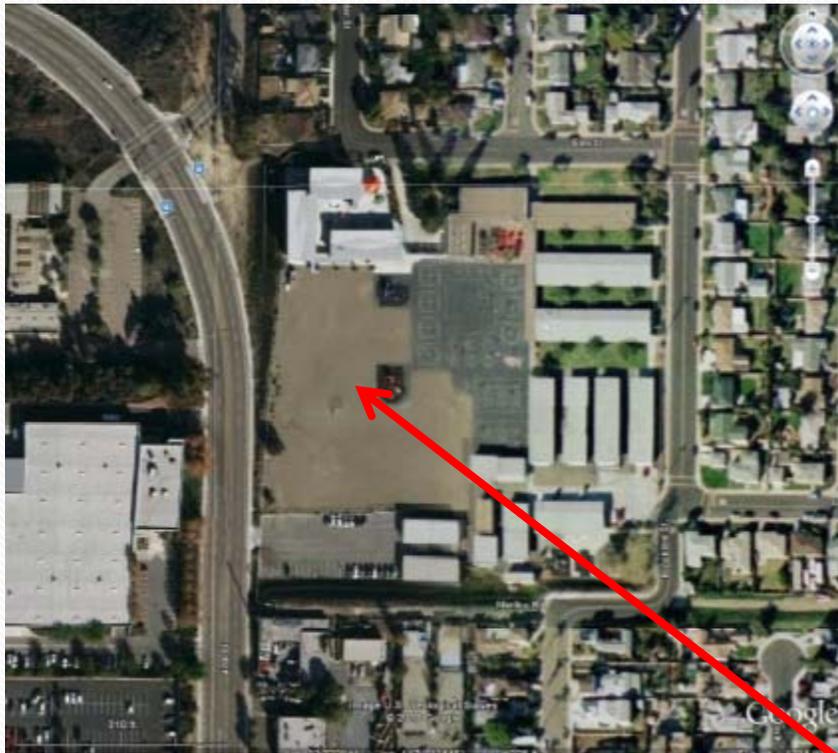
By observing oblique and enhanced view (looking NW) with transparency function of 14th Avenue East Pit, three buildings are seen constructed over the former pit area (that was filled with solid waste); the large building (on the right) was constructed on pilings. A worker was killed by asphyxiation from methane gas (landfill gas) during piling construction.



Parking lot adjacent to commercial warehouse located over waste fill; note settlement and ponding.

Overlaying Historical Aerials in Google Earth

Case Study: Noah Webster Elementary School/Burn Site

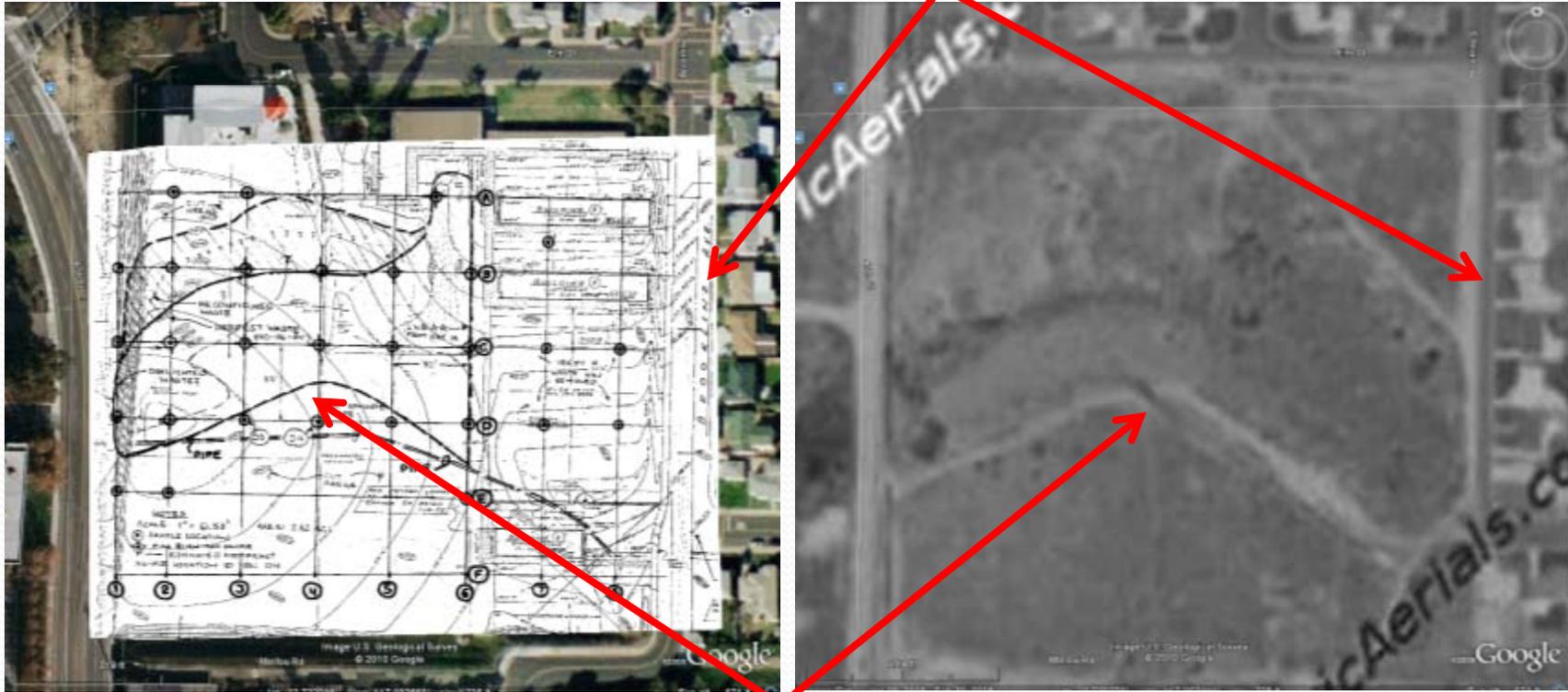


Former burn dump in the City of San Diego was located in a ravine area that was later reconfigured (consolidated and covered) and an elementary school constructed on the site.

Overlaying Historical Aerials in Google Earth

Case Study: Noah Webster

Residences and Streets (Brookline Avenue) at site used as scaling reference



Note Southern Ravine Boundary Feature

A topographic drawing provided by the school district, depicting the “cut-and-cover” sequence of the disposal site and native fill was overlaid and scaled in Google Earth and compared to the historic aerial photograph; the reconfigured boundaries of the waste approximated the ravine shown in the historic aerial. The investigation work plan incorporated this information into the sample location map to verify the extents of the reconfigured waste areas.

Overlaying Historical Aerials in Google Earth

Case Study: La Veta Disposal Station, Orange County, CA

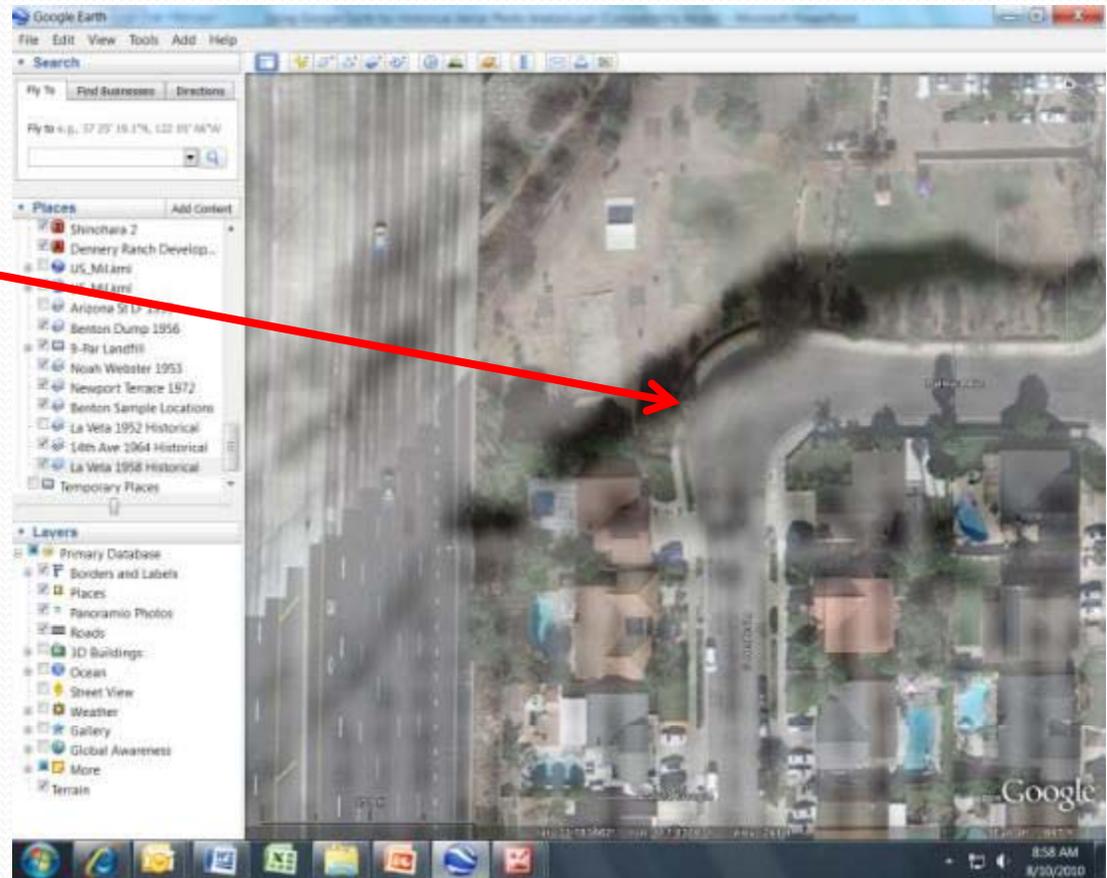


Former aggregate mining operation excavated banks of Santiago Creek; Later used for disposal at La Veta Disposal Station. Site was developed into residential in the 1970s. The residence at 344 Jennifer Lane was discovered to be over a portion of the former disposal site. The use of the Google Earth Overlay Tool assisted in locating the portion of the disposal site under the 344 Jennifer Lane residence.

Overlaying Historical Aerials in Google Earth

Case Study: La Veta Disposal Station

By using opacity or transparency function the boundary of historical features can be compared to current land-uses; in this picture, the boundary of the excavation can be compared to the location of 344 Jennifer Lane.



Oblique view looking southwest along Santiago Creek; Note edge of excavation and location of street and residences (344 Jennifer Lane first house on right).

Overlaying Historical Aerials in Google Earth



344 Jennifer Lane



Note alignment of wall

During landfill gas well construction, landfilled material was encountered down to 30 feet below ground surface adjacent to 344 Jennifer Lane residence.

A damaged cinder block fence was observed to be adjacent to the gas well being constructed



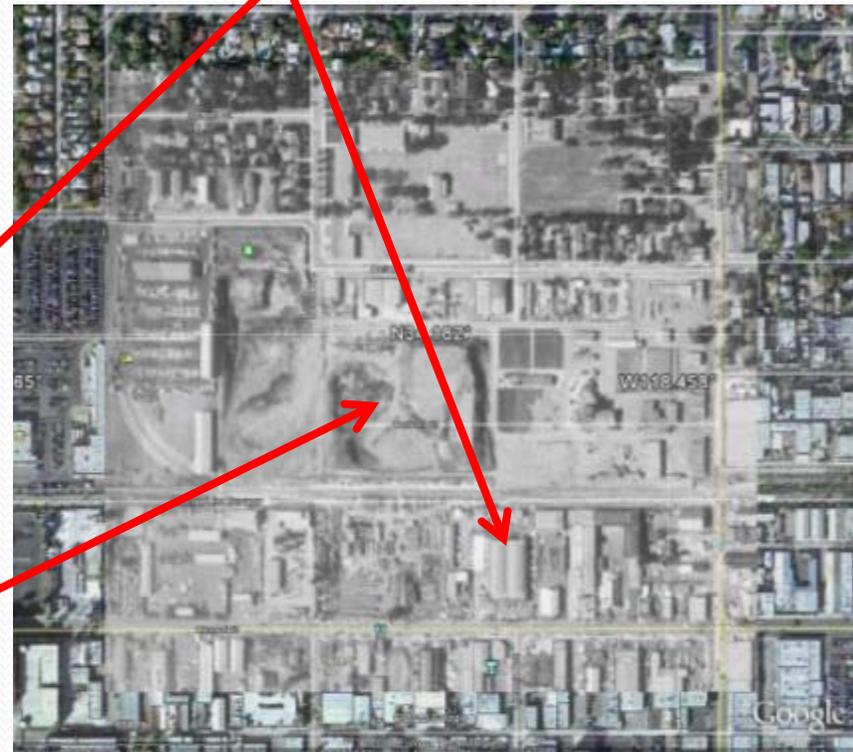
Note cracking and separation of wall



Overlaying Historical Aerials in Google Earth

**Case Study: Valley Brick Disposal
Site, City of Los Angeles**

Note structures common to historic and
current conditions to scale historical aerial



Note pit excavation boundaries and
current building structures

Overlaying Historical Aerials in Google Earth

Case Study: Valley Brick Disposal Site, City of Los Angeles



Overlaying Historical Aerials in Google Earth

Case Study: Valley Brick Disposal Site, City of Los Angeles

By using opacity or transparency function the boundary of historical features can be compared to current land-uses; in this picture, the boundary of the excavation can be compared to a building constructed over the disposal fill area.

Note pit excavation boundaries and current building structures.



Overlaying Historical Aerials in Google Earth

Case Study: Former City of Roseville Landfill, PG&E Atlantic Street Substation



Former City of Roseville landfill operations identified in historical aerial photograph (right); proposed trenching plan to delineate and sample fill with respect to Harding Boulevard (runs through the site) and commercial development to the north.



Overlaying Historical Aerials in Google Earth

- Obtaining Historical Aerial Photographs
- Historic Aerials Online Website with Map Browser:
 - See: <http://www.historicaerials.com/?poi=7958>
- University of California Library System:
 - UC Berkeley
 - UC Santa Cruz
 - UC Santa Barbara
- CalRecycle CIA Office Investigations – Historic Aerials:
 - <http://www.calrecycle.ca.gov/SWFacilities/CIA/Office/AerialPhotos/>