



NIAGARA FALLS STORAGE SITE HISTORICAL PHOTOGRAPHIC ANALYSIS



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FINAL

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Buffalo District, Buffalo, New York

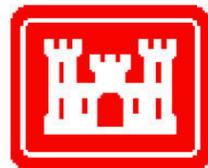


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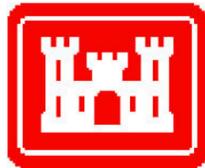


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NOTICE AND INTRODUCTION



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NOTICE

The views, opinions, and conclusions in this report are those of the author and should not be construed as official Department of Army positions or policy unless so designated by other documentation.

Photographic items contained in this report may be restricted for use other than research. It is the responsibility of the party using photographs from this study to contact the U.S. Army Geospatial Center, Operations Division in order to ascertain clearance for use.

INTRODUCTION

This report presents the results of a GIS-based Historical Photographic Analysis of the Niagara Falls Storage Site and a section of the Lewiston-Porter Central School, Lewiston, NY property.

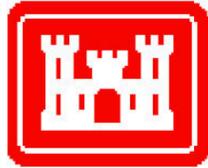
The Hydrologic and Environmental Analysis Branch, Operations Division of the U.S. Army Corps of Engineers, Army Geospatial Center (AGC) was tasked to analyze historical photographic records relative to the Niagara Falls Storage Site (NFSS) area to identify potential areas of concern related to activities around the site since its development. Areas of potential concern (such as ground scars, disturbed ground, trenches, ditches) were identified and mapped based on the analysis of historical aerial photographs.

This task expands the area of research from the Lake Ontario Ordnance Works, NY, (LOOW) completed in September 2002 by the U.S. Army Topographic Engineering Center (the predecessor agency to the U.S. Army Geospatial Center).

Significant features, derived through photo analysis, are displayed on selected photos in this study. The accompanying GIS, supplied on DVD, has additional information useful in locating identified features and defining their extent.

Some of the identified features can be “benign” as it is not always possible to determine the activity that altered the surface. Future field work and additional ancillary information will further determine the relevance of these features.

This analysis was completed for the U.S. Army Corps of Engineers, Buffalo District, Buffalo, NY.



METHODOLOGY

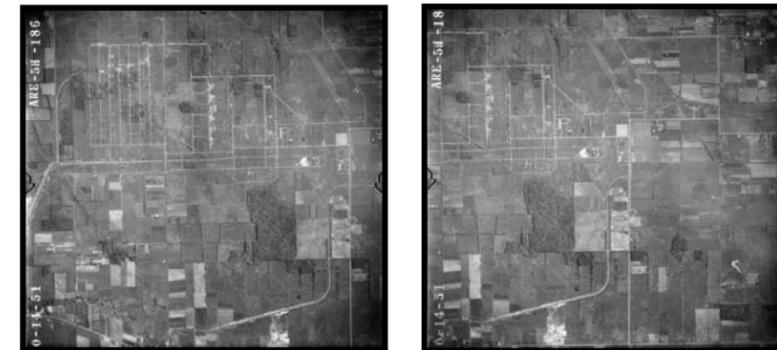
METHODOLOGY

Photographic analysis of historical aerial photography, both vertical and oblique, was the primary method of identifying man-made and natural occurring features in the Niagara Falls Storage Site and a section of the Lewiston-Porter Central School campus.

The analysis in this report is primarily based upon interpretation of black and white and color aerial photography over the project area for the period 1938 to 2005. Stereo viewing was employed where overlapping photographs permitted its use. A list of aerial photography used by AGC appears on the Photographic Source slide.

Both single-optical and stereoscopic viewing, at various magnifications, were performed on AGC collection of historical aerial photographs. Visible signatures such as size, scale, shape, shadow, tone, texture, and pattern allow features to be recognized on the aerial photography.

Stereo-paired images viewed through a stereoscopic microscope allows for a three-dimensional view of the terrain.



Sample of aerial photographs examined.

GEOREFERENCED DATA

Geodetic Control was applied to the 1938, 1942, 1944, 1951, 1956, 1958, 1978, 1985, 1990, and 1995 aerial photography using 2005 New York State GIS data (<http://www.nysgis.state.ny.us/gateway/mg/>). This georeferenced image file is placed on DVD for quick and easy access. A “world file”, or .tfw file, is associated with each .tif image file. The .tfw file contains the coordinate information of the upper left (x,y) pixel and the pixel size (in feet). This .tfw file must be placed in the same directory as the .tif image file before viewing in any Geographic Information System (GIS) software.

The 2005 orthophoto was used for the horizontal control for the historical photos. Also, selected rectified images were created to support mapping and analysis for various years. ERDAS 9.2 software was used to geo-reference these selected historical photos to the 2005 photomap of the site. ESRI’s ArcGIS 9.3 software was used to digitize and create vector layers for the historical years. The data can be shown in a Geographic Information System (GIS) such as ArcMAP. Digital analysis is presented using ArcGIS shape files. Shape files, digital orthophotos and the report are on a DVD. Microsoft PowerPoint 2003 was used to create this report.

Significant features, derived through photo analysis, are displayed on selected photos in this study. All GIS image and vector data are projected in a State Plane coordinate system, New York West, FIPS Zone 3103 ; Spheroid: GRS 1980; Datum: NAD83, Units: feet.



BERM: Man-made ridge or embankment, constructed of natural or man-made materials.

BUILDING/STRUCTURES: Relatively permanent, usually box-like and roofed, man-made structure.

CLEARED AREA: An area from which man has removed trees, shrubs or other natural vegetation cover.

CIRCLE FEATURE: A circular shaped ground scar, varying in size and shape that does not appear to be natural. No depth is apparent for these features; however, they may be associated with areas used to dispose of unwanted material.

DEBRIS: The scattered remains of anything broken or destroyed.

DEPRESSION: An area sunken below the surrounding surface.

DISTURBED GROUND: Rough ground surface that has been cleared, overturned, dug up, filled and/or changed from the surrounding area.

DITCH: A long narrow trench or furrow dug in the ground, as for drainage or irrigation.

EXCAVATION: A cavity in the earth formed by digging or scooping out material (e.g. to facilitate construction).

FENCE: A structure serving as an enclosure, a barrier, or a boundary, usually made of posts or stakes joined together by boards, wire, or rails.

GRADED AREA: Area where the ground surface has been shaped, usually leveled to a smooth horizontal or sloping surface.

GLOSSARY



GROUND SCAR(S): Ground surface, vegetated or not, where marks from a previous activity or feature, or from a subterranean feature, are visible. Ground scars can result from many things and therefore vary greatly in appearance (e.g. septic drain fields, archaeological features, buried waste disposal pits, filled trenches, etc)

LINEAR FEATURE: General classification based on tonal quality of feature, caused by man-made or natural occurrences, such as buried (filled in or closed) trenches, vehicle/tank tracks, or geologic conditions.

MOUNDED MATERIALS: Material that has been placed in piles or mounds.

ORTHOPHOTO: Continuous-tone image created from aerial photographs with geometric distortions and relief displacements removed. Depicts terrain features in their true geographic position. This image can also be referred to as a photomap.

OTHER: Descriptions are noted in the remarks section of the GIS file.

OUTSIDE STORAGE AREA: An open-air, outdoor area for storage of materials, supplies, vehicles and/or equipment; may or may not be enclosed by a fence.

PIT: Relatively deep, steep sided hole in the ground surface.

POND/LAGOON: A containment area, man-made or naturally occurring, that appears to be used for waste and/or water storage, disposal, or treatment.

TOWER: Elevated structure, such as a water tank, storage tank, guard tower, or observation tower.

TRENCH: An excavation, often elongated and linear, having steep-sided walls.

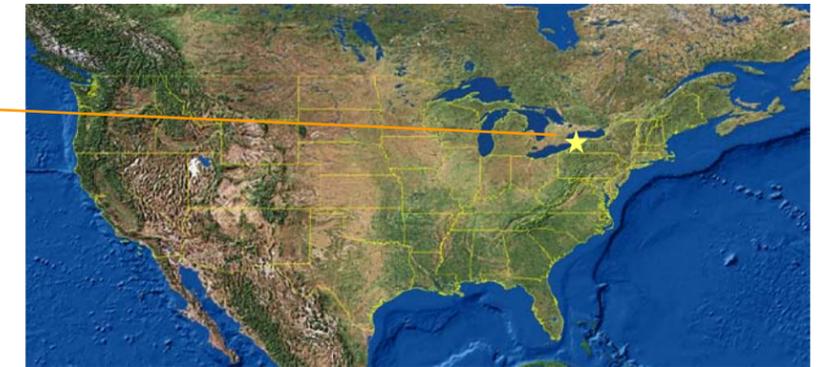


ACRONYMS



AGC	ARMY GEOSPATIAL CENTER
AOI	AREA OF INTEREST
BLDG	BUILDING
BNI	BRUNSWICK NUCLEAR, INC OR BECHTEL NATIONAL, INC
CWM	CHEMICAL WASTE MANAGEMENT
DEC	NY STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DEIS	DRAFT ENVIRONMENTAL IMPACT STATEMENT
DOE	DEPARTMENT OF ENERGY
DOQ	DIGITAL ORTHO QUADRANGLE
DRG	DIGITAL RASTER GRAPHIC
DVD	DIGITAL VERSATILE DISC OR DIGITAL VIDEO DISC
GIS	GEOGRAPHIC INFORMATION SYSTEM
IWCS	INTERIM WASTE CONTAINMENT STRUCTURE
LOOW	LAKE ONTARIO ORDNANCE WORKS
MED	MANHATTAN ENGINEER DISTRICT
NAD	NORTH AMERICAN DATUM
NARA	NATIONAL ARCHIVES & RECORDS ADMINISTRATION
NEPA	NATIONAL ENVIRONMENTAL POLICY ACT
NFSS	NIAGARA FALLS STORAGE SITE
TEC	TOPOGRAPHIC ENGINEERING CENTER
UTM	UNIVERSAL TRANSVERSE MERCATOR
WGS	WORLD GEODETIC SYSTEM

PROJECT AREA LOCATION



Niagara Falls Storage Site project is divided into two areas of interest (AOI 1 and AOI 2).

Area maps shows positions of current study in relation to previous study (LOOW), completed in September 2002 by the U.S. Army Topographic Engineering Center (the predecessor agency to the U.S. Army Geospatial Center).

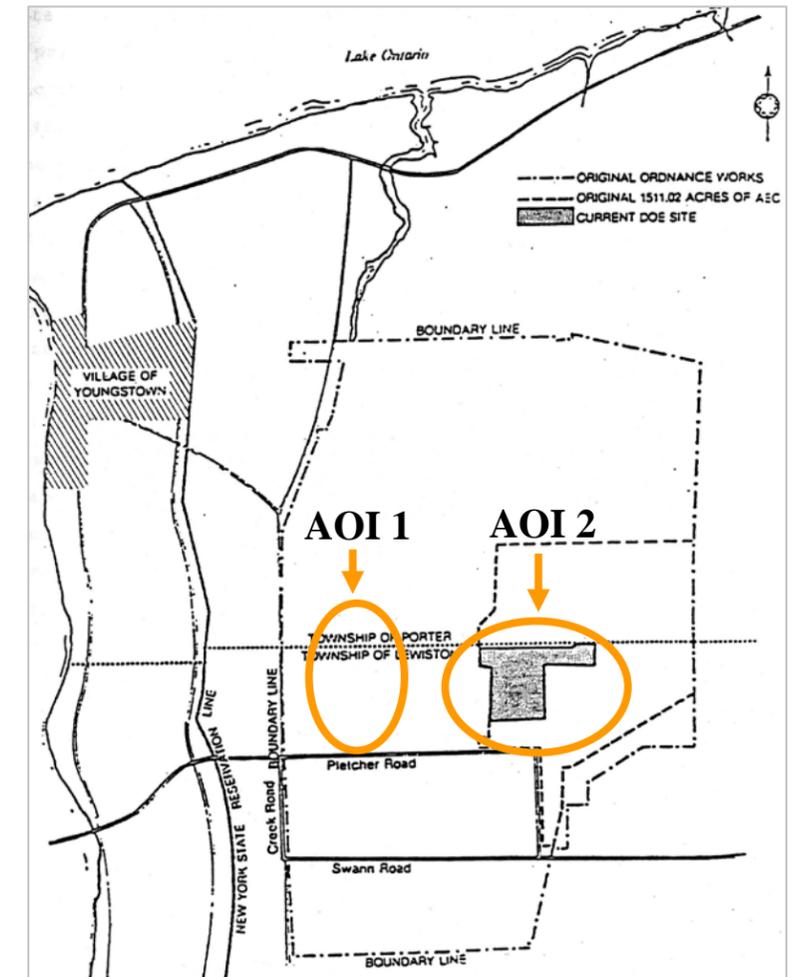
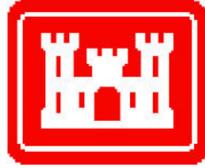


Image Source: Digital Orthoquad (DOQ) data, US Geological Survey, 28 March 1995.

Map Source: Department Of Energy, 1979.



PHOTOGRAPHIC SOURCES



YEAR	MONTH	DAY	SCALE	AGENCY & MISSION ID
1938	September	25	1:20,000	ASCS
1942	April	23	1:20,000	DOD
1944	March	19	1:20,000	DOD
1944	March	19	oblique	DOD
1951	October	14	1:20,000	ASCS
1956	September	27	1:6,000	DOD
1958	August	9	1:20,000	ASCS
1978	May	22	1:36,000	USDA
1985	May	3	1:58,000	USGS/HAP
1990	June	20	1:40,000	USDA
1995	March	28	1:40,000	USGS/NAP
1995	March	28	N/A	USGS/DOQ (color)
2005	April		N/A	NYS CSCIC

ASCS - Agricultural Stabilization and Conservation Service

DOD - Department Of Defense

DOQ - Digital Ortho Quadrangle

HAP - High Altitude Photography

NAP - National Aerial Photography

NYS CSCIC – New York State Cyber Security & Critical Infrastructure Coordination

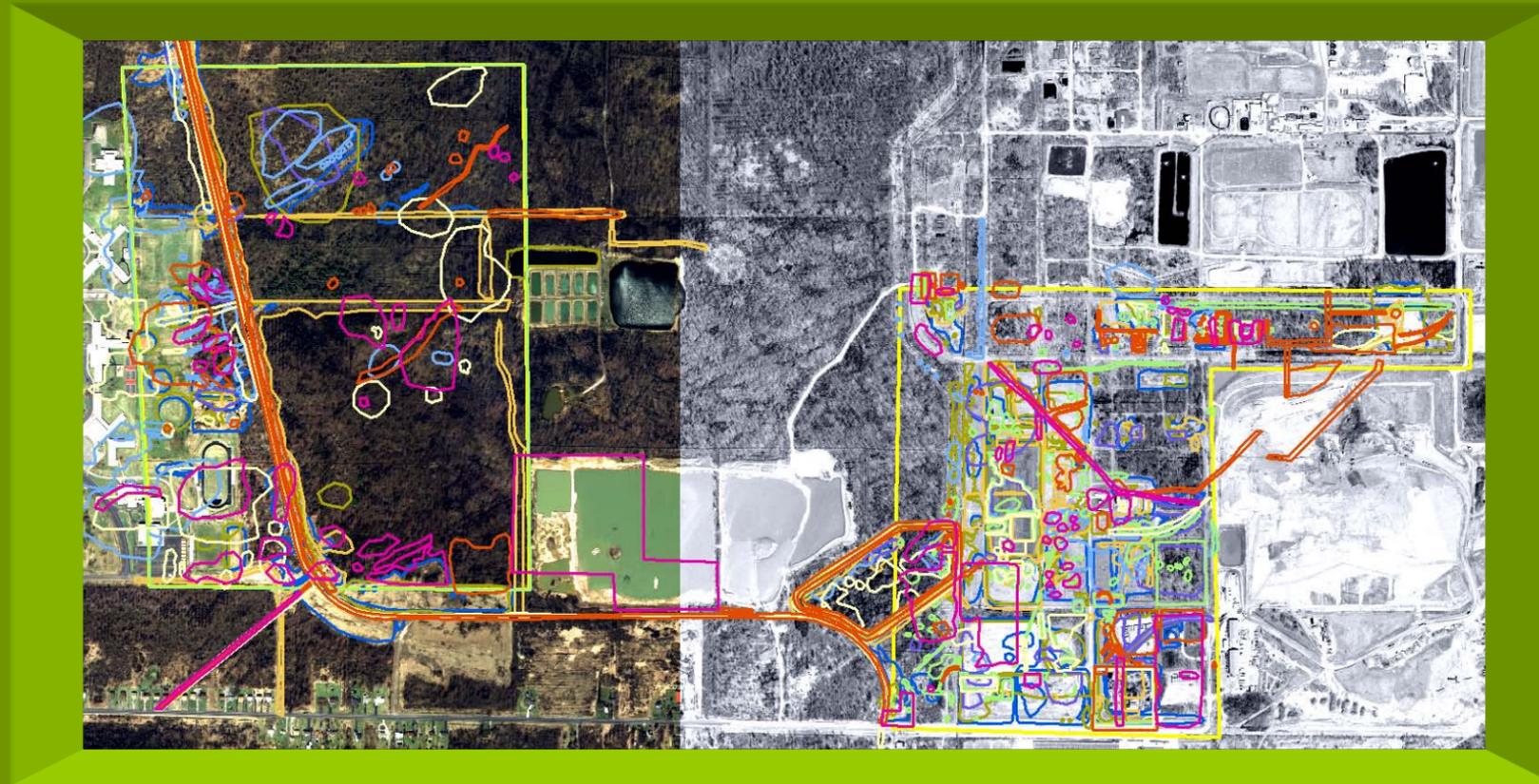
USDA - United States Department Of Agriculture

USGS - United States Geological Survey

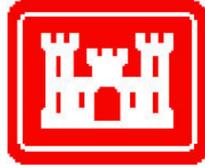
Source information from: Former Lake Ontario Ordnance Works, NY Final Report



FEATURE ANALYSIS



ALL FEATURES FOUND IN EACH YEAR ANALYZED, SHOWN ON 2005 BASE MAP

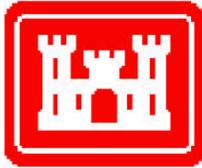


CAVEATS AND EXPLANATIONS



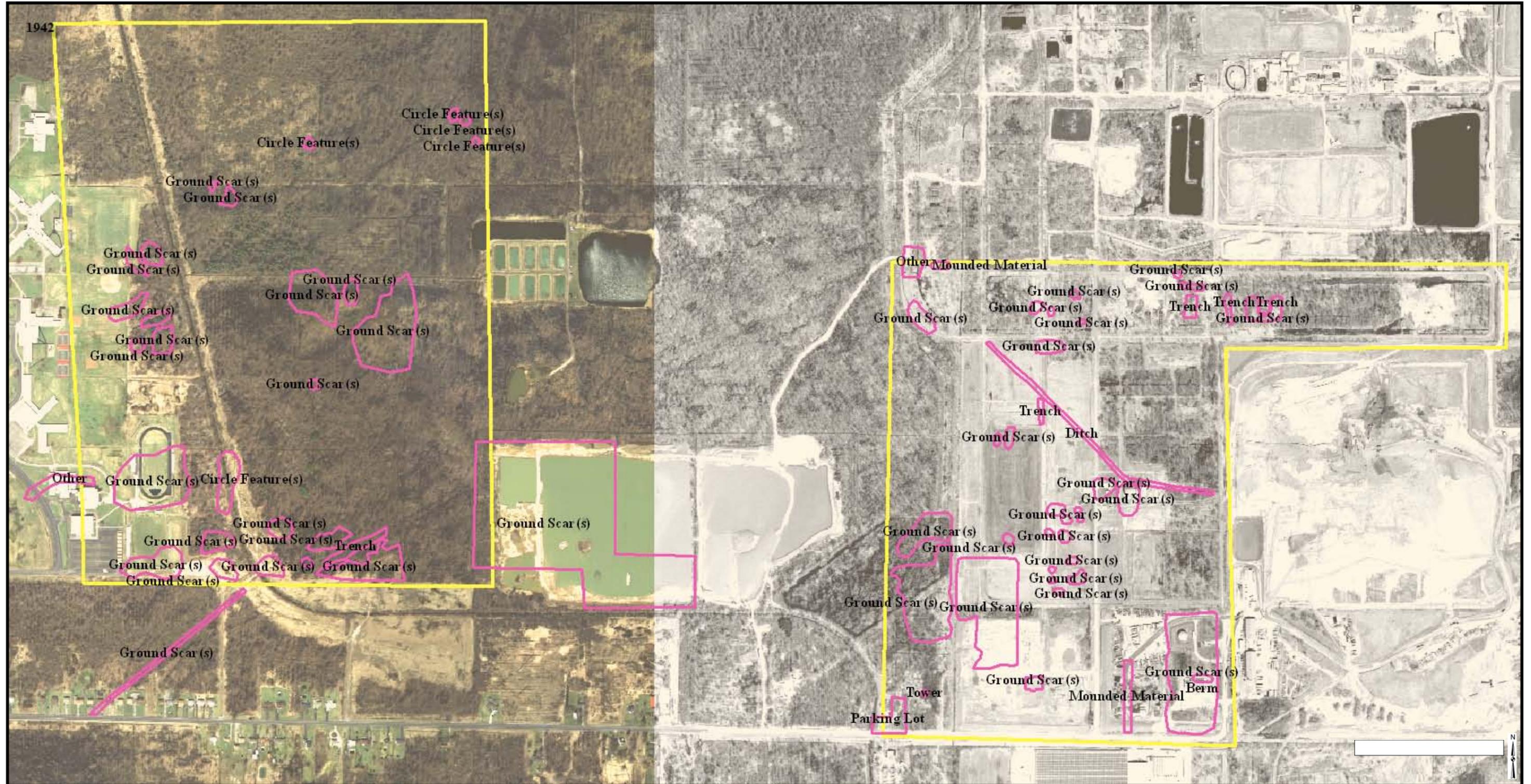
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- 1 Only the building layer and a drainage layer (giving natural above ground drainage, fracture traces, and man-made ditches) are provided for the predevelopment time frame (1938).**
- 2 The labels “Pit(s)” and “Ground Scar(s)” are applied to features that may have one or more pits or ground scars.**
- 3 Features outside the AOI are not displayed unless their boundaries cross to the inside of the AOI boundaries.**
- 4 A 2005 digital orthophoto (or photomap) by the New York State Geographic Information Systems Clearinghouse was obtained (from web site <http://www.nysgis.state.ny.us/gateway/mg/>) and used as the current image map of the area. This orthophoto has a horizontal accuracy of about forty feet (per National Map Accuracy Standards) and was used for the horizontal control for the historical photos. Historical aerial photos rectified to the 2005 orthophoto were used as placement guides for the Features shape file. Towers and storage tanks may appear in both the Building Location shape file and the Features shape file.**
- 5 Buildings locations may appear to shift positions from one year’s analysis to the next. As objects appear farther from true nadir (the shortest distance from the plane’s camera to the ground) the more they appear to lean. The 10 to 20 foot difference in building location is within the National Map Accuracy Standards.**
- 6 Building numbers and Drainage Ditch names are from: Design Report for the Interim Waste Containment Facility at the Niagara Falls Storage Site, May 1986, Prepared for US Department of Energy, Oak Ridge Operations Office Under Contract No. DE-AC05-81OR20722 By Bechtel National, Inc. Advanced Technology Division, Oak Ridge, Tennessee, Bechtel Job No. 14501 (DOE/OR/20722-21 (DE86012601)**
- 7 One drainage file has been created named Drainage1938to2005.shp. It is composed of all of the drainage areas that were analyzed. It includes the fracture traces and the natural drainage paths that were detected, and the man-made ditches created in the years analyzed.**
- 8 The line files, created by tracking the Rail Roads, fences/steam pipes (not including agricultural fences), and utility lines for the years analyzed, have been combined into one file called Lines1938to2005.shp.**
- 9 Drainage and Line features were not redrawn each year after they first appeared. For example the Southwestern Drainage Ditch was displayed in the Features files the first two analysis years it appeared, 1944 and 1951. After that it only appears in the Drainage files and the Drainage1938to2005 file.**
- 10 The best resolution available at the time was chosen for this study area. The result is the West side (AOI 1) is in “Natural Color” and is at a higher resolution than the East side (AOI 2). This accounts for the abrupt change from color to black and white (gray tones) in the base maps.**

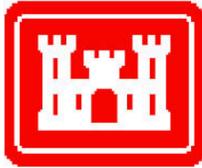


1942 ANALYSIS DISPLAYED ON 2005 BASE MAP

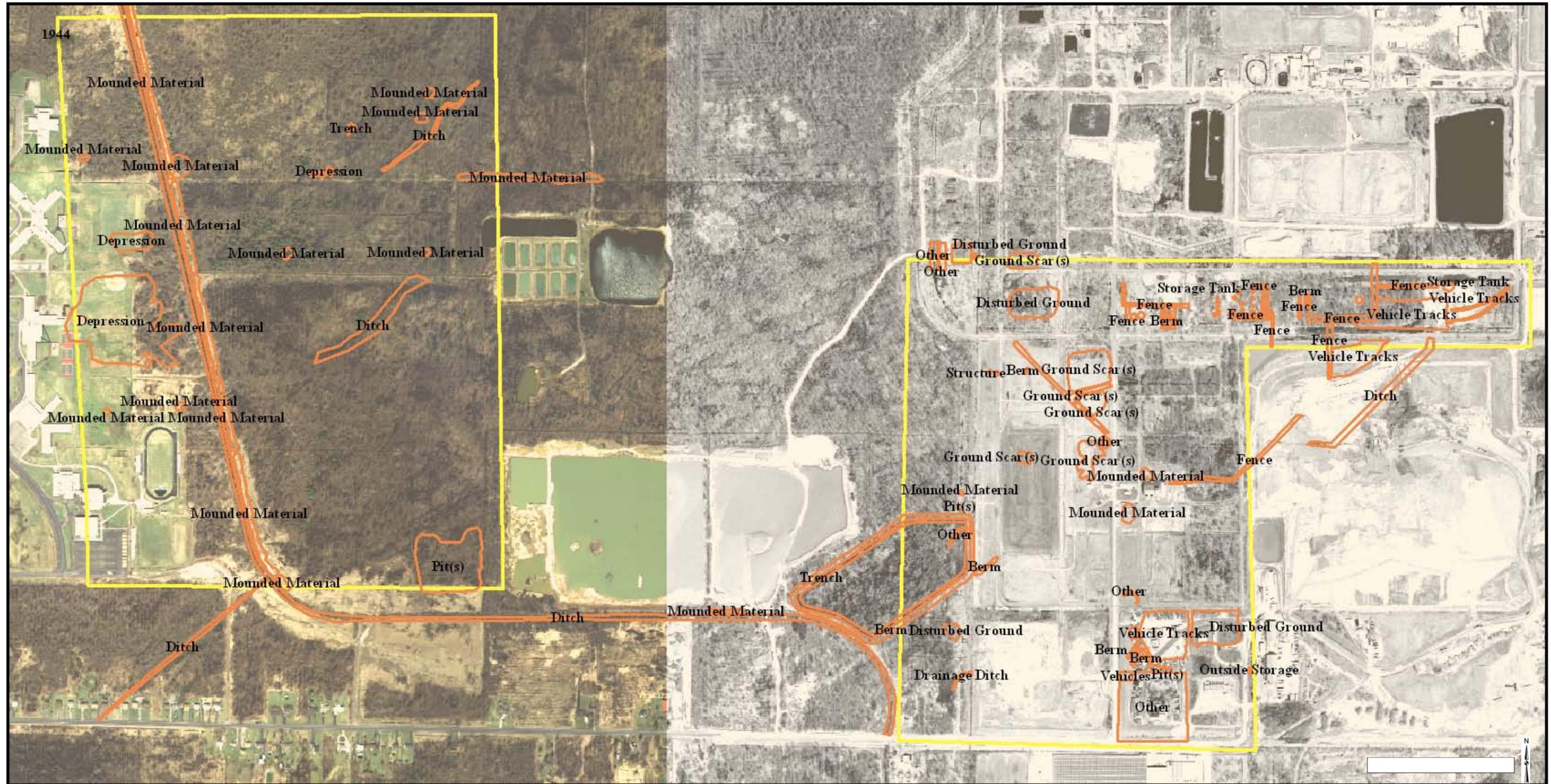
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FEATURES IDENTIFIED FROM 1942 AERIAL PHOTOGRAPHS DISPLAYED ON 2005 BASE MAP



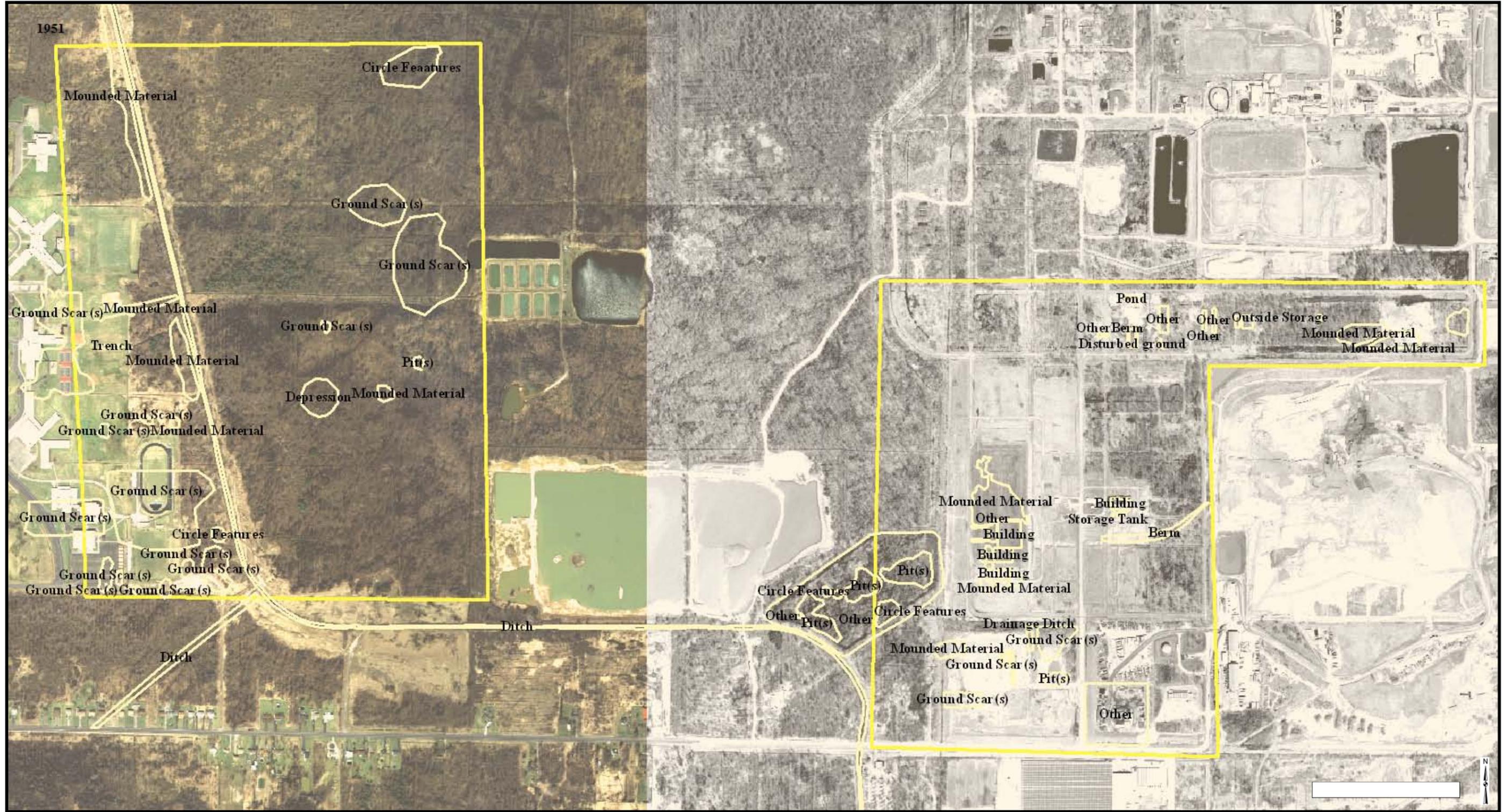
1944 ANALYSIS DISPLAYED ON 2005 BASE MAP



FEATURES IDENTIFIED FROM 1944 AERIAL PHOTOGRAPHS DISPLAYED ON 2005 BASE MAP



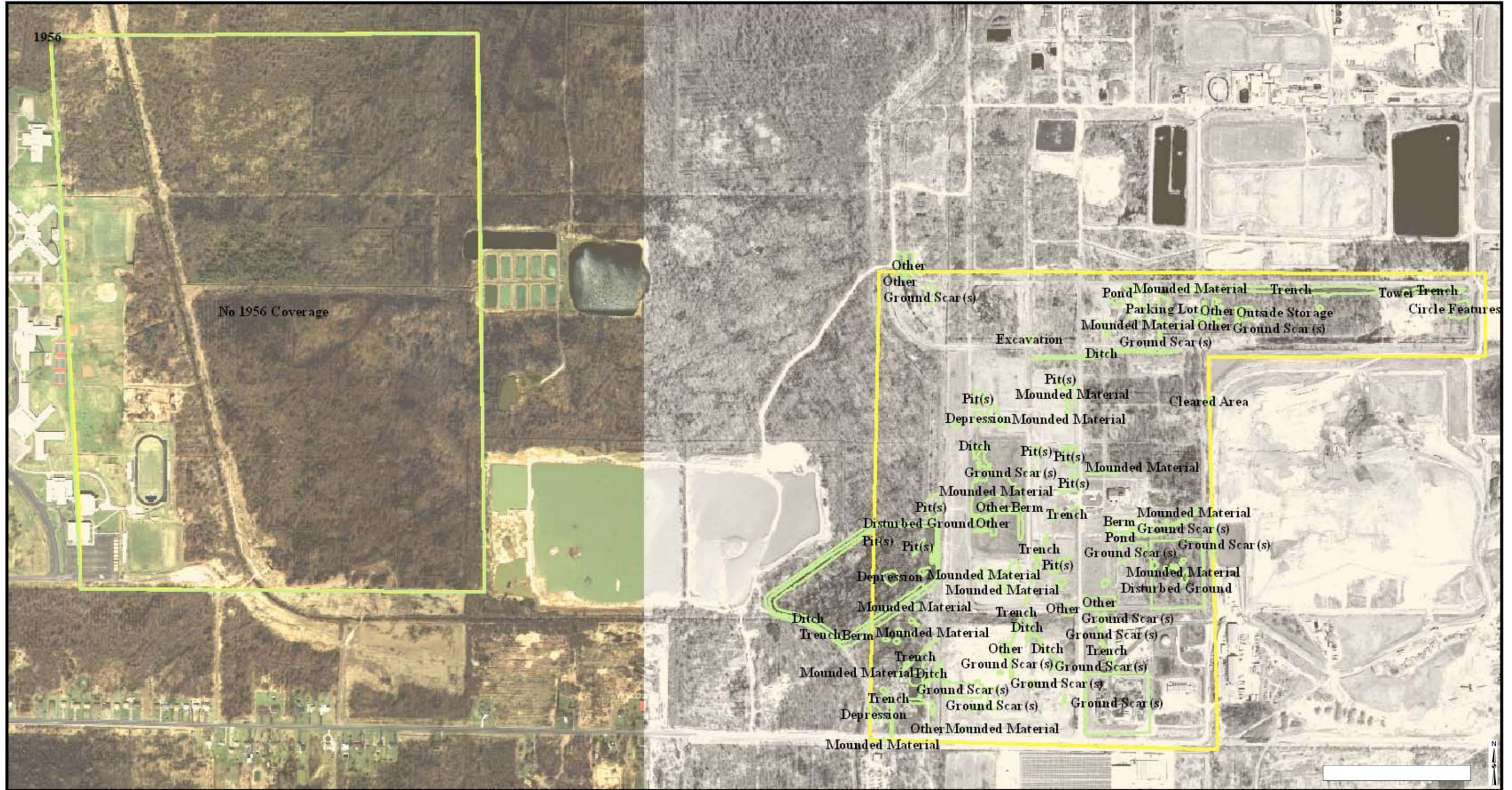
1951 FEATURES DISPLAYED ON 2005 BASE MAP



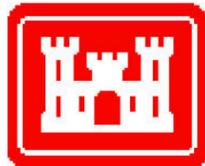
FEATURES IDENTIFIED FROM 1951 AERIAL PHOTOGRAPHS DISPLAYED ON 2005 BASE MAP



1956 FEATURES DISPLAYED ON 2005 BASE MAP

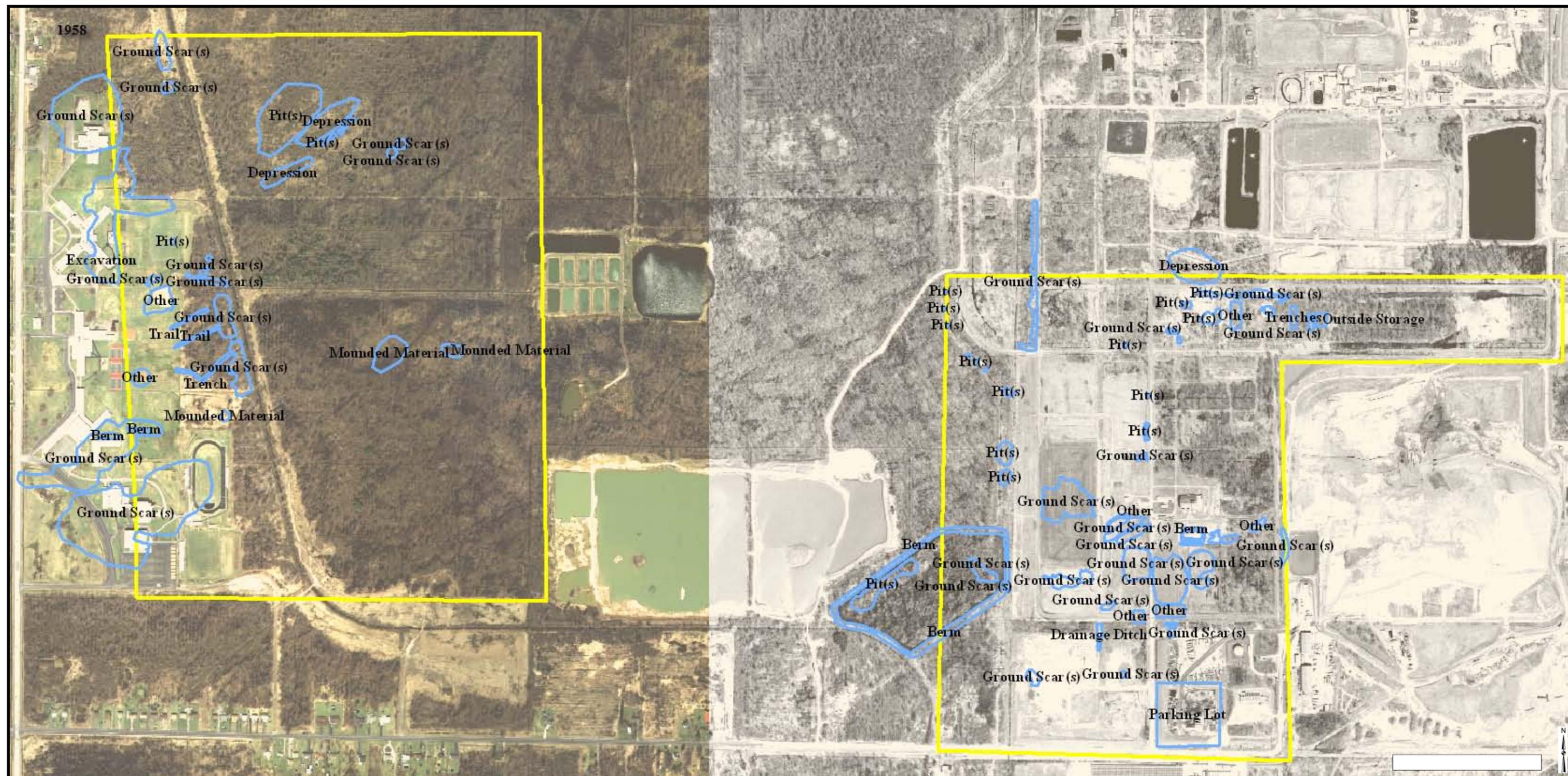


FEATURES IDENTIFIED FROM 1956 AERIAL PHOTOGRAPHS DISPLAYED ON 2005 BASE MAP

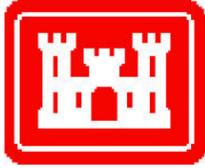


1958 FEATURES DISPLAYED ON 2005 BASE MAP

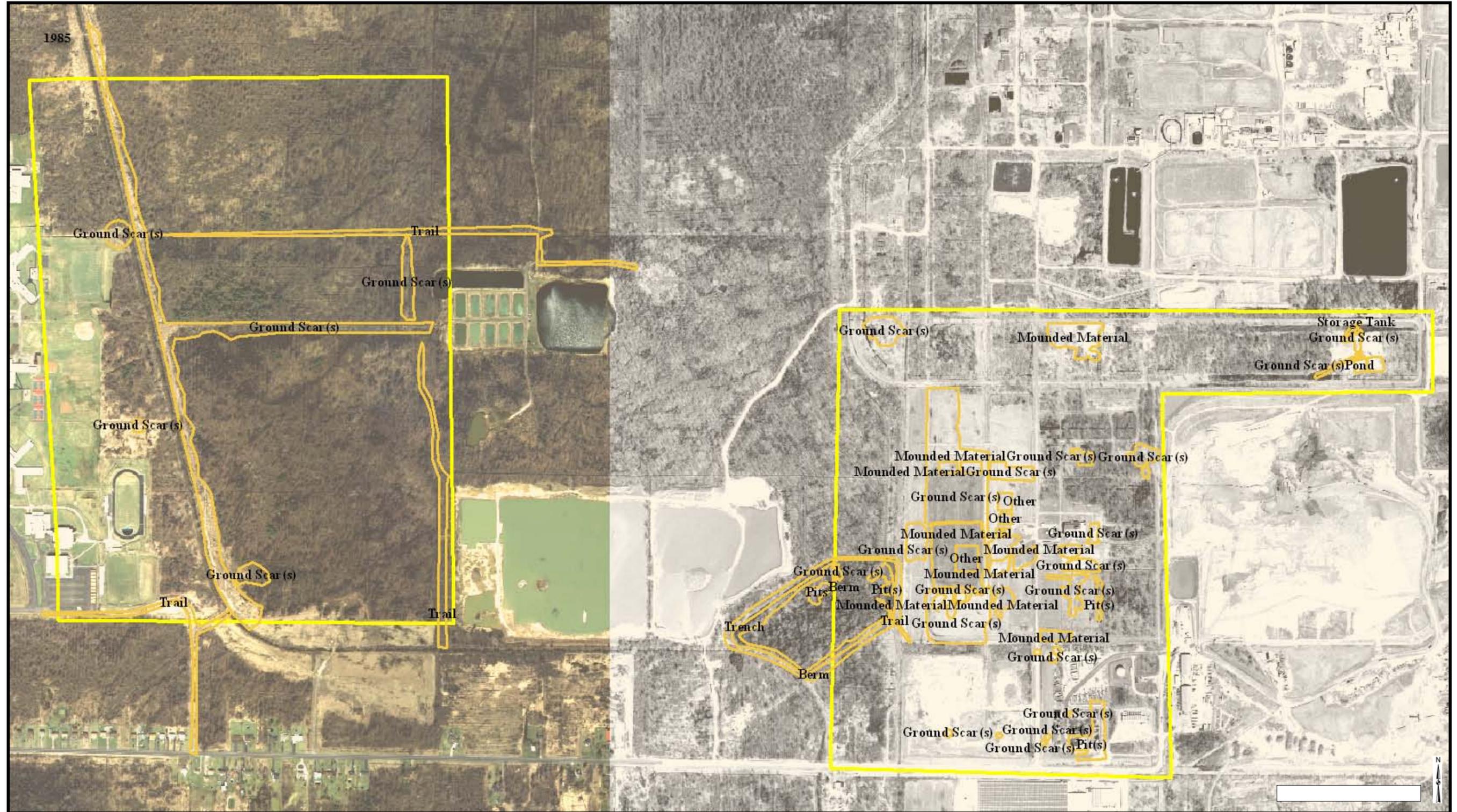
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FEATURES IDENTIFIED FROM 1958 AERIAL PHOTOGRAPHS DISPLAYED ON 2005 BASE MAP



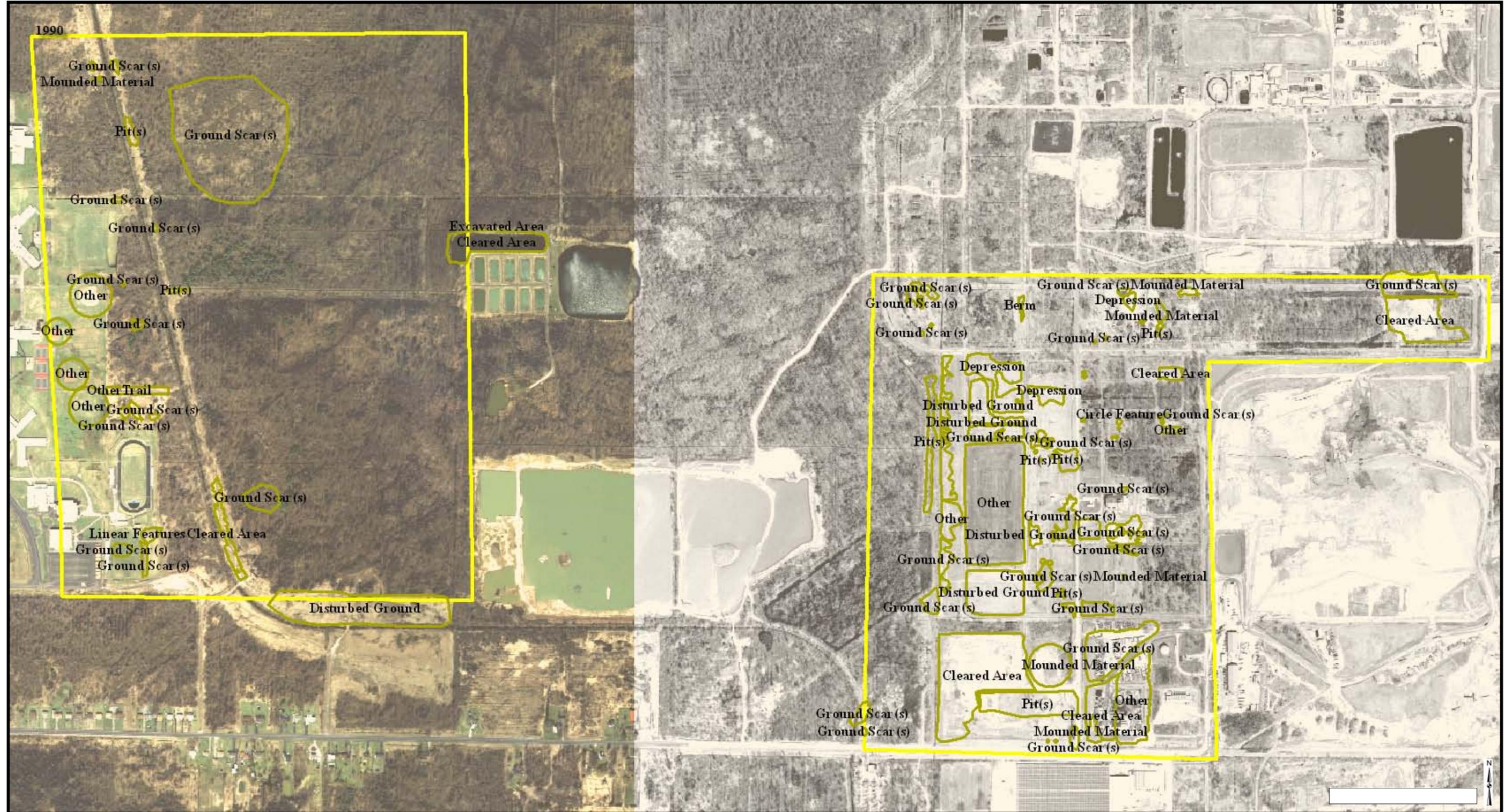
1985 FEATURES DISPLAYED ON 2005 BASE MAP



FEATURES IDENTIFIED FROM 1985 AERIAL PHOTOGRAPHS DISPLAYED ON 2005 BASE MAP



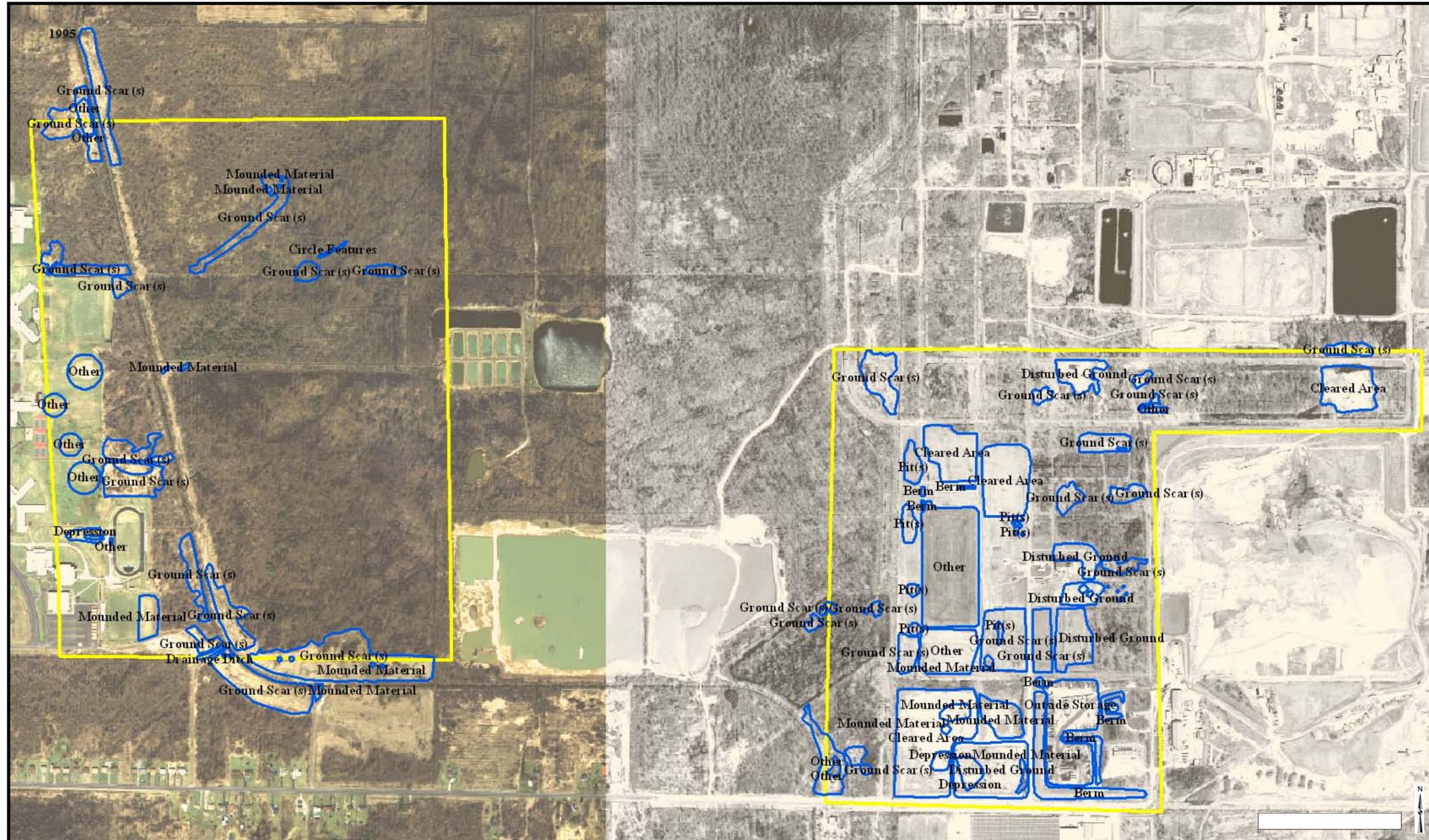
1990 FEATURES DISPLAYED ON 2005 BASE MAP



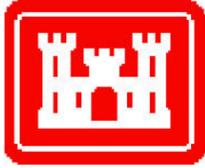
FEATURES IDENTIFIED FROM 1990 AERIAL PHOTOGRAPHS DISPLAYED ON 2005 BASE MAP



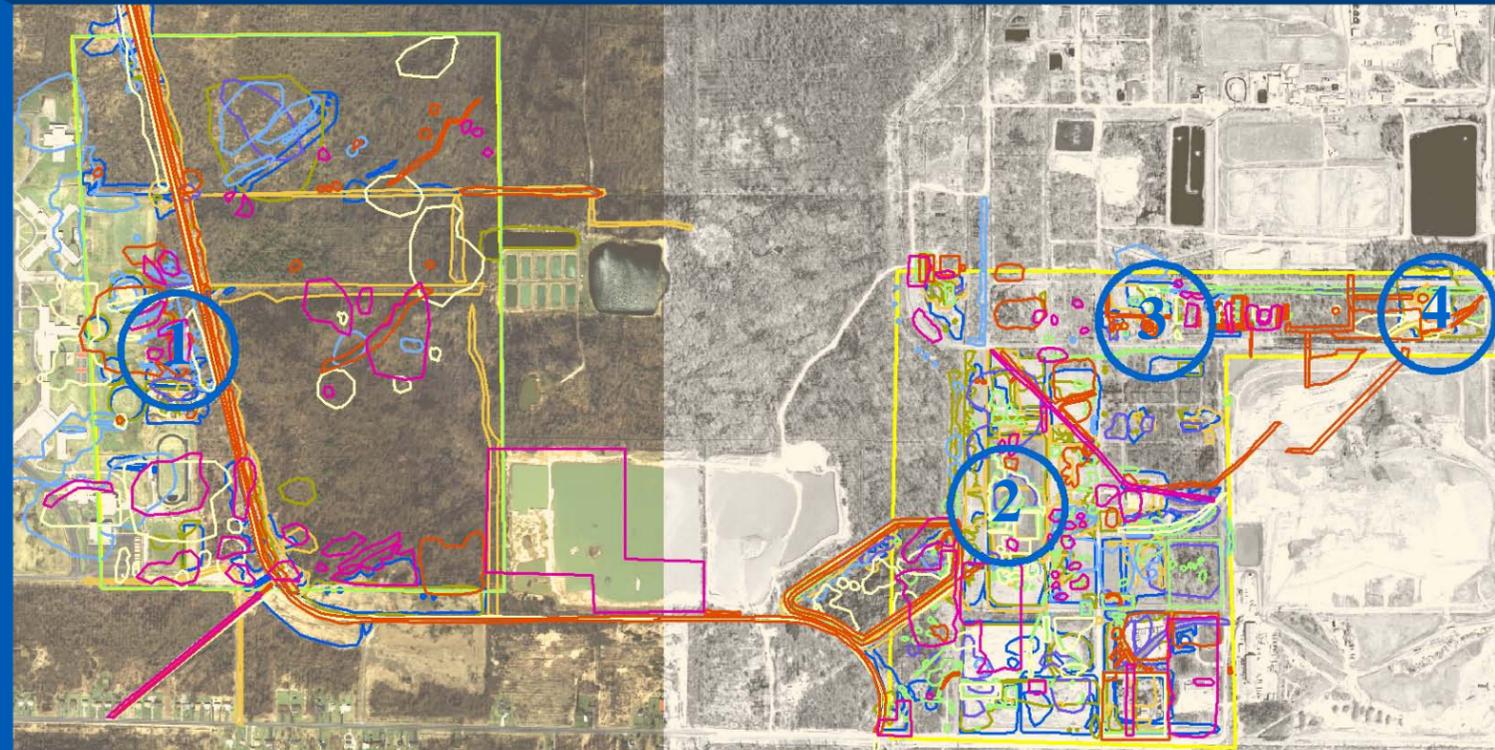
1995 FEATURES DISPLAYED ON 2005 BASE MAP



FEATURES IDENTIFIED FROM 1995 AERIAL PHOTOGRAPHS DISPLAYED ON 2005 BASE MAP



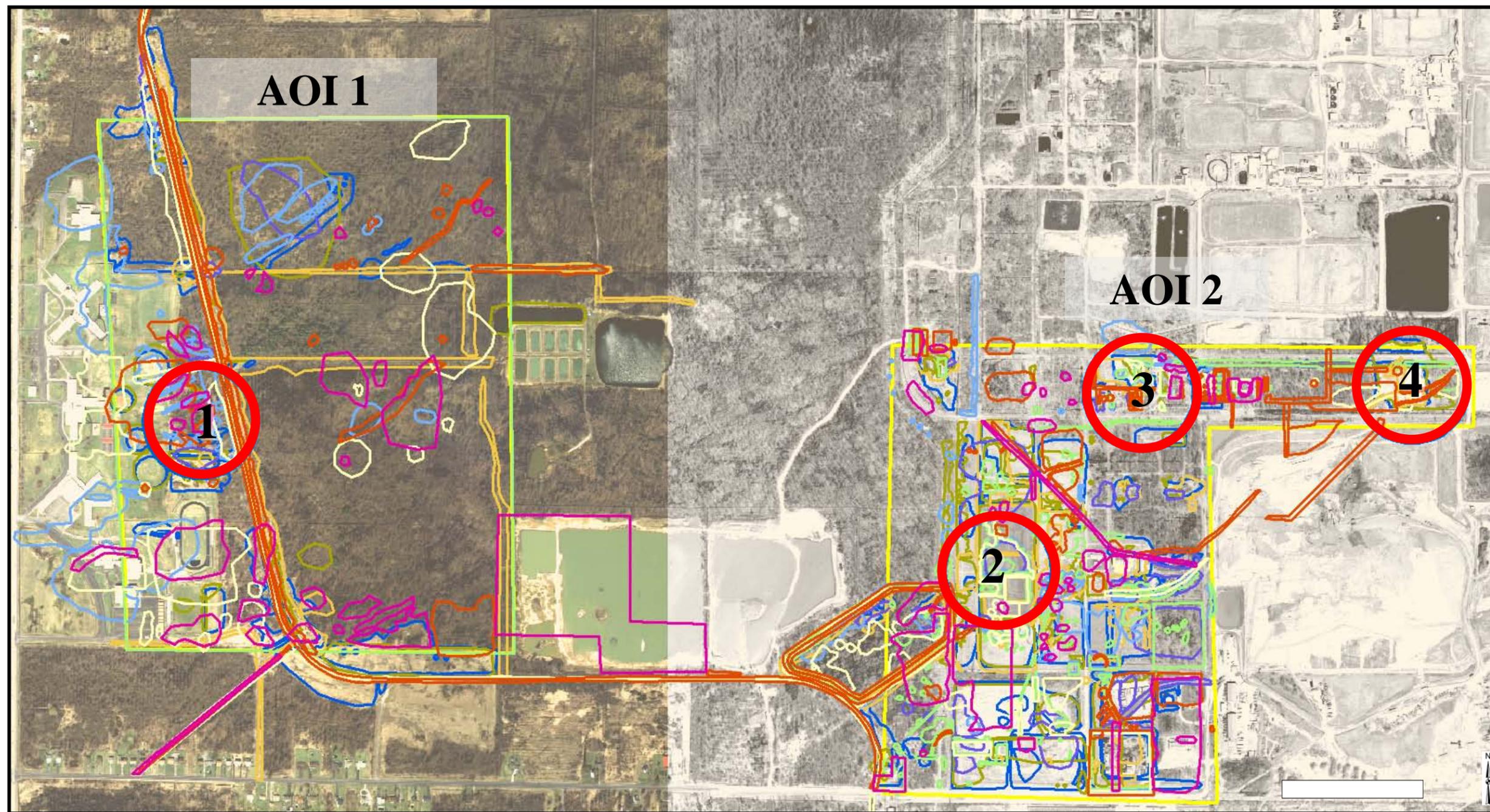
DETAIL LOOK AT SELECTED AREAS →



ALL FEATURES FOUND IN EACH YEAR ANALYZED, SHOWN ON 2005 BASE MAP



AREA OF INTEREST 1 (AOI 1) SELECTED AREA 1

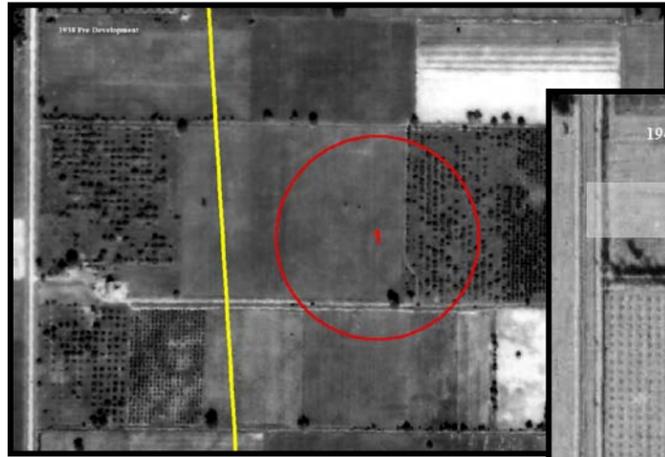




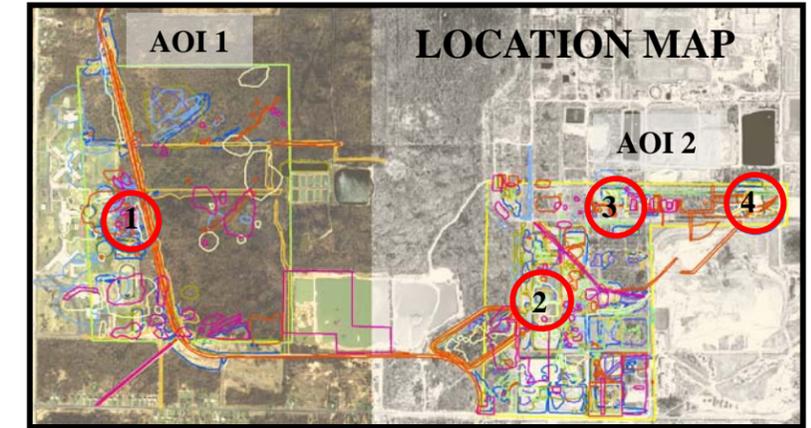
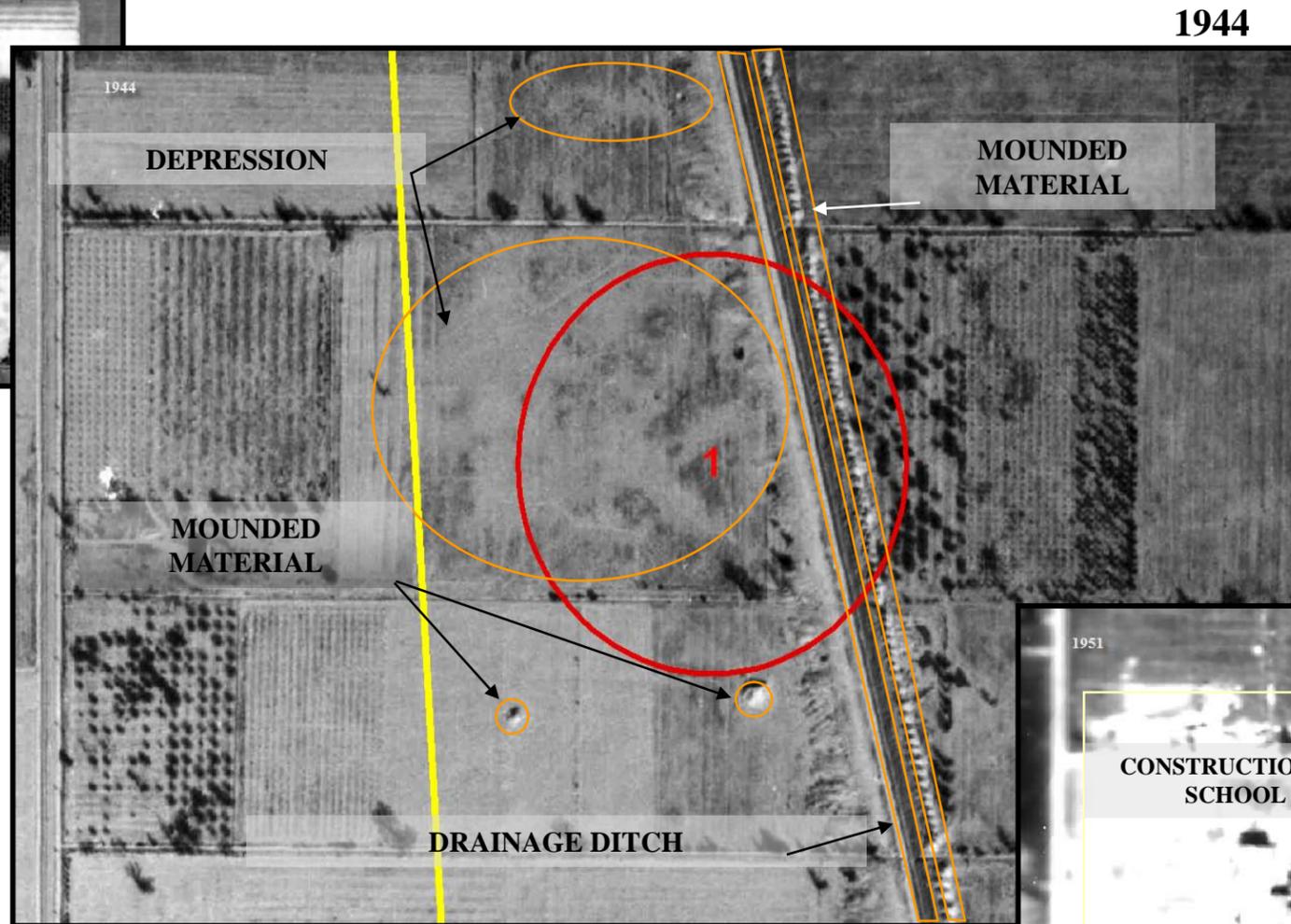
1938, 1944, & 1951 IMAGES DEMONSTRATING CHANGES IN SELECTED AREA 1



PREDEVELOPMENT



The Mounded Material seen in the 1944 photos are not seen in the predevelopment photos. Ground Scars seen in the 1942 photos (illustrated in the GIS) are possibly the result of agricultural activities.

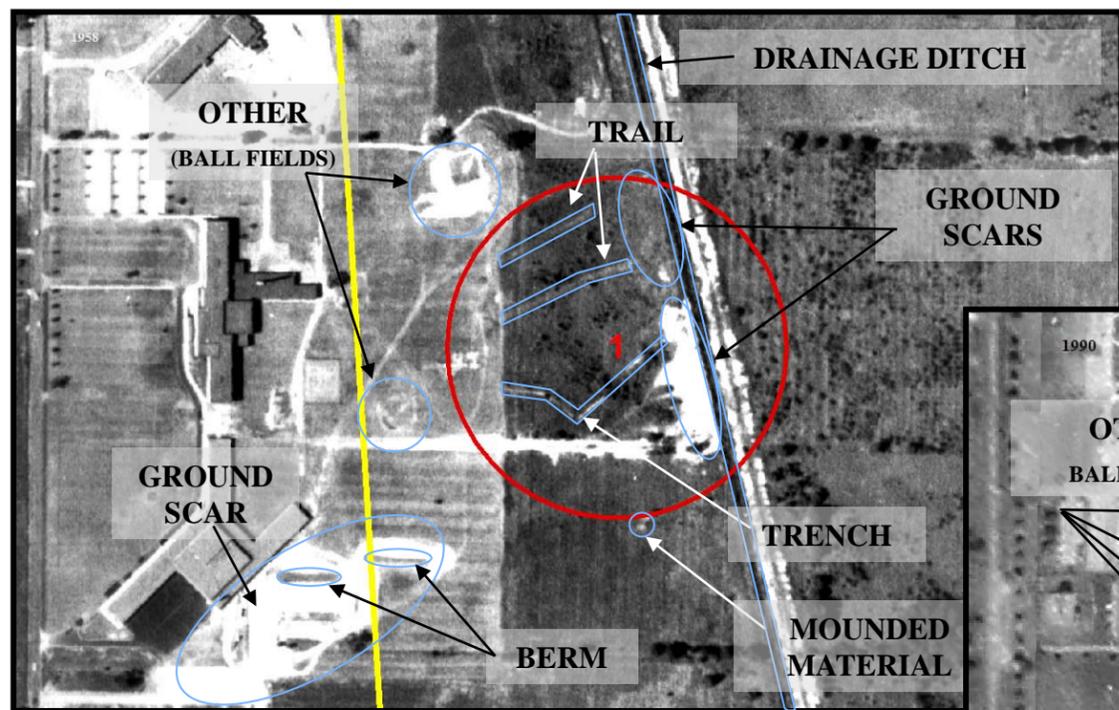


Lewiston-Porter School District was established in the late 1940s, possibly 1947. Construction of the school building is evident in the 1951 photos. Activity along the Drainage Ditch is also evident.



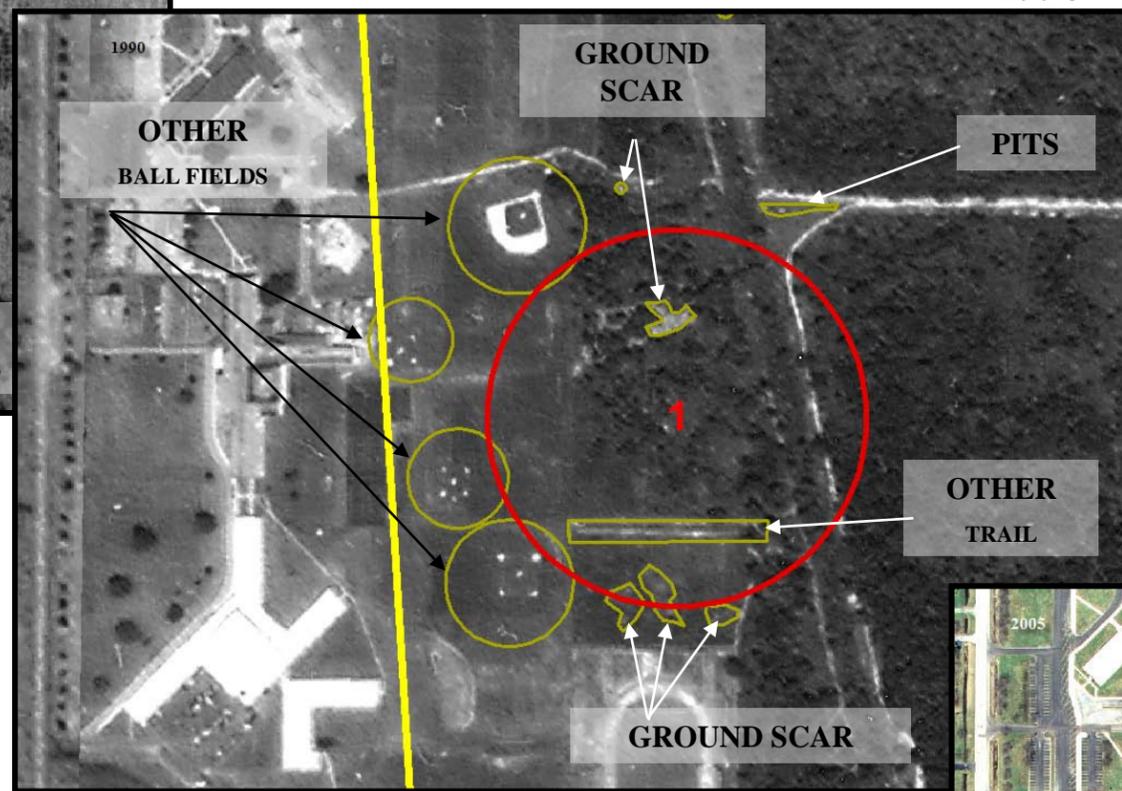


1958, 1990, & 2005 IMAGES DEMONSTRATING CHANGES IN SELECTED AREA 1 (AOI #1)



Activity on either side of the Drainage Ditch is evident in the 1958 photos.

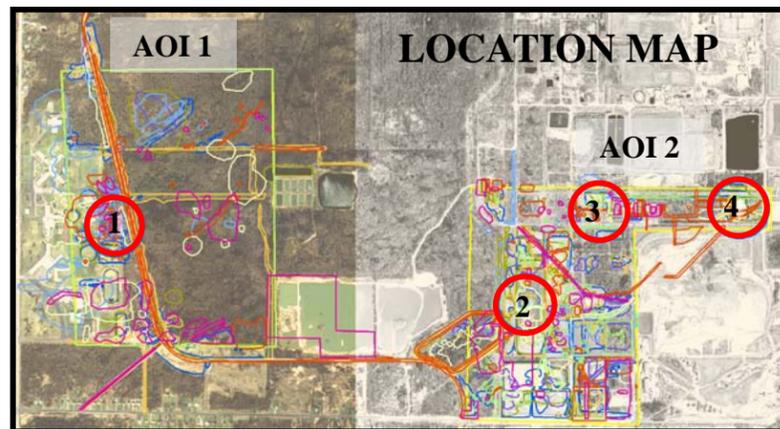
1958



1990

School sports activities are evident in the photos from 1958 to 2005. Only a few ground scars, pits, and/or mounded material appear in photos for these years.

2005

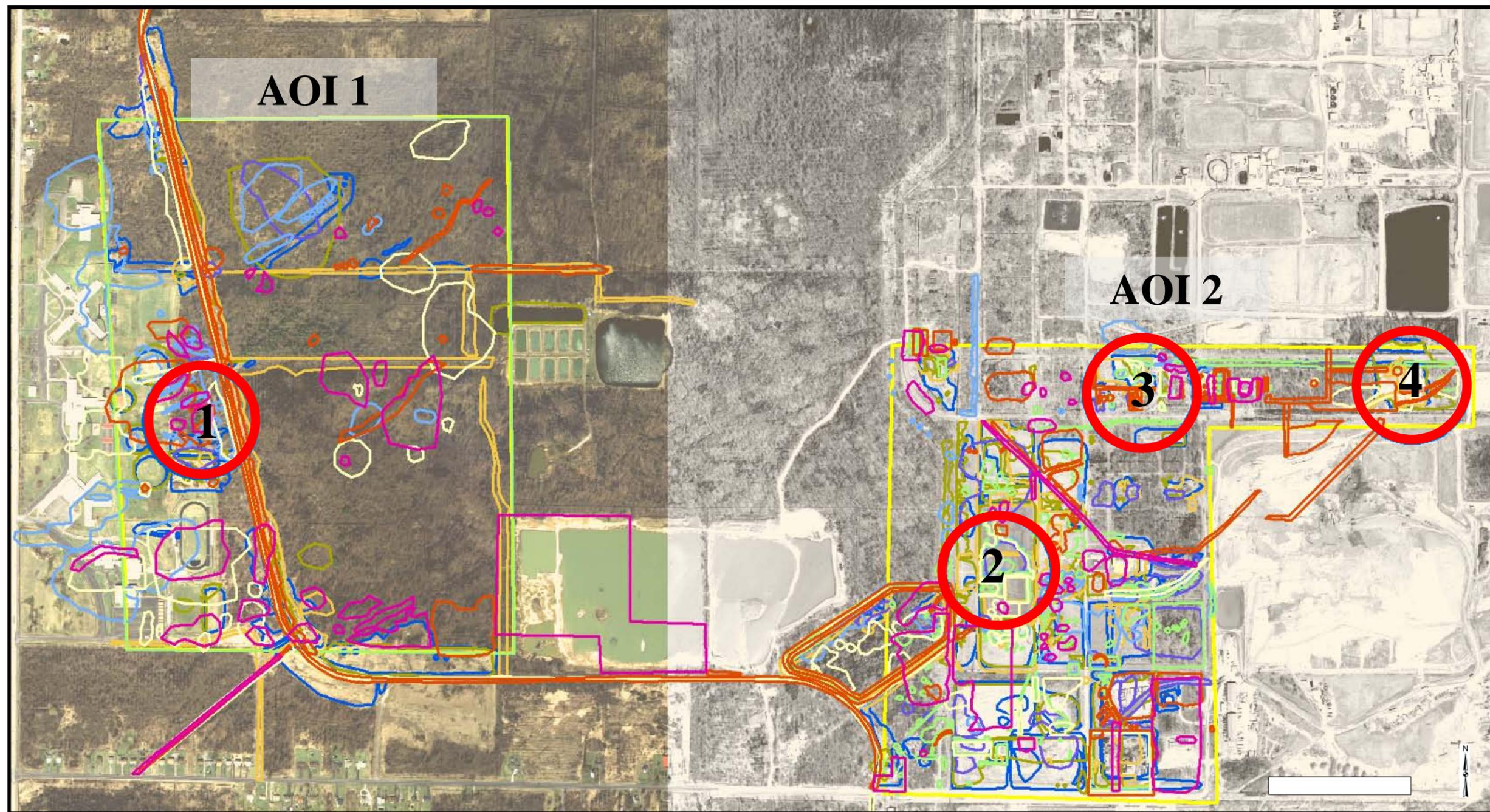


Activity around the Drainage Ditch and south of the AOI 1 is evident on the photos from 1944 to 1995. See the GIS for more detailed coverage of AOI 1.





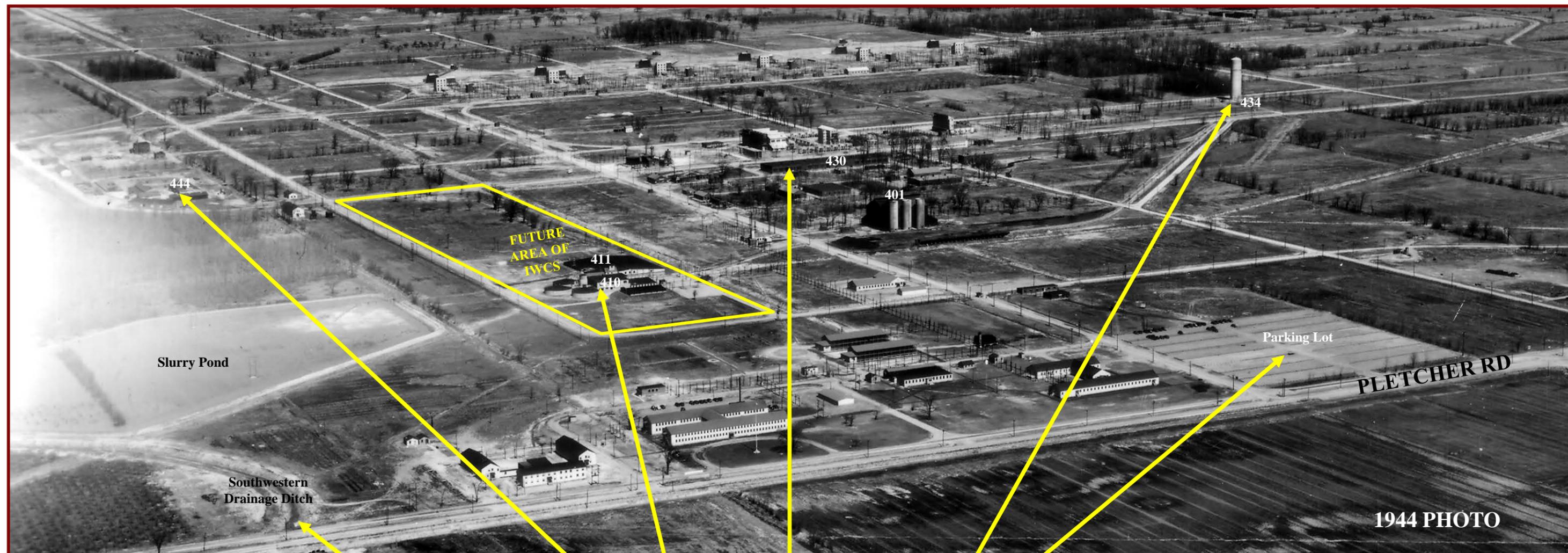
AREA OF INTEREST 2 (AOI 2) SELECTED AREAS 2, 3, AND 4





1944 AND 2005 POSITIONING MAPS FOR AOI #2

FINAL



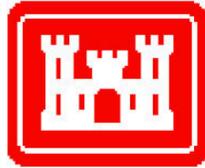
NUMBERS INDICATE 1944 BUILDING NUMBERS



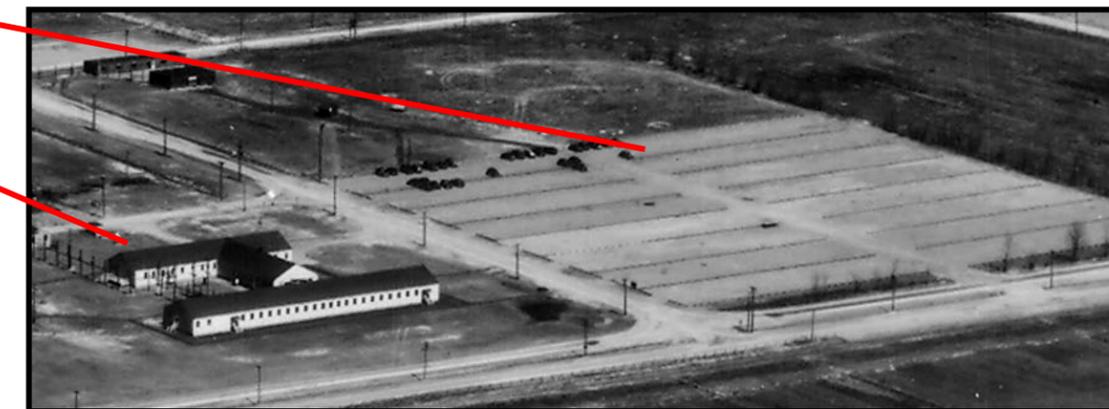
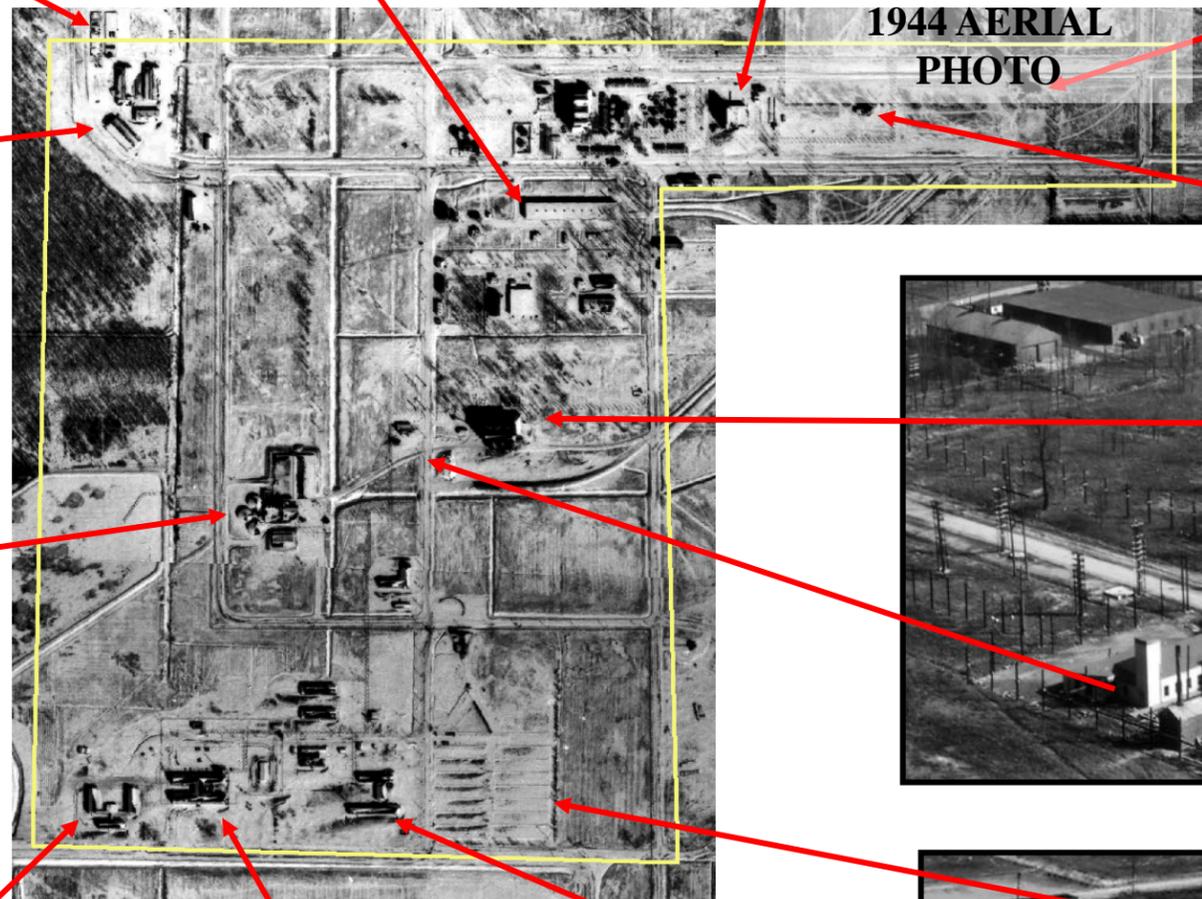
Building numbers are from Bechtel National, Inc; see REFERENCES page.

ABOVE PHOTO SHOWS 1944 MILITARY DEVELOPMENT IN THE AREA AROUND THE AREA THAT HAS BECOME THE PRESENT DAY INTERIM WASTE CONTAINMENT STRUCTURE (IWCS)

TO LEFT, THE 2005 AERIAL PHOTO SHOWS MORE CURRENT CONDITIONS AROUND THE INTERIM WASTE CONTAINMENT STRUCTURE (IWCS)

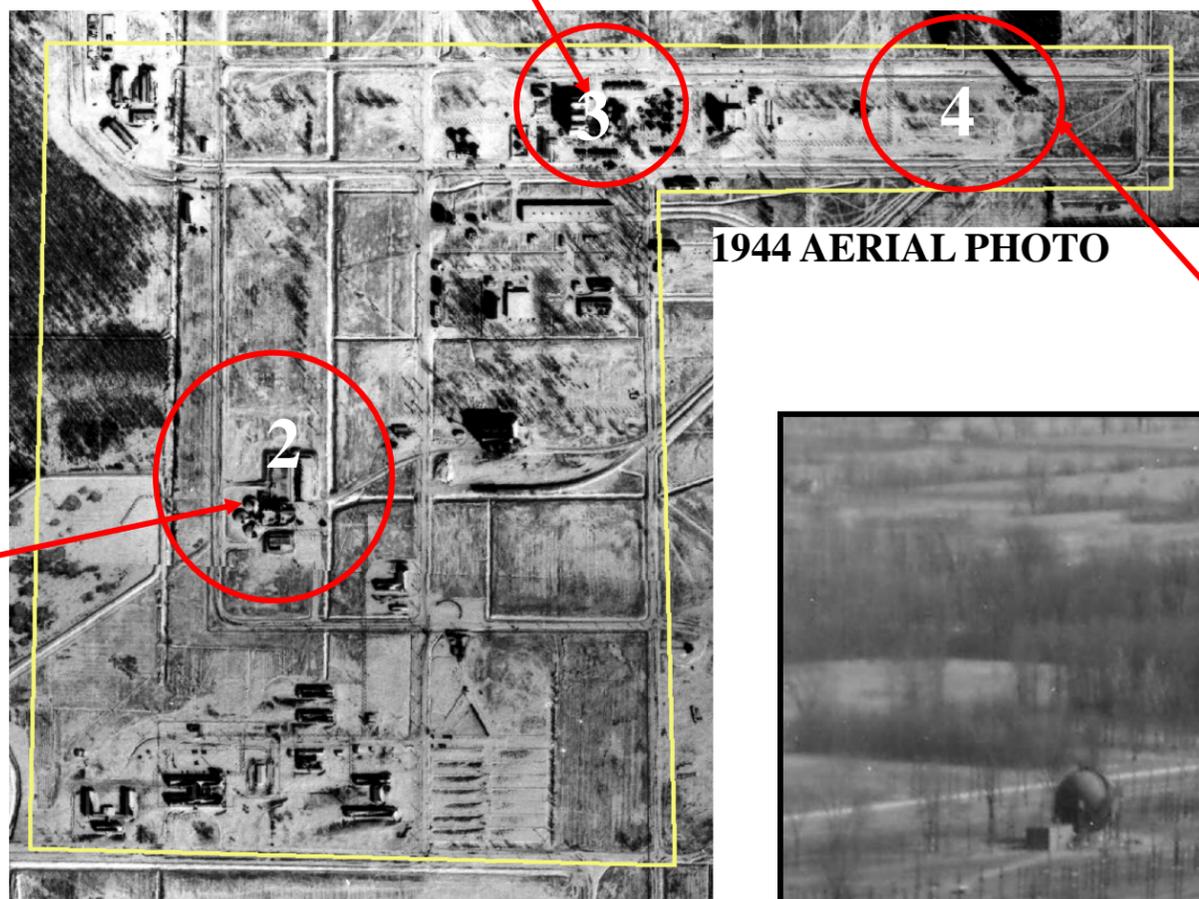


1944 OBLIQUE VIEWS OF AOI #2



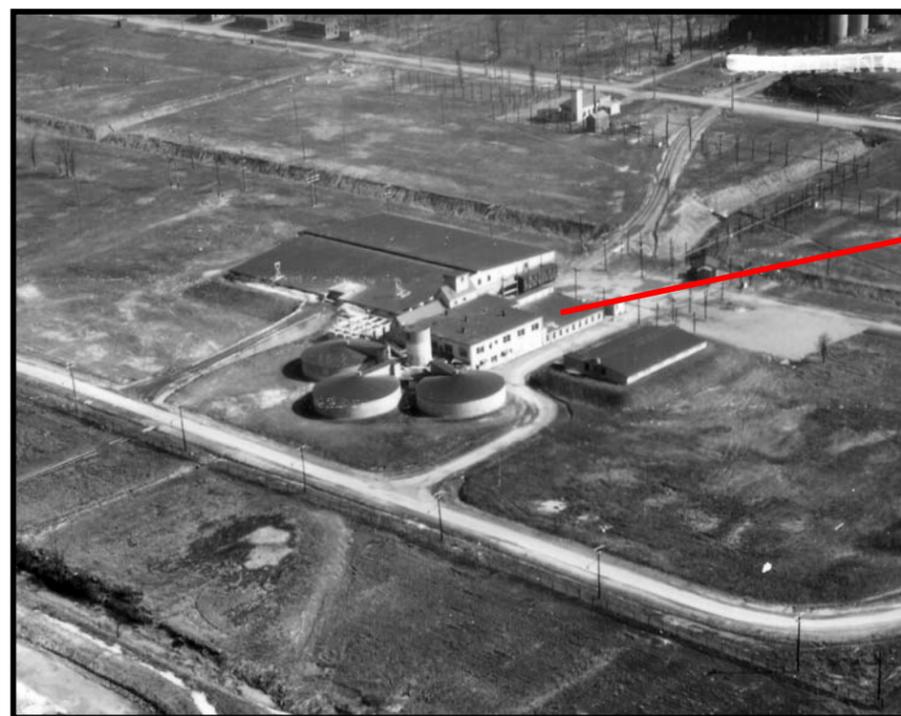


1944 OBLIQUE VIEWS OF SELECTED AREAS 2, 3, AND 4



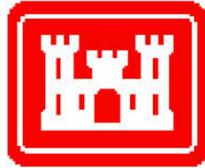
1944 AERIAL PHOTO

AOI 2





2ND - 1944 OBLIQUE VIEW OF SELECTED AREA 2 IN AOI #2



1944 AERIAL PHOTO

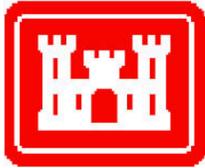


Area seen in 1944 aerial photo and 1944 oblique photo. Oblique photo is taken from the Southwest looking Northeast. Note the single ramp leading to building 411.

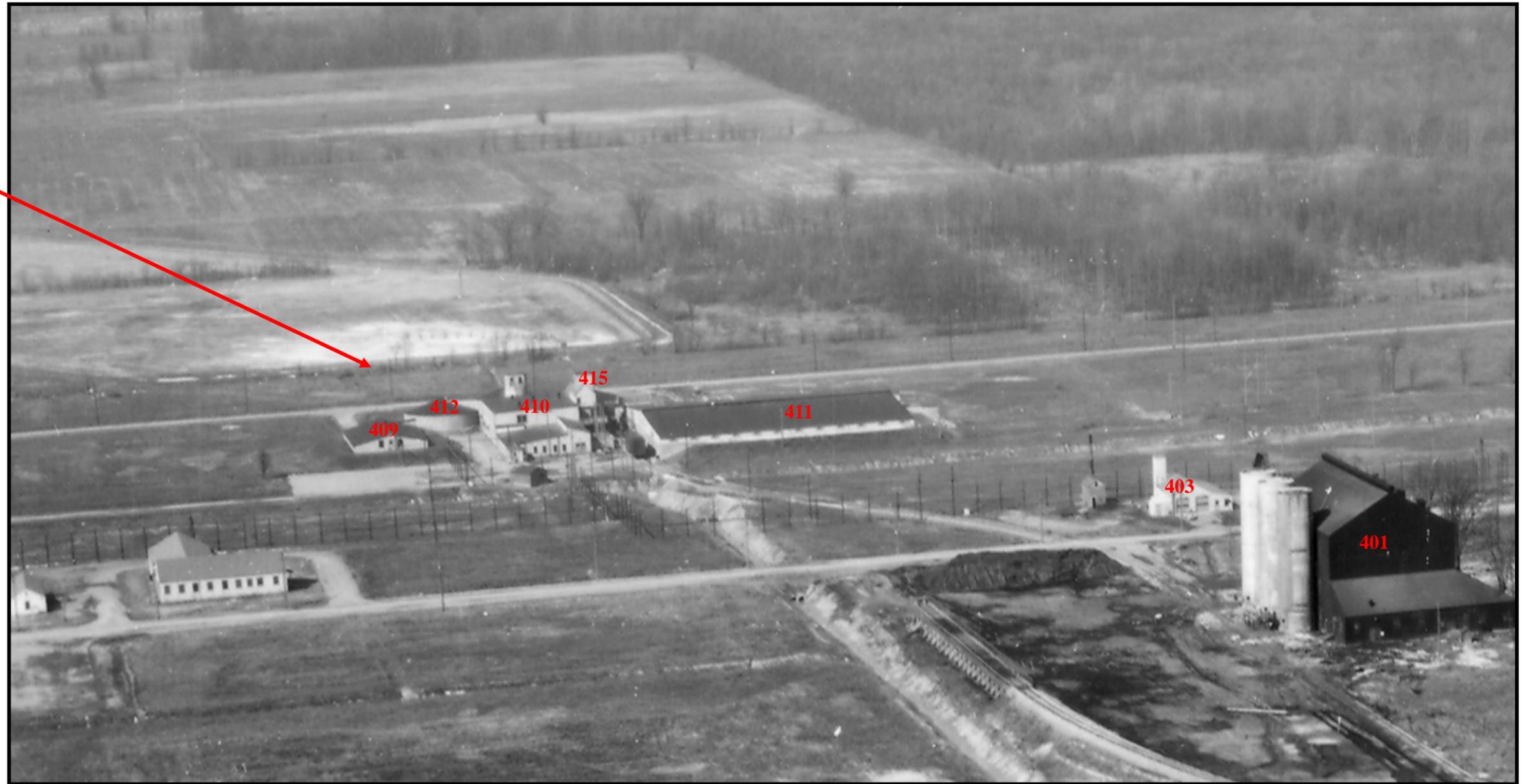
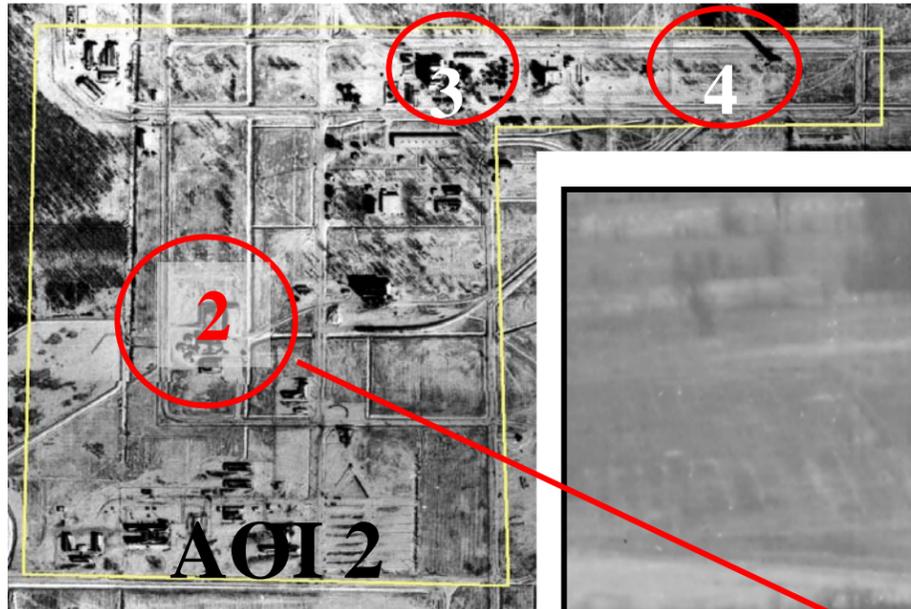
Building numbers are from Bechtel National, Inc; see REFERENCES page.



3RD - 1944 OBLIQUE VIEW OF SELECTED AREA 2 IN AOI #2



1944 AERIAL PHOTO

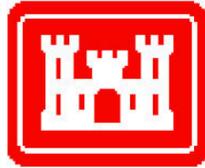


Area seen in 1944 aerial photo and 1944 oblique photo. Oblique photo is taken from the East looking West

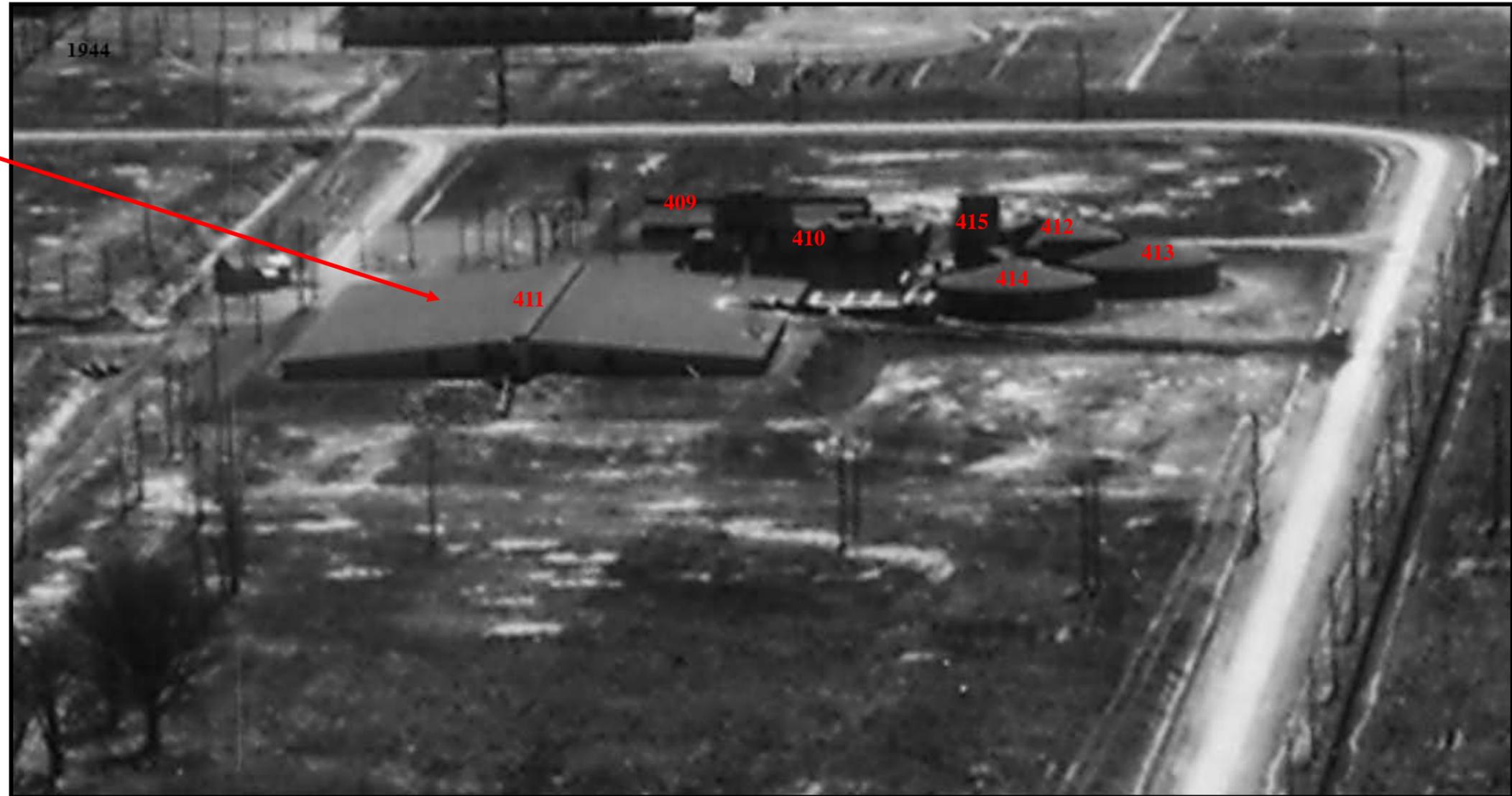
Building numbers are from Bechtel National, Inc; see REFERENCES page.



4TH - 1944 OBLIQUE VIEW OF SELECTED AREA 2 IN AOI #2



1944 AERIAL PHOTO

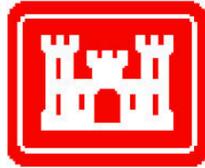


Area seen in 1944 aerial photo and 1944 oblique photo. Oblique photo is taken from the North looking South

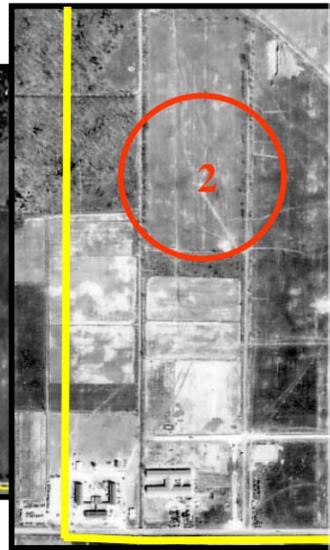
Building numbers are from Bechtel National, Inc; see REFERENCES page.



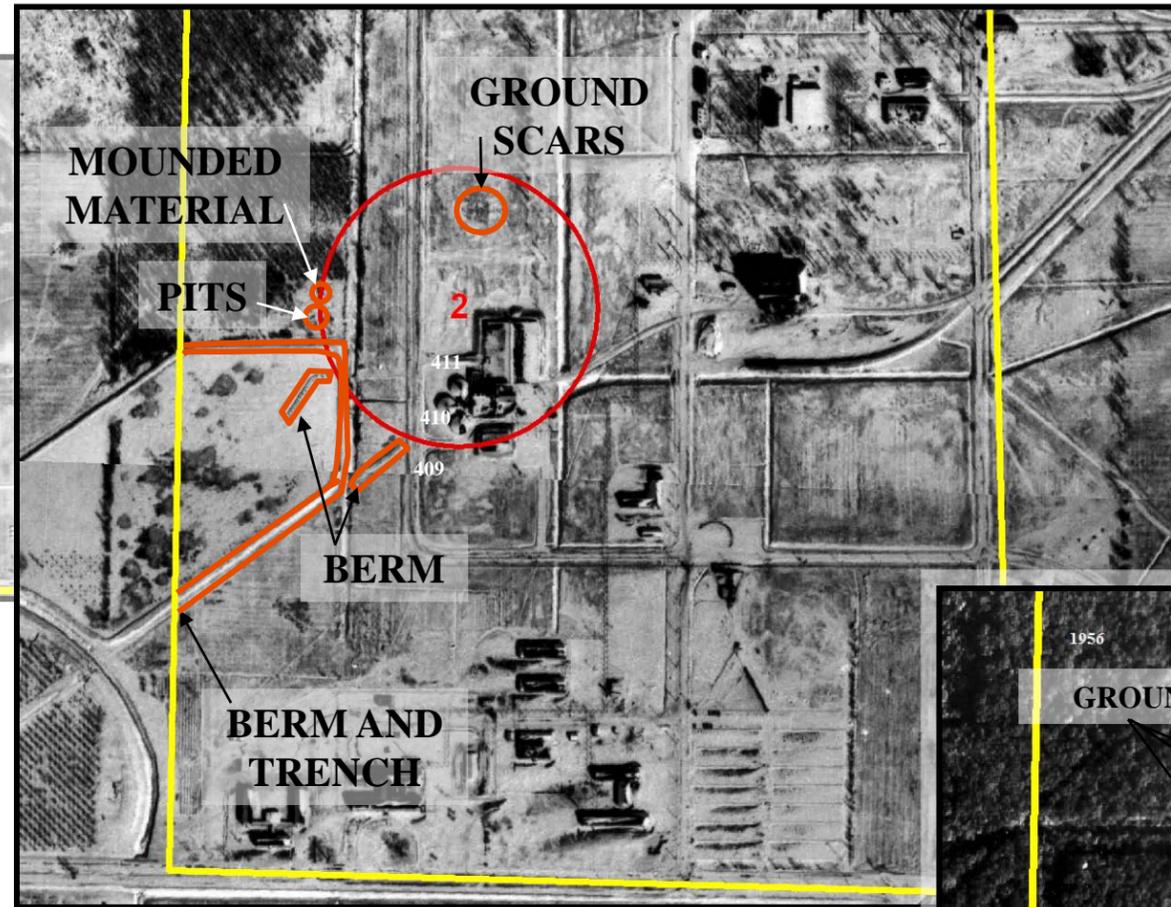
1938, 1942, 1944 & 1956 IMAGES DEMONSTRATING CHANGES IN SELECTED AREA 2 (AOI 2)



1938
PREDEVELOPMENT



1942 NO
DEVELOPMENT
IN SELECTED
AREA 2



1944



1956

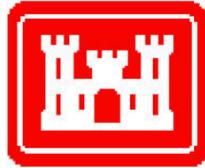
Buildings are not seen in this Selected Area 2 of AOI 2 in the predevelopment nor the 1942 photos. The buildings in Selected Area 2 appear first in the 1944 photos. The Storage Tanks (buildings 412 to 415) are seen in each year analyzed from 1944 to 1978. They do not appear in 1985 photos but building 411 does. Building 411 is not seen in the 1990 photos.

See the GIS for detailed coverage of AOI 2.

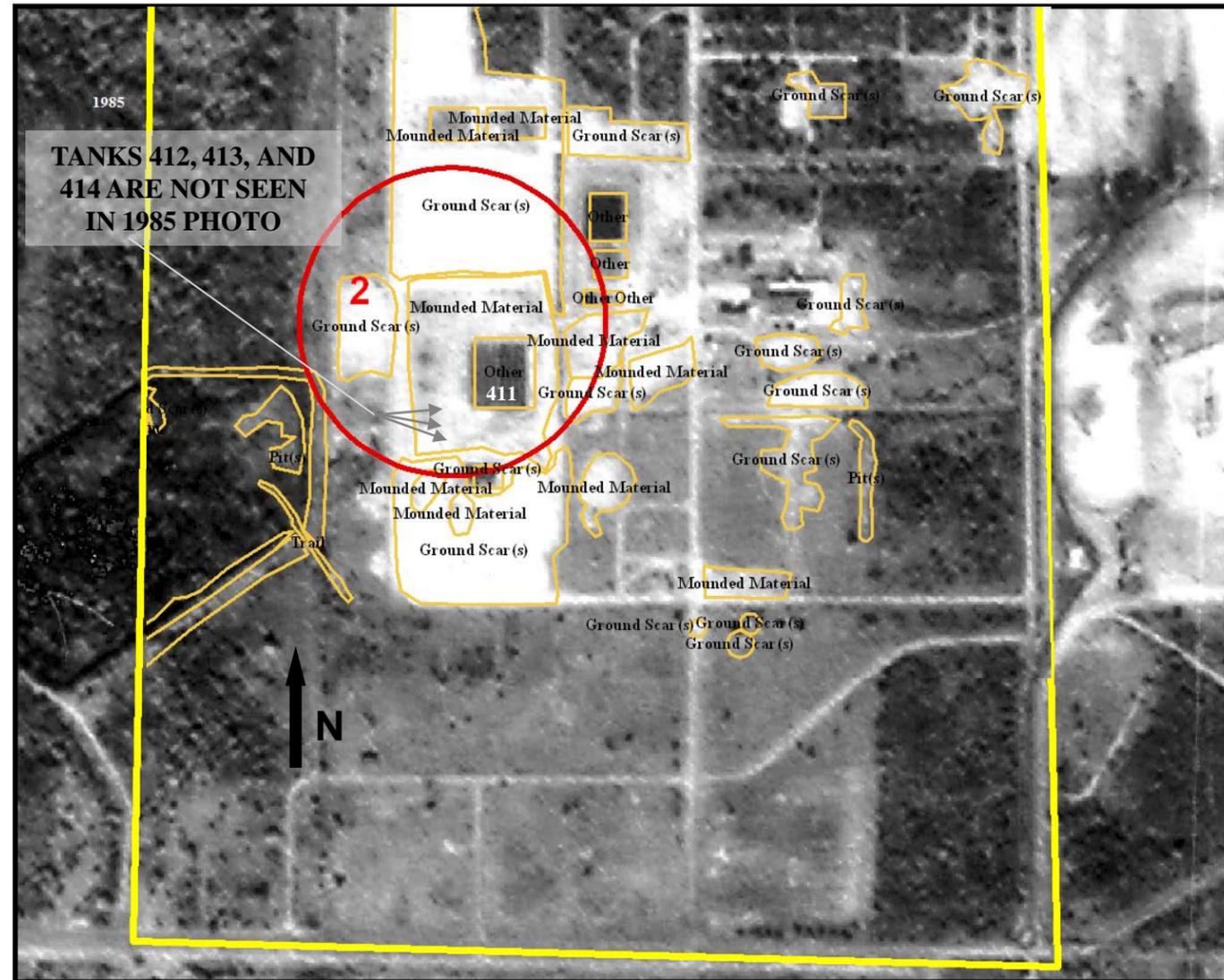
Building numbers are from Bechtel National, Inc; see REFERENCES page.



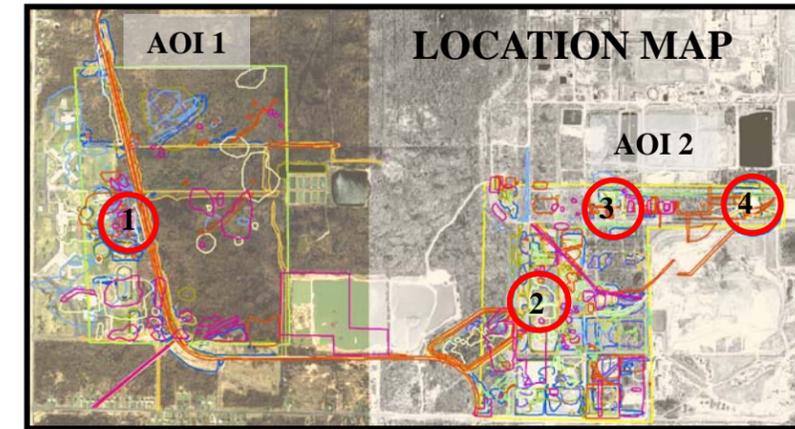
1985 & 1990 IMAGES DEMONSTRATING CHANGES IN SELECTED AREA 2 (AOI 2)



Storage Tanks (412 to 415) and building 410 are not seen in the 1985 photos.



1985



1990

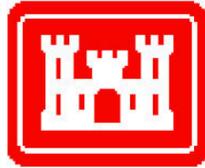


Buildings and Storage Tanks are gone by 1990, with the appearance of the IWCS, an engineered earthen drainage cover (cap).

The cap is designed to minimize water infiltration, radon emanation, gamma radiation, erosion, and frost heave damage. A vegetative cover of shallow-rooted grasses minimizes erosion. The upper layer is compacted and contoured to promote runoff, the same as the underlying layers are.

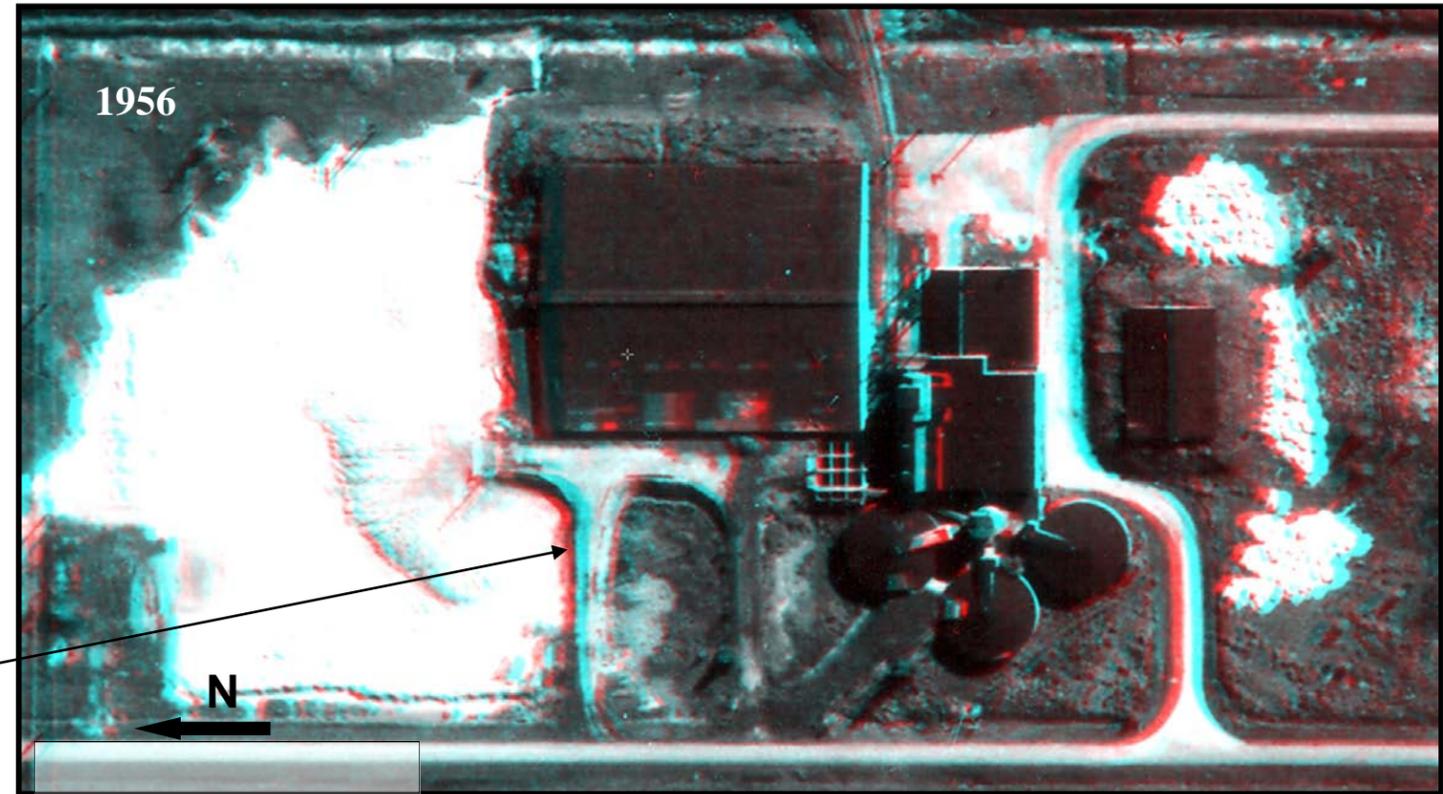


STEREO IMAGES OF CHANGES IN SELECTED AREA 2 OF AOI 2



1944

Note one ramp to building 411 in 1944 oblique. In 1951 photo two ramps are evident, as in this 1956 photo. Building 411 is gone in 1990 stereo.

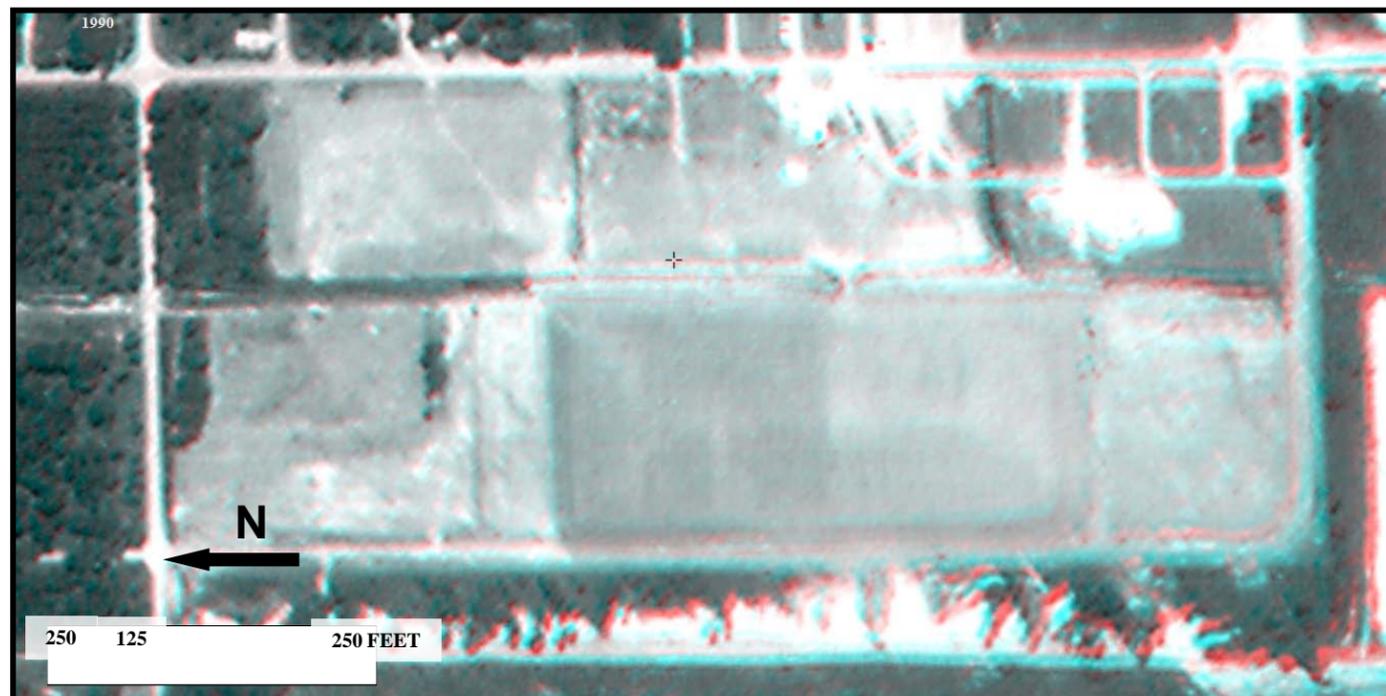


1956

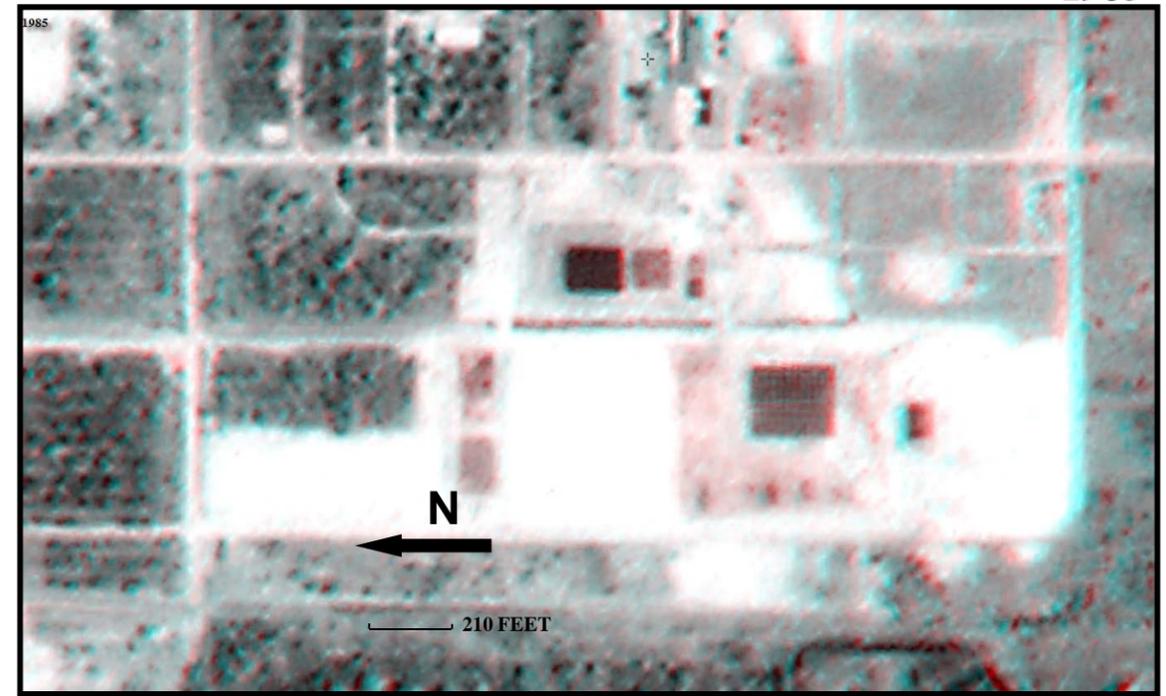
1956

L-30 residue was delivered to building 411 by the truck load in the forties.*

1990



1985

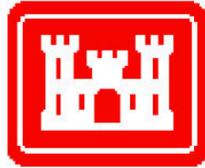


To obtain the 3-D effect, images must be viewed with red/blue lens stereo glasses.

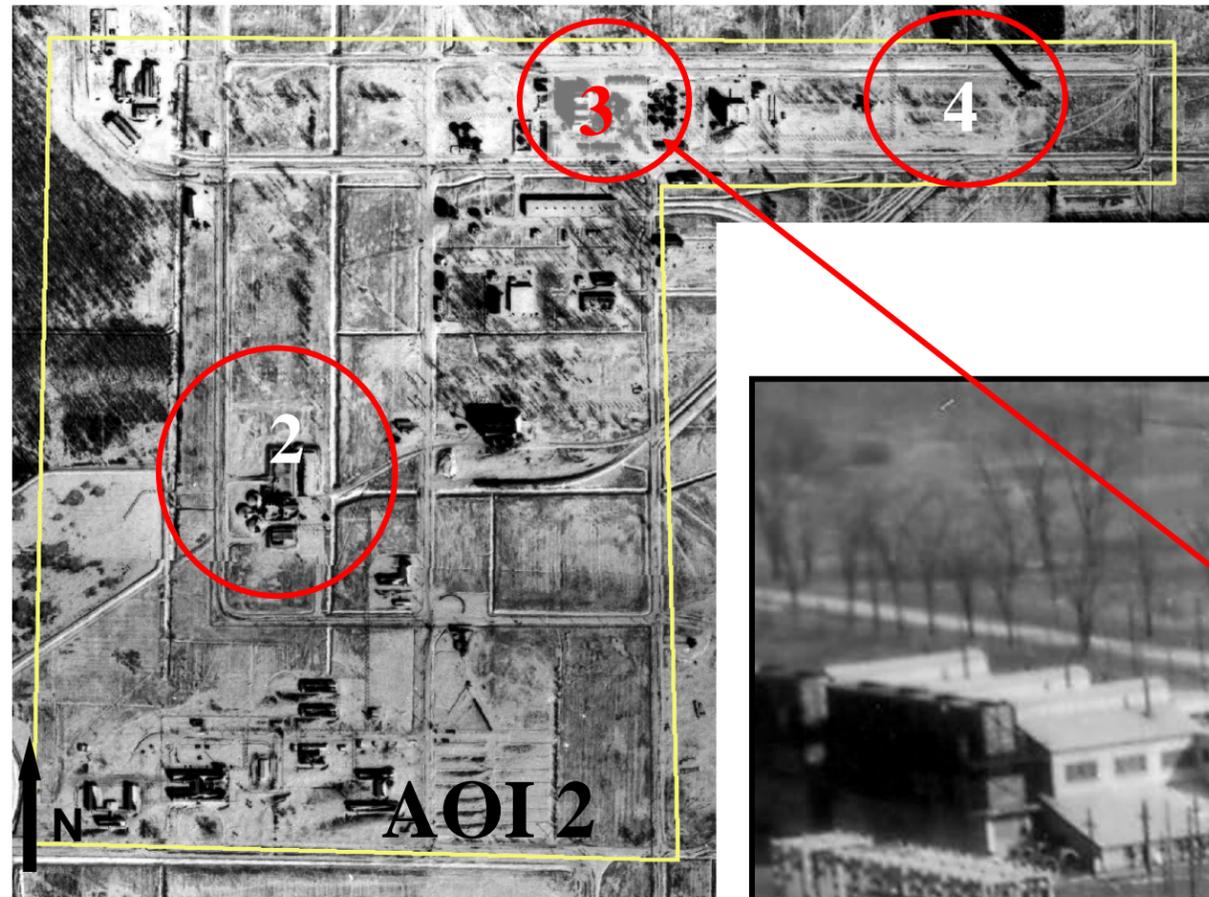
Building numbers are from Bechtel National, Inc. see page 56



1944 OBLIQUE VIEW OF SELECTED AREA 3 IN AOI #2



1944 AERIAL PHOTO



Area seen in 1944 aerial photo and 1944 oblique photo. Oblique photo is taken from the Southwest looking Northeast.

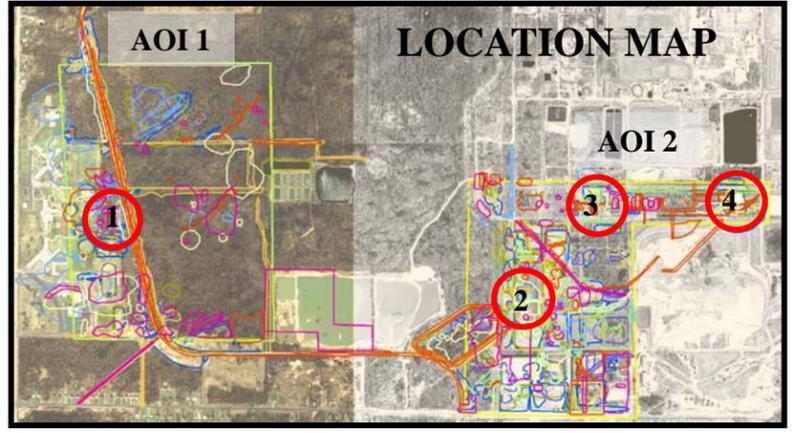


1938, 1944 & 1956 IMAGES DEMONSTRATING CHANGES IN SELECTED AREA 3 (AOI2)

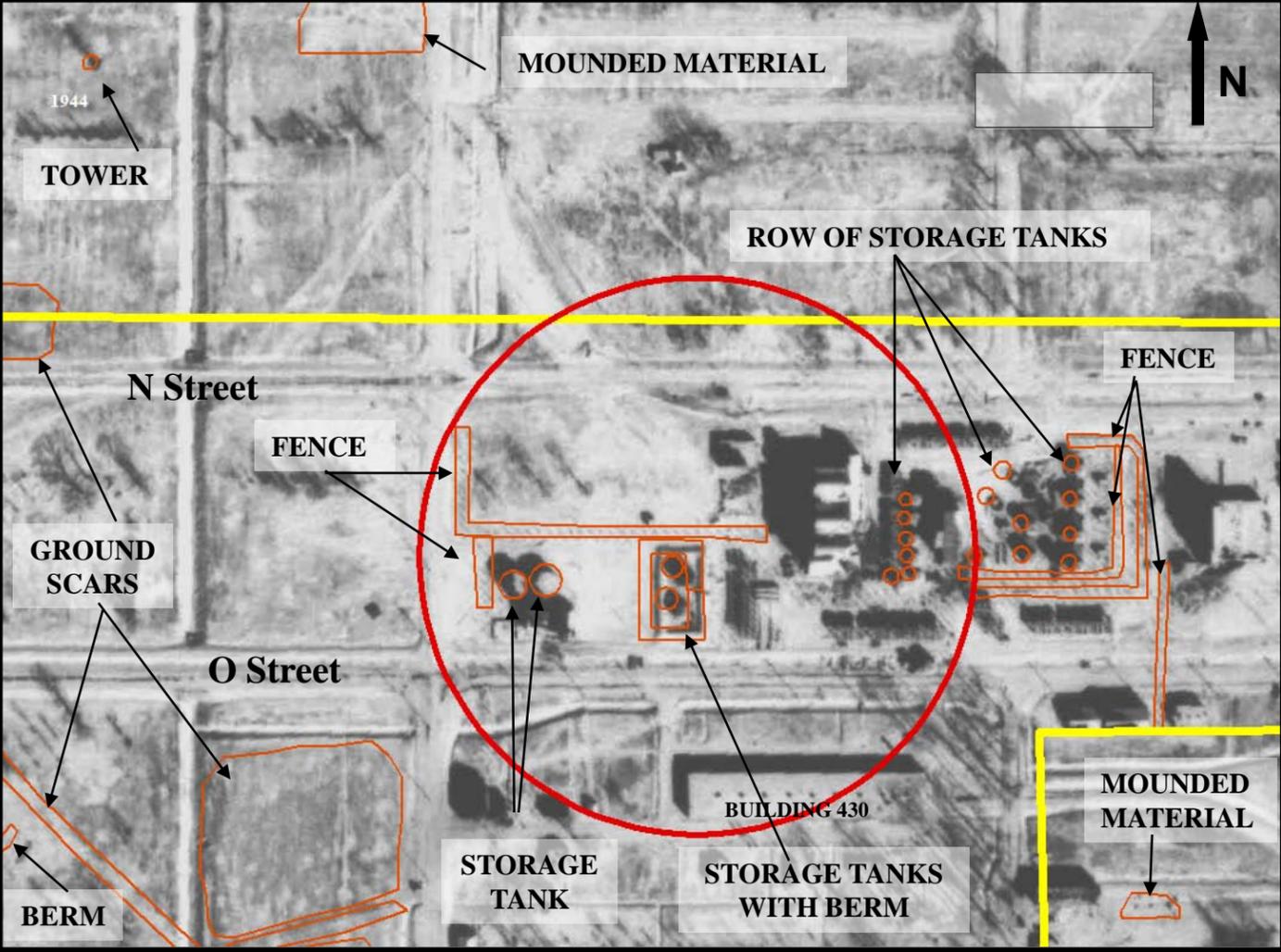
1938 PREDEVELOPMENT



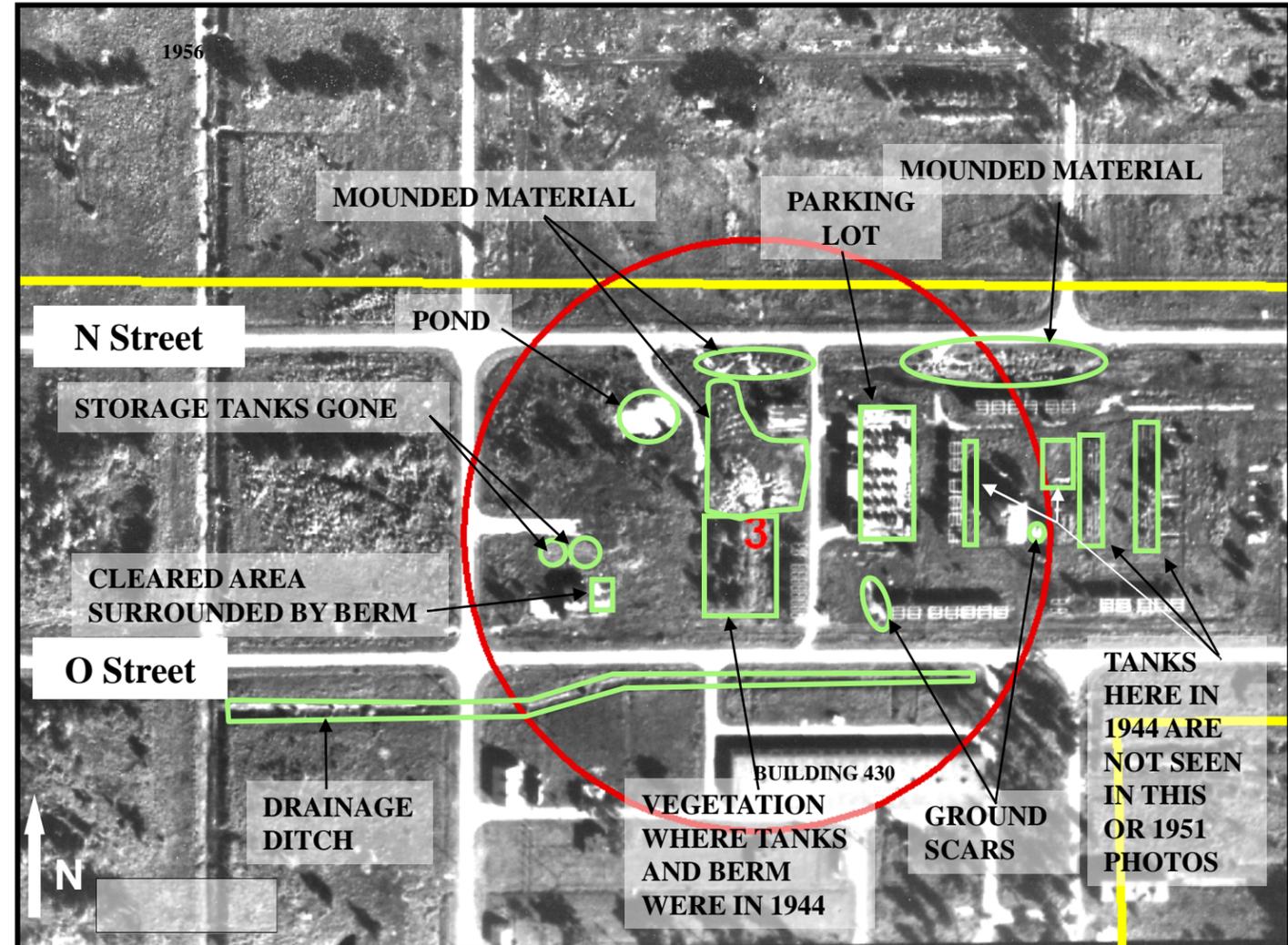
IN 1944 PHOTOS, STORAGE TANKS ARE EVIDENT AMONG THE BUILDINGS BETWEEN "N" AND "O" STREETS. THE TANKS ARE NOT SEEN IN THE 1951 PHOTOS OR AFTER. THE LOCATION WHERE THE 1944 TANKS WERE LOCATED IS MARKED ON THE 1956 PHOTO.



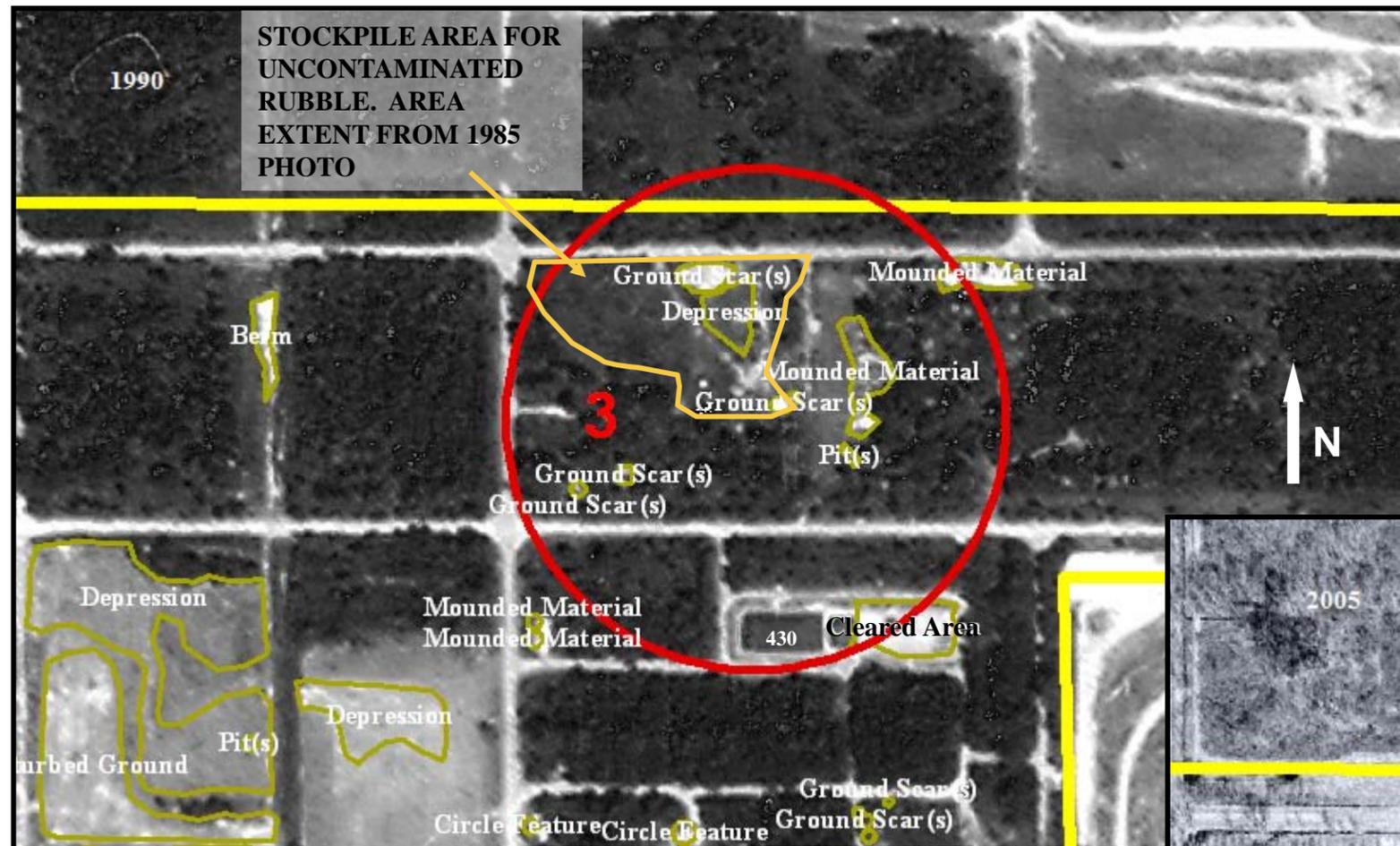
1944



1956

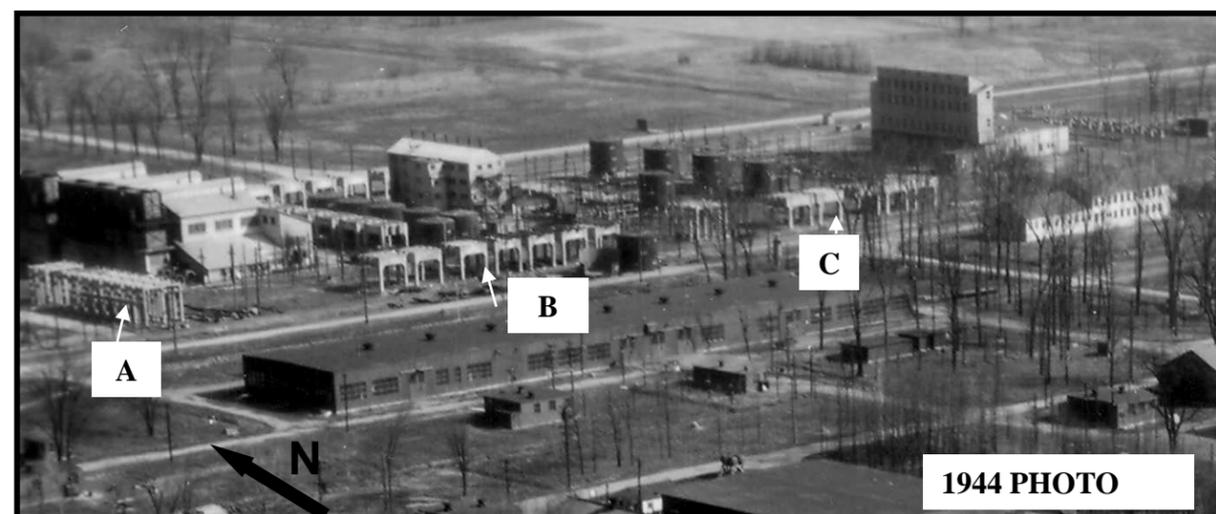
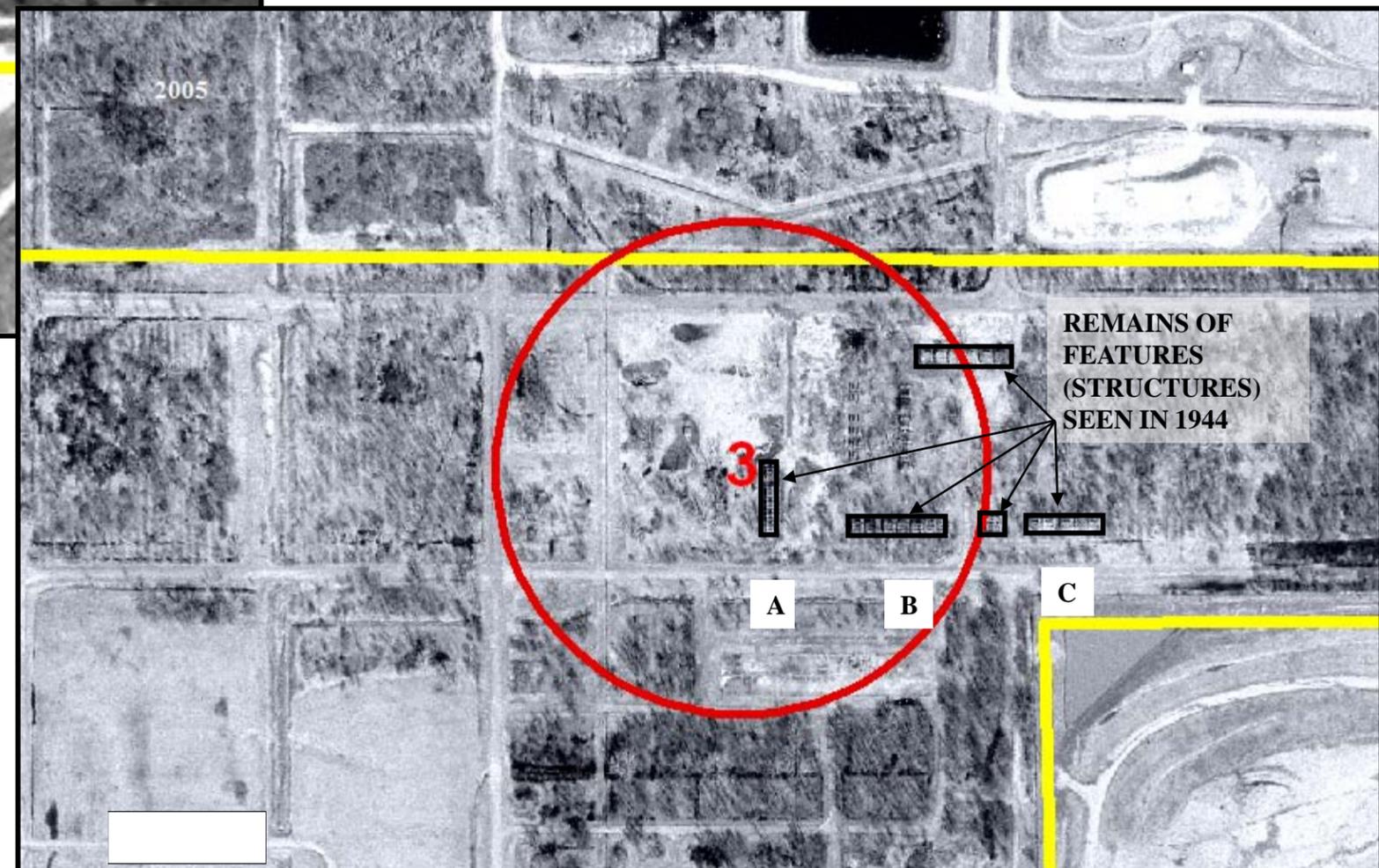


1990 & 2005 IMAGES DEMONSTRATING CHANGES IN SELECTED AREA 3 (AOI2)



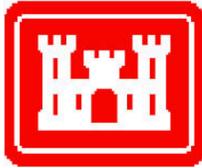
1985 PHOTOS INDICATE MOUNDED MATERIAL IN AN AREA THAT BECHTEL NATIONAL, INC. CALLED “STOCKPILE AREA FOR UNCONTAMINATED RUBBLE” IN THEIR MAY 1986 REPORT. THIS AREA IS OUTLINED ON THE 1990 PHOTO IN LIGHT ORANGE.

THE 1990 PHOTO IS USED BECAUSE IT SHOWS THE SIZE CHANGE OF BUILDING 430. THIS BUILDING DOES NOT CHANGE SIZE FROM 1944 PHOTOS TO 1985 PHOTOS. IT IS LESS THAN HALF ITS FORMER SIZE IN THE 1990 PHOTOS.

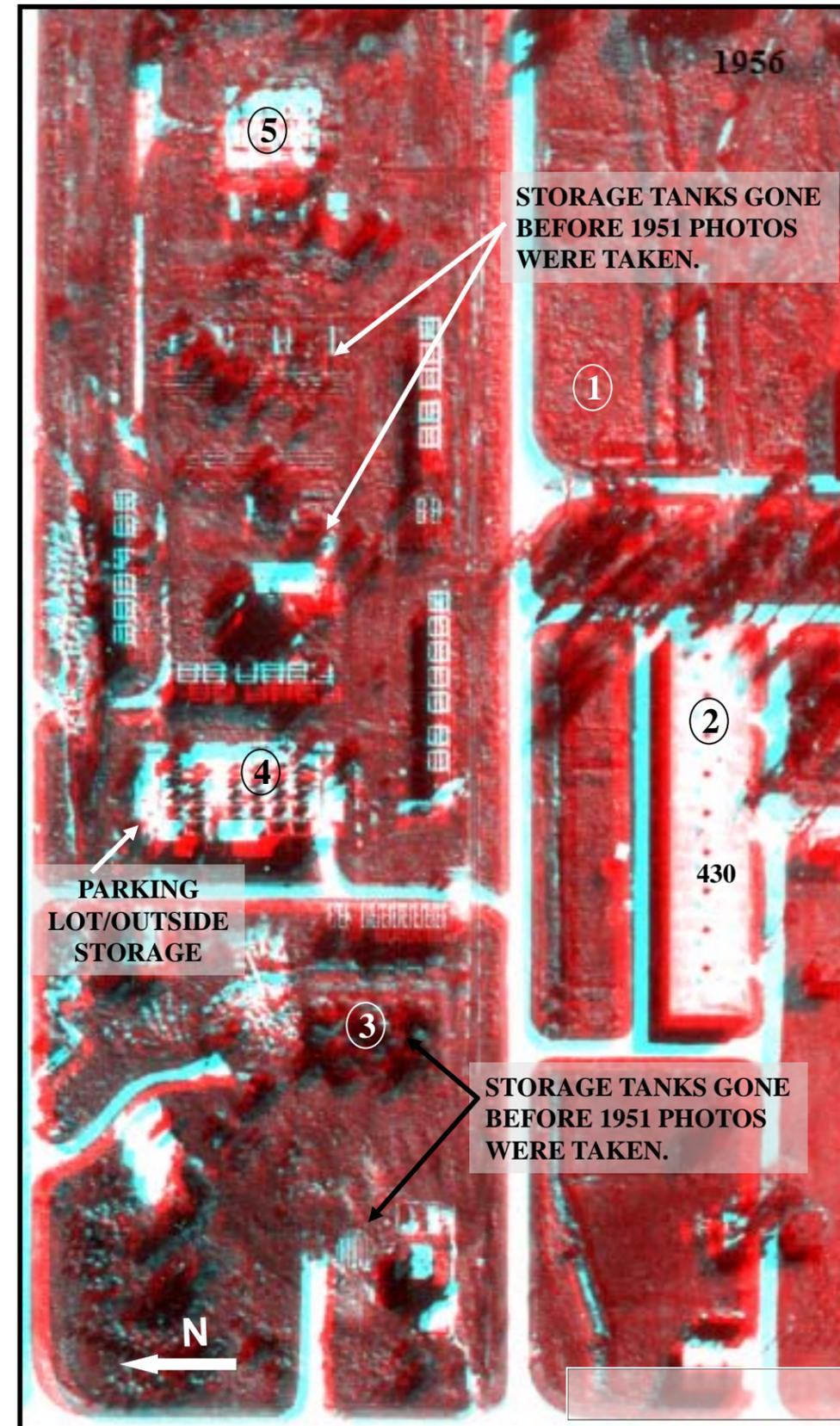




1944 & 1956 - STEREO IMAGES OF CHANGES OF SELECTED AREA 3 (AOI2)



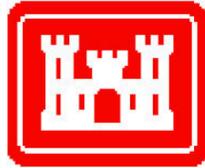
CIRCLED NUMBERS INDICATE A MATCHING LOCATION IN THE ADJACENT PHOTO.



To obtain the 3-D effect, images must be viewed with red/blue lens stereo glasses.



1944 OBLIQUE VIEW OF SELECTED AREA 4 IN AOI #2



1944 AERIAL PHOTO



Area seen in 1944 aerial photo and 1944 oblique photo. Oblique photo is taken from the Southwest looking Northeast



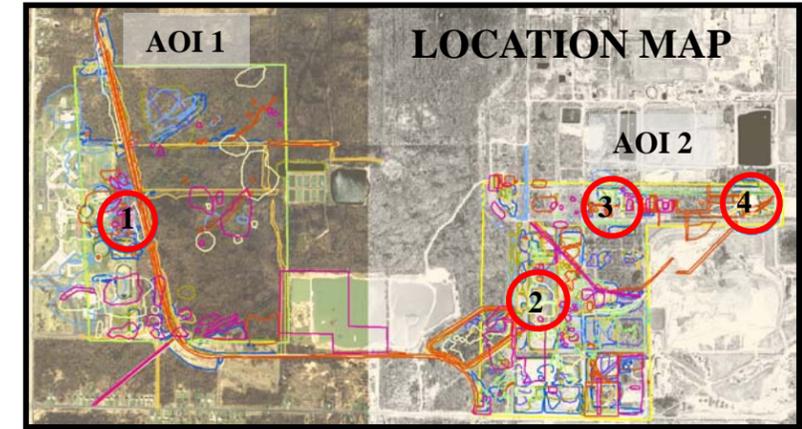
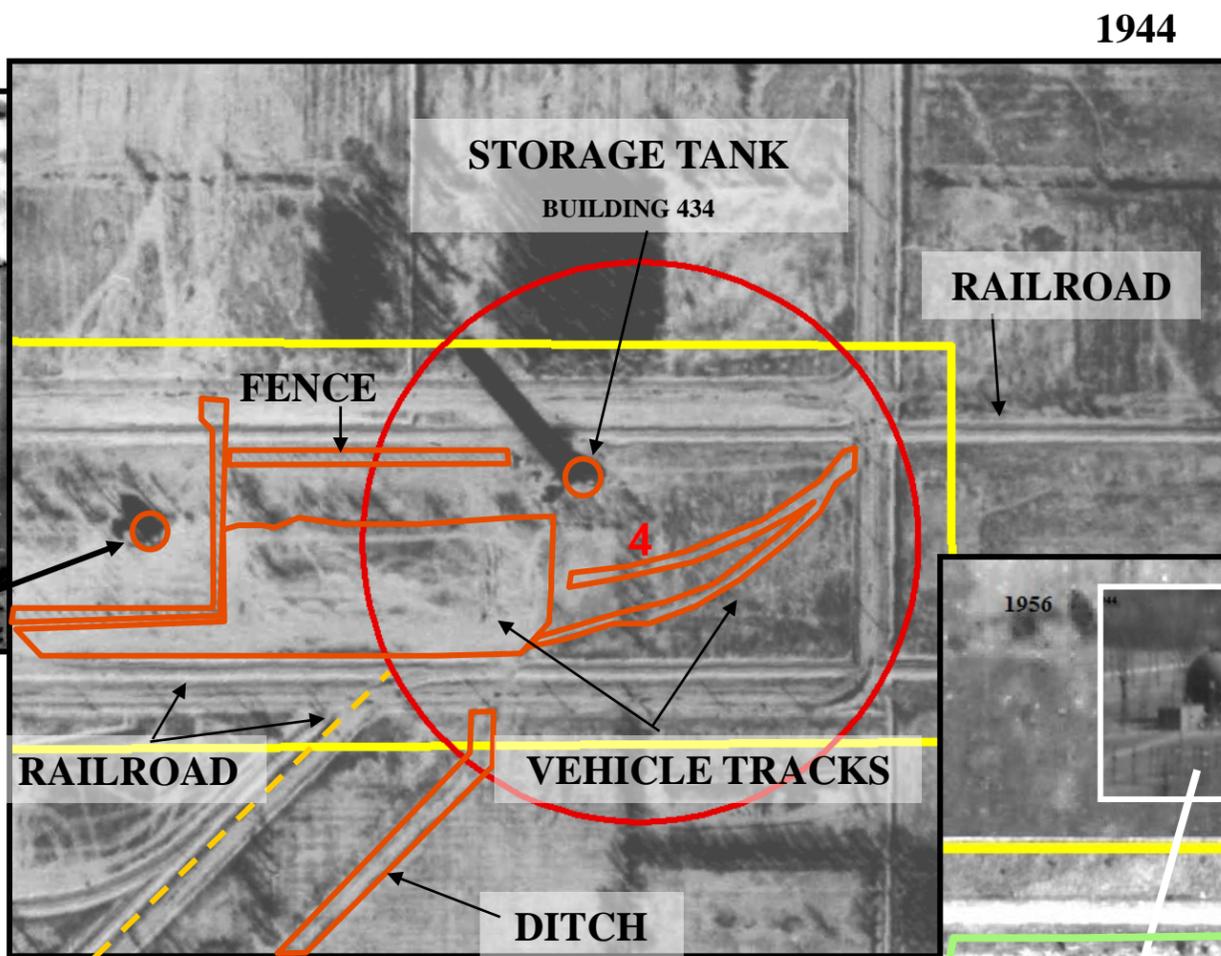
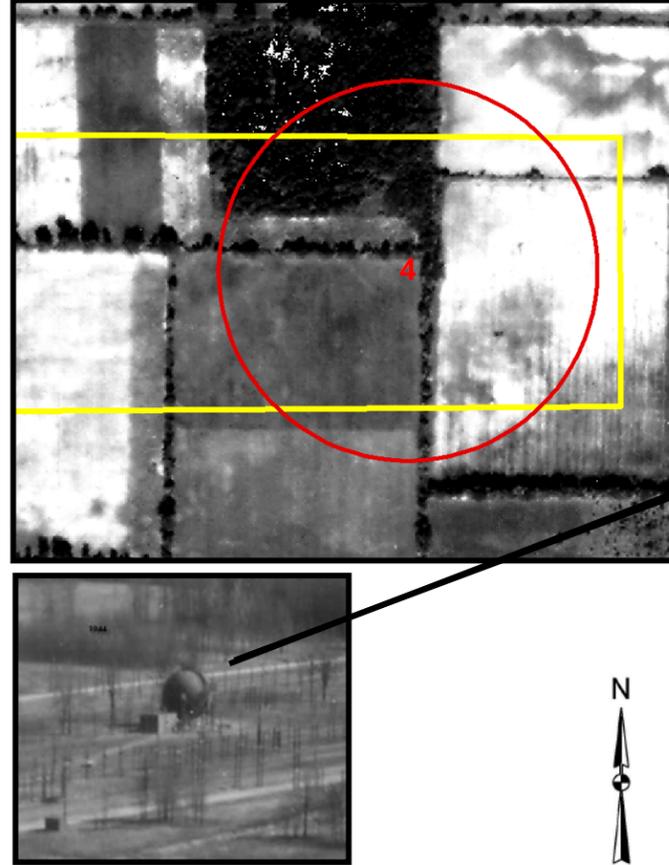
Building numbers are from Bechtel National, Inc. see page 56

1938, 1944 & 1956 IMAGES DEMONSTRATING CHANGES IN SELECTED AREA 4 (AOI2)

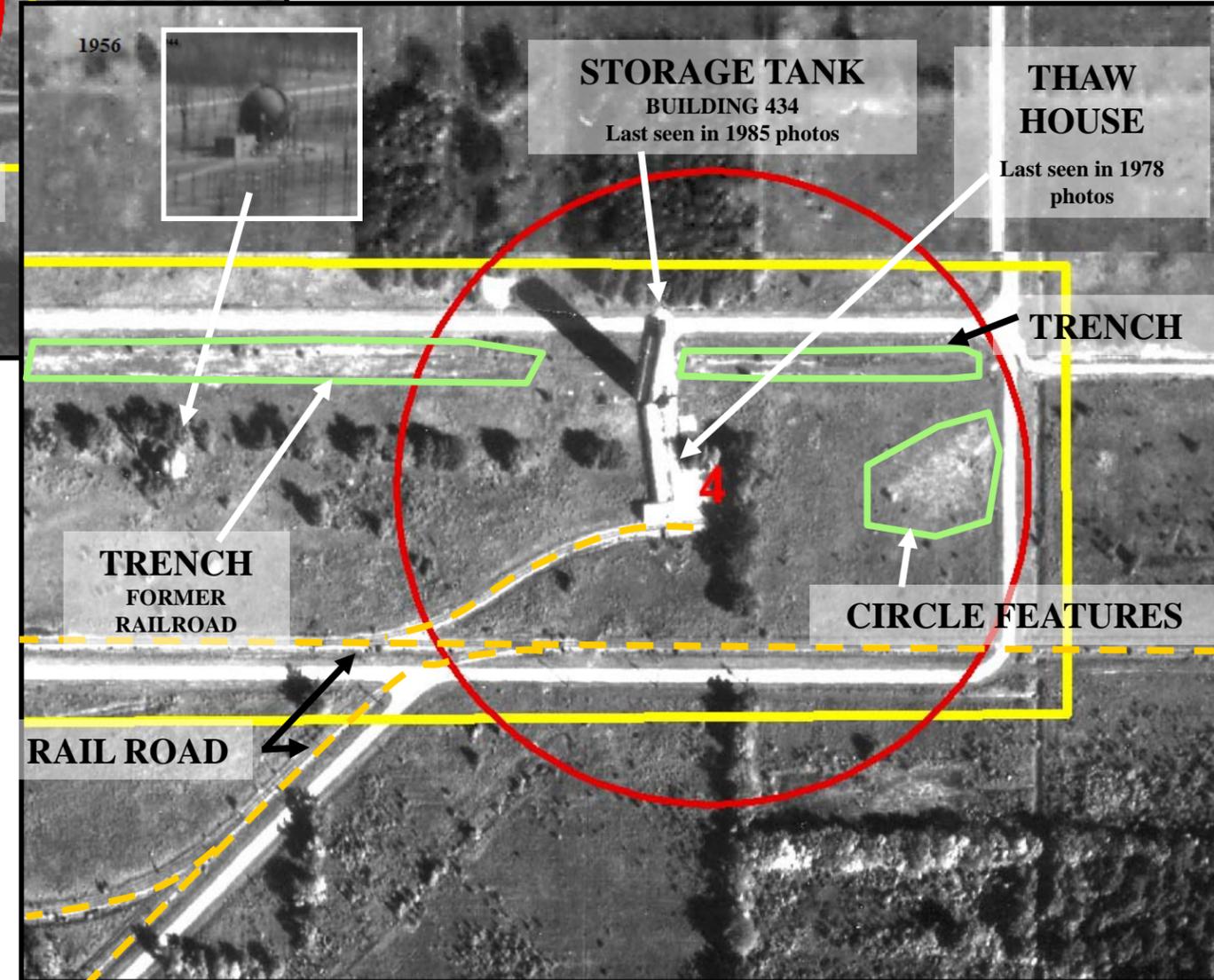
FINAL



1938
PREDEVELOPMENT



1956



THE MAY 1986 REPORT BY BECHTEL NATIONAL, INC. INDICATES A BUILDING CALLED “THAW HOUSE” ADJACENT TO BUILDING 434. THE BUILDING SEEN IN THE 1956 PHOTO IS LABELED “THAW HOUSE” BASED ON THIS REPORT. A BUILDING, OR EVIDENCE OF ONE, IS SEEN IN PHOTOS FROM 1951 THROUGH 1978. IT IS NOT SEEN IN 1985 PHOTOS.

BUILDING 434, THE STORAGE TANK/TOWER, IS SEEN IN PHOTOS FROM 1944 TO 1985.

NEITHER BUILDING NOR STORAGE TANK/TOWER (BUILDING 434) IS SEEN IN THE 1990 PHOTOS



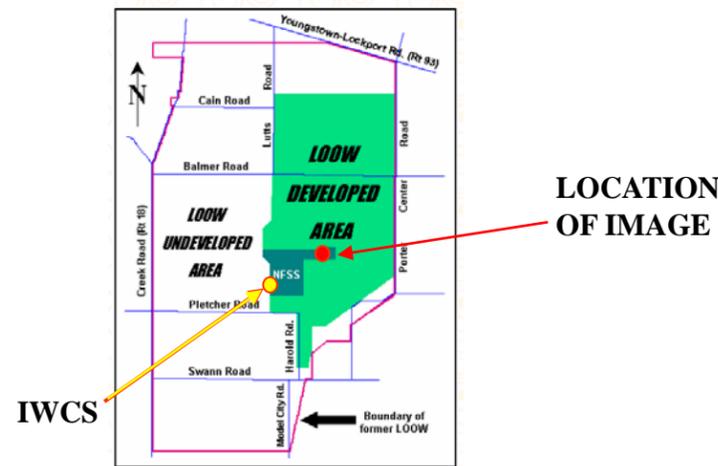
ADDITIONAL INFORMATION REGARDING SELECTED AREA 4 (AOI2)



TNT production, support, and storage were constructed within the 2,500 acres commonly referred to as the “Developed Area” of the LOOW (shown in green in map below). *

In the 1950’s, drums of high-activity radioactive residues from around the Developed Area were emptied into a vented silo* (the one seen in the photo at right).

In the early 1980’s, the Department of Energy transferred this waste from the vented silo to the area now called The Interim Waste Containment Structure, or “IWCS” (pages 29 to 34 of this report).

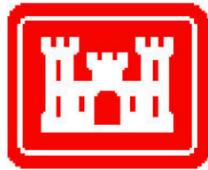


1944



The “Developed Area” is analyzed in the 2002 report produced by TEC and entitled “Former Lake Ontario Ordnance Works, NY”.

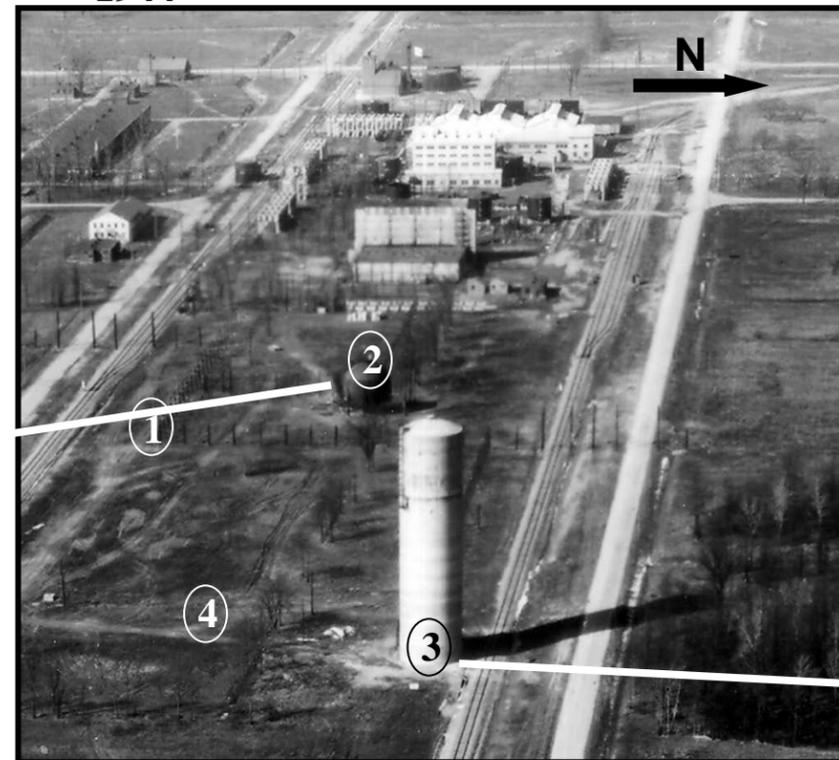
*Information taken from the Restoration Advisory Board, Lake Ontario Ordnance Works web site. LOOW-RAB, P.O.Box, Youngstown, NY 14174



1944 STEREO IMAGES OF CHANGES IN SELECTED AREA 4 (AOI 2)

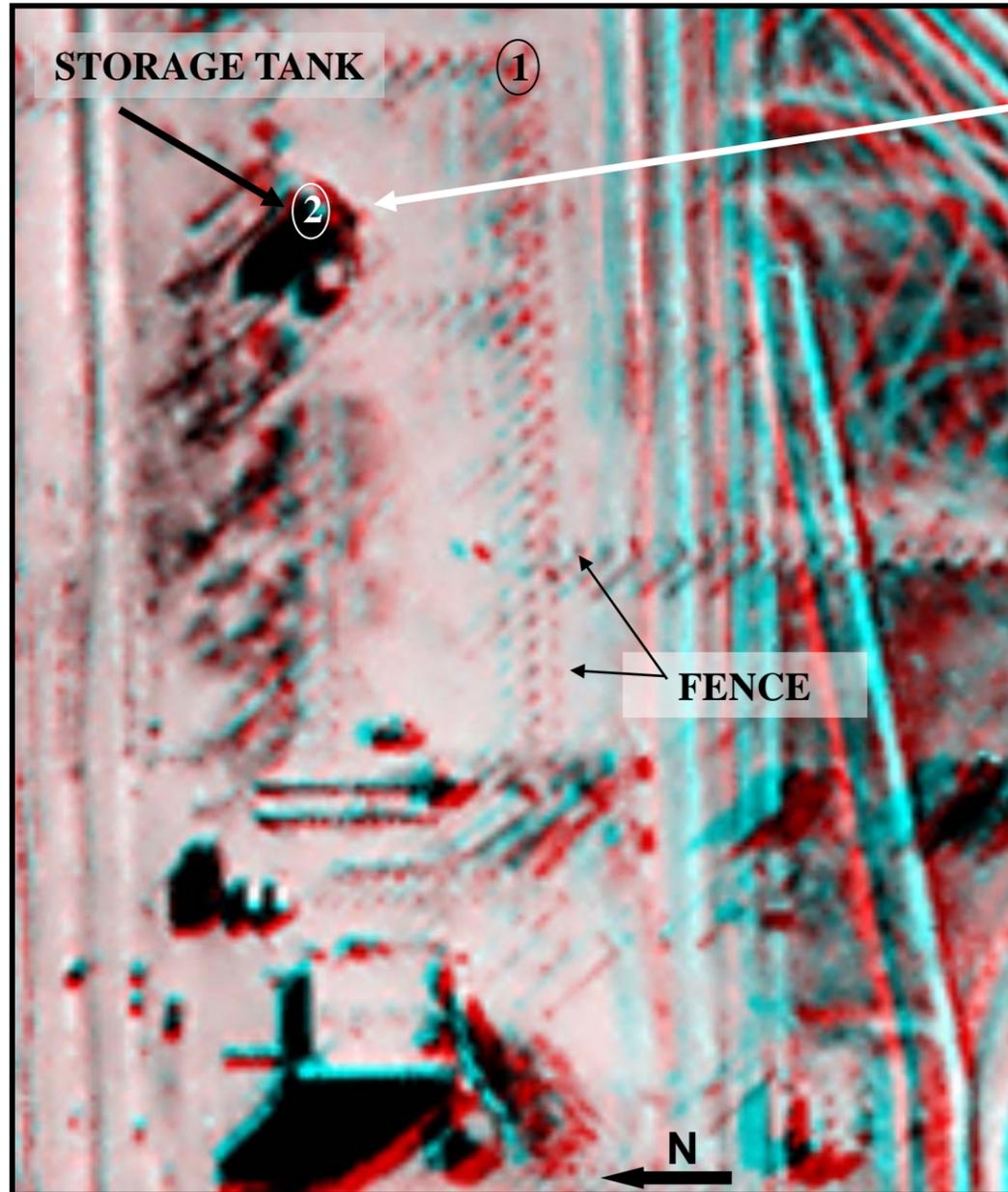


1944

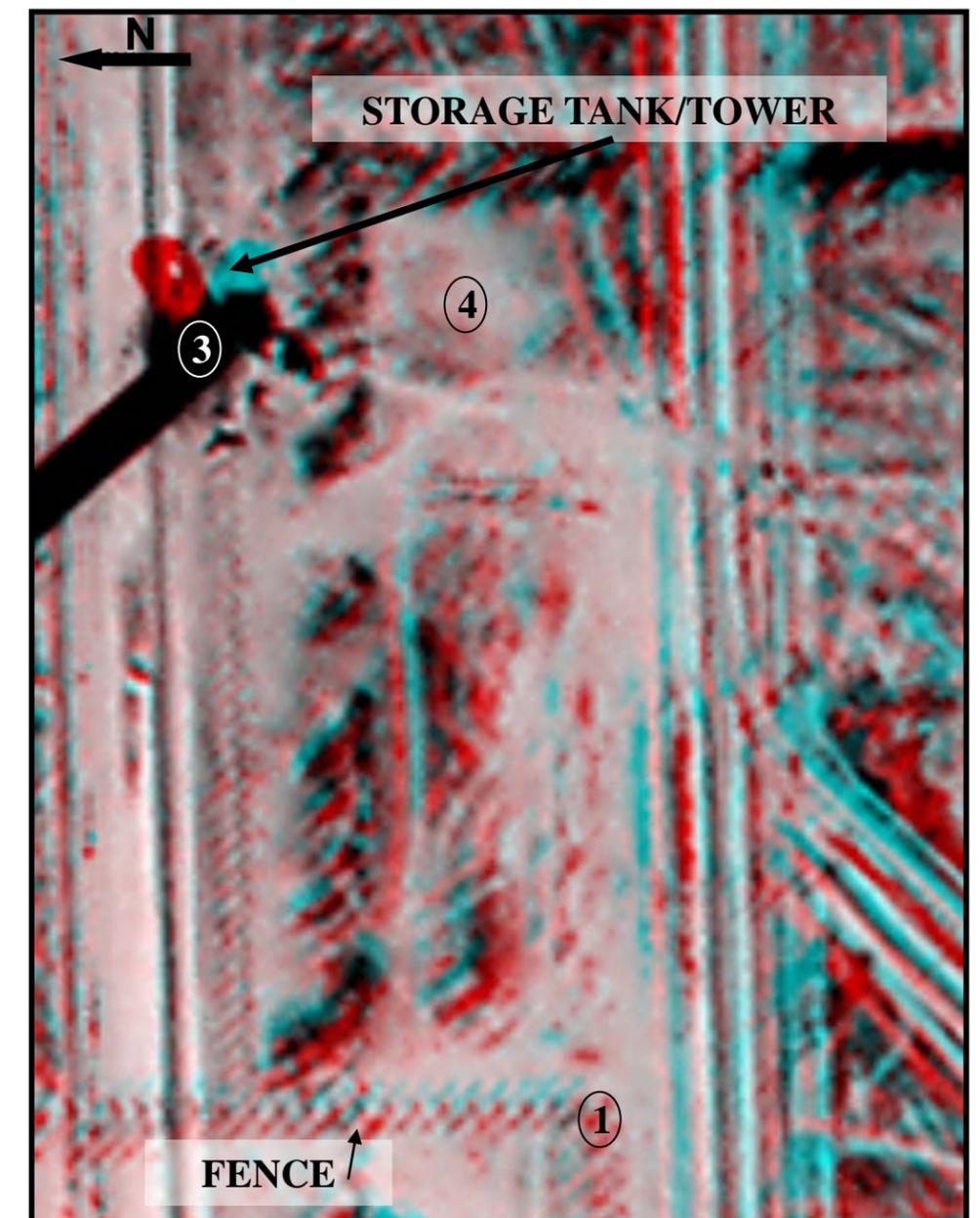


CIRCLED NUMBERS INDICATE A MATCHING LOCATION IN THE ADJACENT PHOTOS.

1944

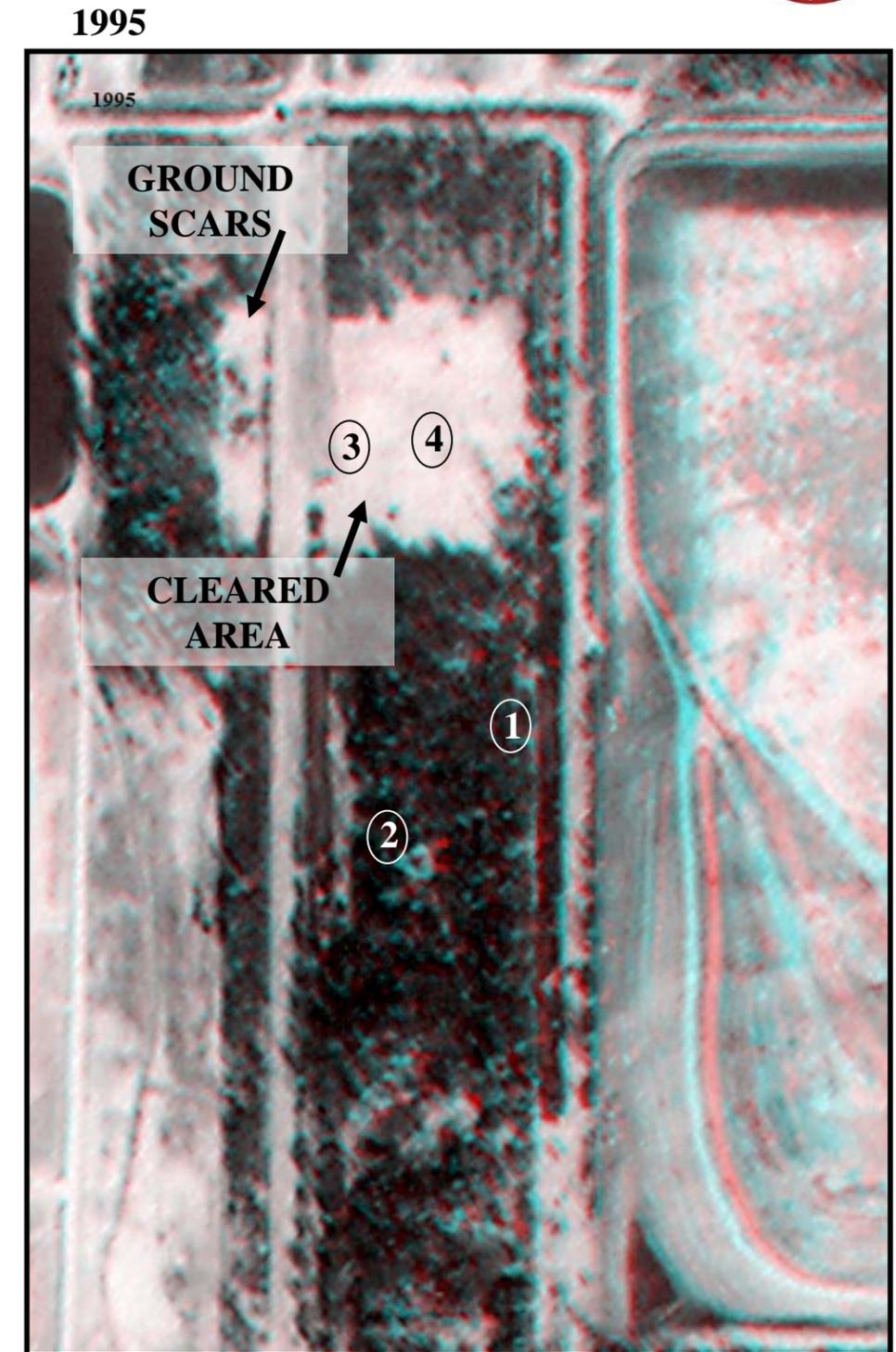
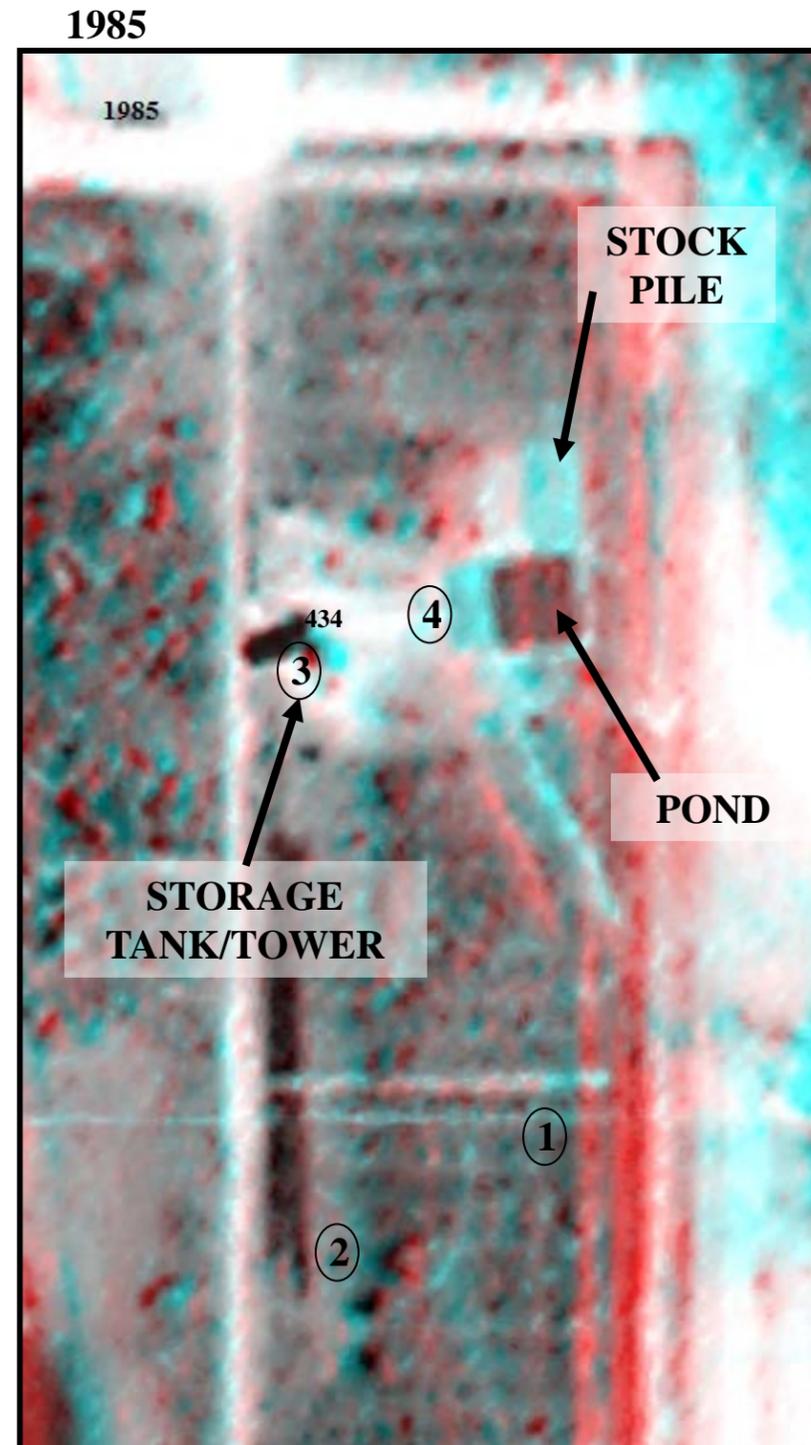
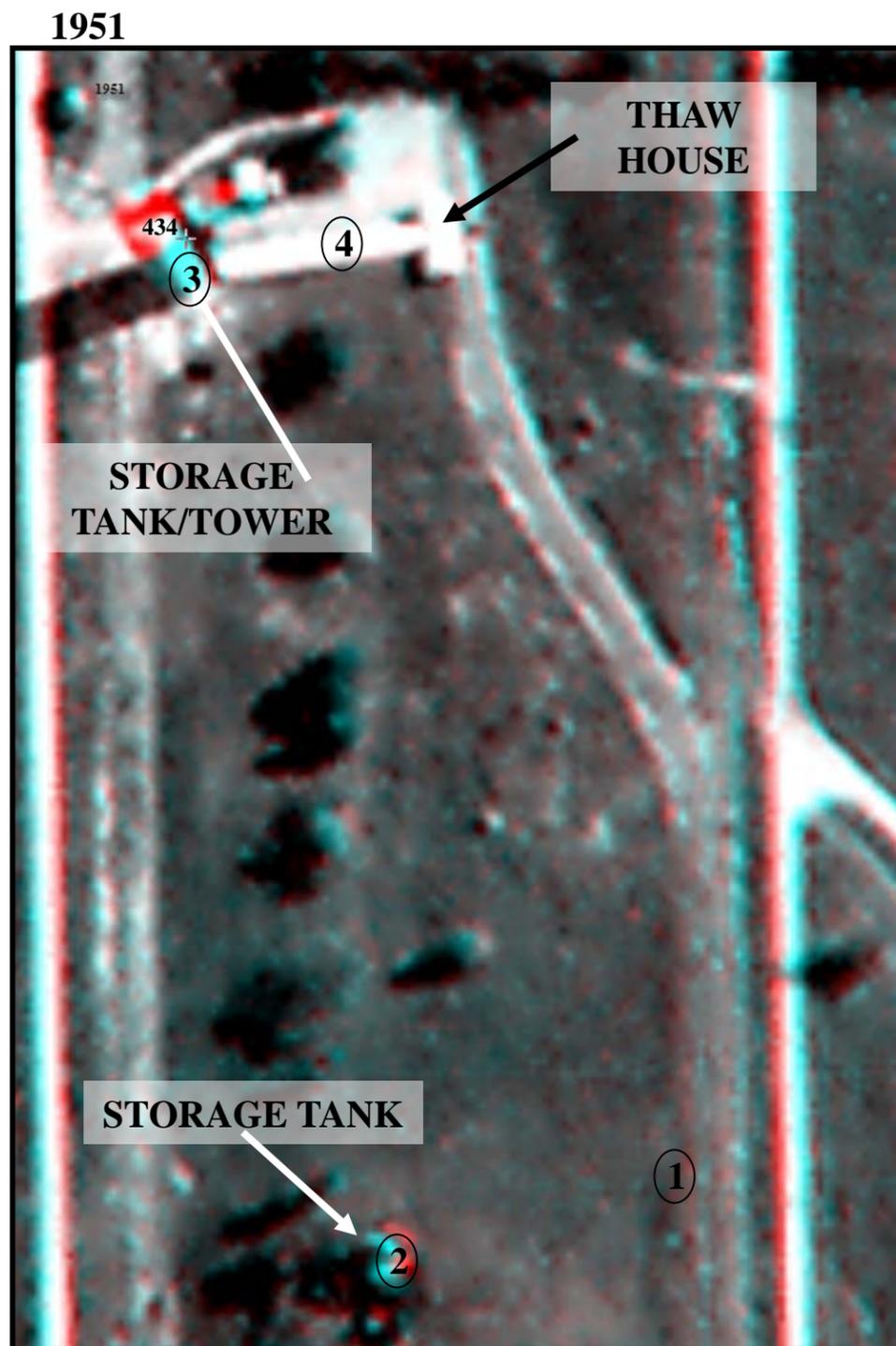


1944



To obtain the 3-D effect, images must be viewed with red/blue lens stereo glasses.

1951, 1985 & 1995 - STEREO IMAGES OF CHANGES IN SELECTED AREA 4 (AOI 2) FINAL



CIRCLED NUMBERS INDICATE A MATCHING LOCATION IN THE ADJACENT PHOTO.



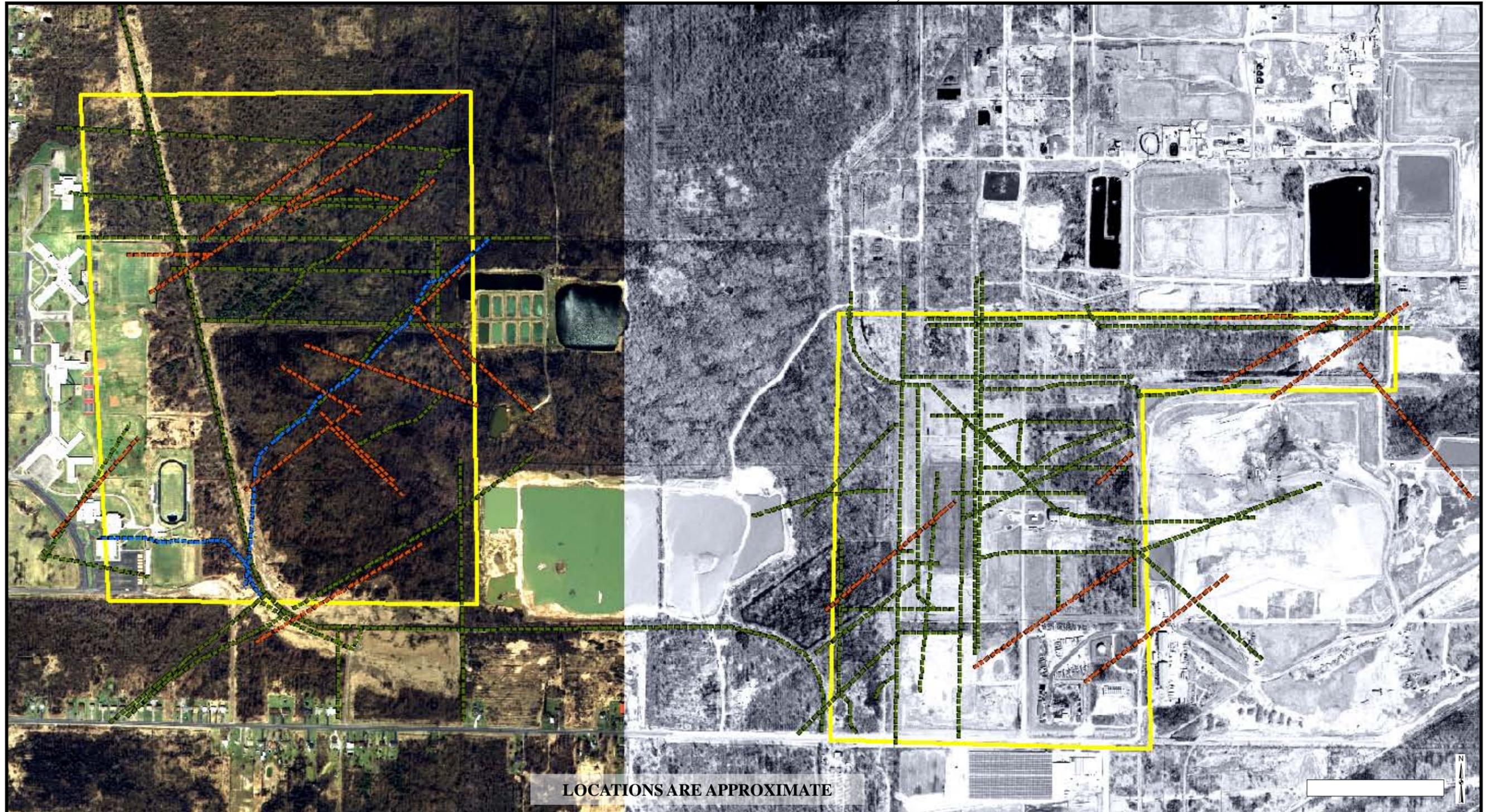
Building numbers are from Bechtel National, Inc; see REFERENCES page.

To obtain the 3-D effect, images must be viewed with red/blue lens stereo glasses.



DRAINAGE INCLUDES FRACTURE TRACES (RED LINES), NATURAL STREAMS (BLUE LINES), AND MAN-MADE DITCHES (GREEN LINES). ANALYSIS INCLUDES CONDUITS OR PATHWAYS AVAILABLE FOR SURFACE WATER TO REACH GROUND WATER. ANALYSIS INCLUDES IMAGERY FROM 1938 (PREDEVELOPMENT) TO 2005.

NOTE: FRACTURE TRACES (RED) WERE GATHERED FROM PREDEVELOPMENT PHOTOS. MANY OF THE MAN-MADE DITCHES (GREEN) ARE SEEN ON THE 1938 PHOTOS AND HAVE BEEN ALTERED IN SIZE OR DIRECTION IN LATER PHOTOS,



LOCATIONS ARE APPROXIMATE

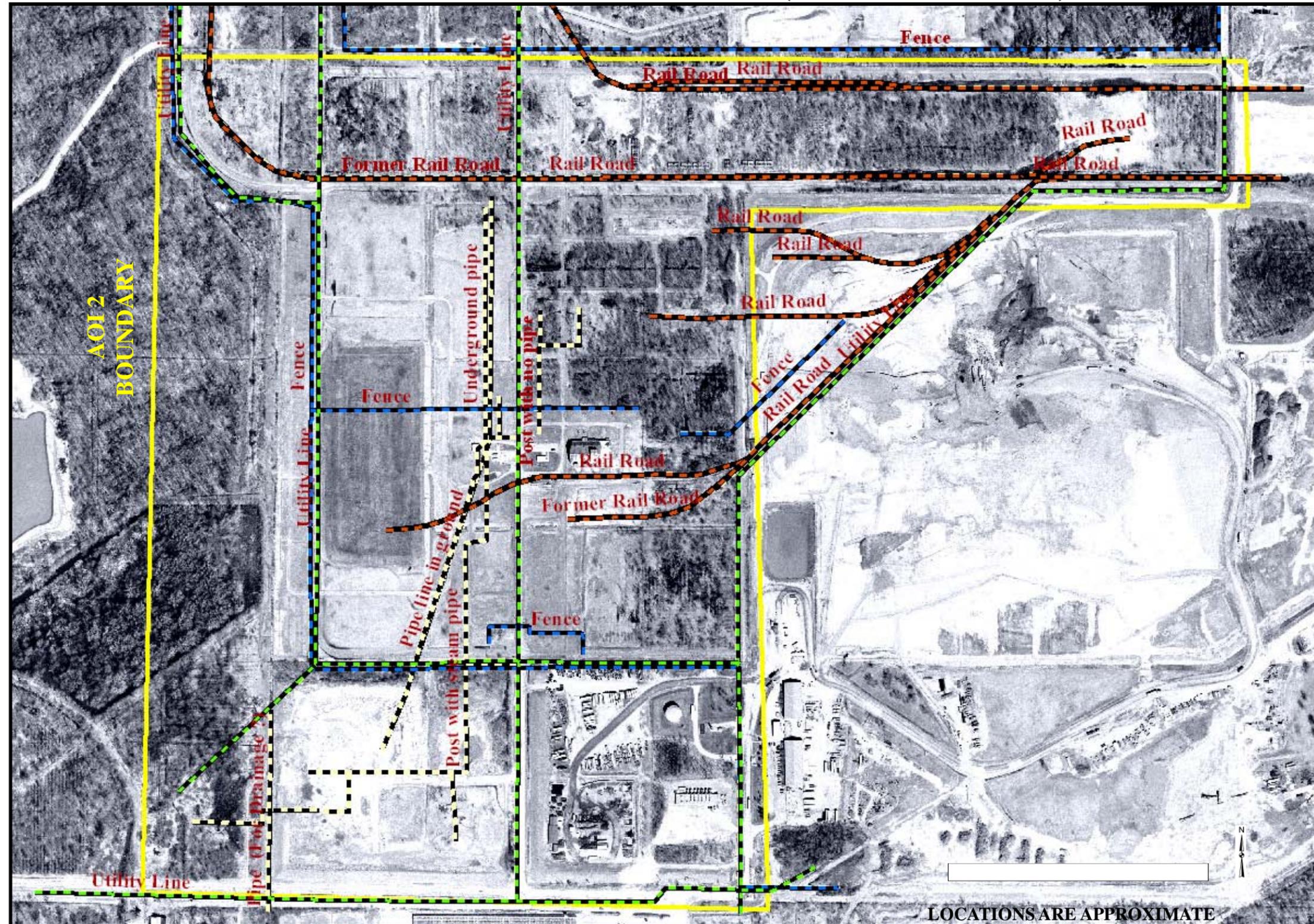
DRAINAGE IDENTIFIED FROM AERIAL PHOTOGRAPHS IS DISPLAYED ON 2005 BASE MAP

MAJOR UTILITY LINES (RAILROAD, PIPES, ELECTRICITY)

ANALYSIS INCLUDES IMAGERY FROM 1938 (PREDEVELOPMENT) TO 2005

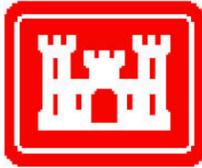


FINAL

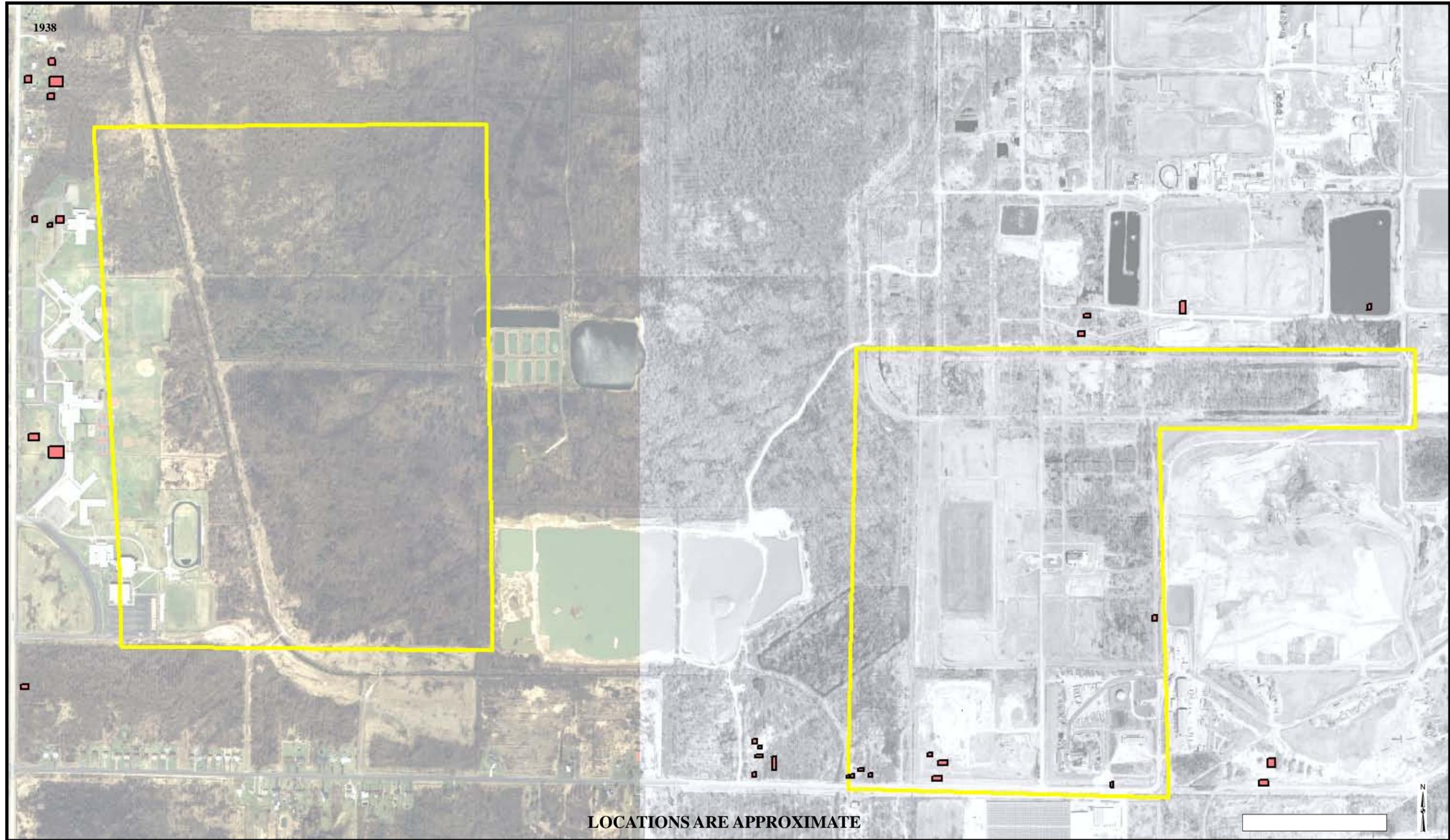


LINES IDENTIFIED FROM AERIAL PHOTOGRAPHS IN AOI 2 ARE DISPLAYED ON 2005 BASE MAP.
RAIL ROADS ARE IN RED; PIPES, YELLOW; FENCE, BLUE; UTILITY LINE, GREEN.

NO MAJOR UTILITY LINES ARE SEEN IN AOI 1. NO BASE MAP WAS COMPOSED



PREDEVELOPMENT BUILDING LOCATIONS

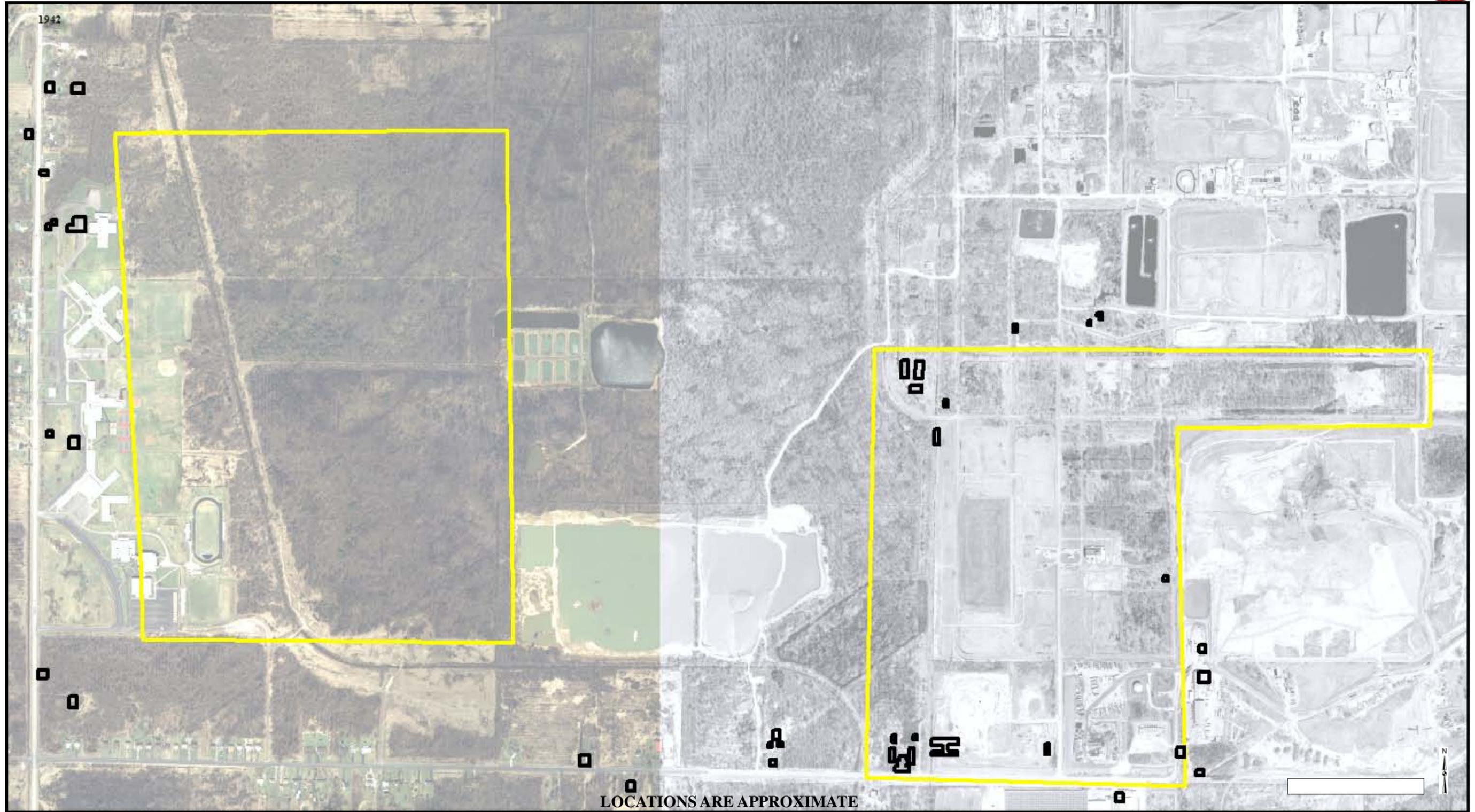


BUILDINGS IDENTIFIED FROM 1938 PHOTOS ARE LOCATED ON 2005 BASE MAP.



FARM HOUSES AND FARM STRUCTURES.

1942 BUILDING LOCATIONS



LOCATIONS ARE APPROXIMATE

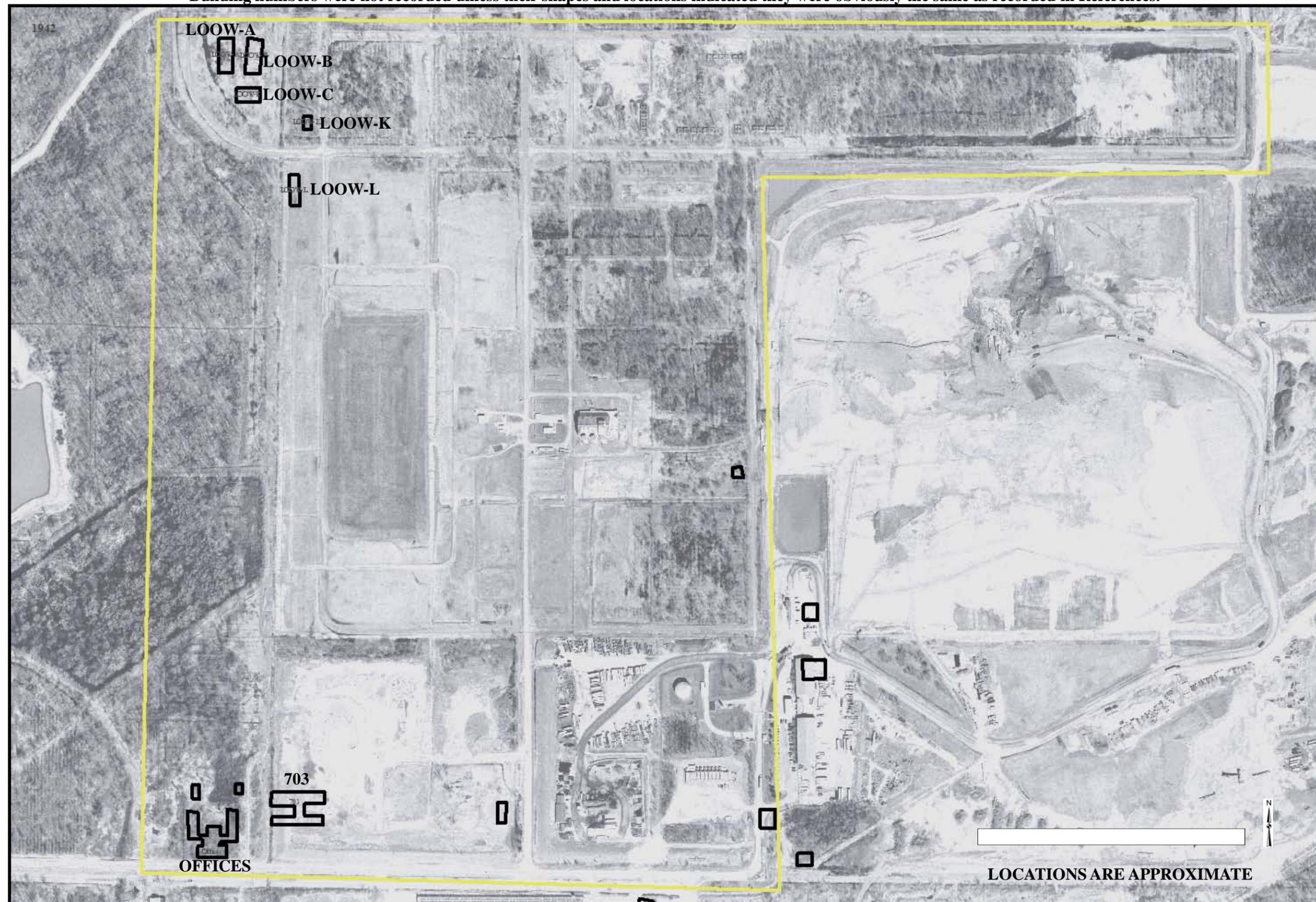
BUILDINGS IDENTIFIED FROM 1942 PHOTOS ARE LOCATED ON 2005 BASE MAP.  FARM HOUSES AND MILITARY STRUCTURES.



1942 BUILDING LOCATIONS AND NUMBERS IN AOI 2

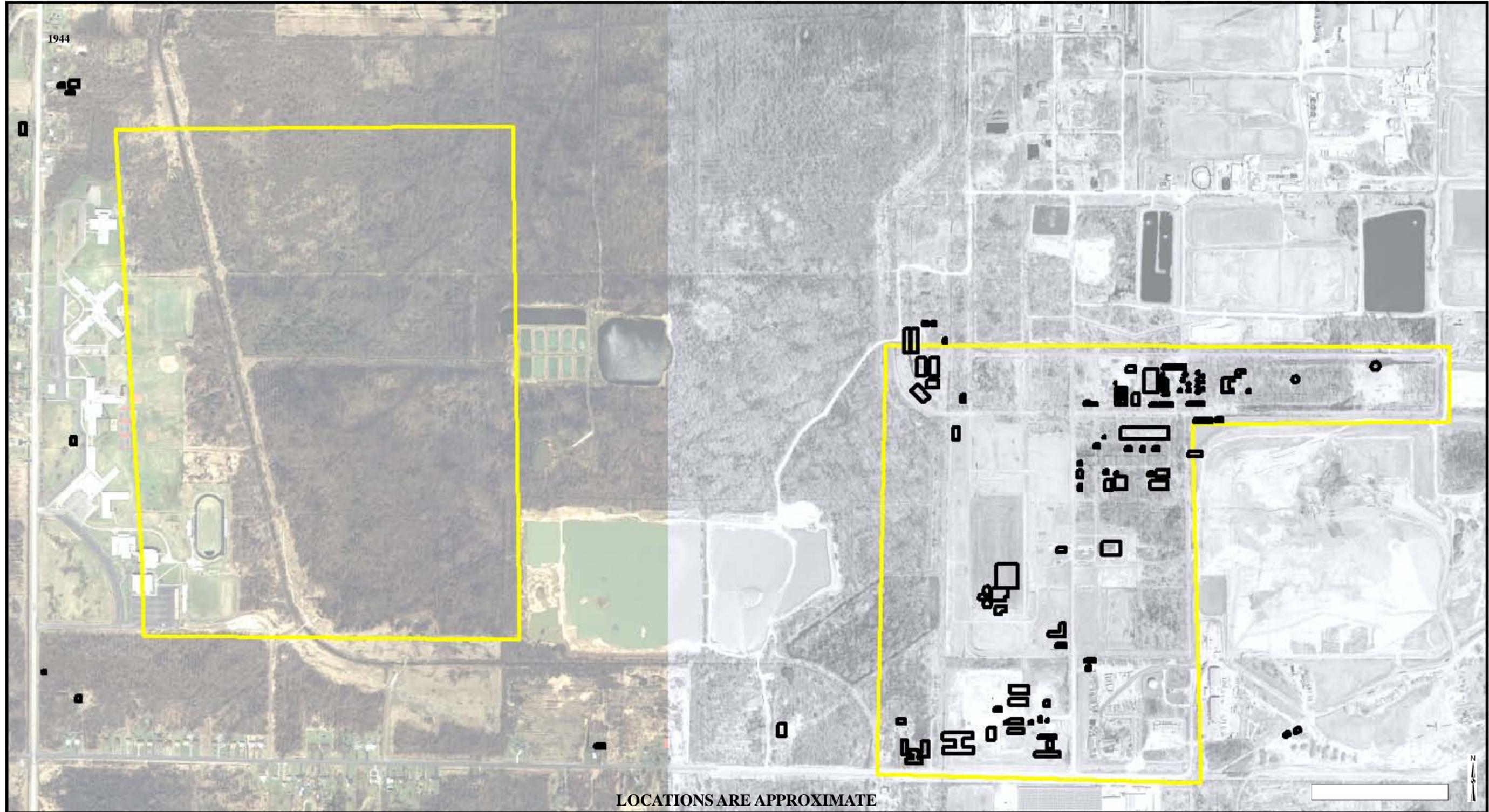
Building numbers were not recorded unless their shapes and locations indicated they were obviously the same as recorded in References.

FINAL



Building numbers are from Bechtel National, Inc, and EA Engineering, Science, and Technology; see REFERENCES page.

1944 BUILDING LOCATIONS



LOCATIONS ARE APPROXIMATE

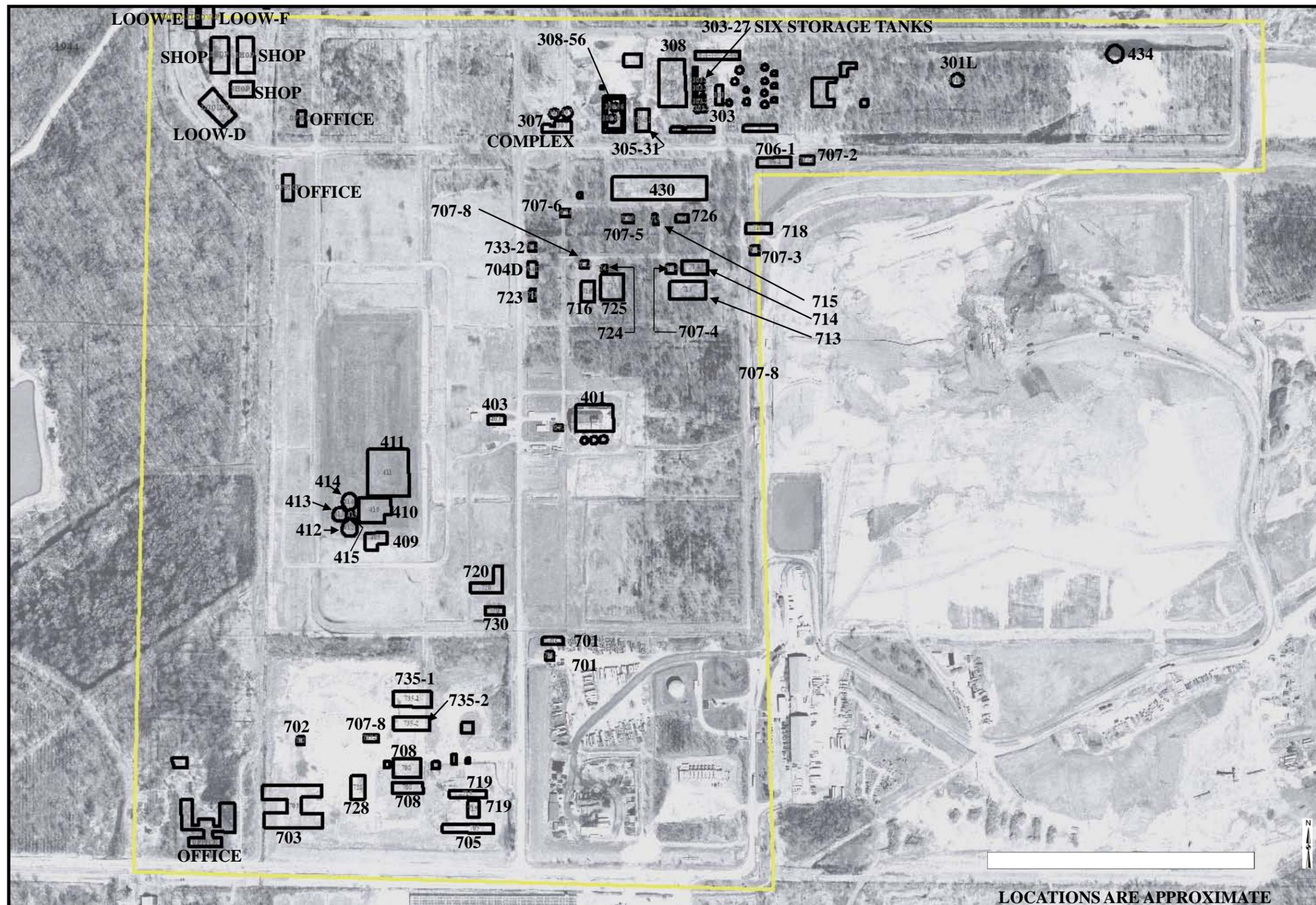
BUILDINGS IDENTIFIED FROM 1944 PHOTOS ARE LOCATED ON 2005 BASE MAP.  MOSTLY MILITARY STRUCTURES.



1944 BUILDING LOCATIONS AND NUMBERS IN AOI 2



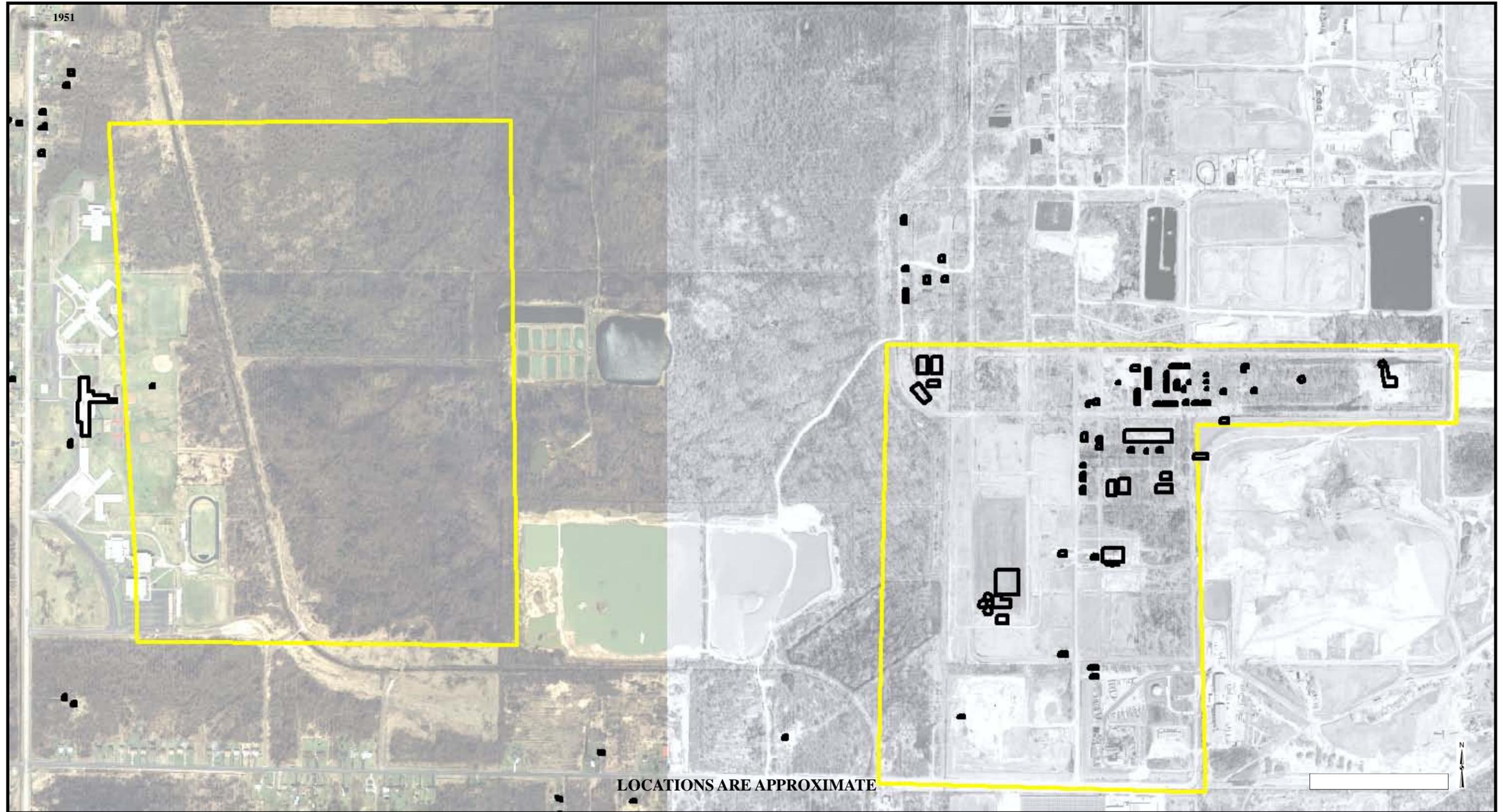
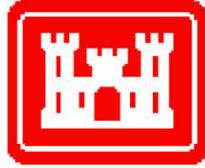
Building numbers are recorded when shapes and locations indicate buildings seen on 1944 photos are the same as recorded in References.



LOCATIONS ARE APPROXIMATE

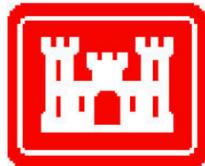
Building numbers are from Bechtel National, Inc, and EA Engineering, Science, and Technology; see REFERENCES page.

1951 BUILDING LOCATIONS



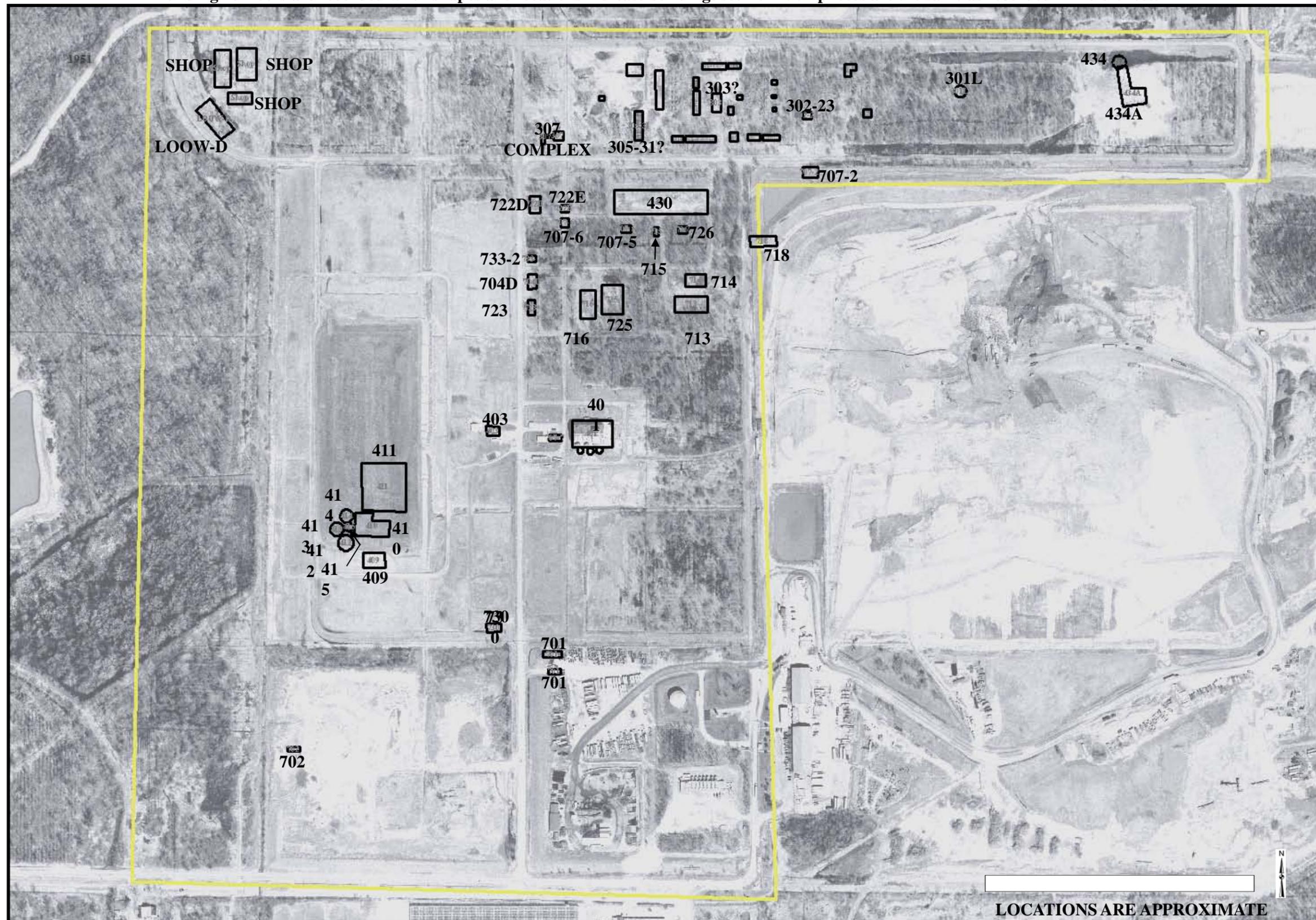
LOCATIONS ARE APPROXIMATE

BUILDINGS IDENTIFIED FROM 1951 PHOTOS ARE LOCATED ON 2005 BASE MAP.  CIVILIAN AND MILITARY STRUCTURES.



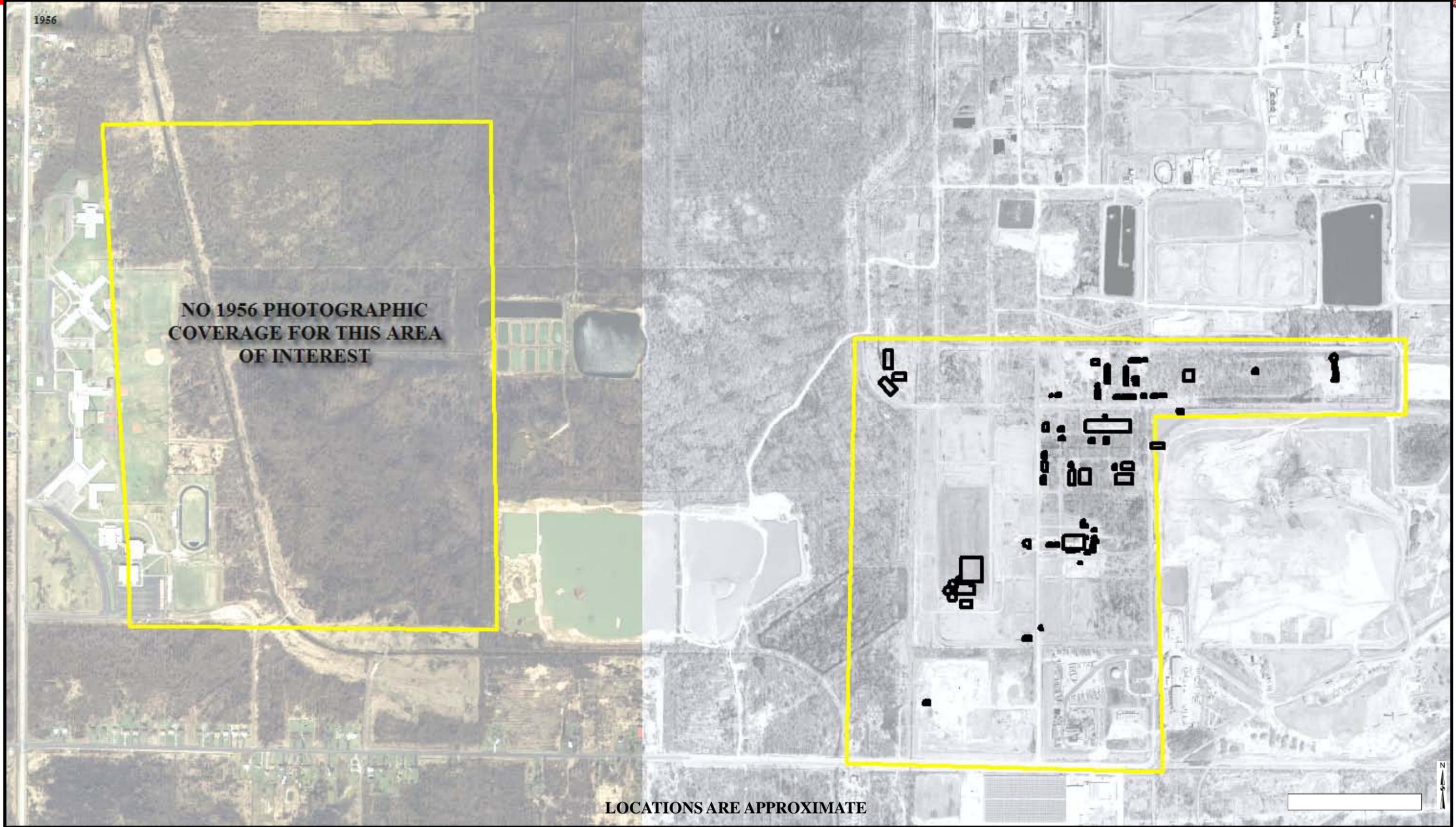
1951 BUILDING LOCATIONS AND NUMBERS IN AOI 2

Building numbers are recorded when shapes and locations indicate buildings seen on 1951 photos are the same as recorded in References.



Building numbers are from Bechtel National, Inc, and EA Engineering, Science, and Technology; see REFERENCES page.

1956 BUILDING LOCATIONS



BUILDINGS IDENTIFIED FROM 1956 PHOTOS ARE LOCATED ON 2005 BASE MAP. MILITARY STRUCTURES.

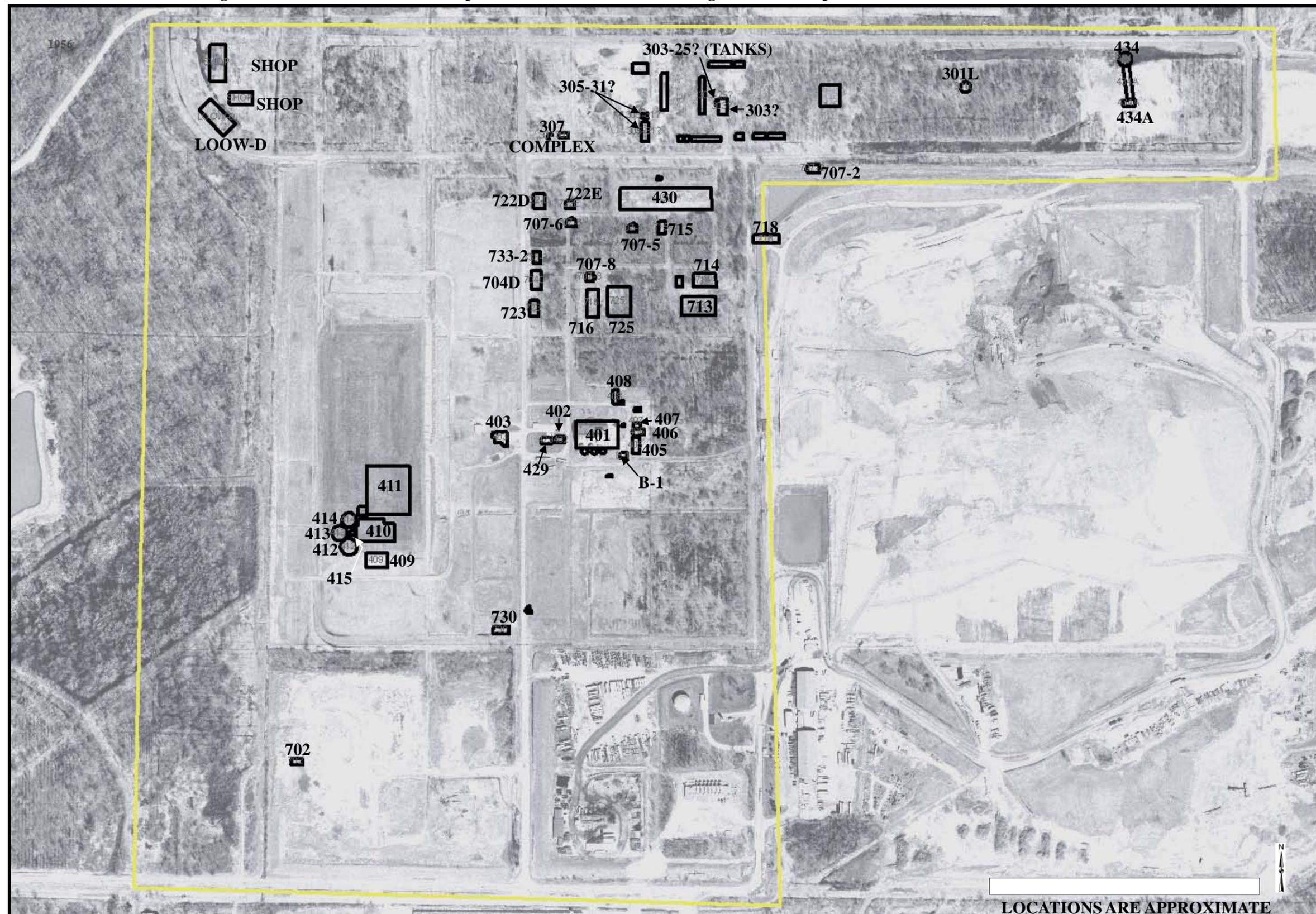


1956 BUILDING LOCATIONS AND NUMBERS IN AOI 2

FINAL



Building numbers are recorded when shapes and locations indicate buildings seen on 1956 photos are the same as recorded in References.

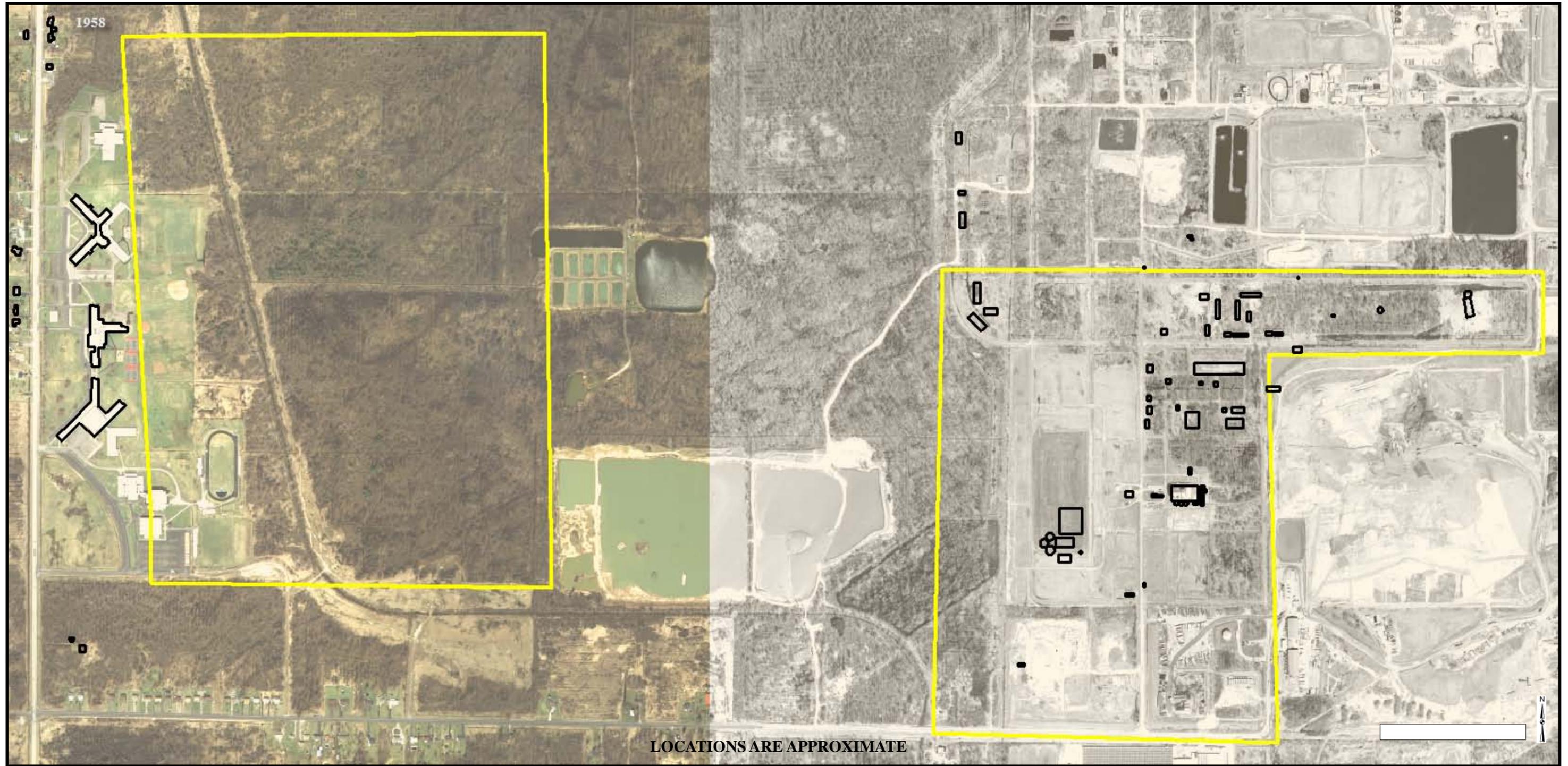


LOCATIONS ARE APPROXIMATE

Building numbers are from Bechtel National, Inc. and EA Engineering, Science, and Technology; see REFERENCES page.



1958 BUILDING LOCATIONS



LOCATIONS ARE APPROXIMATE

BUILDINGS IDENTIFIED FROM 1958 PHOTOS ARE LOCATED ON 2005 BASE MAP.

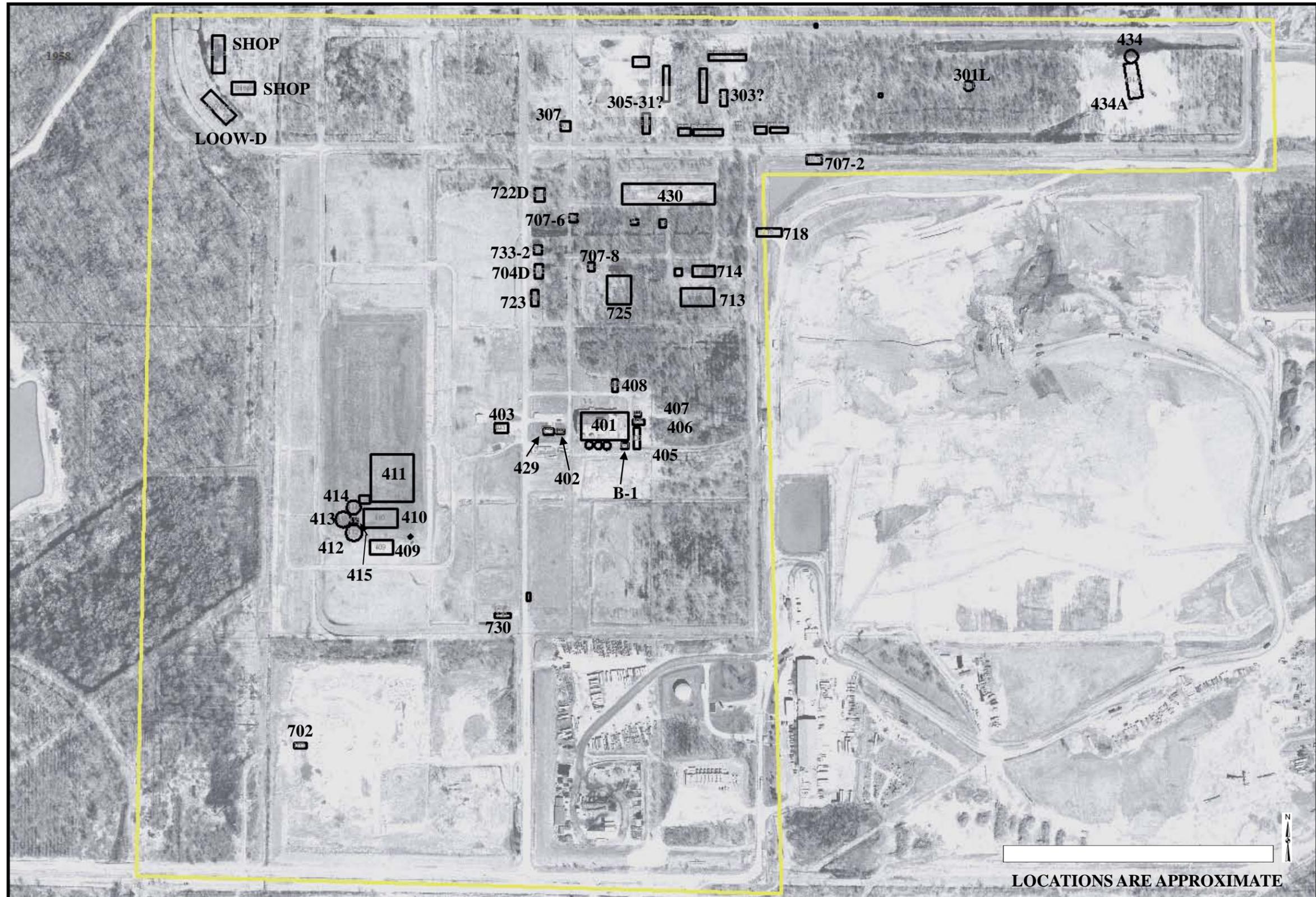
 **CIVILIAN AND MILITARY STRUCTURES.**



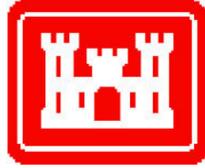
1958 BUILDING LOCATIONS AND NUMBERS IN AOI 2



Building numbers are recorded when shapes and locations indicate buildings seen on 1958 photos are the same as recorded in References.

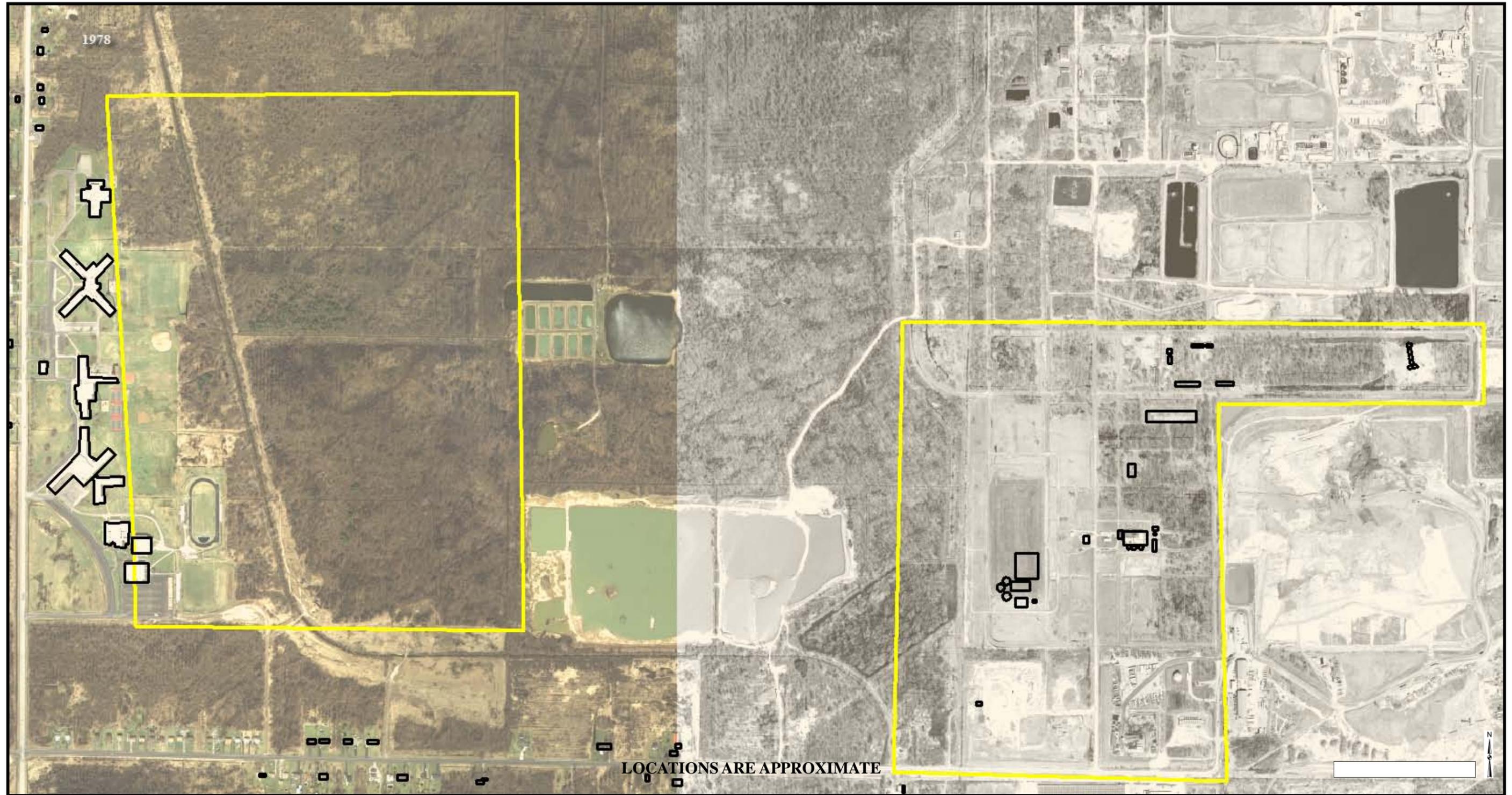


Building numbers are from Bechtel National, Inc, and EA Engineering, Science, and Technology; see REFERENCES page.



1978 BUILDING LOCATIONS

FINAL

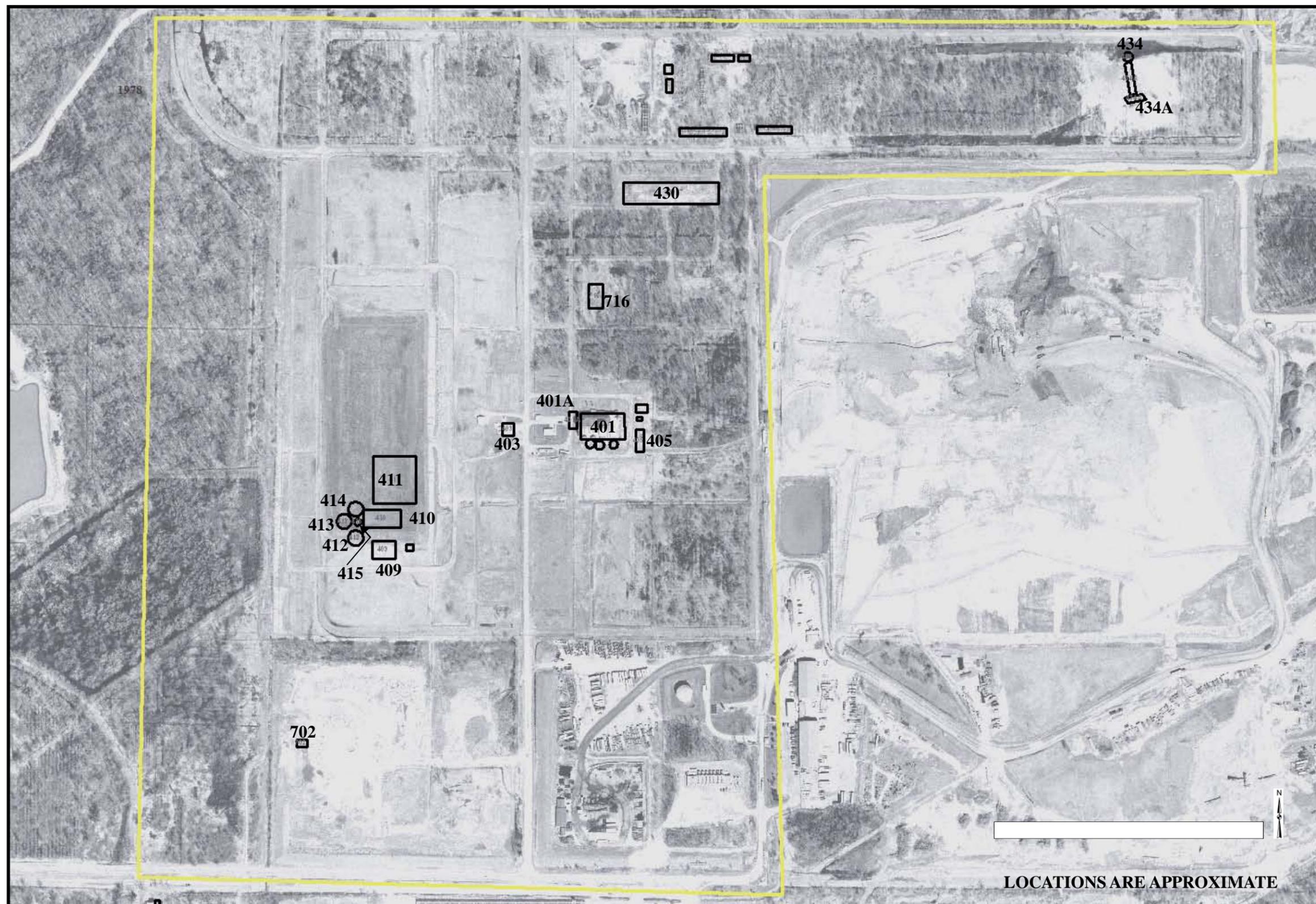


BUILDINGS IDENTIFIED FROM 1978 PHOTOS ARE LOCATED ON 2005 BASE MAP.  CIVILIAN AND POSSIBLE MILITARY STRUCTURES.

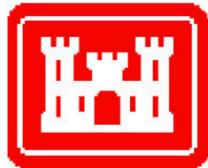


1978 BUILDING LOCATIONS AND NUMBERS IN AOI 2

Building numbers are recorded when shapes and locations indicate buildings seen on 1978 photos are the same as recorded in References.

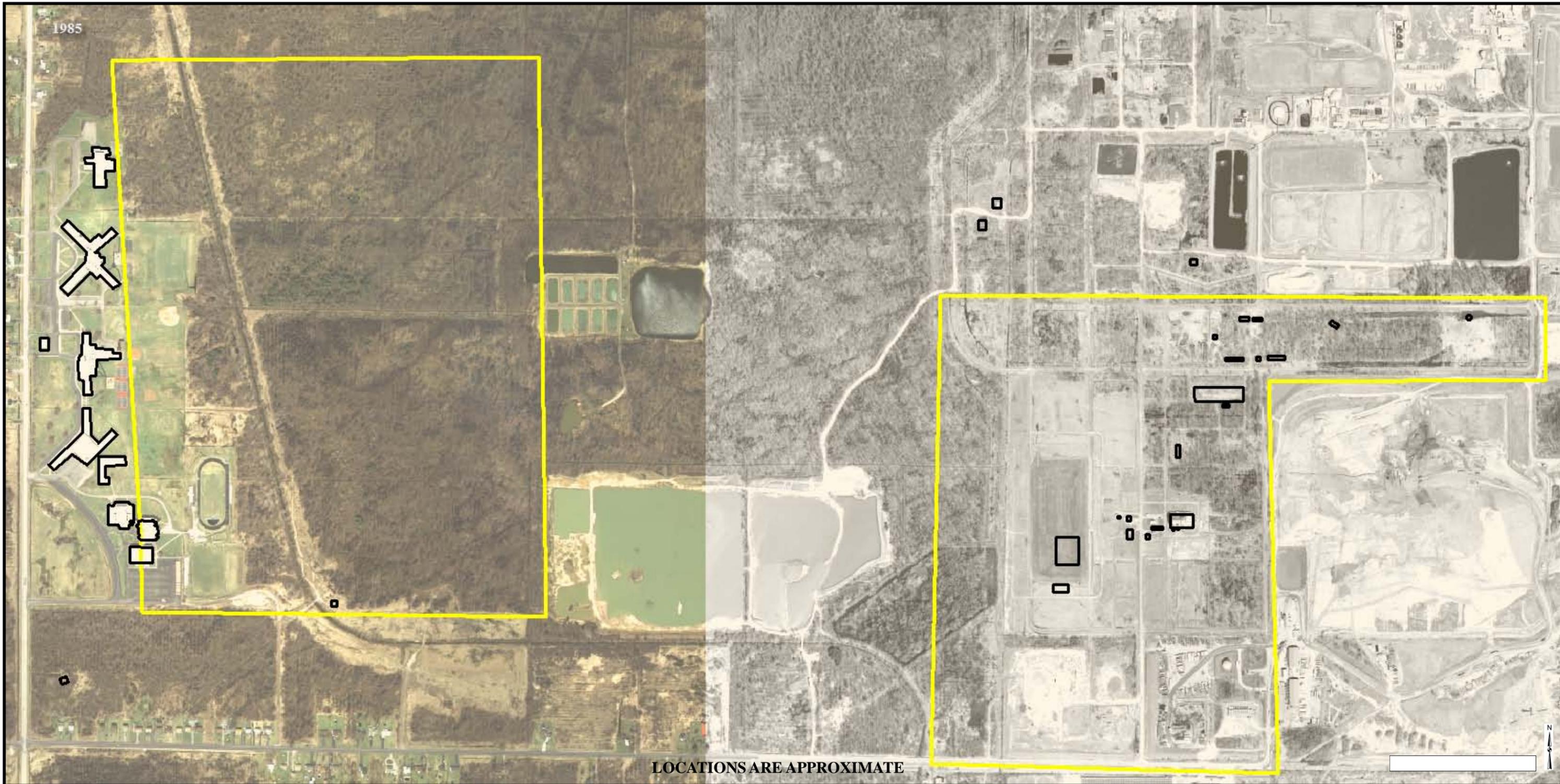


Building numbers are from Bechtel National, Inc, and EA Engineering, Science, and Technology; see REFERENCES page.



1985 BUILDING LOCATIONS

FINAL



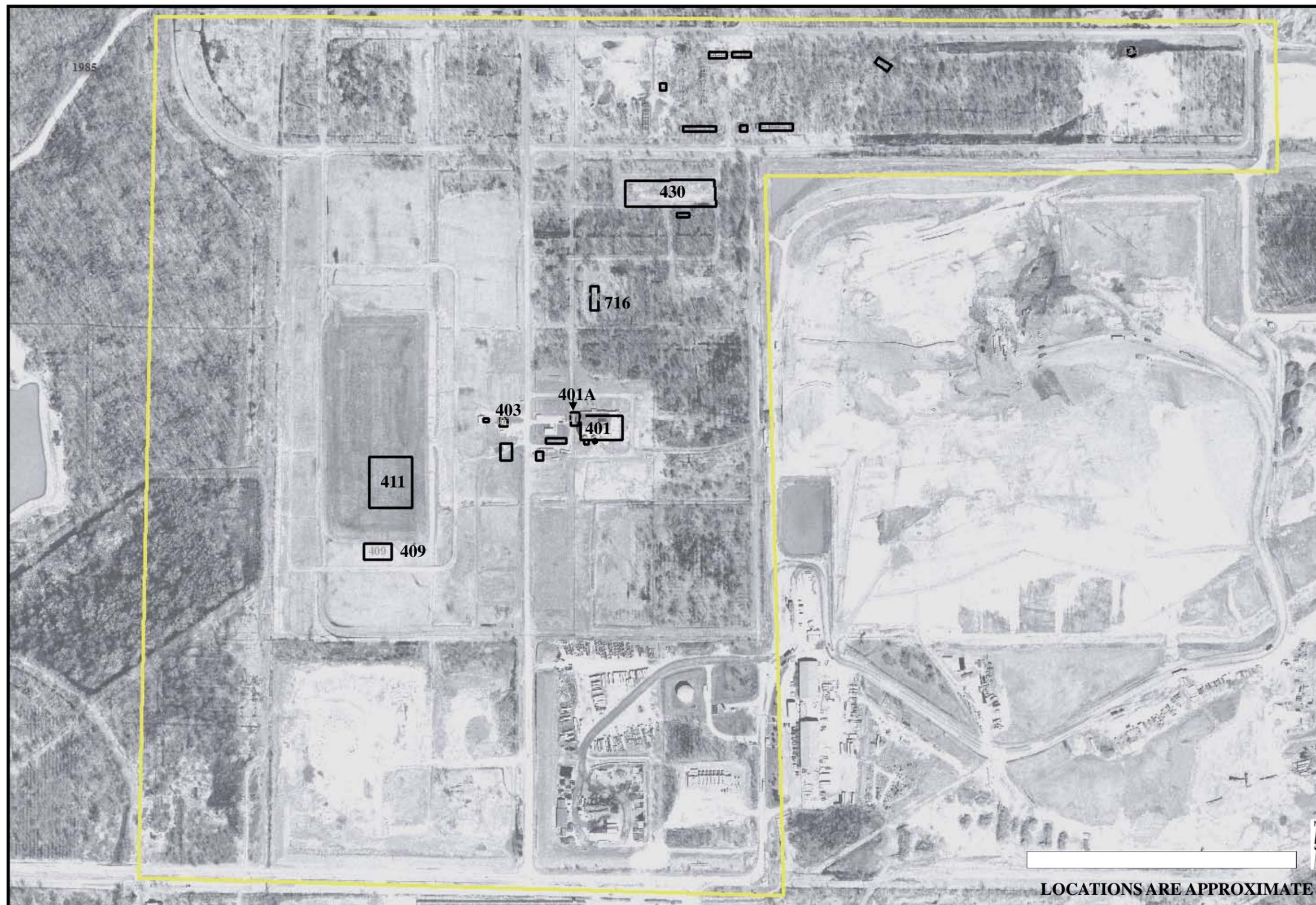
LOCATIONS ARE APPROXIMATE

BUILDINGS IDENTIFIED FROM 1985 PHOTOS ARE LOCATED ON 2005 BASE MAP. [Black Rectangle] CIVILIAN AND POSSIBLE MILITARY STRUCTURES.



1985 BUILDING LOCATIONS AND NUMBERS IN AOI 2

Building numbers are recorded when shapes and locations indicate buildings seen on 1985 photos are the same as recorded in References.

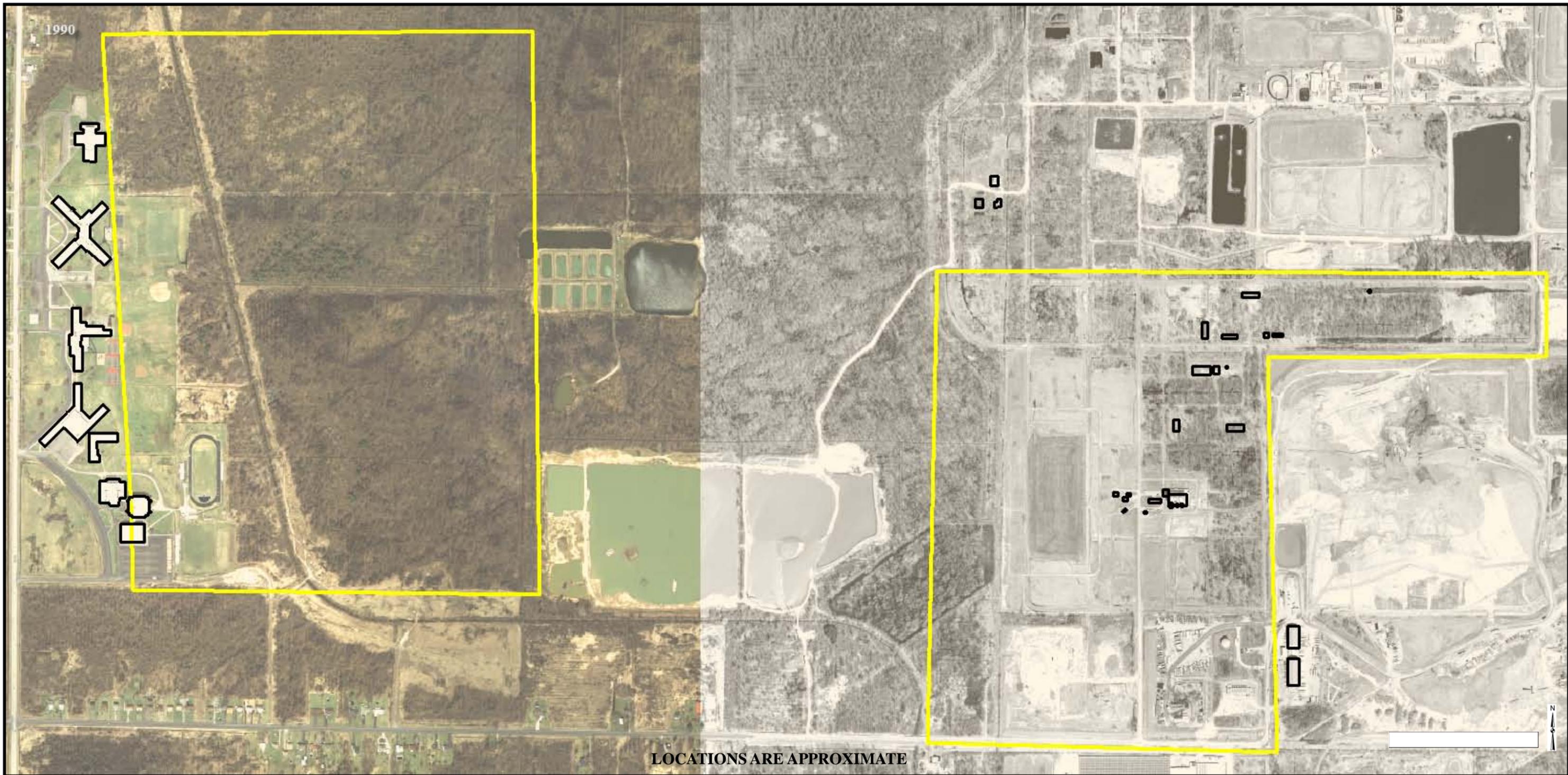


Building numbers are from Bechtel National, Inc, and EA Engineering, Science, and Technology; see REFERENCES page.



1990 BUILDING LOCATIONS

FINAL



LOCATIONS ARE APPROXIMATE

BUILDINGS IDENTIFIED FROM 1990 PHOTOS ARE LOCATED ON 2005 BASE MAP.  CIVILIAN AND POSSIBLE MILITARY STRUCTURES.

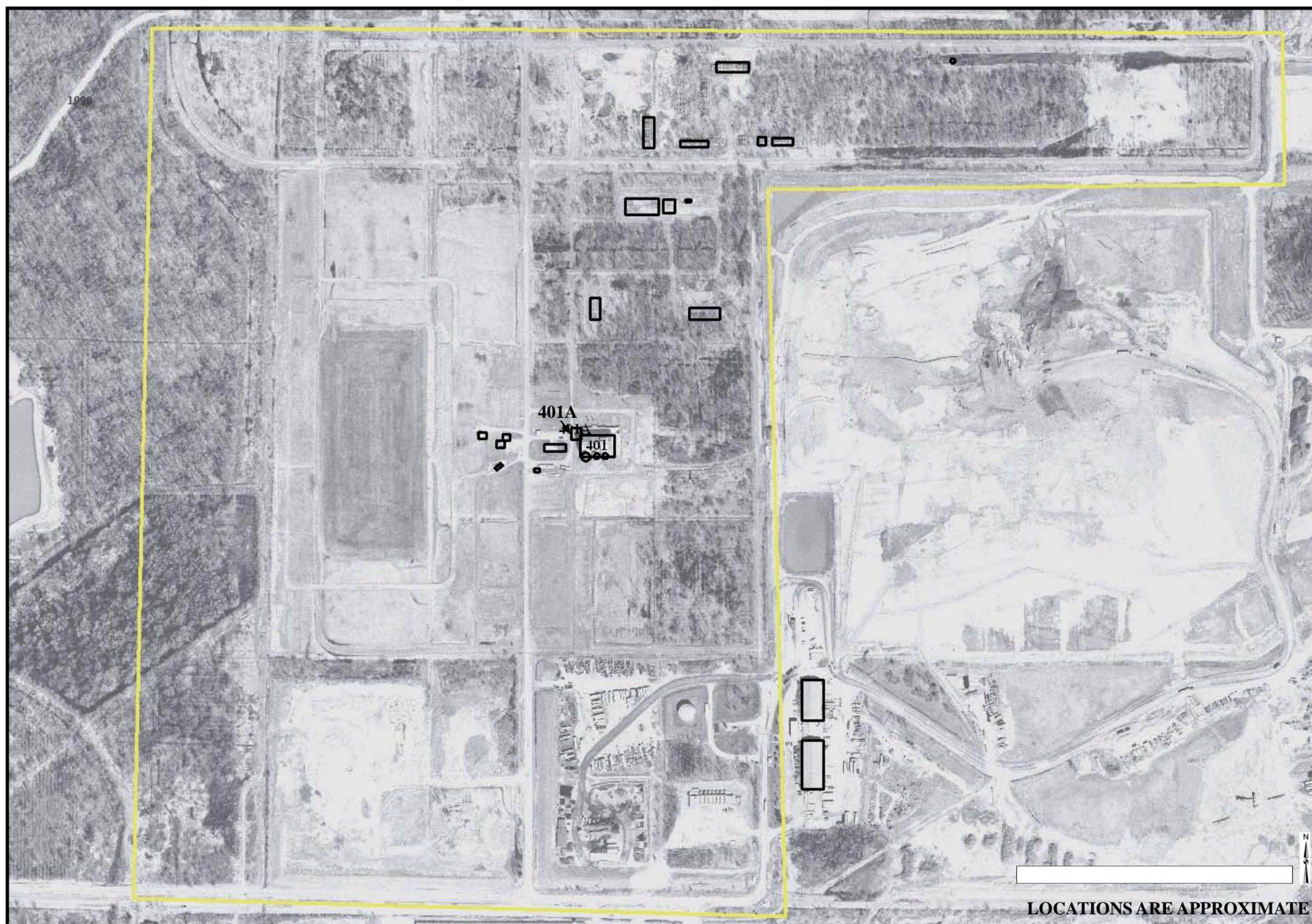


1990 BUILDING LOCATIONS AND NUMBERS IN AOI 2

FINAL



Building numbers are recorded when shapes and locations indicate buildings seen on 1990 photos are the same as recorded in References.

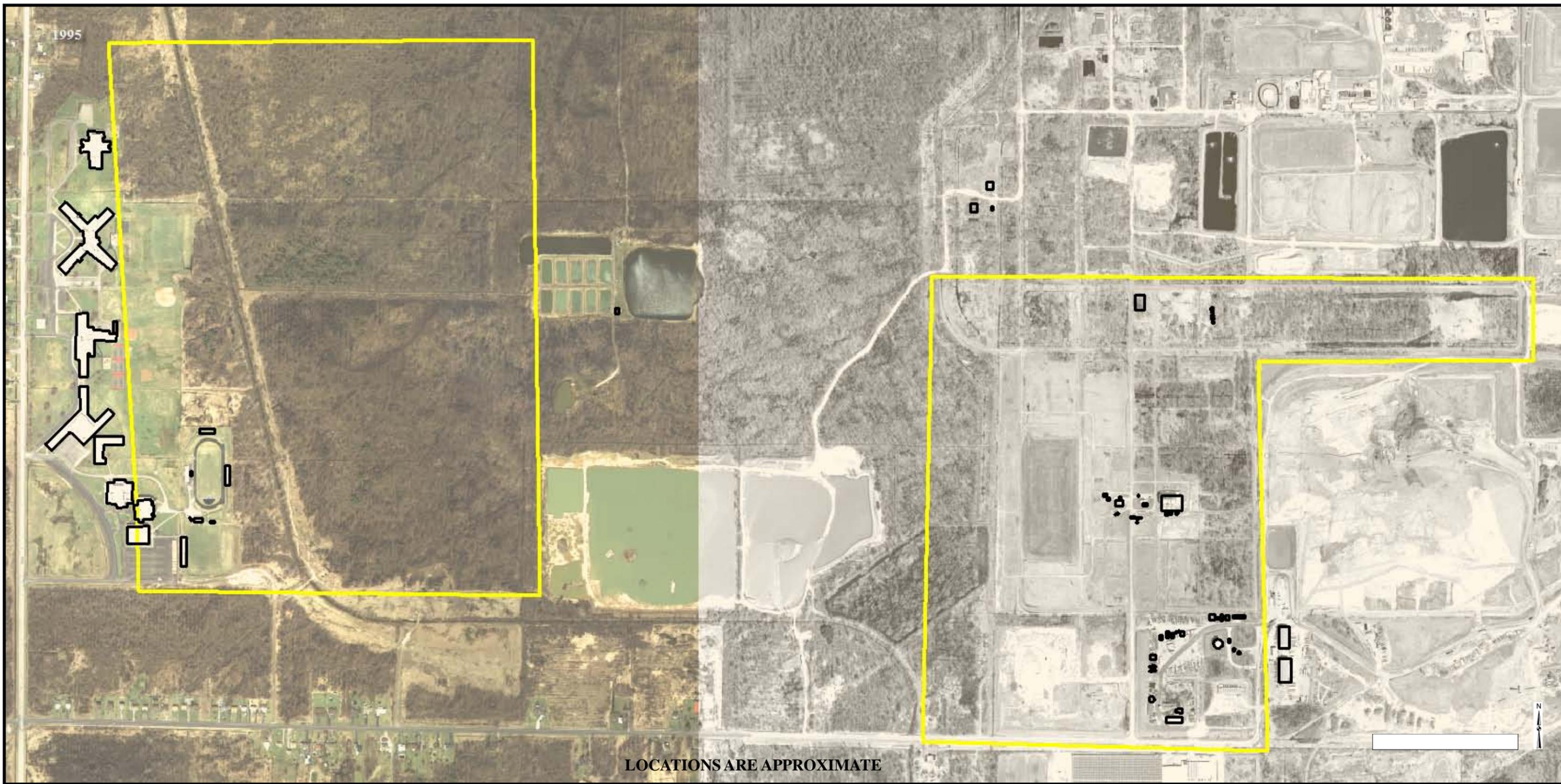


Building numbers are from Bechtel National, Inc, and EA Engineering, Science, and Technology; see REFERENCES page.



1995 BUILDING LOCATIONS

FINAL



LOCATIONS ARE APPROXIMATE

BUILDINGS IDENTIFIED FROM 1995 PHOTOS ARE LOCATED ON 2005 BASE MAP.  CIVILIAN AND POSSIBLE MILITARY STRUCTURES.

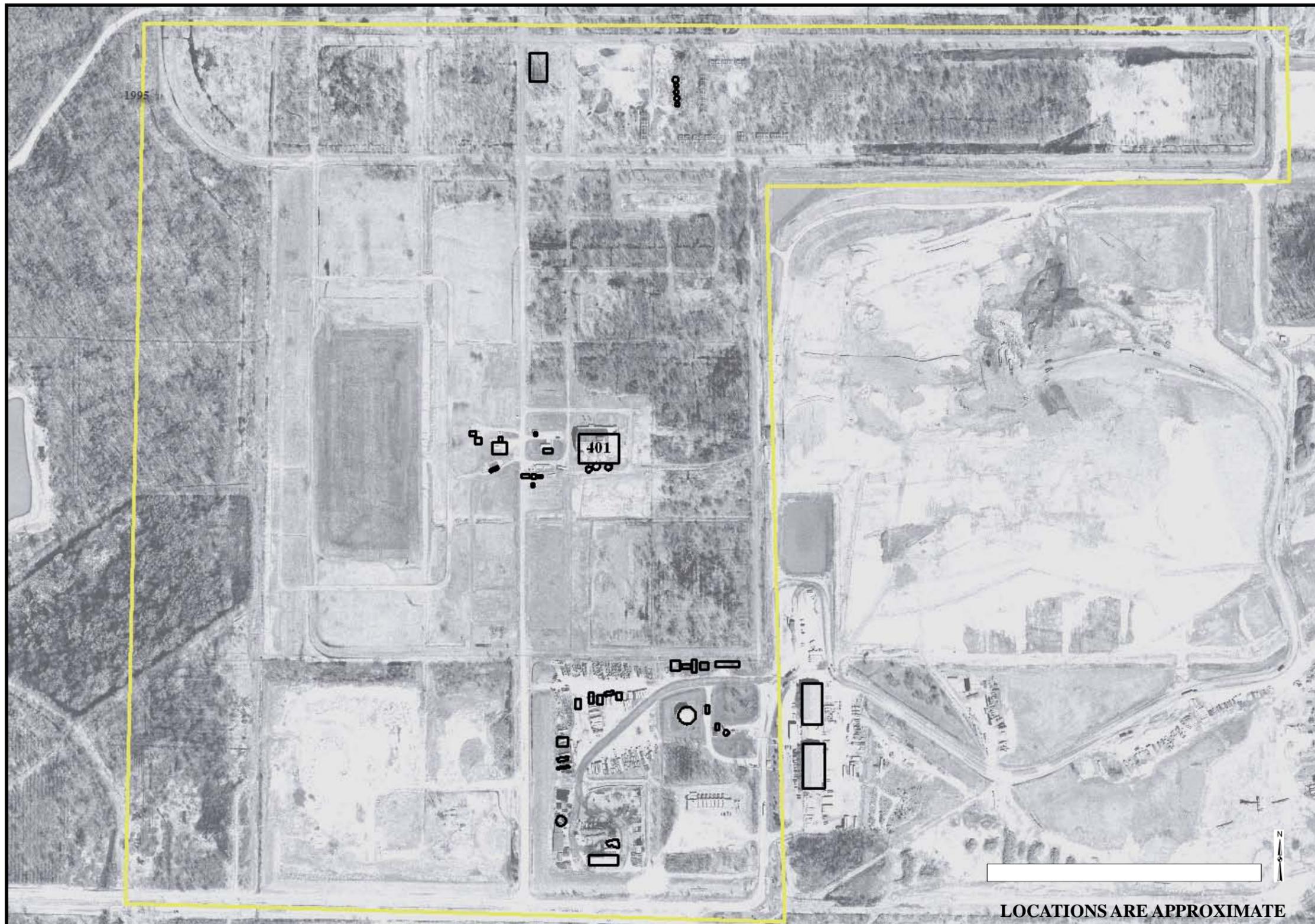


1995 BUILDING LOCATIONS AND NUMBERS IN AOI 2

FINAL



Building numbers are recorded when shapes and locations indicate buildings seen on 1995 photos are the same as recorded in References.



Building numbers are from Bechtel National, Inc. and EA Engineering, Science, and Technology; see REFERENCES page.



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2005 orthophoto base image was originated by New York State Cyber Security & Critical Infrastructure Coordination

<http://www.nysgis.state.ny.us/>