

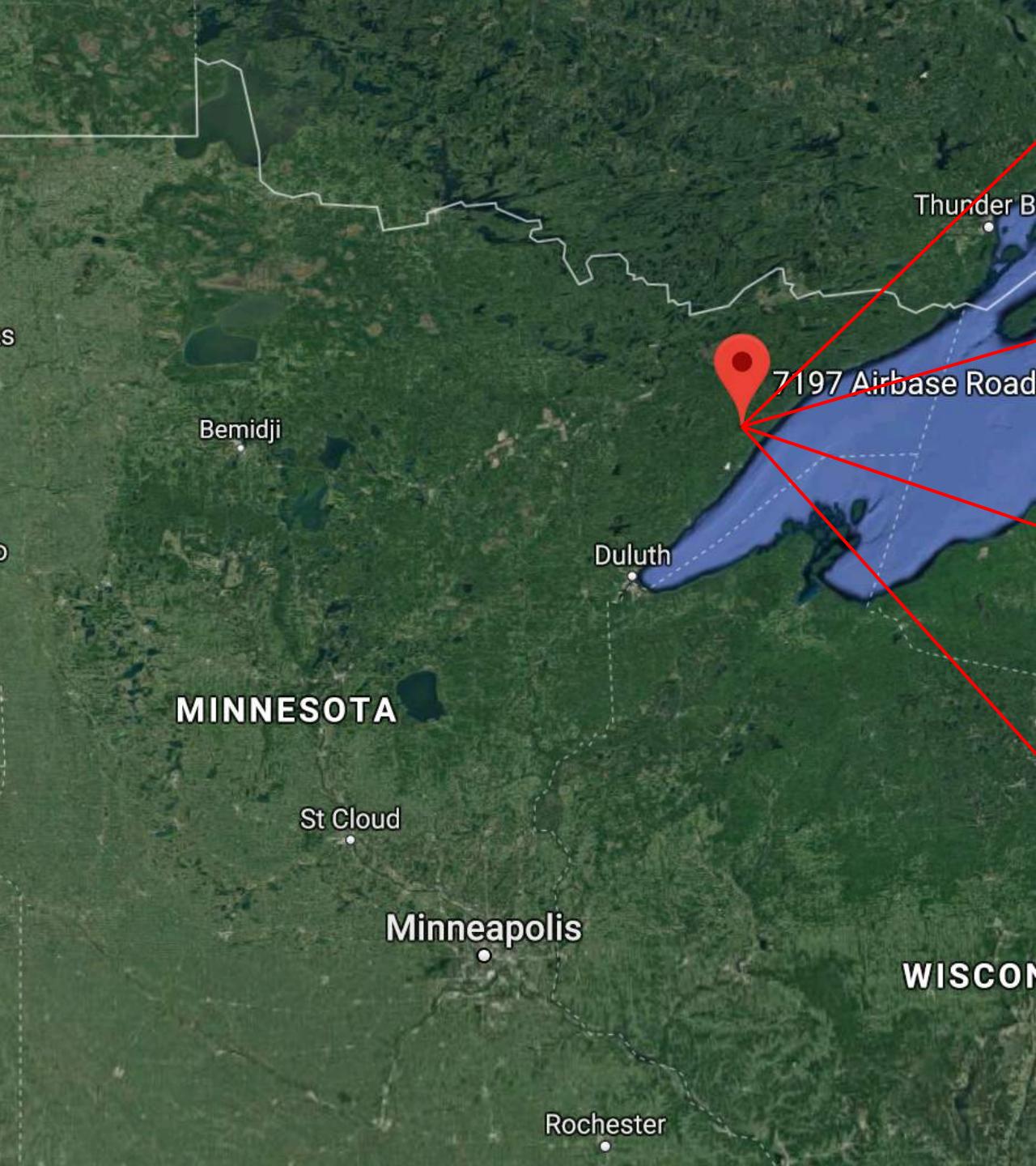
Finland Air Force Base

Historical Photographic Analysis

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GEOG 480 – GISc and Environmental Hazards



Located a few miles away from Finland, MN (pop. 195)
on the Northern Shore of Minnesota

Introduction

Finland Air Force Base was commissioned in 1951, the same year as the base in Chandler, MN; and others around the nation. It was a part of the Semi-Automatic Ground Environment (SAGE) system during the Cold War era. This station reports to a larger Duluth station, about 65 miles away.

The station was decommissioned in 1980, becoming abandoned. Multiple projects were proposed, including a tourist resort called Finlandia. With that project falling through, it is now a religious retreat location. The Site is listed on the Federally Used Defense Sites (FUDS), as well as a Superfund site. It is listed as having underground tanks, radioactive, and hazardous waste.



Concerns

Looking at historical imagery, and air photos, the goal is to interpret and mark possible locations of hazards on site. This data will be used for further investigation and field studies of the site. Possible contamination could be from possible asbestos insulation, automotive related wastes, solvents, and other hazards wastes from heating and power plants.

Because it is marked does not mean it is a confirmed hazard, but brings forth enough reason for it to be further looked into, and tested.



Methodology

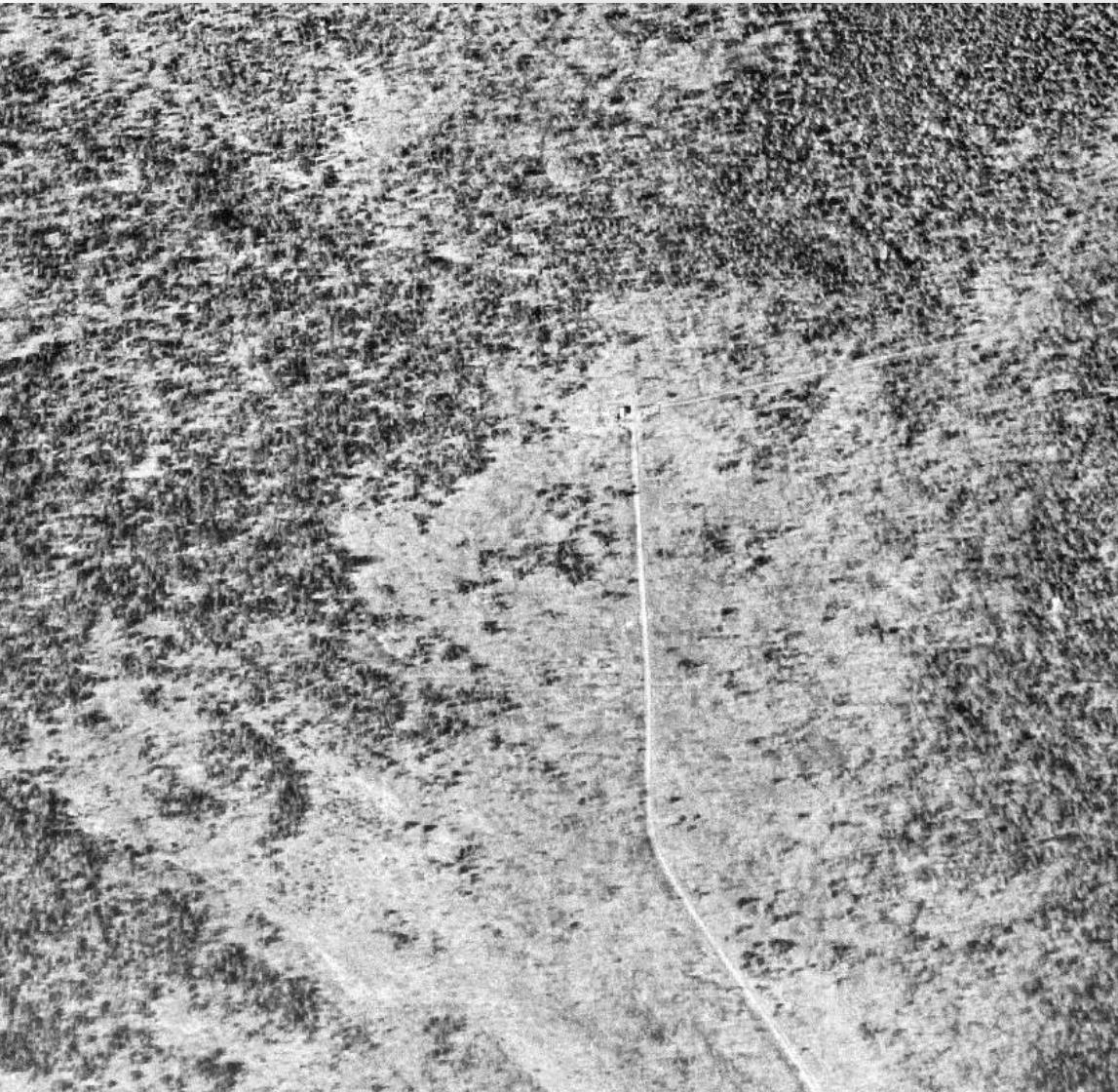
ArcGIS Pro was used to georeferenced aerial photos, digitize and mark areas of hazards, and derive products from the LAS file. With this information, 3D models of the known buildings (buildings that are intact as of 2012) can be created, and visualized.

ERDAS Image was used to compose 3D stereo pairs to better visualize some of the marked environmental hazards.

Data

Data used for this project were aerial photos from USGS's Earth Explorer, LiDAR LAS file from MnTOPO, and images and information about the site from radomes.org, and fortwiki.com.

1951 v. 1954



1977 v. 2018

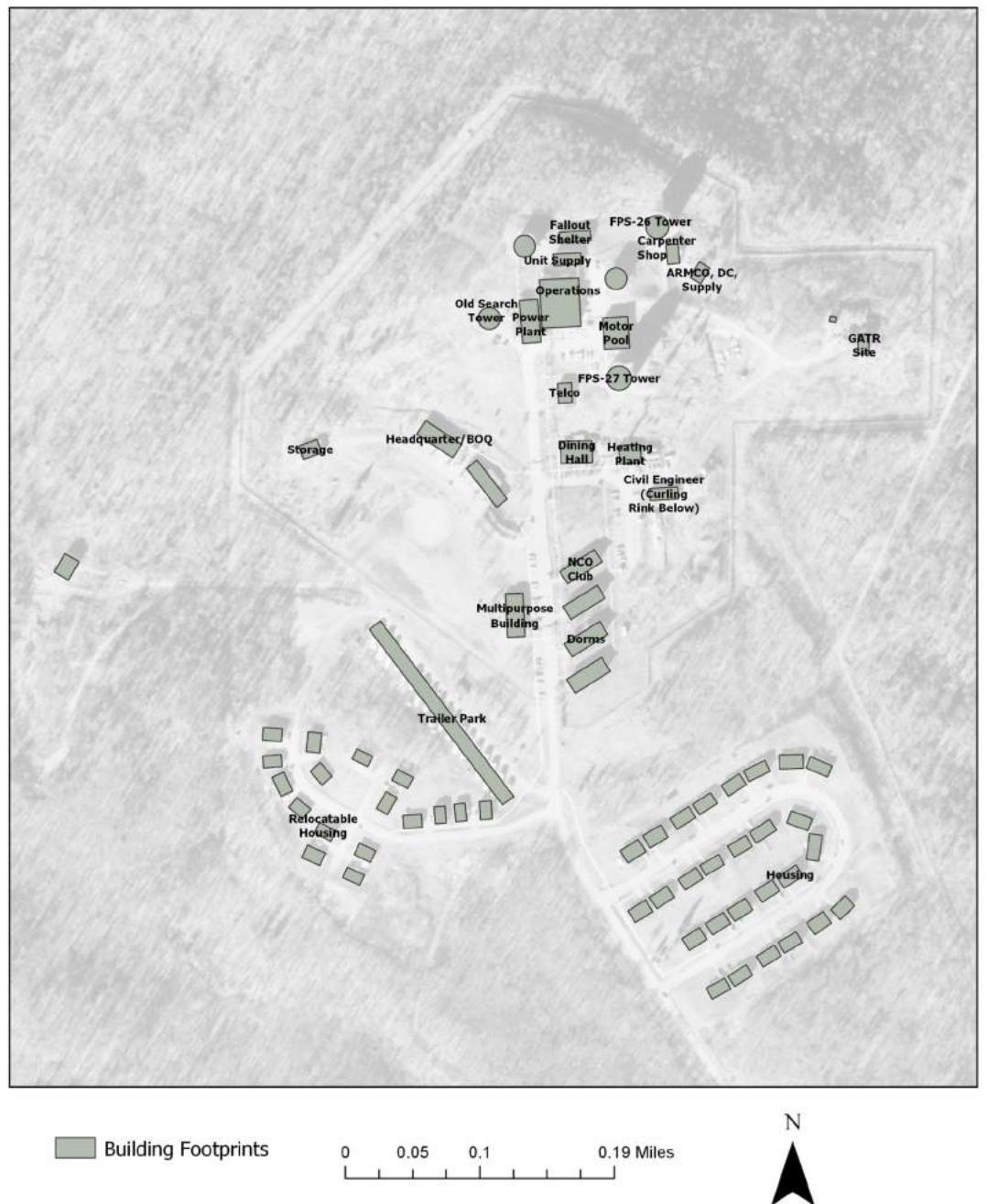
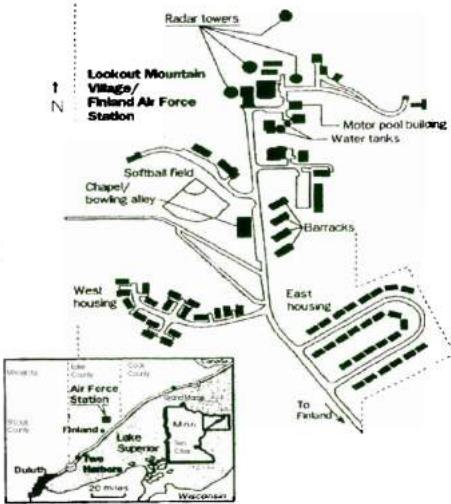
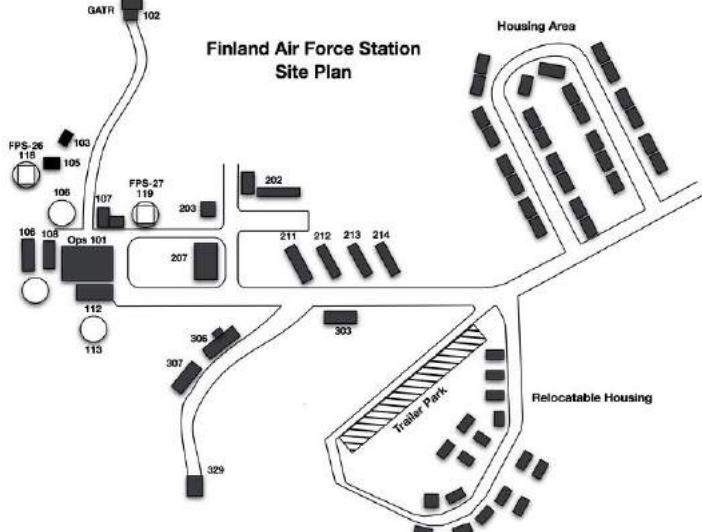


Building Usage of Finland AFS

Building Usage

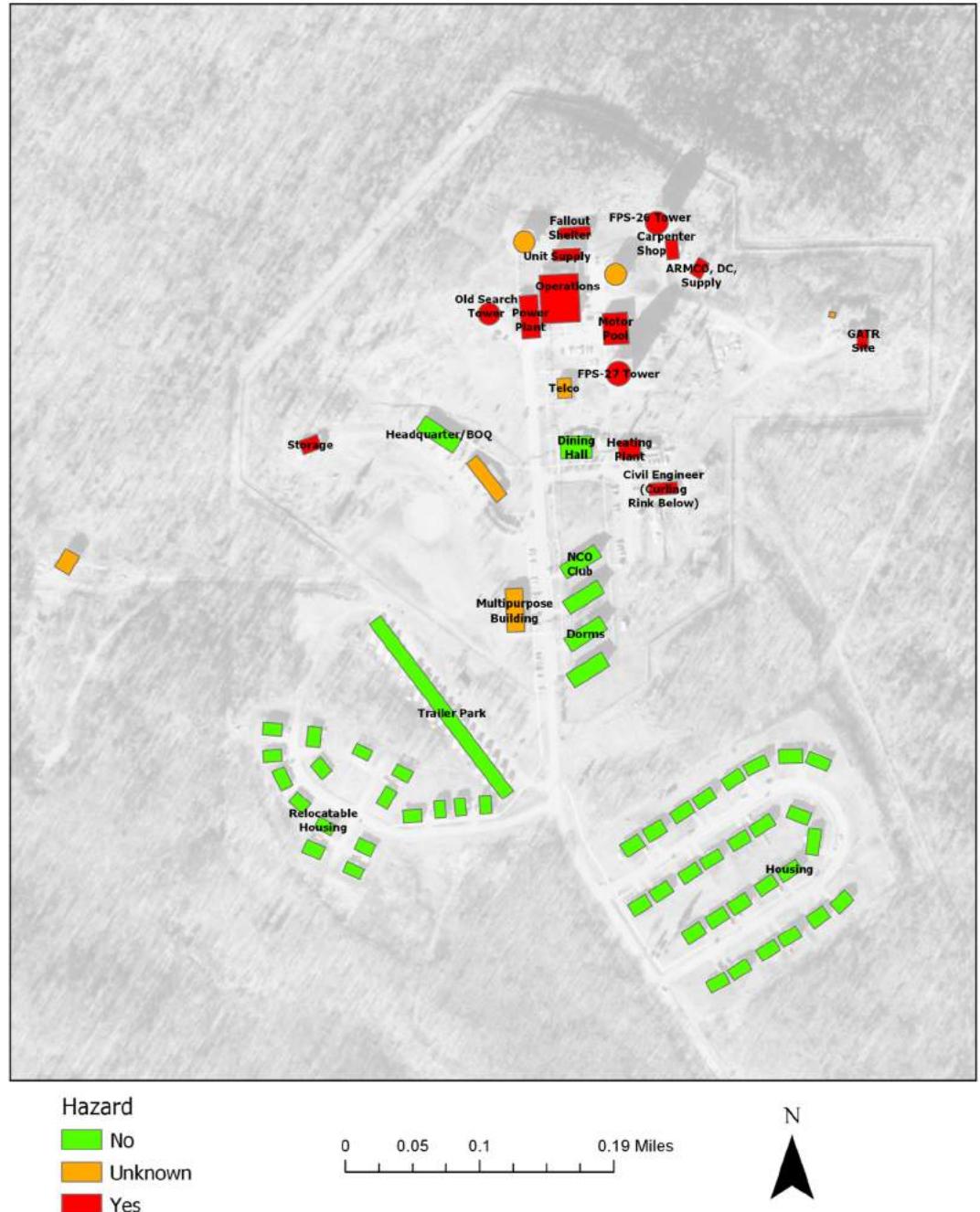
A site plan of the air force station was found on fortwiki.com. This contained both the map and key. Some of the items were missing, but much of the site was able to be classified.

Using ArcGIS Pro, digitizing and attributes were able to be created to form this map.



Building Hazards

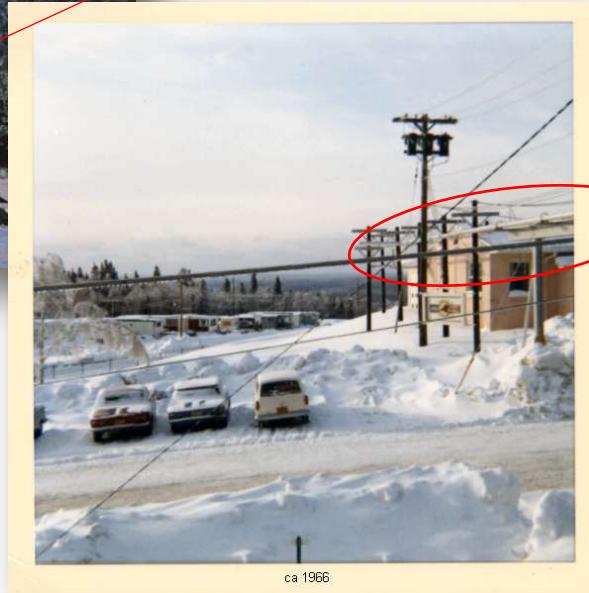
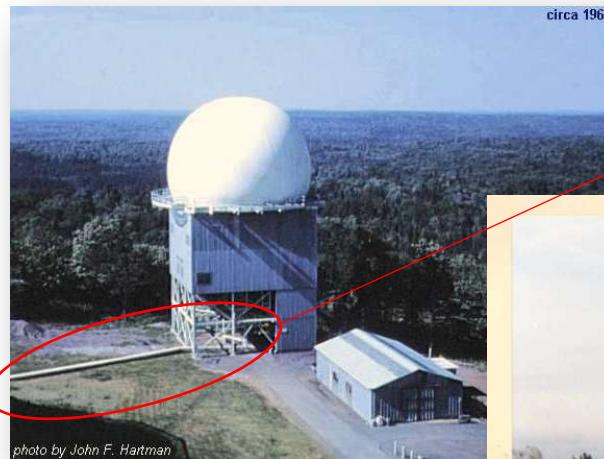
Based off of the previous building usage map, an assessment of whether a building would have any sort of hazard was completed. This is confirmed, but is able to give an idea of points of interest to conduct further testing.



Possible Pipe Contamination Source

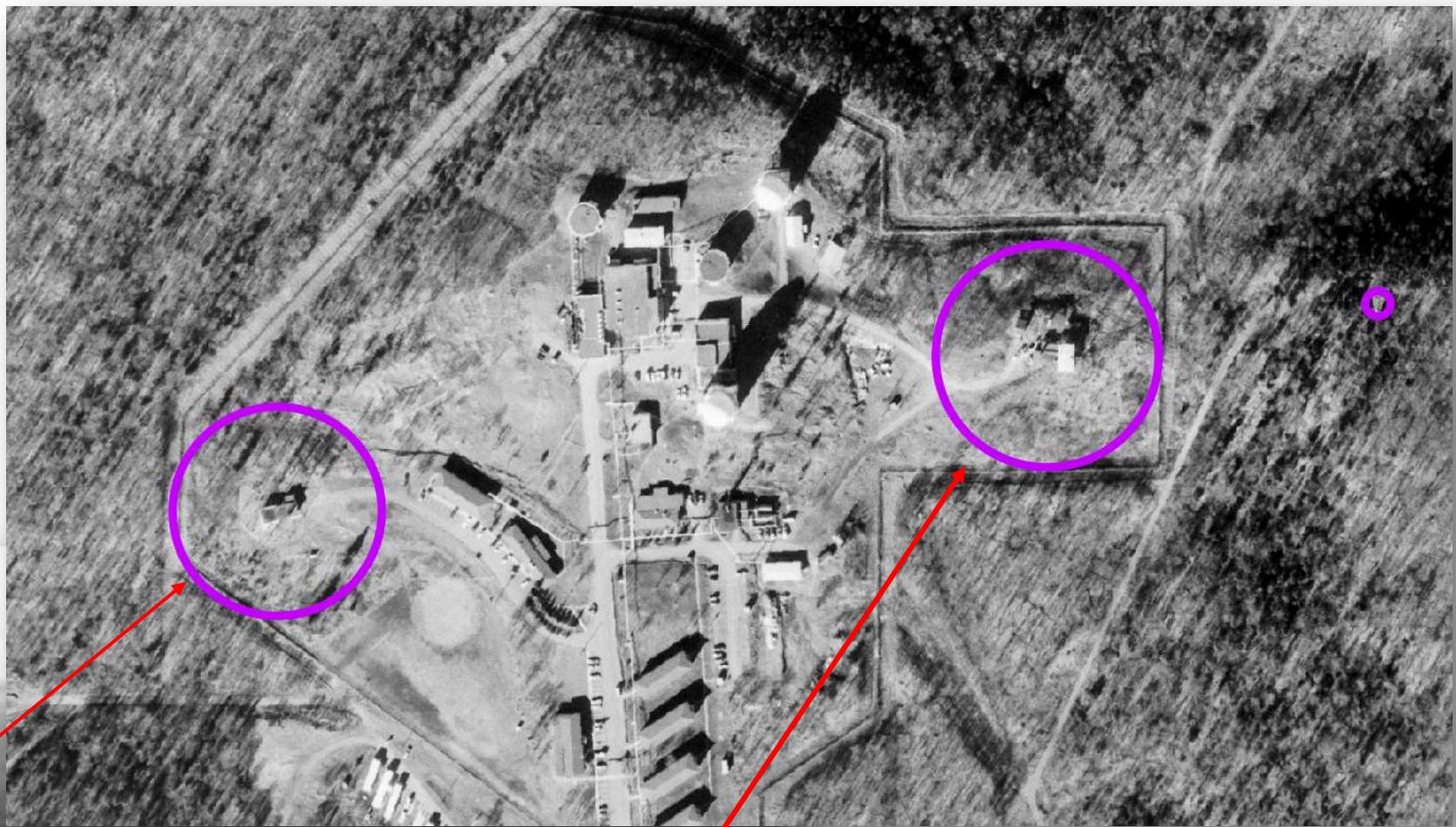
Pipelines

The site has pipes running around the base, which due to the time of construction, there could be a chance of asbestos contamination.



Antennas

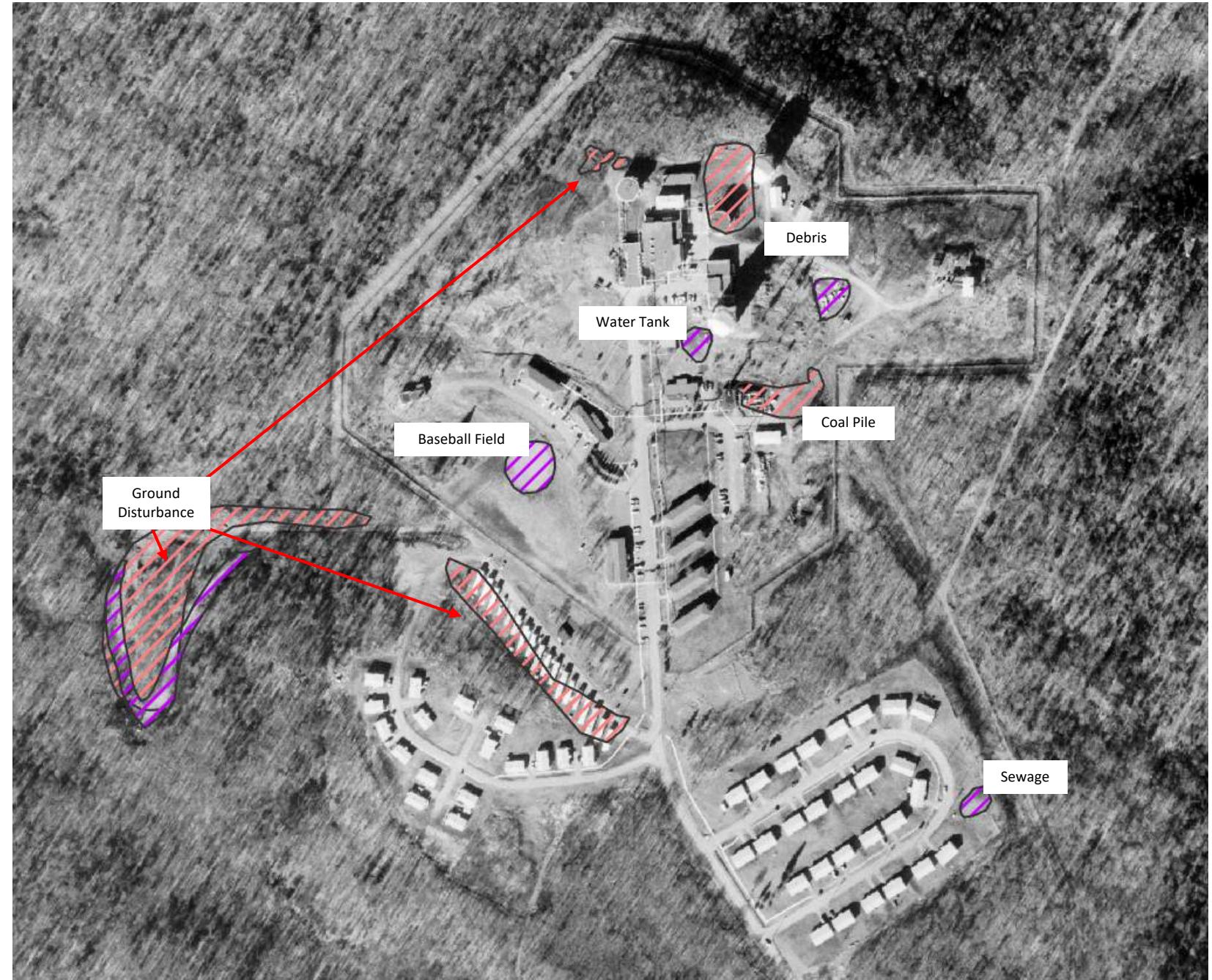
There are two main locations where there are many antenna towers in one spot. One of these spots is the Ground Air Transmit Receive (GATR) location.



Ground Disturbance and Debris

Suspicious locations of ground disturbance or debris were mapped from 1954 and 1977 air photos. Locations can be seen better in stereo pairs in the subsequent slides.

- Disturbances_1954
- Disturbances_1977

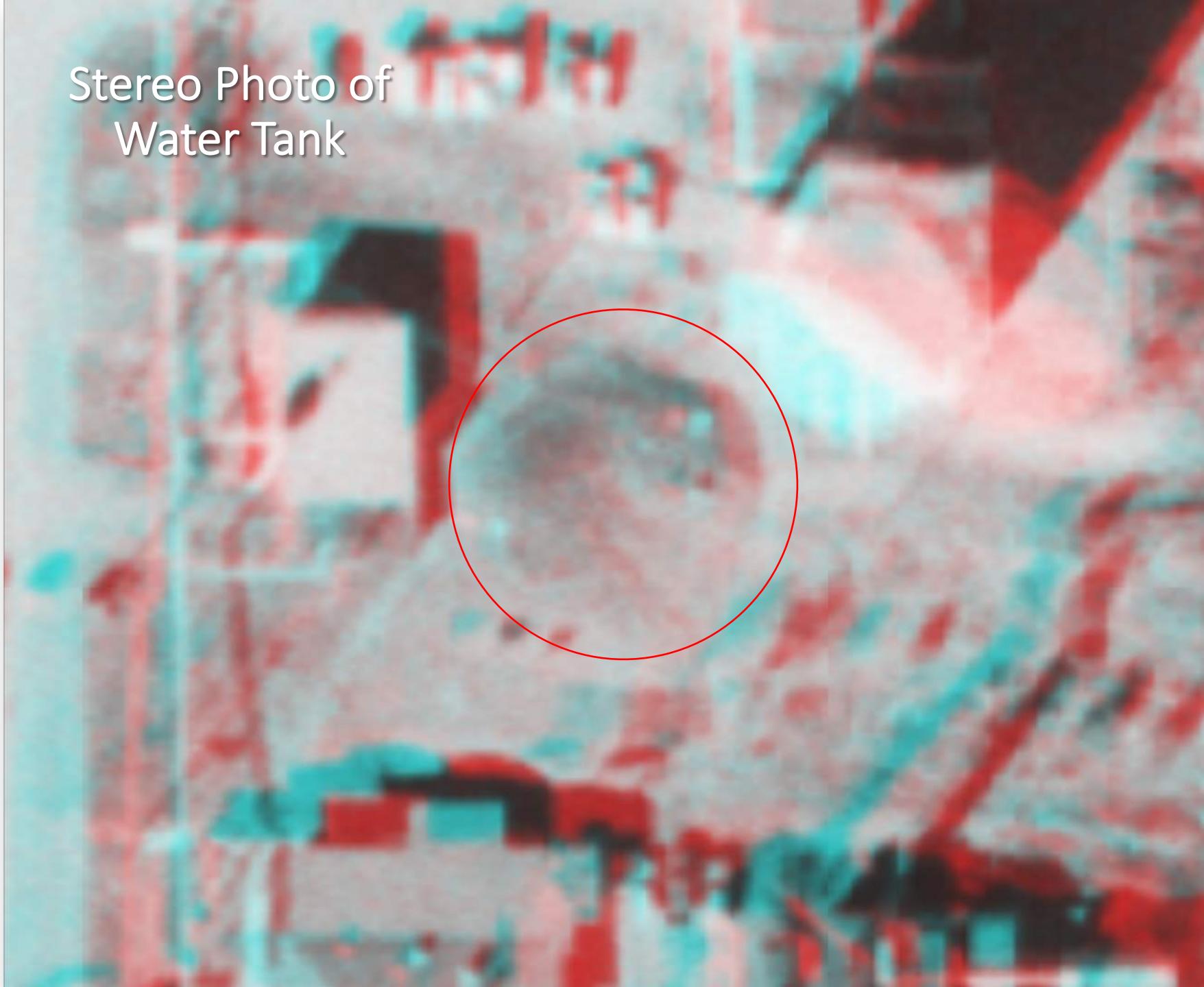




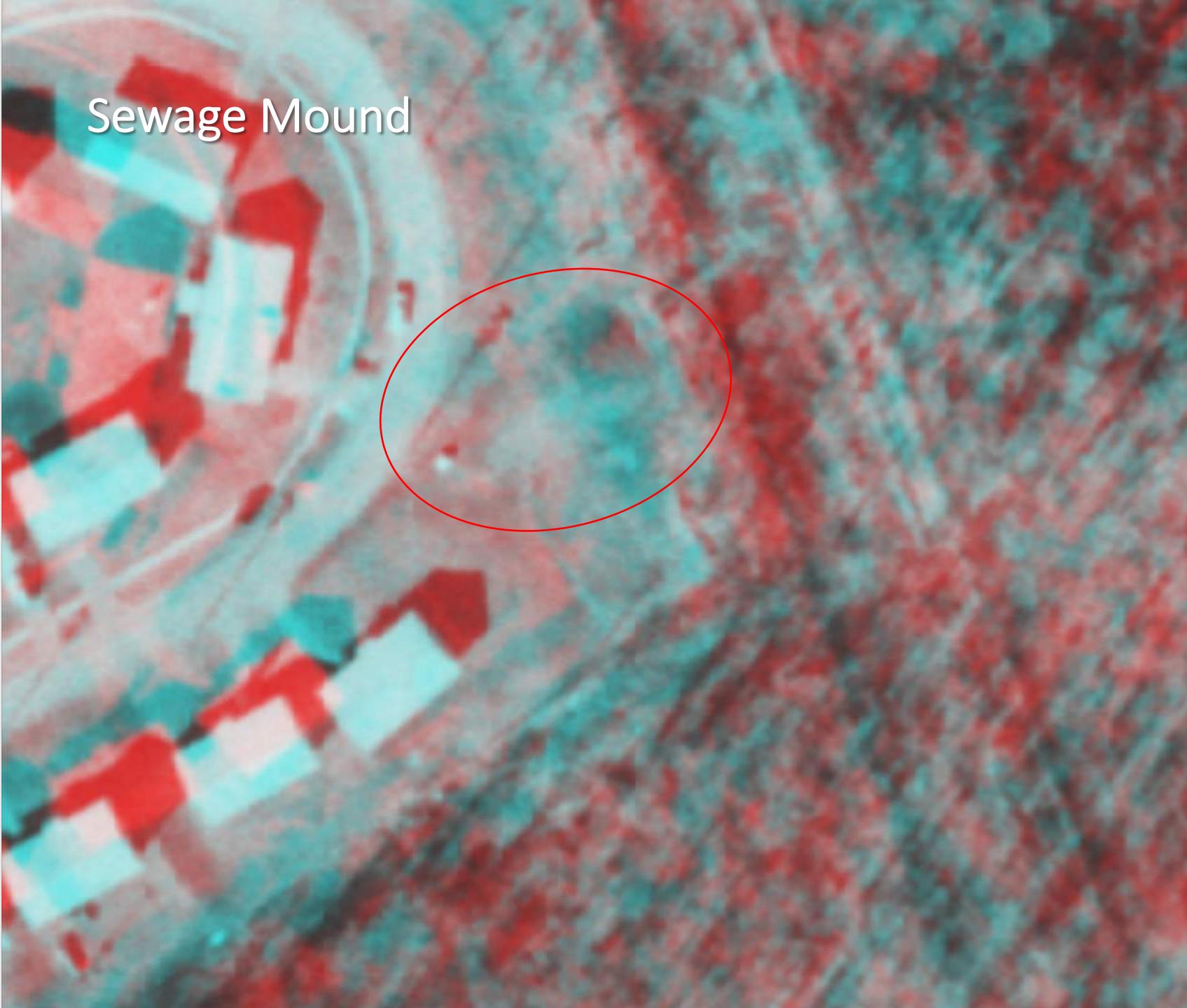
Stereo Photos of Heating Plant



Stereo Photo of
Water Tank



Sewage Mound



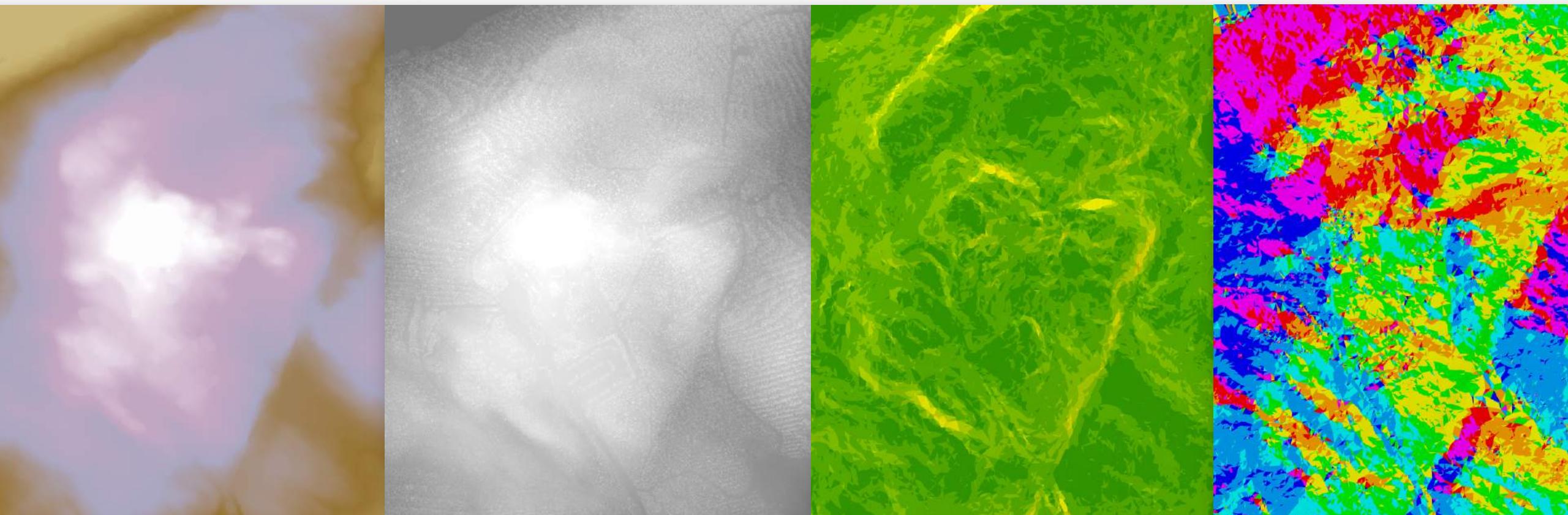
Issue for Present/Future

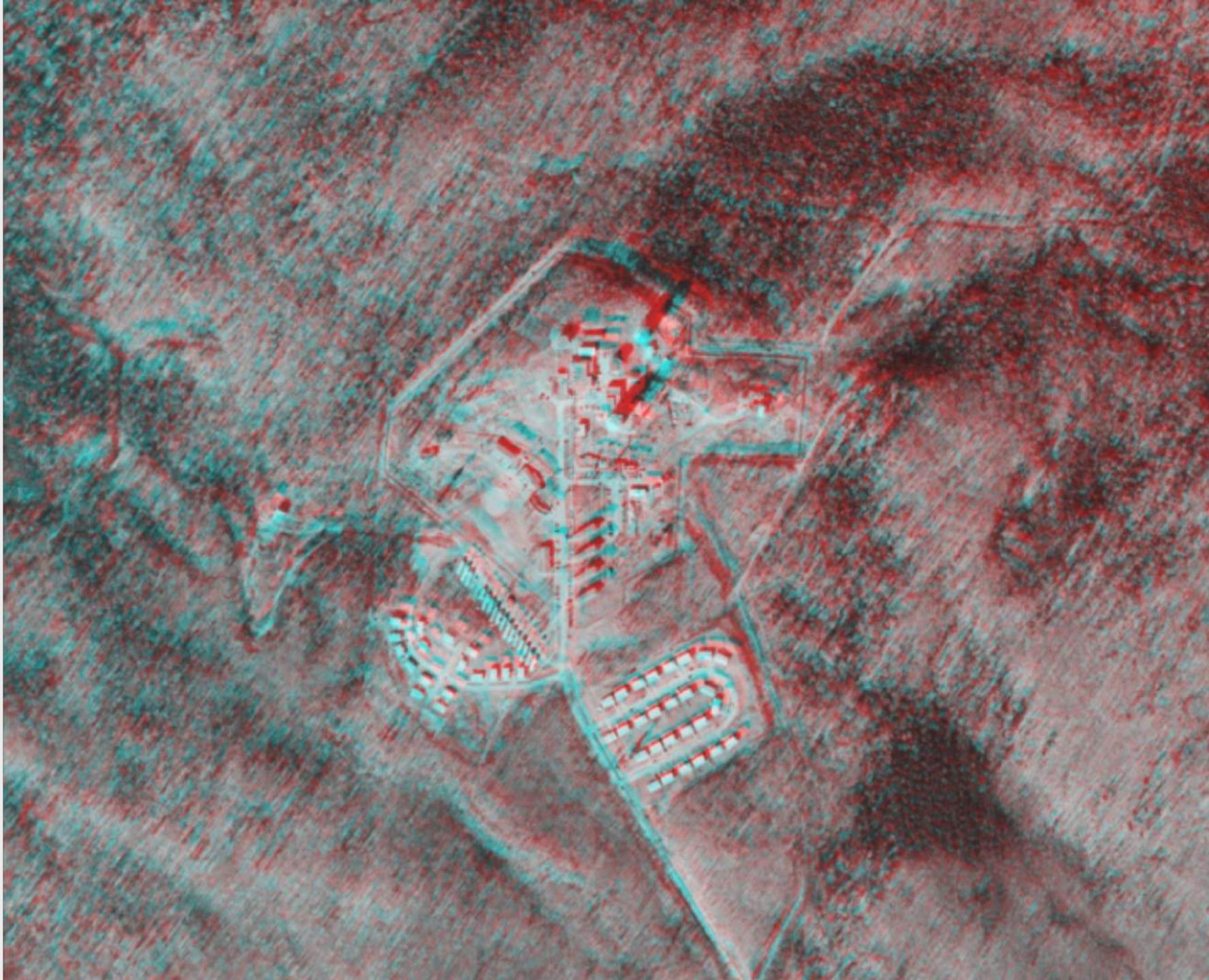
There appears to be natural gas tanks supplying energy to all the eastern most households.

Should be kept in mind for the future, as to not have any other issues like previously.



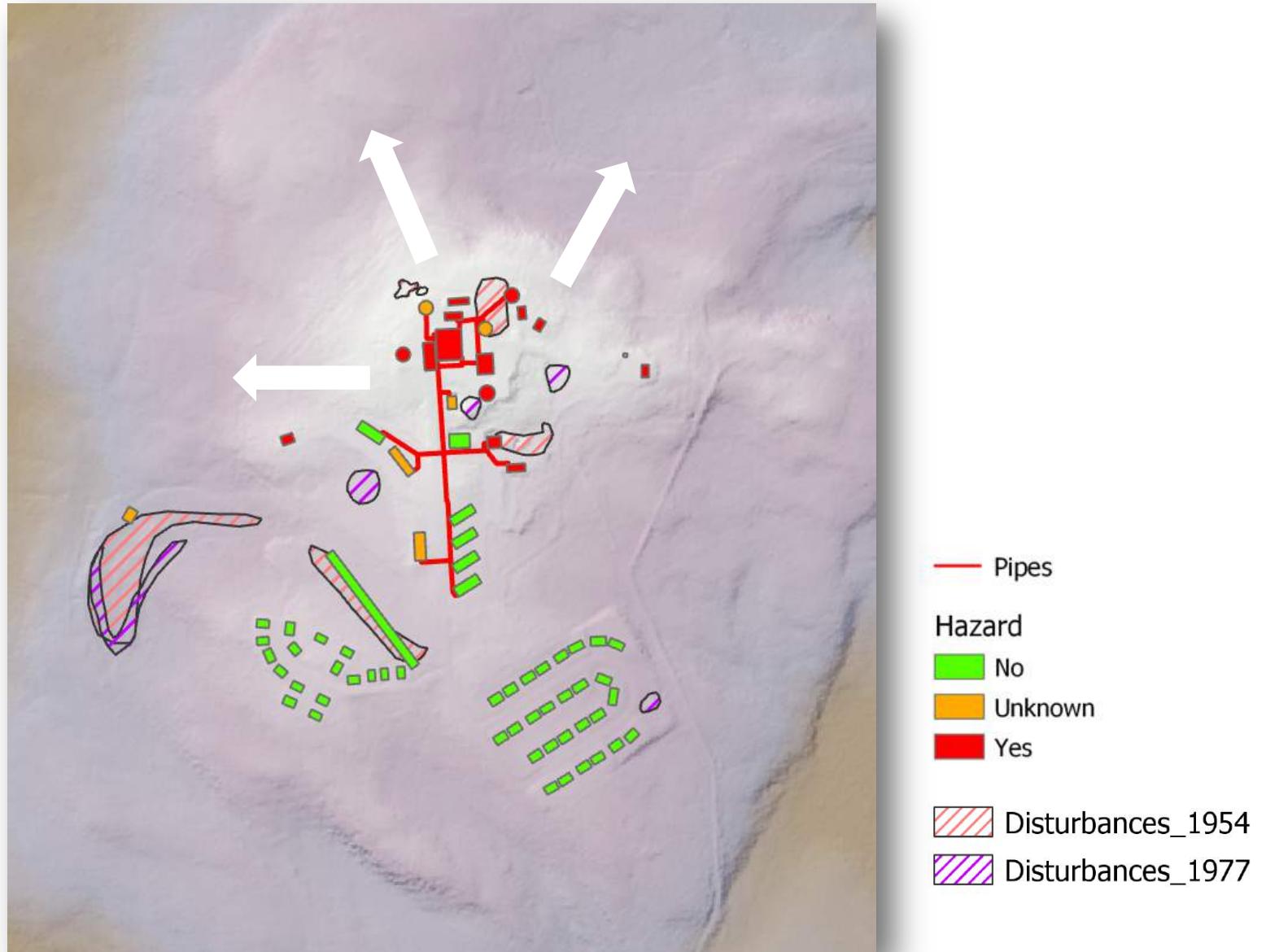
DEM, DSM, Slope, and Aspect



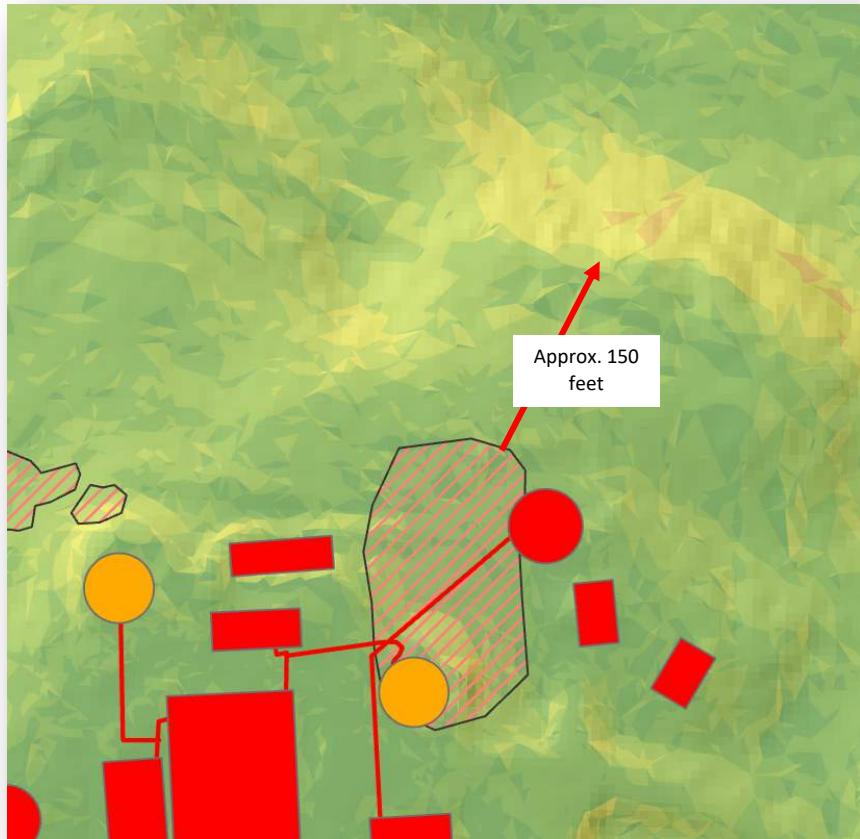
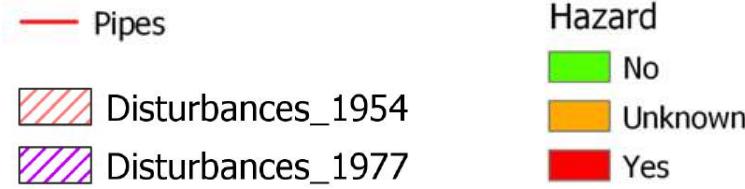


Elevation in Relation to Hazards

The Air Force Base is located on a peak of elevation, which could bring possible issues with downhill runoff from possible contaminates or leakages.

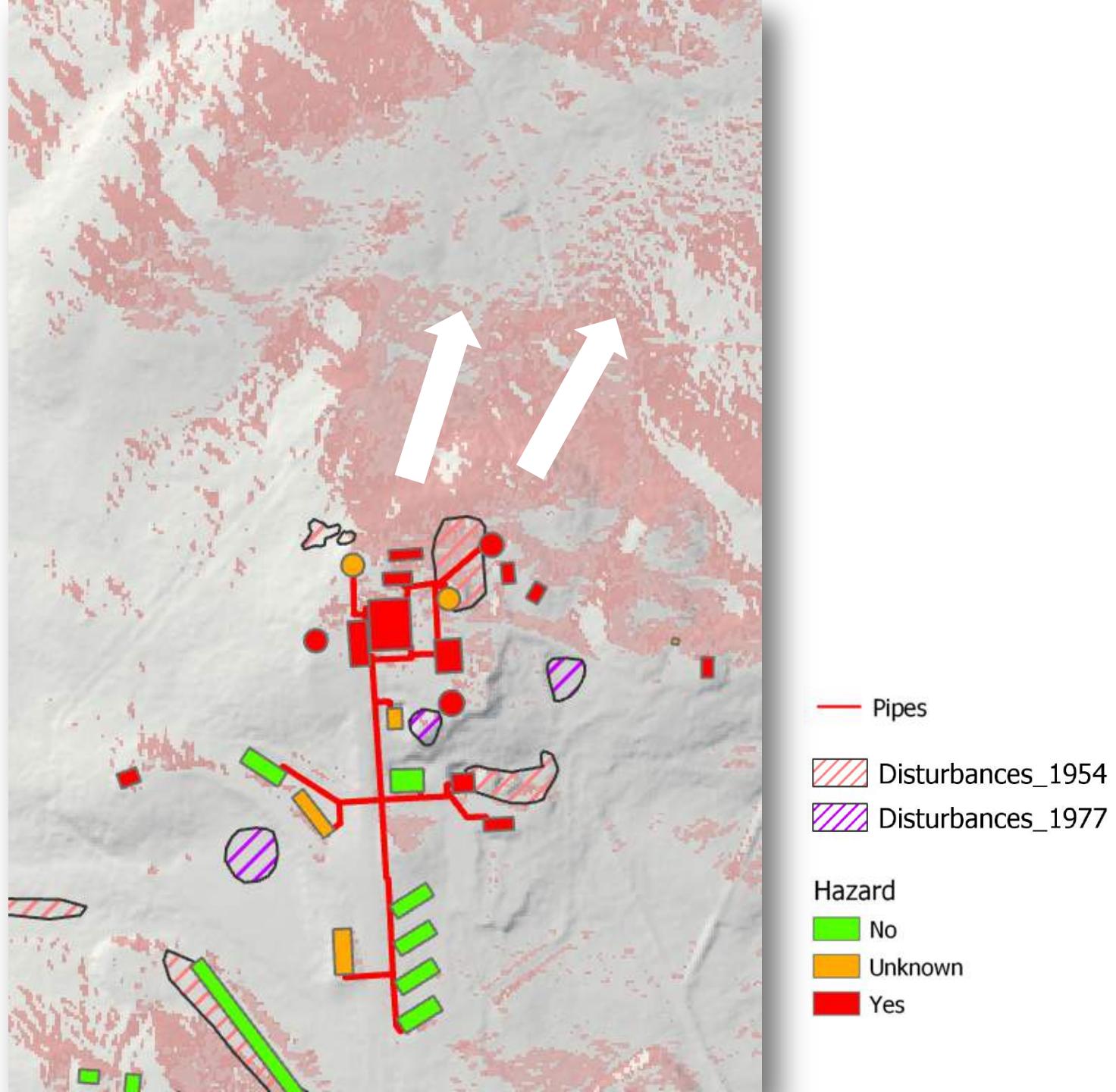


Elevation in Relation to Hazards



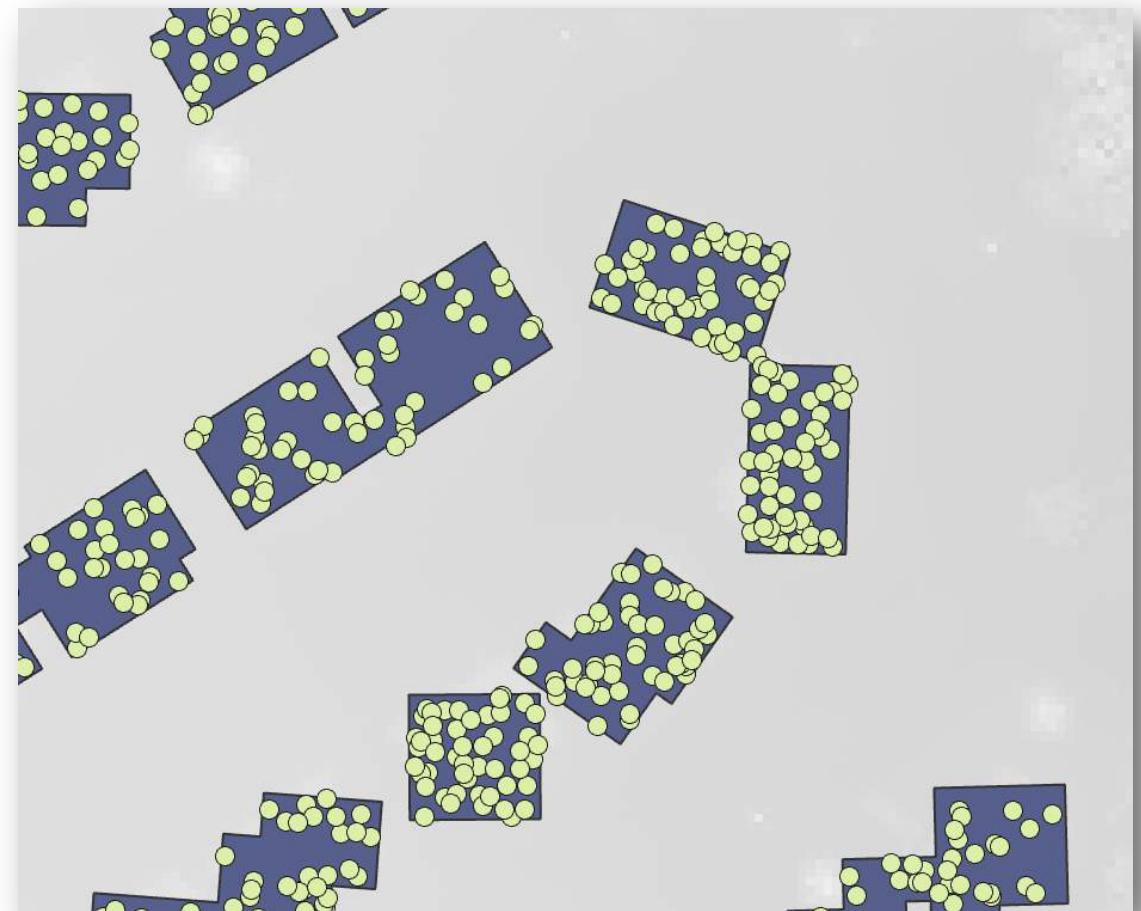
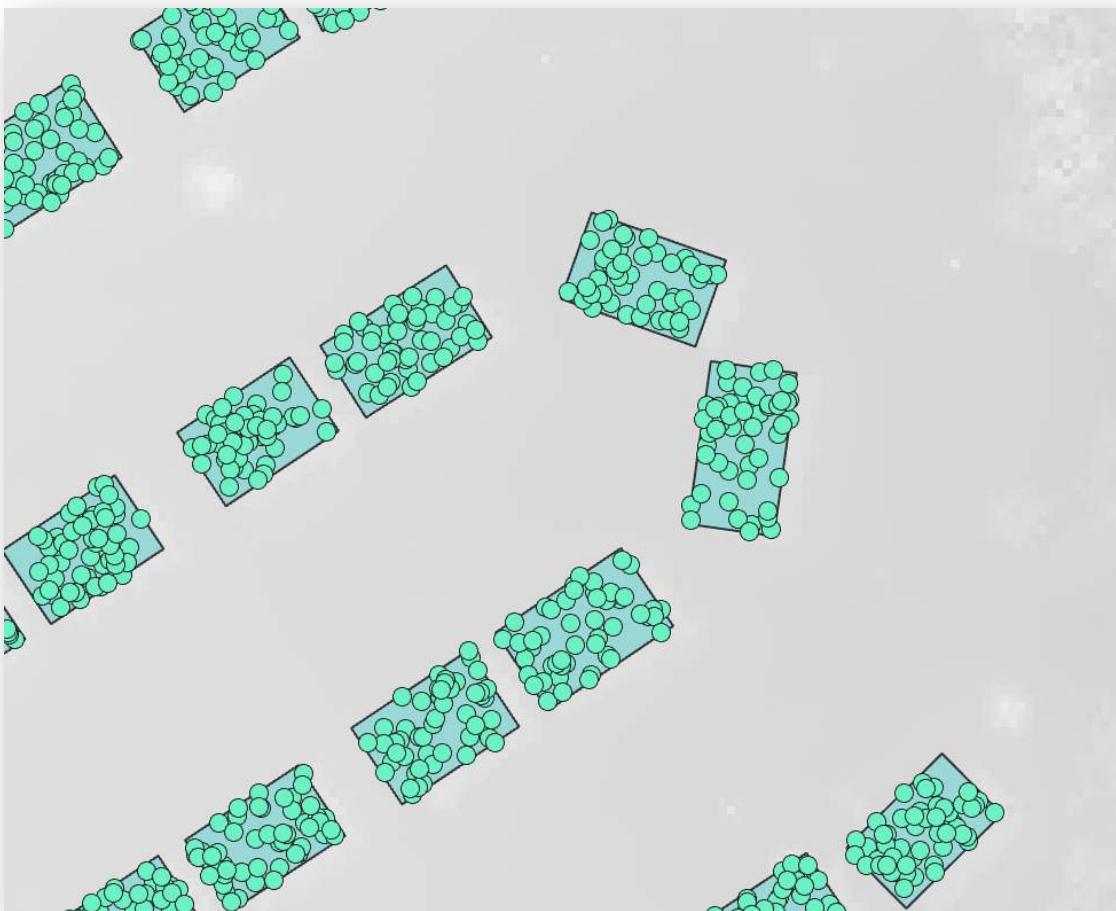
Elevation in Relation to Hazards

The red raster are aspects facing NW, N or NE. With the base being located at a peak in elevation, and with the concentration of concern being next the slopes, this aspect map confirms it could have impacts downhill.



Automated v. Manual Building Footprints

Extrusion (Random Points, and Summary Statistics)



Automated v. Manual Building Footprints

Two methods were used to extract building footprints, one being hand digitizing of known buildings (mainly from 1977 aerial photo), and the second being using building returns from 2012 LiDAR data, and exporting them to rasters, and then to regularized polygons.

Both methods found an average height of the building by creating random points in the polygon and doing summary statistics with the points in relation to the DSM derived from the 2012 LiDAR data.

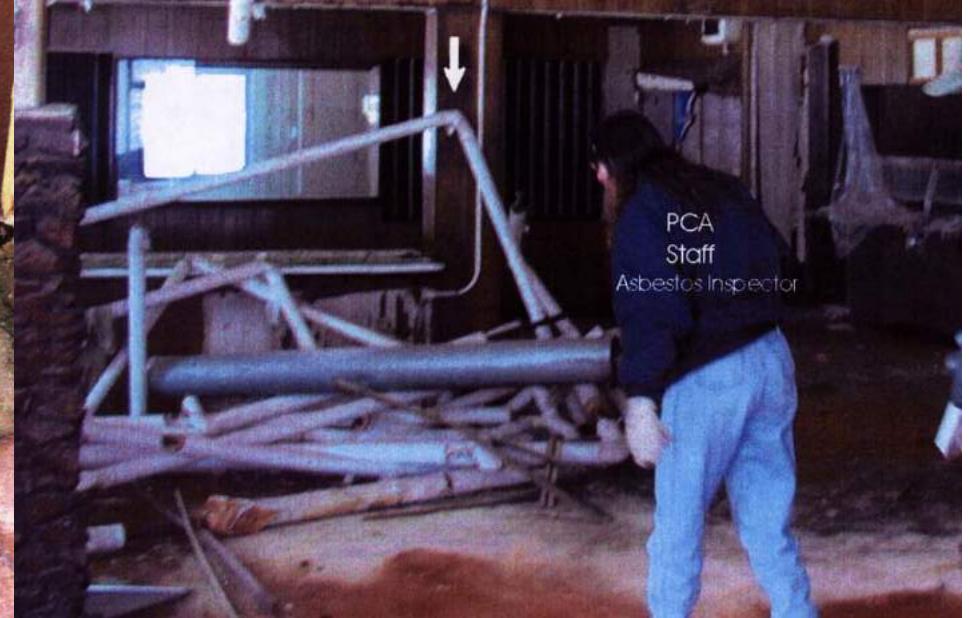
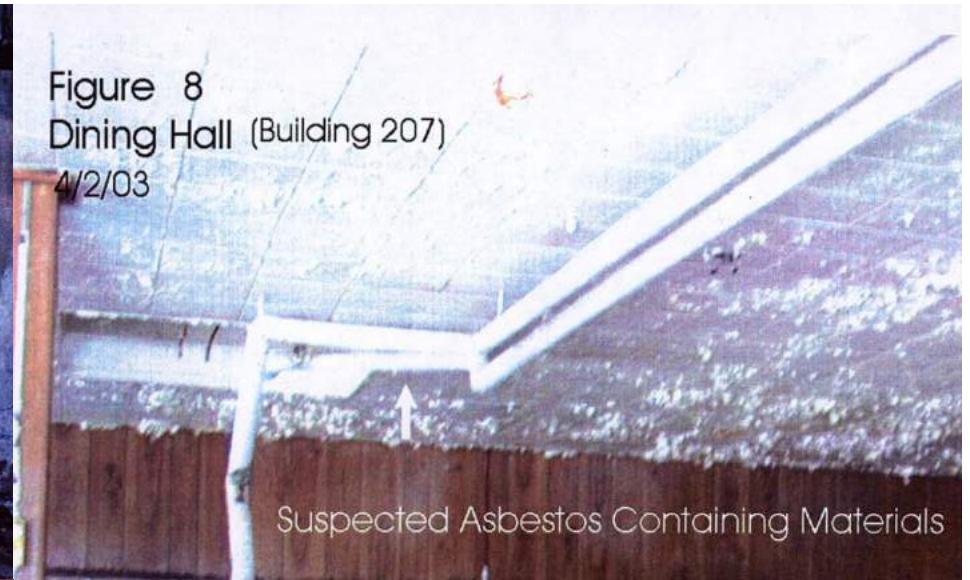
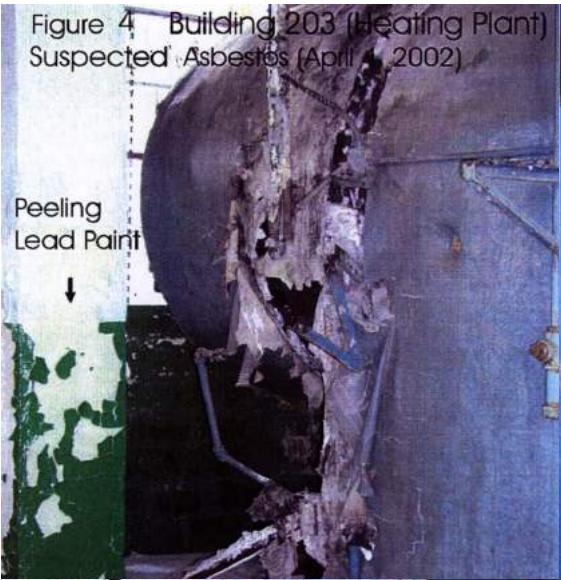


Automated v. Manual Building Footprints

3D Visualization w/ DEM and 3D Buildings

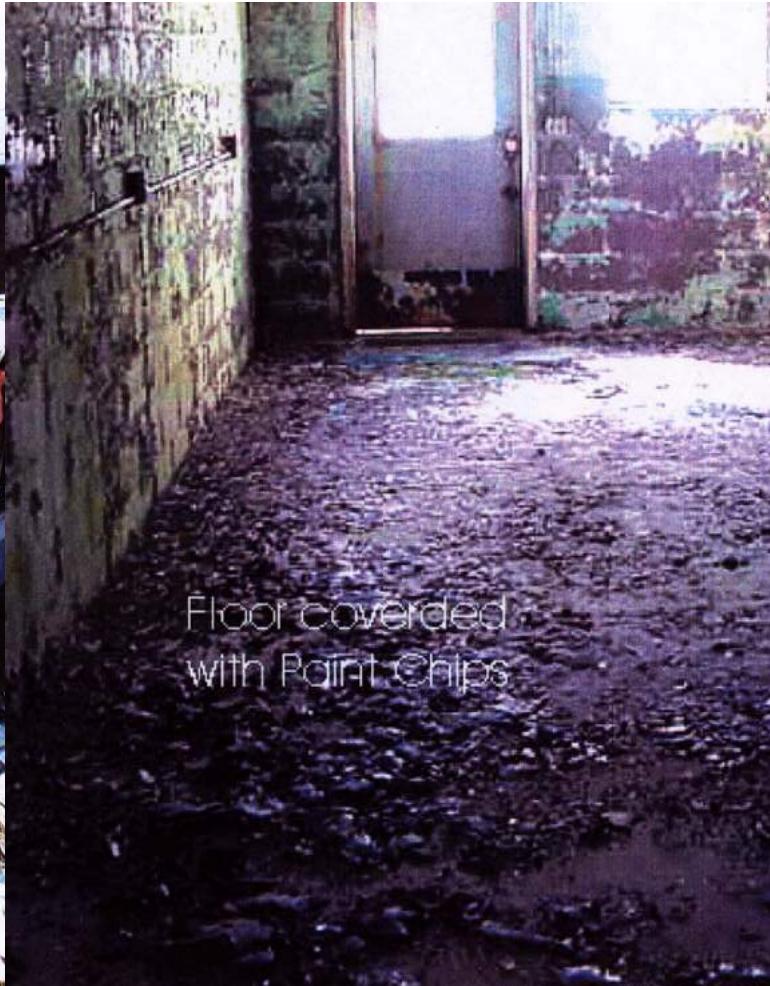


After the fact....



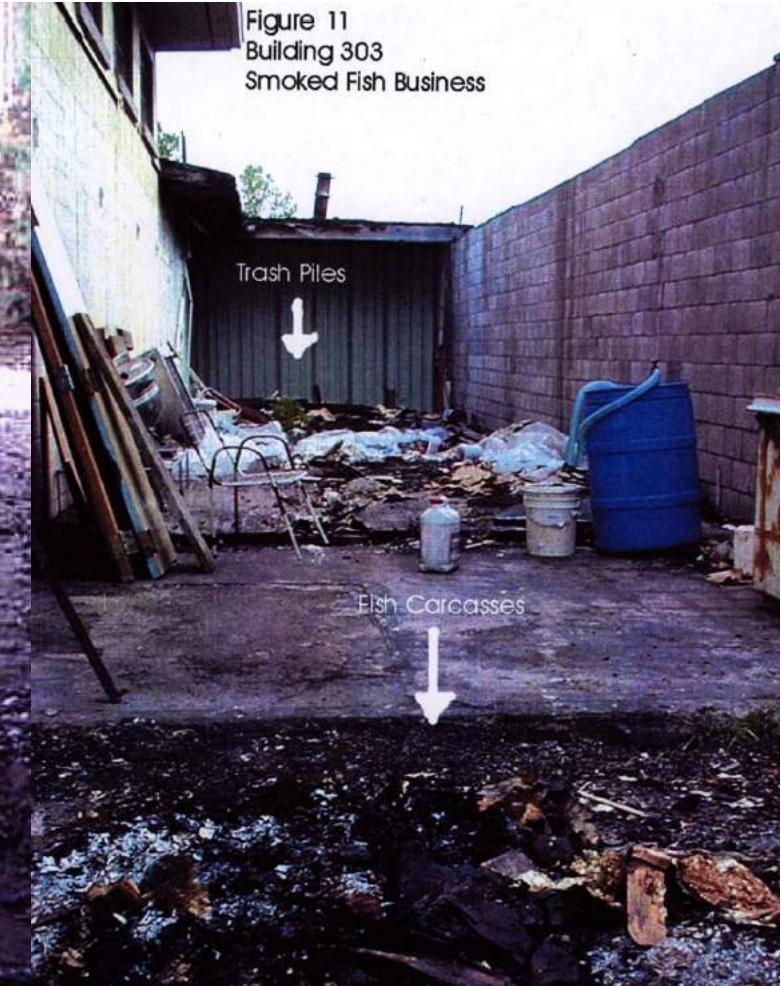
After the fact....

Figure 13 Solid Waste Pile (6/9/03)

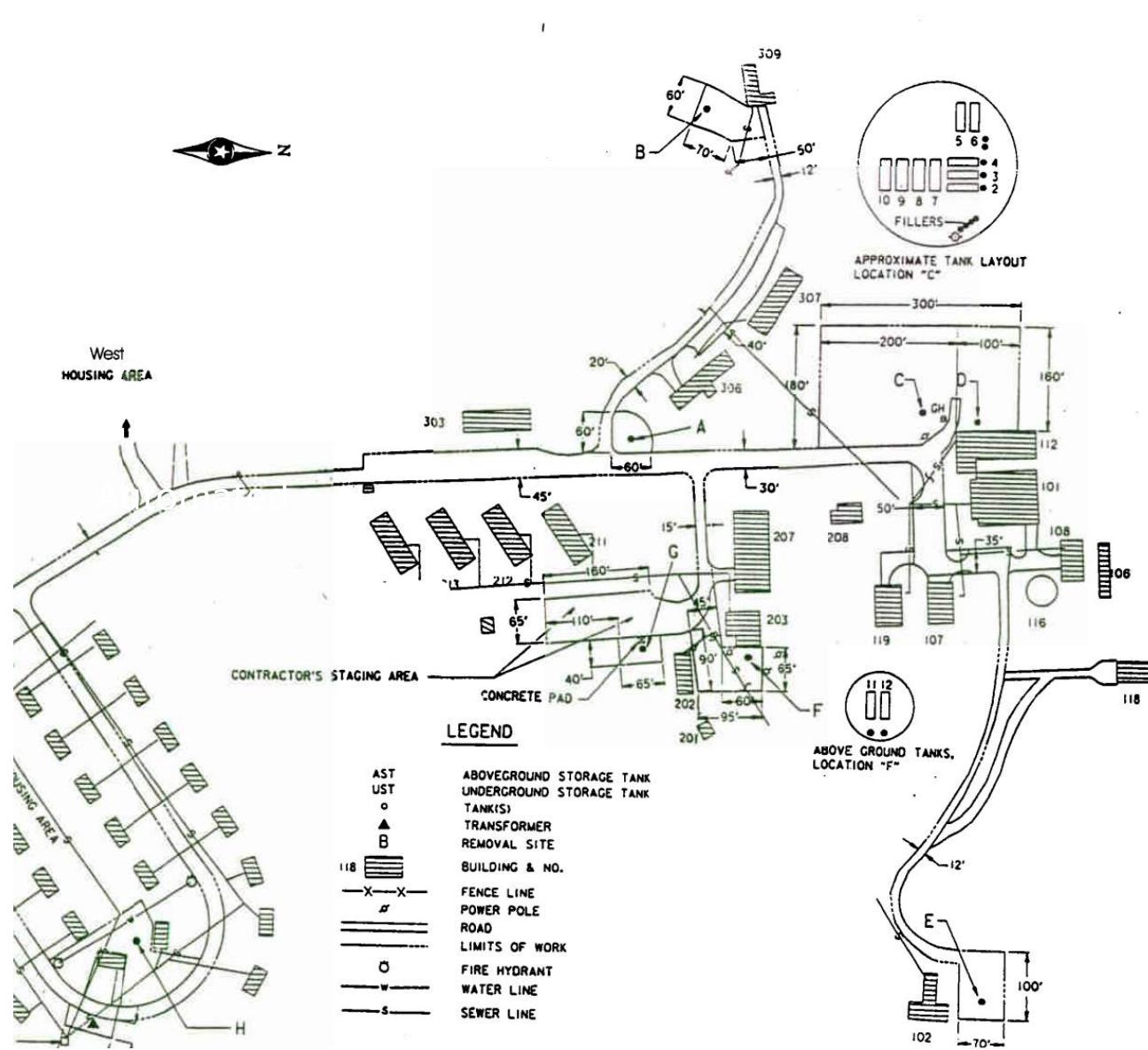


Floor covered
with Paint Chips

Figure 11
Building 303
Smoked Fish Business



After the fact....



Sources

- <https://www.radomes.org/museum/documents.php?site=Finland+AFS,+MN>
- [http://www.fortwiki.com/Finland Air Force Station](http://www.fortwiki.com/Finland_Air_Force_Station)
- <https://earthexplorer.usgs.gov/>
- <http://arcgis.dnr.state.mn.us/maps/mntopo/>