



RECOGNIZING TOP QUALITY
HISTORICAL AERIAL PHOTOGRAPHS
FOR ENVIRONMENTAL INVESTIGATION



Historical
Information
Gatherers

When you're conducting historical research for environmental due diligence or other environmental investigations you want to make sure that the research and resulting data are of the quality you need to reach the best conclusions. This article is designed to help you understand the differences in historical aerial photograph quality available on the market today so that you can work with your information provider to get the right match for your project.

Uses for Historical Aerial Photographs

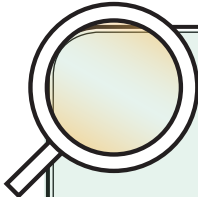
Aerial photographs (aerials) are best for identifying the presence of structures and assessing land use changes over time. Aerials can provide the general location of specific areas that may need further investigation such as outdoor storage areas, areas of staining, and drainage areas. You can find a lot of variety in the quality of aerials available in the marketplace. It's fairly easy to spot a poor quality aerial because the elements in it will be blurry. Other quality differences may be harder to spot. This article will provide some basic guidance on how to tell if you are getting the best quality aerials.

High Quality Vs. Low Quality Aerial Scans

See *photos on Page 3*

Good aerial scans are made from the best available source: either an original negative or a high quality print. High quality scans also take more effort to produce because it takes longer to scan an image at a high resolution (more dots per square inch or dpi) and the resulting file size is larger. Sometimes the original negative or prints are no longer available or the aerial images were taken at a low resolution. In these cases, even the best scanning job cannot make the features on the aerial more clear. In addition, digital photography first used in the 1980s was not of the great quality available today. That is why you may have observed that aerials from the 1940s often look better than those from the 1980s.

What is the solution? Look for an information provider that uses the best original source material available, has many years of coverage, and has scanned the images properly so you can clearly see the structures and land features that were present in the past. *(continued on Page 4)*



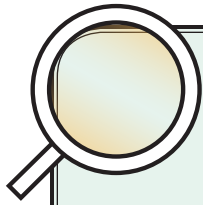
Historical Use Information

GUIDING PRINCIPLE FROM ASTM E1527-05

8.3.1 Objective—The objective of consulting historical sources is to develop a history of the previous uses of the property and surrounding area, in order to help identify the likelihood of past uses having led to recognized environmental conditions in connection with the property.

Historical research completed during environmental due diligence can help identify environmental issues and obligations such as:

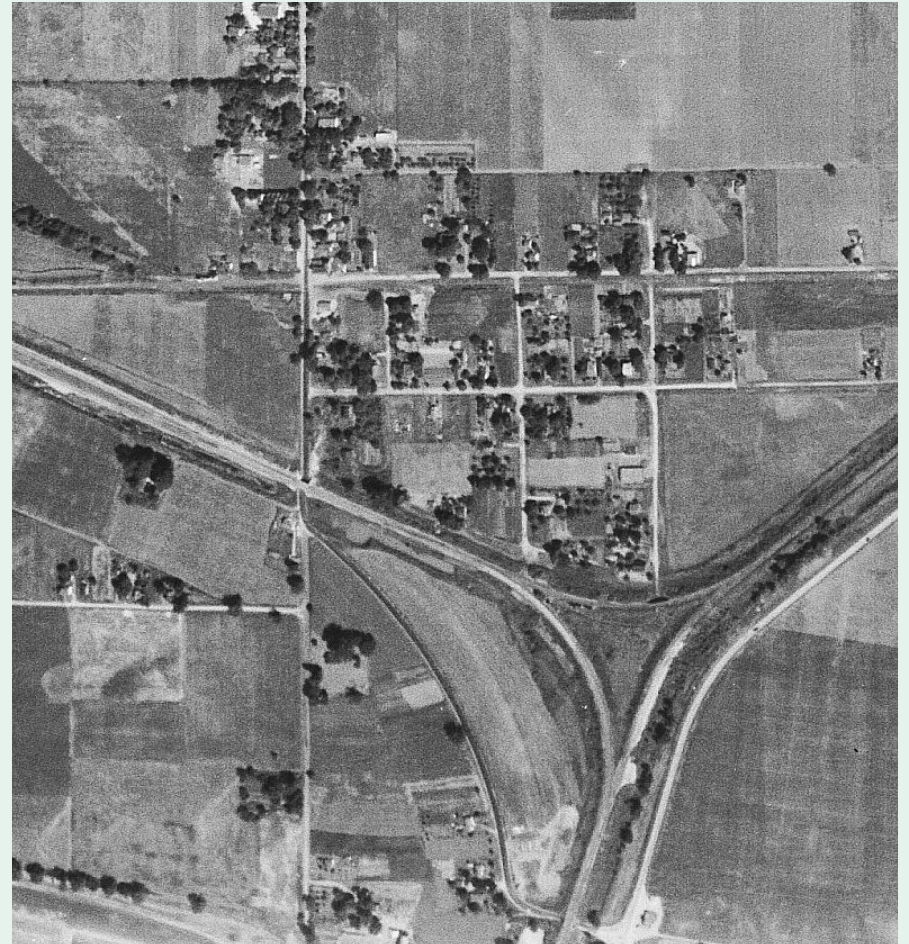
- Items of potential environmental concern that do not rise to the level of RECs.
- The need for operation and maintenance or removal/closure of wells, waste handling systems, ACM, and PCB-containing equipment.
- Local environmental reporting, licensing and permitting requirements as well as possible health and safety issues related to active or abandoned wells, ASTs/USTs, air or water discharges, residual contamination and institutional controls.



High Quality Vs. Low Quality Aerial Scans



An example of a bad scan



An example of a good scan

Ask For a Consistent View and Scale

Another feature to look for in aerials is a standardized view and consistent scale. This means that your information provider delivers a set of historical aerials with the same scale whenever possible. Ideally, you want your information provider to also center the photos on your site. Why does site location and scale matter? It is easier to review the photos without having to hunt for your site or try to adjust to changes in scale. You will be able to more quickly spot what changes have occurred to the site and surrounding properties over time. Information providers that create high resolution aerial scans are able to produce sharper aerial images centered on your site and can provide more of these aerials at a consistent scale.

Correcting Distortion On Historical Aerials

On original historical aerials, the most accurate depiction of the features is found in the center of the photograph. Features along the edges of the aerial are distorted due to curvature of the earth, the curved camera lens, elevation differences on the ground and other factors. In the market today you can find historical aerials in their original format, georeferenced aerials, and orthorectified aerials. The best historical aerials will have been scanned from negatives or original prints and depending on their intended use, the aerials may also need to be corrected for distortions in scale to a degree that meets your project requirements.

For a Phase I Environmental Site Assessment (ESA), reviewing good quality scans of historical aerials is typically sufficient to identify land use changes over time. These aerials can be provided as PDFs that can easily be placed inside title blocks for use in reports and do not require expensive software to view.

For Phase II ESAs or remediation work, a more accurate scale is preferred on the aerials. Why is this important? If you're using historical aerials to determine where to conduct soil or groundwater sampling, you don't want to be off by 100 feet or more. You should request your aerials be georeferenced. This means that at least three features on the aerial are matched up with the same features on a base map. This base map may be a properly scaled current aerial or other map that shows the true scale on the ground. In layman's terms, georeferencing effectively condenses and/or stretches features on the aerial to a more accurate horizontal scale.

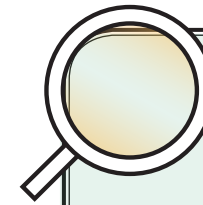
Georeferenced aerals are typically provided as tif, jpg or other digital image files that can be used with GIS or CAD software. These images can be overlaid on a current site survey or recent aerial. This helps the environmental professional determine the current location of historical areas of environmental concern. The GIS or CAD software can be then be used to create maps that outline these areas of concern or show proposed soil boring and monitoring well locations.

Many aerial photographs have distortions in them due to the tilt of the camera, lens distortion, and topographic relief. For even more accurately scaled historical aerals, you could request your aerals be orthorectified. In the process of orthorectification, complex mathematics are used to correct for distortions in horizontal scale and correct for spatial distortions due to elevation changes on the land surface.

If your site has significant elevation changes, the use of orthorectified historical aerals is your best bet for determining sampling locations and assessing the best way to conduct remediation work. The geometric corrections that occur with orthorectification make the scale of the photograph uniform so that it can be read like a map and used to measure true positions, distances, areas and angles.

The images on Page 6 show the difference in a photo after it has been orthorectified. In the image on the top, you can see the angle and curve of the original photograph. In the image on the bottom, orthorectification has been used and you can see the map-like quality of the streets.

Fun Fact Photos are the only historical source that is not subject to human error or omissions. For example, fire insurance maps were hand drawn by insurance company employees. City directory (CD) information was voluntarily submitted by property occupants and/or compiled by directory publishers based on door to door surveys.



Useful Tips

- Consider reviewing or ordering orthorectified photos for best scale preservation and lack of distortion on sites with significant changes in elevation.
- Combine aerals with a set of historical topographic maps to fill data gaps; this is most useful in rural areas that may have few historical resources.
- Georeferenced aerial photos are a great option for large area studies and corridor projects.
- If you don't know what a feature on a photo is, find out! Ask a colleague, environmental consultant, or your data provider. You could also show the photo during site visit interviews or post the photo on a professional social networking site to get opinions.



Orthorectification



An image before orthorectification



An image after orthorectification

The images in above show the difference in a photo after it has been orthorectified. In the image on the top, you can see the angle and curve of the original photograph. In the image on the bottom, orthorectification has been used and you can see the map-like quality of the streets.