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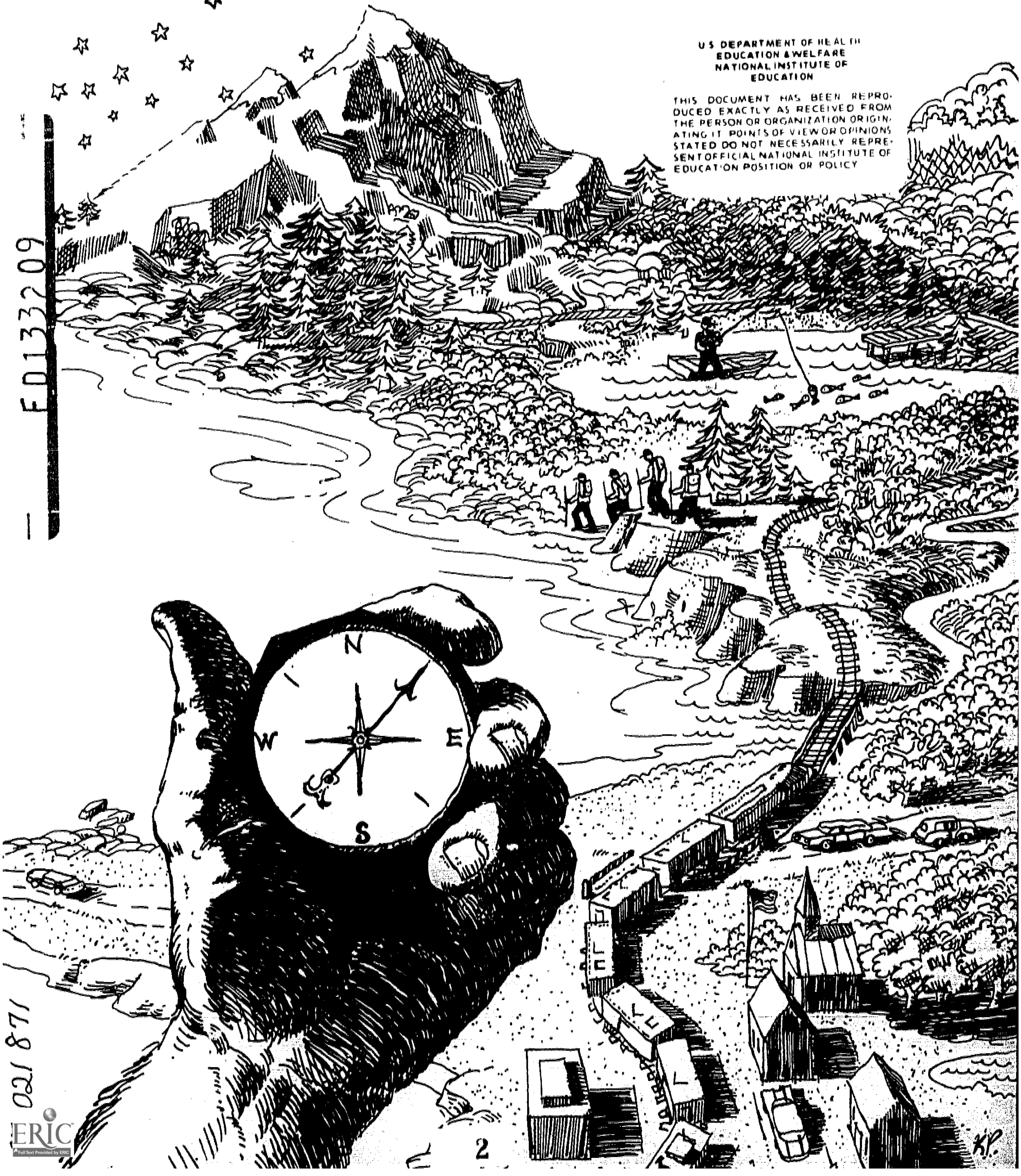
ABSTRACT

Included in this set of materials are two units: (1) Maps and Map Reading and (2) Aerial Photography. Each unit includes student guide sheets, reference material, and tape script. A set of 35mm slides and audiotapes are usually used with the materials. The unit on Maps and Map Reading is designed to develop map reading skills and the use of these skills in land use decision making. The unit on Aerial Photography provides an introduction to the use of aerial photographs in the planning process and assistance in the development of fundamental skills of photo interpretation. (RH)

MAPS – MAP READING



GUIDE SHEET #1

MAPS AND MAP READING

Maps play a vital role in the land use decision making process. From them we can obtain a wide variety of information that can assist us in making objective analyses of our community and plans for development.

This unit will not turn you into a cartographer or a planner in a few short minutes. It will, however, assist you in the development of map reading skills which will prove to be valuable in land use decision making. The skills developed in this unit using a topographic map are transferable to other maps.

More specifically, at the conclusion of this unit you should be able to:

1. Compare and contrast planimetric and topographic maps.
2. Describe the meaning of the term scale as applied to the mapping process.
3. Distinguish among small scale, medium, and large scale maps.
4. Determine the longitude and latitude of major sites on a topographic map.
5. Identify sites on the map by reading the pictographics(i.e. symbols).
6. Distinguish between flat and hilly sections of the quadrangle by use of contour lines.
7. Make use of maps in support of argumentation generated by the land use decision making process.

To complete this unit you will need a pencil, scrap paper, guide sheets, A-T tape and the map of the Wallingford Quadrangle. If at any point in the unit you wish to go back over a section of the lesson, rewind the tape and repeat the desired material.

(Start the recorder! Enjoy!)

BE A RECYCLER YOURSELF. WRITE YOUR COMMENTS, NOTES, AND ANSWERS ON SCRAP PAPER INSTEAD OF THESE GUIDE SHEETS. IN THIS WAY, THESE GUIDE SHEETS WILL BE AVAILABLE FOR THE NEXT PERSON IN YOUR COMMUNITY WHO WILL BE MAKING USE OF THIS UNIT.

The project presented herein was performed pursuant to a grant from the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

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A. Glossary

CADASTRAL MAP--A map,usually, but not always, planimetric, at a scale of 1:10,000 and larger that shows the boundaries of land subdivisions and the areas of individual tracts.

CONTOUR LINE--A line on a map that connects points of equal elevation above some prescribed datum plane, usually mean sea level.

ELEVATION--The heighth of a point or place about an established datum level, usually mean sea level.

INDEX CONTOUR LINE--The contour line that is expressed by a heavier line, normally every fifth contour line.

LATITUDE--The angular distance of a point on the earth's surface north or south of the equator, as measured from the center of the earth.

LONGITUDE--The angular distance of a point east or west of the prime meridian, as measured along the equator.

MAP--A two-dimensional representation of a portion of the earth's surface, this in accordance with a pre-determined scale and projection.

MEAN SEA LEVEL(MSL)--The average level of the sea as calculated from a large number of observations, or a continuous recording device, obtained over a long period of time.

PLANIMETRIC MAP--A map that may show a variety of data but only in terms of the horizontal position of the map features.

PRIME MERIDIAN--An arbitrary meridian of longitude connecting the North Pole and the South Pole and passing through Greenwich Observatory, England.

RELIEF--The differences in elevation of adjacent portions of the earth's surface.

REPRESENTATIVE FRACTION (RF)--See scale.

SCALE--The ratio between distance on a map and the distance it represents on the earth's surface.

SLOPE--The deviation of the earth's surface from horizontal.

SPECIAL SUBJECT MAP--A map, which may be on either a planimetric or topographic base, that is designed to show a single class of data.

TOPOGRAPHIC MAP--A map on a sufficiently large scale to show the details of the principal physical and cultural features of an area.

B. General statements about maps:

1. A map is a shorthand method for representing part of the reality of the earth's surface.

2. A map is a selective, rigidly structured, and somewhat generalized, representation of a real situation that emphasizes those elements relevant to the purpose for which the map was designed.

3. A map is an invaluable tool for the presentation of collected data, and for use as a base on which to display evidence of an existing condition, project future development plans and record change.

C. Concept of scale:

Scale is the ratio of distances on a map to the corresponding distances on the earth.

Maps are often categorized on the basis of their scale:

1:600,000 and smaller scaled maps are considered small scale maps
1:75,000 to 1:600,000 scale maps are considered to be medium scale maps
1:20,000 to 1:75,000 scale maps are considered to be large scale maps

Scales larger than 1:20,000 are very large and are normally used for special subject maps such as city plans, cadastral maps and maps of utility systems.

On a 1:75,000 map, 1 inch on the map would equal 75,000 inches on the earth's surface
On a 1:24,000 map. 1 inch on the map would equal______ inches on the earth's surface.

TOPOGRAPHIC MAP SYMBOLS

VARIATIONS WILL BE FOUND ON OLDER MAPS

Primary highway, hard surface
Secondary highway, hard surface
Light-duty road, hard or improved surface
Unimproved road
Road under construction, alinement known
Proposed road
Dual highway, dividing strip 25 feet or less
Dual highway, dividing strip exceeding 25 feet
Trail

Railroad: single track and multiple track
Railroads in juxtaposition
Narrow gage: single track and multiple track
Railroad in street and carline
Bridge: road and railroad
Drawbridge: road and railroad
Footbridge
Tunnel: road and railroad
Overpass and underpass
Small masonry or concrete dam
Dam with lock
Dam with road
Canal with lock

Buildings (dwelling, place of employment, etc.)
School, church, and cemetery
Buildings (barn, warehouse, etc.)
Power transmission line with located metal tower
Telephone line, pipeline, etc. (labeled as to type)
Wells other than water (labeled as to type)
Tanks: oil, water, etc. (labeled only if water)
Located or landmark object; windmill
Open pit, mine, or quarry; prospect
Shaft and tunnel entrance

Horizontal and vertical control station:
Tablet, spirit level elevation
Other recoverable mark, spirit level elevation
Horizontal control station: tablet, vertical angle elevation
Any recoverable mark, vertical angle or checked elevation
Vertical control station: tablet, spirit level elevation
Other recoverable mark, spirit level elevation
Spot elevation
Water elevation

Boundaries: National
State
County, parish, municipio
Civil township, precinct, town, barrio
Incorporated city, village, town, hamlet
Reservation, National or State
Small park, cemetery, airport, etc.
Land grant
Township or range line, United States land survey
Township or range line, approximate location
Section line, United States land survey
Section line, approximate location
Township line, not United States land survey
Section line, not United States land survey
Found corner: section and closing
Boundary monument: land grant and other
Fence or field line

Index contour	Intermediate contour
Supplementary contour	Depression contours
Fill	Cut
Levee	Levee with road
Mine dump	Wash
Tailings	Tailings pond
Shifting sand or dunes	Intricate surface
Sand area	Gravel beach

Perennial streams	Intermittent streams
Elevated aqueduct	Aqueduct tunnel
Water well and spring	Glacier
Small rapids	Small falls
Large rapids	Large falls
Intermittent lake	Dry lake bed
Foreshore flat	Rock or coral reef
Sounding, depth curve	Piling or dolphin
Exposed wreck	Sunken wreck

Rock, bare or awash; dangerous to navigation

Marsh (swamp)	Submerged marsh
Wooded marsh	Mangrove
Woods or brushwood	Orchard
Vineyard	Scrub
Land subject to controlled inundation	Urban area

MILE SCALE 1:62 500

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

TOPOGRAPHIC MAP INFORMATION AND SYMBOLS

SEPTEMBER 1972

QUADRANGLE MAPS AND SERIES

Quadrangle maps cover four-sided areas bounded by parallels of latitude and meridians of longitude. Quadrangle size is given in minutes or degrees. The usual dimensions of quadrangles are: 7.5 by 7.5 minutes, 15 by 15 minutes, and 1 degree by 2 or 3 degrees.

Map series are groups of maps that conform to established specifications for size, scale, content, and other elements.

MAP SCALE DEPENDS ON QUADRANGLE SIZE

Map scale is the relationship between distance on a map and the corresponding distance on the ground.

Map scale is expressed as a numerical ratio or shown graphically by bar scales marked in feet, miles, and kilometers.

NATIONAL TOPOGRAPHIC MAPS

Series	Scale	1 inch represents	Standard quadrangle size (latitude-longitude)	Quadrangle area (square miles)	Price
7½-minute	1:24,000	2000 feet	7½ × 7½ min	49 to 70	$0.75
Puerto Rico 7½-minute	1:20,000	about 1,667 feet	7½ × 7½ min	71	.75
15-minute	1:62,500	nearly 1 mile	15 × 15 min	197 to 282	.75
Alaska 1:63,360	1:63,360	1 mile	15 × 20 to 36 min	207 to 281	.75
U.S. 1:250,000	1:250,000	nearly 4 miles	1° × 2° or 3°	4,580 to 8,669	1.00
U.S. 1:1,000,000	1:1,000,000	nearly 16 miles	4° × 6°	73,734 to 102,759	1.00
Antarctica 1:250,000	1:250,000	nearly 4 miles	1° × 3° to 15°	4,089 to 8,336	.75
Antarctica 1:500,000	1:500,000	nearly 8 miles	2° × 7½°	28,171 to 30,462	.75

CONTOUR LINES SHOW LAND SHAPES AND ELEVATION

The shape of the land, portrayed by contours, is the distinctive characteristic of topographic maps.

Contours are imaginary lines following the ground surface at a constant elevation above or below sea level.

Contour interval is the elevation difference represented by adjacent contour lines on maps.

Contour intervals depend on ground slope and map scale; they vary from 5 to 1,000 feet. Small contour intervals are used for flat areas; larger intervals are used for mountainous terrain.

Supplementary dotted contours, at less than the regular interval, are used in selected flat areas.

Index contours are heavier than others and most have elevation figures.

Relief shading, an overprint giving a three-dimensional impression, is used on selected maps.

Orthophotomaps, which depict terrain and other map features by color-enhanced photographic images, are available for selected areas.

COLORS DISTINGUISH KINDS OF MAP FEATURES

Black is used for manmade or cultural features, such as roads, buildings, names, and boundaries.

Blue is used for water or hydrographic features, such as lakes, rivers, canals, glaciers, and swamps.

Brown is used for relief or hypsographic features--land shapes portrayed by contour lines.

Green is used for woodland cover, with patterns to show scrub, vineyards, or orchards.

Red emphasizes important roads and is used to show public land subdivision lines, land grants, and fence and field lines.

Red tint indicates urban areas, in which only landmark buildings are shown.

Purple is used to show office revision from aerial photographs. The changes are not field checked.

INDEXES SHOW PUBLISHED TOPOGRAPHIC MAPS

Indexes for each State, Puerto Rico and the Virgin Islands of the United States, Guam, American Samoa, and Antarctica show available published maps. Index maps show quadrangle location, name, and survey date. Listed also are special maps and sheets, with prices, map dealers, Federal distribution centers, and map reference libraries, and instructions for ordering maps. Indexes and a booklet describing topographic maps are available free on request.

HOW MAPS CAN BE OBTAINED

Mail orders for maps of areas east of the Mississippi River, including Puerto Rico, the Virgin Islands of the United States, and Antarctica should be ordered from the U. S. Geological Survey Distribution Section, 1200 South Eads Street, Arlington, Virginia 22202. Maps of areas west of the Mississippi River, including Alaska, Hawaii, Louisiana, Minnesota, American Samoa, and Guam should be ordered from the Distribution Section, Federal Center, Denver, Colorado 80225. A single order combining both eastern and western maps may be placed with either office. Residents of Alaska may order Alaska maps or an index for Alaska from the Distribution Section, 310 First Avenue, Fairbanks, Alaska 99701. Order by map name, State, and series. Maps without woodland overprint are available on request. On an order amounting to $300 or more at the list price, a 30-percent discount is allowed. No other discount is applicable. Prepayment is required and must accompany each order. Payment may be made by money order or check payable to the U. S. Geological Survey, or cash (the exact amount) at sender's risk. Your ZIP code is required.

Sales counters are maintained in the following U. S. Geological Survey offices, where maps of the area may be purchased in person: 1200 South Eads Street, Arlington, Va.; Room 1028, General Services Administration Building, 18th & F Streets NW., Washington, D. C.; 1109 North Highland Street, Arlington, Va.; 900 Pine Street, Rolla, Mo.; 345 Middlefield Road, Menlo Park, Calif.; 7638 Federal Building, 300 North Los Angeles Street, Los Angeles, Calif.; 504 Custom House, 555 Battery Street, San Francisco, Calif.; Building 41, Federal Center, Denver, Colo.; 1012 Federal Building, 1961 Stout Street, Denver, Colo.; Room 1-C 45, 1100 Commerce Street, Dallas, Texas; 8102 Federal Building, 125 South State Street, Salt Lake City, Utah; 678 U. S. Court House, West 920 Riverside Avenue, Spokane, Wash.; 108 Skyline Building, 508 Second Avenue, Anchorage, Alaska; 441 Federal Building, 709 West Ninth Street, Juneau, Alaska; and 310 First Avenue, Fairbanks, Alaska.

Commercial dealers sell U. S. Geological Survey maps at their own prices. Names and addresses of dealers are listed in each State index.

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GUIDE SHEET #4

COLORS AND THEIR SIGNIFICANCE IN MAP READING

1. Black is used for all names and for most man-made cultural features, such as minor roads, buildings, spot elevations, bench marks, railroads, power lines, pipelines and boundaries.

2. Blue is associated with water and hydrographic features, such as lakes, ponds, reservoirs, canals, marshland and similar features.

3. Red is employed to emphasize major roads and highways, route numbers, built-up areas and certain marginal notes.

4. Brown is reserved contours and features pertaining to relief or elevation of terrain.

5. Green is associated with woodland, agriculture, orchards and vineyards.

6. Purple has been used in recent years for overprinting published sheets as part of an interim revision. Because of this, purple may replace any one of the above colors on a temporary basis. Once a complete revision is carried out, the proper color replaces the purple of the interim revision.

The following is a short self quiz on the colors used on the Wallingford Quadrangle map. We will give you a map feature, you write in the color which this feature should be on the map.

School built between 1967 and 1972	______	Sleeping Giant State Park	______
North Farms Reservoir	______	Quinnipiac River	______
Downtown section of Wallingford	______	School built in 1938	______
Penn Central railroad tracks	______	Wilbur Cross Parkway	______
Apple and pear orchards	______	Farmland east of Wallingford	______
Contour lines	______	Streets of Wallingford	______

GUIDE SHEET #5

DESCRIPTIONS OF PHOTOGRAPHS OF SELECTED SITES FROM THE MAP OF THE WALLINGFORD QUADRANGLE

The following photographs have been taken of sites in the Wallingford Quadrangle. As you study the slides and the sites on the map, feel free to turn off the tape recorder. When you are ready to move on to the next slide, turn the recorder back on. Each site is marked with a special marker to aid in the location of the sites in the slides.

Slide 1. Orchards located on a hillside to the west of the Wilbur Cross Parkway.

Slide 2. Housing development built on a slope in a formerly wooded area. The development activity took place between 1967 and 1972.

Slide 3. Shopping center constructed between 1967 and 1972 in a flat, open area.

Slide 4. Sandpit in active operation.

Slide 5. An inland wetland area symbolized on the map as a partially wooded marsh. During spring high water periods much of this area may be under several inches of water.

Slide 6. Railroad station. A historic building inside the heavily settled area of Wallingford.

Slide 7. Choate School. Note the flag on top of the black building symbol. The flag tells that this is a school and the black color indicates that it was built before 1967.

Slide 8. Apartment complex next to Simpson Pond. The apartments were made remodeling an old factory building alongside property owned by the water company.

Slide 9. An apartment complex built on a hillside, Individual buildings are not shown since they occur in a heavily settled area and the apartments are not landmark buildings.

Slide 10. Cross-country power transmission lines. Note the scar they create on the land surface.

Slide 11. A factory built on a flat section of land between 1967 and 1972. Additional factories are now under construction but they do not appear on the map.

Slide 12. Church--note the cross on the black symbol. This and other churches in the community are considered landmark buildings.

Slide 13. Ridge above Tamarak Swamp. Note the correspondence of the steep slope to the closely spaced contour lines.

Slide 14. Dam at the south end of MacKenzie Reservoir.

Spend some time studying the map...try locating some other churches, schools, municipal buildings, reservoirs, ridges, transmission lines, highways, factories, cemetaries, parks, wetlands, sandpits, rivers, etc. There is a great deal of information on the map if you decide to dig it out! Try measuring distances, finding high points on ridges and locating the low spots between hills or ridges. What you need most at this point is practice. Some activities are outlined for you on guide sheet #6.

For more information on maps and map reading consult:

DeBruin, Richard. 100 Topographic Maps. Northbrook, Illinois: Hubbard Press, 1970.

Dury, G.H. Map Interpretation. London: Sir Isaac Pitman and Sons, Ltd., 1967.

Greenhood, David. Mapping. Chicago: University of Chicago Press, 1964.

Richardson, Benjamin F. Atlas of Cultural Features. Northbrook, Illinois: Hubbard Press, 1972.

GUIDE SHEET #6

SOME ACTIVITIES FOR REFINING YOUR MAP READING SKILLS

A. Profile Activity: To increase your skills and understanding of contour lines, we will construct a profile of a section of the map. Imagine that you are taking a hike from the bridge over the MacKenzie Reservoir eastward to Cooke Road. Your walk will follow a straight line from the bridge to the letter R of Cooke Road. What is the distance from the bridge to the letter R.

To construct the profile, follow these six steps:

1. Secure a piece of paper with equally spaced horizontal lines. (Regular lined paper will work fine.)
2. Assign values equal to the contour interval--ten feet in this instance--to the distance between lines on the paper.
3. Label the value of each line along the left margin of the paper, beginning with 390' for the first line from the top and continuing down the page with 380',370' and so on until 200' is reached.
4. Fold the sheet along the 200' line and place the bottom of the sheet of paper along your hiking route from the bridge to the R.
5. Proceeding from west to east, at each point where a contour line crosses or touches your hiking path, draw a perpendicular line on the paper to the line that bears the same value as the contour line; and make a small mark at the point of intersection. Do this for all contour line intersections.
6. Connect the tick marks by a smooth curve. There you have it...a profile of your hiking trail.

B. Additional skill developing activities:

1. Name the highest mountain in the Wallingford Quadrangle and give its exact elevation.

2. Whirlwind Hill Road starts at MacKenzie Reservoir and goes eastward to the edge of the map. What is the elevation of the road at the reservoir? What is the highest elevation the road passes through before reaching the neatline of the map?

3. What is the distance from the railroad station to the apartment complex next to simpson Pond?

4. There are several wetland areas on your map, but only two large wetland areas in the Wallingford Quadrangle have been given specific names. Locate these wetland areas and write down their names.

5. Locate and name three reservoirs in the Wallingford Quadrangle.

6. What is the latitude of the most northern line of this map?

7. What is the name of the river that flows from MacKenzie Reservoir to Dayton Pond?

8. Where are the flatest land areas in the Wallingford Quadrangle?

9. What is the distance on route I-91 from the south neatline of this map to interstate 95 in New Haven?

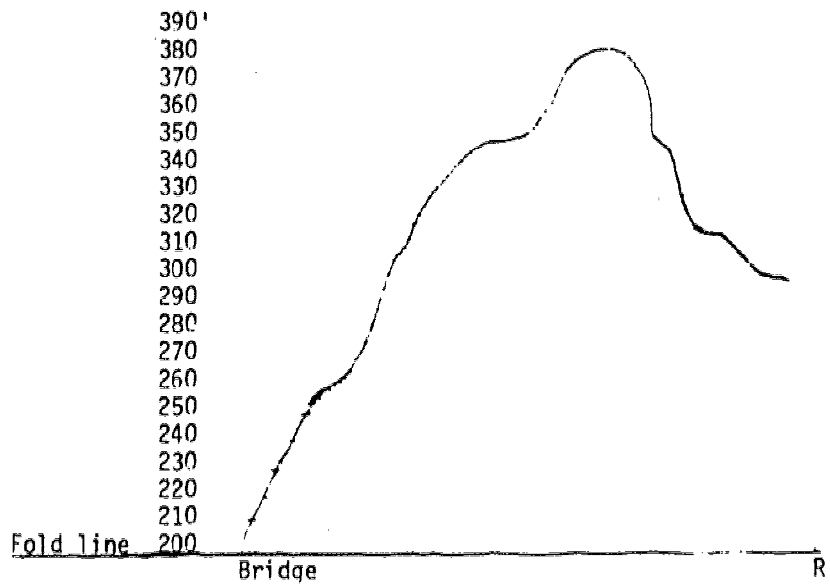
GUIDE SHEET #7

ANSWERS TO QUESTIONS ON GUIDE SHEET #6

A. <u>Profile Activity:</u>

1. Distance from the bridge over the MacKenzie Reservoir to the letter R of Cooke Road is almost exactly a mile.

2. Profile:



Note that the distance on the base is equal to one mile, while the height is a total of 190 feet. By using graph paper and changing the height scale, a more accurate profile can be obtained using the same technique.

B. <u>Additional Skill Activities:</u>

1. Totoket Mountain---598 feet.

2. Elevation at the reservoir is approximately 200 feet. Highest elevation through which the road passes is approximately 460 feet.(Note the bench mark near the intersection of Whirlwind Hill Road and North Branford Road. The elevation at the bench amrk is 462 feet)

3. Approximately eight tenths of a mile(0.8 miles).

4. Tamarac Swamp and Fresh Meadows.

5. There are four reservoirs in the Quadrangle. The three you located would be in the list including the Broad Brook Reservoir, North Farms Reservoir, Spring Lake Reservoir and MacKenzie Reservoir.

6. 41^{o} 30'---read 41 degrees, 30 minutes

7. Muddy River

8. The flattest land in the Quandrangle is found on either side of the Quinnipiac River.

9. 6 miles--the information is written in red just below the neatline at the end of I-91.

Audio Tape Script

Maps & Mapping

Welcome to the audio-tutorial unit on maps and map reading.

This unit has been designed to introduce you to basic mapping concepts and to help you develop skills in map utilization. A more detailed list of objectives is outlined on guide sheet number one...If you haven't read guide sheet #1, please stop the recorder and read the objectives for the unit now! (Pause 5 sec. Musical Interlude)

G.S. #1
Objectives
of maps unit

Before proceeding through a unit on maps and map reading, we might want to spend time discussing why this unit is so important in land use decision making.

There are many stories one can tell, about planning errors that have occurred simply because people were not skilled map readers.

One of the classic stories comes from a community in the Northeast, that agreed to the building of an airport on the outskirts of the city. Selecting the proper site was extremely important, so the community hired a consulting firm to study the area and make recommendations for the airport site.

The consulting firm was given twelve months to complete the study and make a presentation at a public meeting. They had no idea how significant the public meeting was to be!

Twelve months after engaging the consultants, the meeting was called and the consultants and interested citizens arrived. There was a great deal of excitement and speculation about the location of the new airport. The consultants got out their maps, transparencies and overlays and the meeting started.

A topographic map was shown on the overhead projector. In case you're not familar with topographic maps, they are maps that show details of the principal physical and cultural features of an area.

If we use terms that are new to you, and you don't understand stop the recorder and look for the term in the glossary for this unit.

Well, lets get on with the story. Now when the topographic map was displayed the consultant pointed out the major land forms, highways and population centers. Several open spaces surrounded the community and these were pointed out. Each one was discussed in terms of accessability, proximity to housing development and safety factors. Then came the long awaited moment, an overlay was put on the map and there was the airport layout complete with runways, buildings and other constructions details. Without waiting for reaction, the consultant pointed out the advantages of the site. There was an interstate highway close by, there were no housing centers in the landing or take off pattern for the proposed airport. The site would have the smallest possible impact on the citizens and the environment. It would not disrupt citizens of the community by producing inordinate noise levels in populated area, and it would prove to be an asset to the city. When the consultant finished his speech, he asked if there were any questions. A person in the back of the room raised their hand, and asked if the consultant really thought that this would be the best location. Once again, the consultant pointed out that for all of the reasons mentioned, this obviously would be the best place for the airport. The person that had brought up the question suggested that he felt the map was inaccurate, because if his memory served him properly, the runway went right through a subdivision that had been built recently.

It may sound unbelieveable, but when the person raising the question finished his statement there was no doubt about it! The runway went right through a housing development.

This stupendous error occurred because the consultant used maps that were out of date. Based upon the old map a good site was located, but the area was not field checked. As a result, the consultant picked a site that was very well suited for the airport based upon old information. In this real case the town and the consultant got a costly lesson.

The reason for telling this story is very simple. Some basic map reading skills may have saved the town and the consulting firm a great deal of money. Some preliminary work could have been done by an existing committee of the community and consultants might have been employed to obtain data that was not available to the city. There are many reputable firms and individiduals who can provide communities with environmental decision making information. But much information is already available on existing maps which can provide a base for decision making.

There are dozens of other stories that can be told about individuals, corporations and communities who have made costly land use errors because they were not able to interpret information on maps, or they simply did not take time to check. I'm sure you have read about developers who have purchased property in flood plains or in wetland areas, only to find that they could not build as they had planned...or the individual who got a bargain on the house of their dreams only to find that the noise of traffic or an interstate close to the property made sleeping difficult.

These and other problems can be avoided by obtaining and studying appropriate maps of your community.

This unit is designed to alert you to the importance of maps to the land use decision making process, and to acquaint you with the basic principles of map reading. In a "real life" situation, several types of maps would be utilized in decision making, including topographic maps, city plans and other planimertric and special subject maps. In this unit we will focus our attention on large scale topographic maps, such as the standard 1:24,000 quadrangle sheets published by the United States Geological Survey (USGS). One sheet in this series-the Wallingford Quadrangle-has been included in the unit and will be used in several exercises.

The competence you acquire working with the Wallingford Quadrangle will be valuable when you progress to the other units. In later units and in the process of land use decision making you will become involved in reading soils maps, land use maps, city plans and zoning maps as well as other special purpose maps. The principles governing topographic map reading, and the techniques employed, are similar and in many instances identical-to those required for reading other types of maps. Should you experience difficulty in reading the maps used in other units, it is suggested that you return to this unit and review the material presented here.

The remainder of this unit focuses on the development of an understanding of the various pictograph symbols used on topographic maps, an ability to translate there symbols into significant these distributional patterns and an awareness of the importance of distributional patterns to the decision making process. ~~If you complete all elements of~~ this unit in accordance with the instructions, you will acquire these skills. The specialized knowledge required for synthesizing map data and arriving at professionally sound land use decisions is quite complex and will require additional study beyond this introductory unit.

Before proceeding with the remaidar of the unit, arrange the guide sheets, topographic map and slides so that they will be handy for ready reference. In addition, you should spend the time necessary to familiarize yourself with the terms contained in the Glossary on Guide Sheet 2. While you make these arrangements turn the recorder off...when you are ready to continue turn the recorder back on. (Pause 5 sec.)

Lets start with the basics...by definition, a map is a "cwo-dimensional representation of a portion of the earth's surface, this in accordance with a pre-determined scale and projection." This definition can be found in the glossary. Each point on a map must correspond exactly to its geographical location on the earth's surface. This definition is equally valid for topographic maps, city plans, and special subject maps. Variations in detail and data content do not change the basic definition.

In addition to the formal definition of "map", there are numerous statements about a map that contribute to a general understanding of its characteristics and use. A summary of such statements can be found at the bottom of Guide Sheet #2. (Pause)

1. A map is a shorthand method for representing part of the reality of the earth's surface;
2. A map is a selective, rigidly structured, and somewhat generalized, representation of a real situtation that emphasizes those elements relevant to the purpose for which the map was designed, and,
3. A map is an invaluable tool for the presentation of collected data, and for use as a base on which to display,evidence of an existing condition, project future development plans and record change.

The ability to read and interpret maps is a required competence for a professional planner, and a welcome attribute of a concerned citizen. To the planner, a properly designed map may summarize, in readily usable form, the results of many man-months of technical study. Further, when used in conjuction with the written report that customarily accompanies a technical study, maps provide the planner with essential data for land use decision making.

Concerned citizens who wish to interact with individuals responsible for land use planning will find it easier to do so if they are able to read and interpret maps. Land use decisions are generally made in conconance with a master plan that is summarized in map form, or planning guidelines illustrated by a series of maps. In addition, public hearings of local Planning and Zoning Commissions and Conservation Commissions frequently involve interpretations of technical data presented in map form

Maps used by planners fall naturally into two broad categores - those that are planimetric and those that are topographic. Planimetric maps are maps that indicate only horizontal positions, or north-south and east-west location of map features with respect to established baselines. Position is expressed in terms of one or another of several acceptable grid systems, latitude and longitude being most commonly used. Topographic maps contain, in addition to horizontal position, some indication of elevation. This is expressed in terms of feet or meters above an established datum plans, usually mean sea level (MSL).

Both planimetric and topographic maps are in common use in land use planning. Planimetric maps are normally employed to show single factor data for which reference to elevation would serve no useful purpose. For example, maps designed to show population distribution, dwelling types, road networks and numerous other cultural features are generally planimetric; although a topographic base map may be used for convenience. Topographic maps are, or should be, used whenever expressions of relief or elevation enhances the understanding of the data being presented.

Some planners, particularly those receiving their early training in geography, many classify maps according to function rather than the presence or absence of any indication of relief or elevation. The categories employed in this instance are topographic and special subject. The distinction is made in the purpose for which the map is designed. For example, a map compiled to show the road network of Connecticut would be classified as a special subject map even though the base used might contain "some indication of relief."

Finally, maps may be classified according to scale. If you refer to the glossary you will find scale defined as the "ratio between distance on a map and distance on the earth's surface." Maps published at the scale of 1:600 ,000 and smaller are considered to be small scale maps. Those published at scales of 1:75,000 and 1:600,000 are classified as medium scale maps, and those that are scaled at a scale larger than 1:75,000 are large scale maps. Remember, the larger the second number in the ratio, the smaller the ratio, and thus the smaller the scale.

Persons accustomed to working primarily with topographic maps may restrict the classification "large scale" to maps published at scales between 1:20,000 and 1:75,000. This is in recognition of the fact that maps at a scale larger than 1:20,000 are normally special subject maps, and may or may not be compiled on a topographic base. Included are such items as city plans, maps of the various utility systems and cadastral maps. Cadastral maps are maps which show boundaries of particular tracts of land. A summary of the concept of scale can be found in section C at the bottom of Guide Sheet #2. Stop the recorder and review guide sheet 2C. When you are ready turn the recorder back on. G.S. #2

On the assumption that you have mastered the information presented in Guide Sheet 2, we will proceed to the first steps in map reading. All good maps contain, as a minimum, seven clues that can assist you in reading and interpreting the data presented on the map. These should be studied carefully before any concerted effort is made to read the body of the map.

The first clue may be found in the map title. Normally, a map title is either descriptive of the map content or of the geographic area covered. Occasionally, however, the title will contain information relative to either the date of the information or the publishing authority, or both. This is most common among special subject maps. TURN OFF THE RECORDER and study the map included in the unit to determine whether the title is descriptive of the content of the map or the geographic area covered. When you are ready, TURN RECORDER BACK ON. You're correct - the maps covers a geographic area.

Once you have learned everything possible from the title, examine the scale at which the map was published. Scale determines the amount of detail that can be shown clearly on any map-the larger the scale the greater the amount of detail and the nearer the map is to an expression of reality. If,for example, the Wallingford Quadrangle, which was published at the scale of 1:24,000, were reduced to one-half size, or to a scale of 1:48,000, much of the detail would either be lost or would become so small as to be insignificant. Such features as individual building, minor streets, small streams, and nurseries and orchards would "drop out." At the reduced scale, one-tenth of an inch on the map would represent 400 feet on the earth's surface. Even a toll road would be too small to show without gross exaggeration of reality. A further reduction in scale by one-half would result in the entire Wallingford Quadrangle being compressed to a sheet 4.25" x 5.50" and the loss of virtually all detail.

On the Wallingford Quadrangle sheet included in this unit, the scale is indicated in the middle of the border area at the bottom of the sheet. (Pause) Have you located the scale on your map? (Pause) Note that in addition to the ratio, commonly referred to as the Representative Fraction, or RF, bar or graphic scales are included. The particular advantage of the bar scale is that it facilitates the computation of distance on the map. Distance measurment is accomplished by using a ruler to measure map distance and calculating the representative distance on the earth's surface on the bar scale. Finally, note that the quadrangle sheet contains three different bar scales, thus permitting distance measurement in miles, feet or kilometers.

TURN OFF THE RECORDER and examine carefully the ways in which scale is indicated on the use a ruler to measure some distances on the map, Wallingford Quadrangle; then when you are ready to proceed TURN RECORDER BACK ON.

An additional technique is sometimes employed in indicating scale, particularly on maps designed for military specifications. This is a verbal statement of the distance on the map that is equivalent to one mile on the earth's surface. Thus, a quarter inch map is one on which the distance of one quarter inch on the map represents one mile on the earth's surface. Stated as a representative fraction, the quarter inch map is at a scale of 1:253,440. Similarly, a one inch map, restated, is at the scale of 1:63,360.

One of the early skills to be acquired in map reading is the ability to determine location of points of reference on a map. This is somewhat simplified when you recognize that north is customarily at the top of the map. The three systems most frequently used to determine location or points of reference are all incorporated in the Wallingford Quadrangle. Of the three methods, it is suggested that you first acquire competence in the use of latitude and longitude as a means of determining and expressing geographic location. Once this is done, the other two systems are relatively simple to learn.

The system of latitude and longitude is based upon the fact that the earth is round, or nearly so, and a circle has 360 degrees. Each degree, for accuracy of positioning, is divided into 60 minutes, and each minute into 60 seconds. Latitudinal values indicate position north or south of the equator, and longitudinal values establish position east or west of the prime meridian, a meridian of longitude passing through Greenwich Observatory, a short distance outside London, England. In stating location in terms of latitude and longitude, latitudinal position should be stated first. For example, Wallingford is located as 41° 27' N(orth) 72° 49' W(est). Since one second of latitude represents slightly less than 103 feet on the earth's surface, and a second of longitude about 75 feet it is usual to state locations of populated centers in degrees and minutes only. Longitude readings for a quadrangle are given at the top and bottom of longitude lines, while latitude readings are given at the end of latitude lines on the right and left margins of the map. Study your map carefully . . . do you see the latitude line 41°22'30'' at the bottom of the map? (Pause) What is the latitude at the top of the map? Correct! 41°30'. What is the longitude at the right margin of the map? Correct! 72° 45'. If you would like to study the latitude and longitude marks a little bit longer, stop the recorder, and turn it back on when you are ready to continue.

The second system employed a Connecticut state, or local, grid that subdivides the state into units 10,000 feet square. Precise positioning can be obtained by using an engineer's rule and calculating distance within the 10,000 square foot grid pattern. The third system is similar to the Connecticut grid, differing primarily in that the state is subdivided into units that are 1,000 meters This grid was developed by the U.S. Army Topographic Command for use in world wide military mapping. Again, precise positioning is possible by using an engineer's rule. If either of these systems is utilized, the value for the position corresponding to latitudinal location should be stated first.

TURN OFF THE RECORDER and study the systems of grid coordinates used in the design of the Wallingford Quadrangle, paying particular attention to the latitude and longitude system and the metric grid system. TURN ON THE RECORDER AND PROCEED with the unit when you are ready!

Investigation of direction has major significance at the local and national level and for certain types of surveys. If you remember that maps are customarily oriented with north at the top, most of your requirements will be satisfied. The quadrangle actually contains three references to north direction. The middle arrow of the three arrows to the left of the bar scale indicates "true" north. The arrow on the left points toward "magnetic" north, or compass north; and the arrow on the right identifies the north orientation of the 1,000-meter grid. Have you found these three arrows to the left of the bar scales? Remember, the center shows true north, the left arrow points to magnetic north and the arrow on the right points to grid north. (Pause)

The next two items are frequently combined into a single statement on the map. The statement with respect to the date the map was published and the publishing authority is usually located along the lower margin outside the neat line - the line enclosing the body of the map. Information on the date that the map was published and the publishing authority is often very useful in assessing the reliability of the information contained on the body of the map;

The Wallingford Quadrangle contains, an overprinted statement in purple informing the user that some portions of the data were revised under an interim program, without resorting to a complete revision of the sheet. When was the Wallingford map completed? (Pause) Correct - 1967. In what year was the map photo-revised? Correct again . . . 1972. If you had any trouble answering these questions look closely at the lower right hand margin of the map . . . there you will see the answer to our questions!

The last item, and possibly the most significant, is the legend. Here is found, a complete listing of all symbols contained in the body of the map. The legend is often referred to as the map key, an association that is most appropriate; for the legend truly contains the key to map reading.

Map reading, then, is the art, or science, of associating the symbols contained on a map with the reality present on the earth's surface.

In instances where a map is but one sheet of a series, as is true of the Wallingford Quadrangle, it is customary to omit the legend. The map user who has yet to learn the

symbols has available a separate list that contains all symbols employed in the compilation of the series. The list included on Guide Sheet #3 contains Topographic Map Symbols, theoretically this Guide Sheet lists all symbols used in compiling the United States Geological Survey topographic sheets. Similar lists are available for geologic and soils maps, and for the maps of such specialized agencies as the United States Army Topographic Command. Study the Topographic map symbols sheet on Guide Sheet # 3. G.S. #3
Try and locate some of these symbols on the Wallingford Quadrangle map. Stop the recorder while you carry out this activity, when you are ready to proceed, turn the recorder back on!

In addition to the seven elements of maps discussed so far, two other items deserve comment before you undertake an exercise in map reading. One is the importance of color to map reading, and the other is the relevance of contour lines to map interpretation (note the distinction between map reading and map interpretation). The colors you see have not been selected haphazardly; rather, through use, there has evolved an association of color with a specific class of data. A list of colors and the class of data they represent can be found on Guide Sheet # 4.

Stop the tape recorder while you study Guide Sheet # 4. When you are ready, turn the recorder back on. G.S. # 4

Now that you have reviewed the colors you may in fact find when you are reading maps that certain tones and shadings appear that are different than those we have just discussed. In reality these are just the result of screening out of a portion of one of the above colors during printing. There is a

There is a self test at the bottom of Guide Sheet #4. Stop the recorder while you take the self test . . . then continue. (Pause) Let's check your answers. The school built between 1967 & 1972 would be purple. The reservoir and the Quinnipiac river would be blue. Downtown Wallingford is red, while the streets of Wallingford and the railroad tracks are black. The farms, orchards and the State Park will all be green. The old school is black and the Wilbur Cross Parkway is red. Before going any further, you might want to stop the recorder and take some time to study the map, paying particular attention to the use of color and identifying as many symbols as possible. (Pause)

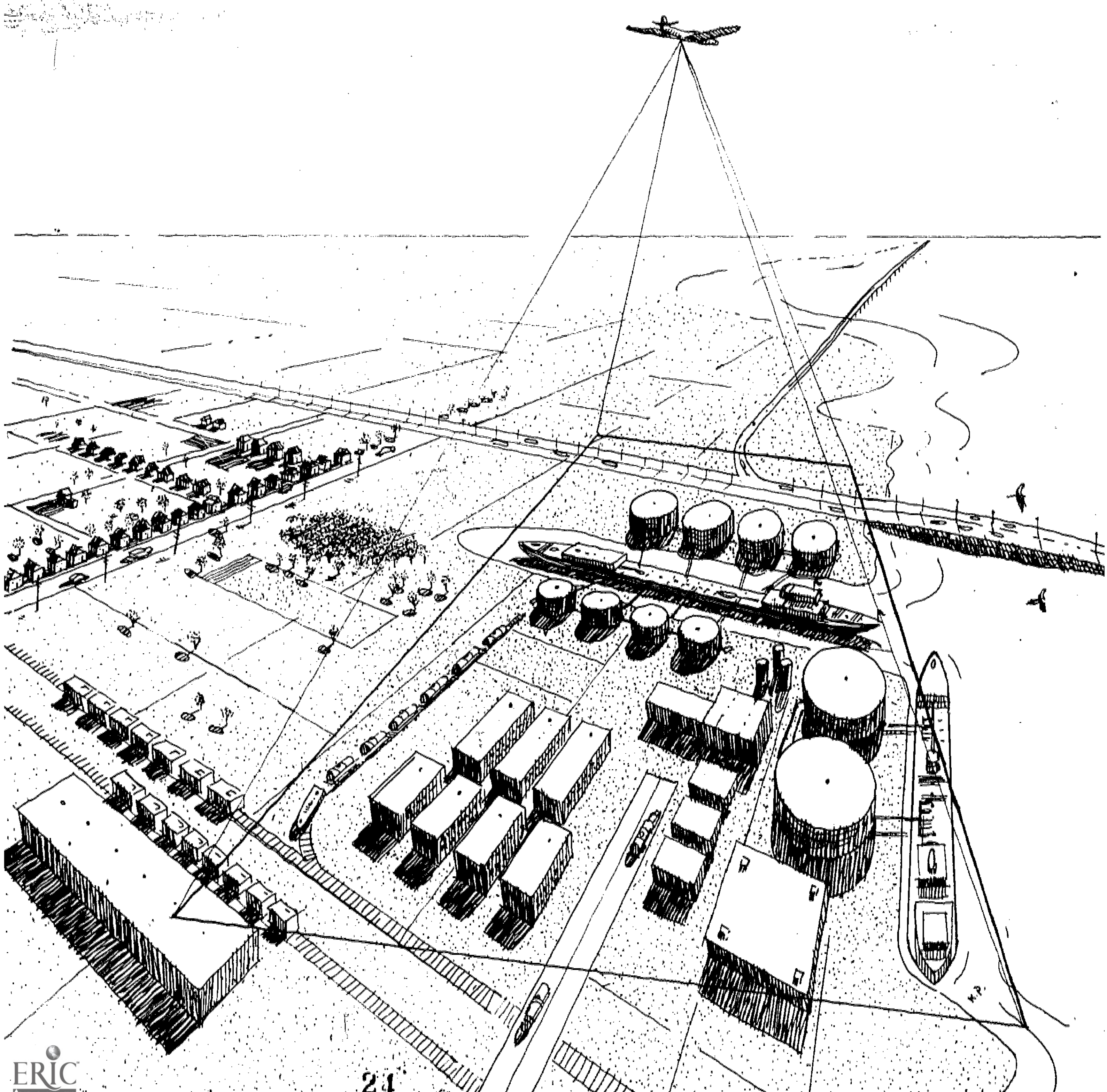
Finally, a word about contour lines, the solid brown lines appearing on topographic maps are called contour lines. By definition, a contour line is "a line on a map that connects points of equal elevation above some prescribed datum plane, usually mean sea level." You will note that mean sea level is the datum plane for the Wallingford Quadrangle and that contours have been plotted at intervals of ten feet in elevation. The way that contour lines behave on a map tells much of the story of the topography of the area: the closer together the contour lines . . . the steeper the slope. In areas that are relatively flat, contour lines will be widely separated. Note, further, that every fifth contour line is heavier and contains a number. This number indicates the elevation above the datum plane. On the Wallingford map, the number represents height above sea level.

TURN OFF THE RECORDER and study the contours on the Wallingford Quadrangle map. When you are ready to continue, turn the recorder back on.

The remainder of the unit consists of a series of forteen slides that are keyed to the Wallingford Quadrangle. The purpose is to show how reality, as it exists on the earth's surface, has been captured by symbolization on a map.

Turn to Guide Sheet # 5. On Guide Sheet # 5, we have described the sites which you will G.S. #5
observe in each slides. Place the slides in your viewer one at a time and read the description that matches the number of the slide, then look at the map. The fourteen sites are marked by bright triangles. Locate the site, and see how the photograph compares to the map symbol. Stop the recorder while you go through this exercise. Now that you have mastered some map reading skills you simply need to spend more time practicing. At the conclusion of this unit, spend time with your map, locating sites, measuring distances and determining which areas of the community are hilly or flat. There is a page of exercises at the conclusion of this unit to assist you in this exercise. Enjoy your study.

AERIAL PHOTOGRAPHY



OBJECTIVES

The ability to read, analyze and interpret aerial photographs is a required competence for the professional planner, and a welcome attribute for the concerned citizen. This unit has been designed to introduce you to the role that aerial photographs play in the planning process. In addition, it will assist you in the development of fundamental skills of photo interpretation.

More specifically, at the conclusion of this unit you should be able to:

1. Identify objects on aerial photography using information concerning size, shape, stone, texture, pattern, site and situation information.
2. Measure distance on an aerial photograph and translate those measurements into approximate distance on the earths surface.
3. Differentiate between new and old development areas using information on general layout and tree cover.
4. Identify rural suburban and urban areas on an aerial photograph.
5. Compare and contrast vertical and oblique aerial photographs.
6. Interpret code symbols on aerial photographs indicating month and year of the photograph.
7. Describe ways in which aerial photographs can be used in concert with topographic maps in the planning process.
8. Locate a source of aerial photographs for your community.

Before starting the tape recorder assemble the following:

from the kit:
- guidesheets
- cassette tape
- 5X7 index card with holes
- clear acetate

on your own:
- pencil
- scrap paper
- water based ink felt pen
- paper clips

BE A RECYCLER YOURSELF. WRITE YOUR COMMENTS, NOTES, AND ANSWERS ON SCRAP PAPER INSTEAD OF THESE GUIDE SHEETS. IN THIS WAY, THESE GUIDE SHEETS WILL BE AVAILABLE FOR THE NEXT PERSON IN YOUR COMMUNITY WHO WILL BE MAKING USE OF THIS UNIT.

CREDITS:
UNIT DESIGNERS: LARRY SCHAEFER
CHARLES FERGUSON

UNIT EDITOR: HARRY HAAKONSEN

Guide sheet #14 is based on an idea of Roger Clarke of the Yale School of Forestry and Environmental Studies.

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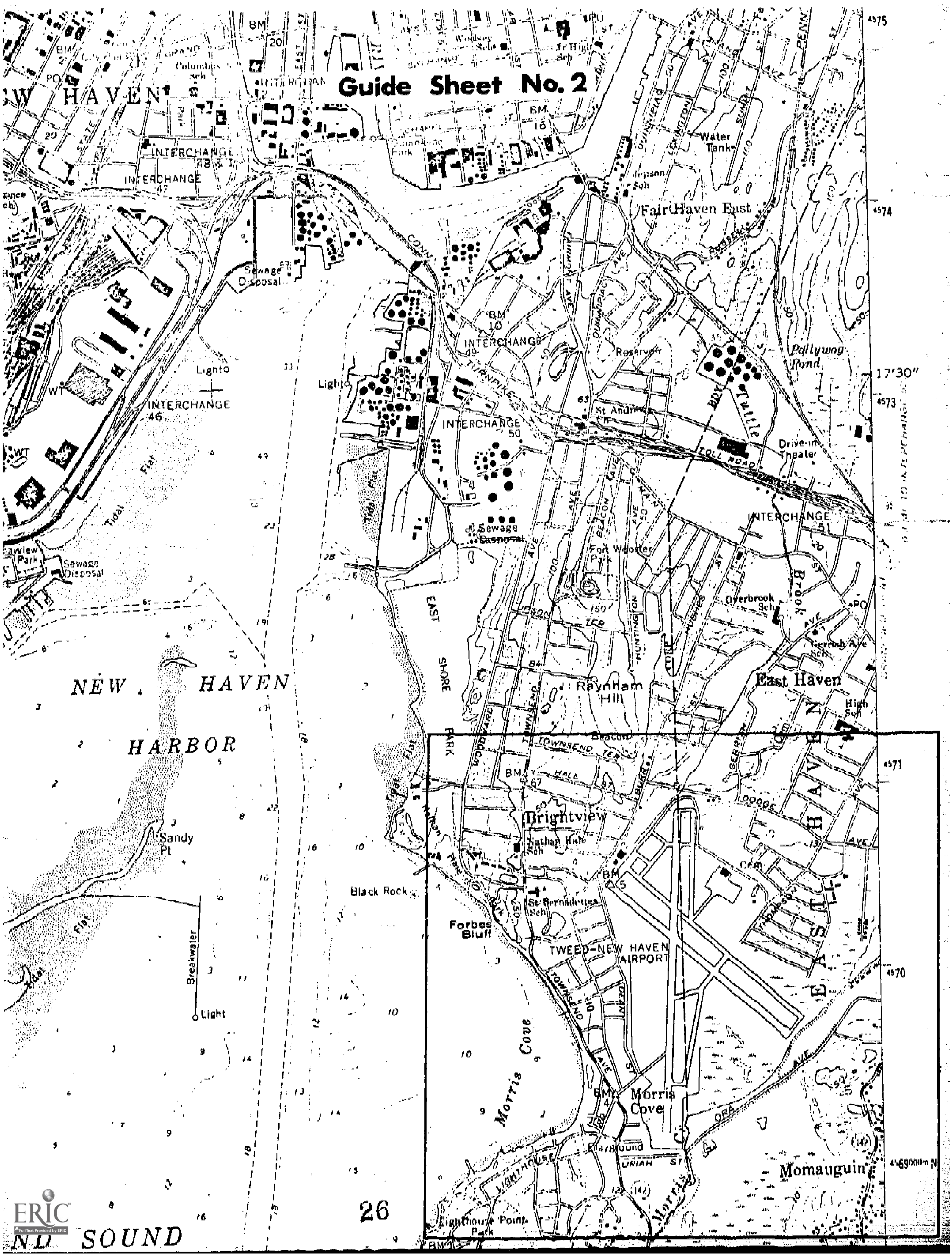
Guide Sheet No. 2



GUIDE SHEET NO. 3

Guide Sheet No. 3A

TASK SHEET BASED ON GUIDE SHEET #2 & 3

I. RELATIONSHIP BETWEEN THE SCALE OF THE TOPOGRAPHIC MAP AND AERIAL PHOTOGRAPH
Length of diagonal runway on aerial photograph (Guide Sheet #3) _____ inches.
Length of diagonal runway on topographic map (Guide Sheet #2) _____ inches.

$$\text{ratio} = \frac{\_\_\_\_\ \text{inches on aerial photograph}}{\_\_\_\_\ \text{inches on to topographic map}} = \_\_\_\_\_\_\_\_\_\_\_\_$$

$$\text{ratio of scale} = \frac{24{,}000}{12{,}000} = \frac{2}{1}$$

II. APPROXIMATION OF RUNWAY LENGTH BASED UPON AERIAL PHOTOGRAPH

a. Diagonal runway -
Scale of aerial photo _____ : _______
which means that 1 foot of 12 inches on the aerial photo = _____ feet on the earths surface therefore 1 inch = _____.
Length of runway = _____ inches...since 1 inch = 1000 feet the runway is _____ X 1000 = _______ feet.

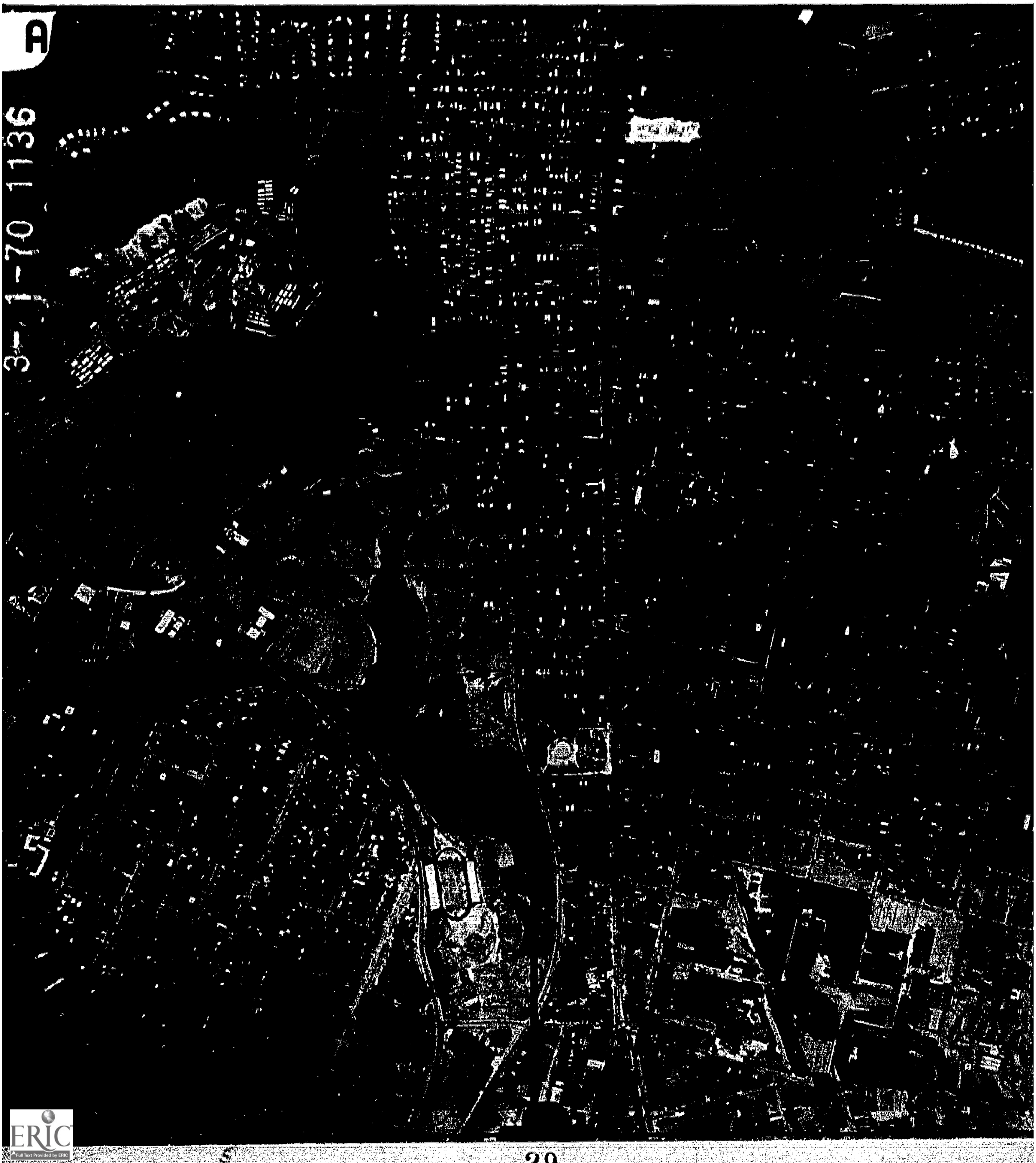
b. Main runway
Length of runway is ______ inches
Since 1 inch = 1,000 feet the runway is approximately _____ feet in length.

III. TOPOGRAPHIC MAP AND AERIAL PHOTOGRAPH COMPARISON EXERCISE
When instructed to do so turn off the tape recorder and study the topographic map on Guide Sheet #2 and the aerial photo from Guide Sheet #3 - By using both resources locate:

1. Nathan Hale School
2. Nathan Hale Park
3. Townsend Avenue
4. Morris Cove
5. Marshes
6. Morris Creek
7. Beach

As you can see, both aerial photographs and topographic maps provide us with detailed information about specific geographical areas. When used in concert, a great deal can be learned about regions of interest.

GUIDE SHEET NO. 4



Guide Sheet No. 5

RECOGNITION CLUES

A.1. SIZE

2. SHAPE

3. SITE and SITUATION - i.e. athletic field - school, storage tanks in port suggest oil, storage tanks away from harbor suggest water storage.

4. TONE (PHOTOGRAPHIC)
   objects that absorb light appear dark (e.g. water, forests)
   objects that reflect light appear light (e.g. frozen ponds, concrete roads)

5. TEXTURE

6. SHADOW

7. RELATIVE ELEVATION, DRAINAGE PATTERNS

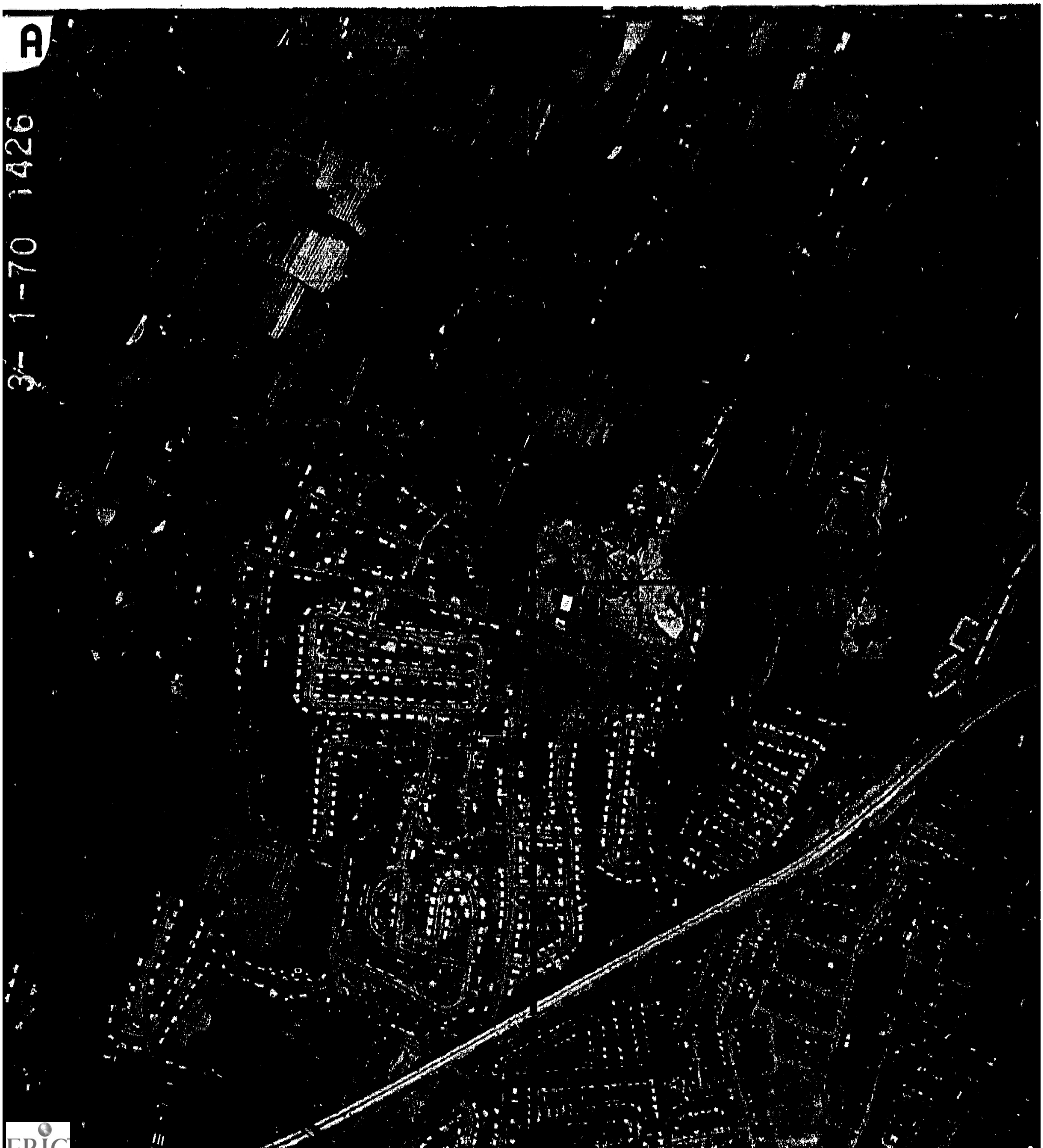
8. PATTERN - housing pattern
   orchard or nursery

B.

INDICATION OF LAND USE	CLUES
school	tracks baseball diamond football field large building
industrial area	large building nearness to other plants access to transportation parking lots
shopping center	large building parking lots access to transportation
recently built housing	few trees - vegetation further apart houses further apart houses larger on fringes of built up area not contiguous to older residential area change from rectilinear to curvilinear streets swimming pool in background
older residential area	tree lined streets rectilinear streets close to central business district
central business district	few trees or no trees buildings larger than houses public monuments scattered parking lots building close together
commercial or industrial	smoke stack water tower piles of sand or coal railroad spurs

GUIDE SHEET NO. 6

GUIDE SHEET NO. 7



Guide Sheet No. 8

LAND USE ANALYSIS ACTIVITY

INSTRUCTIONS:

1. Arrange guide sheets #7 and #8 in front of you. Locate a clear acetate sheet, a water soluble felt tip pen, and a few paper clips.

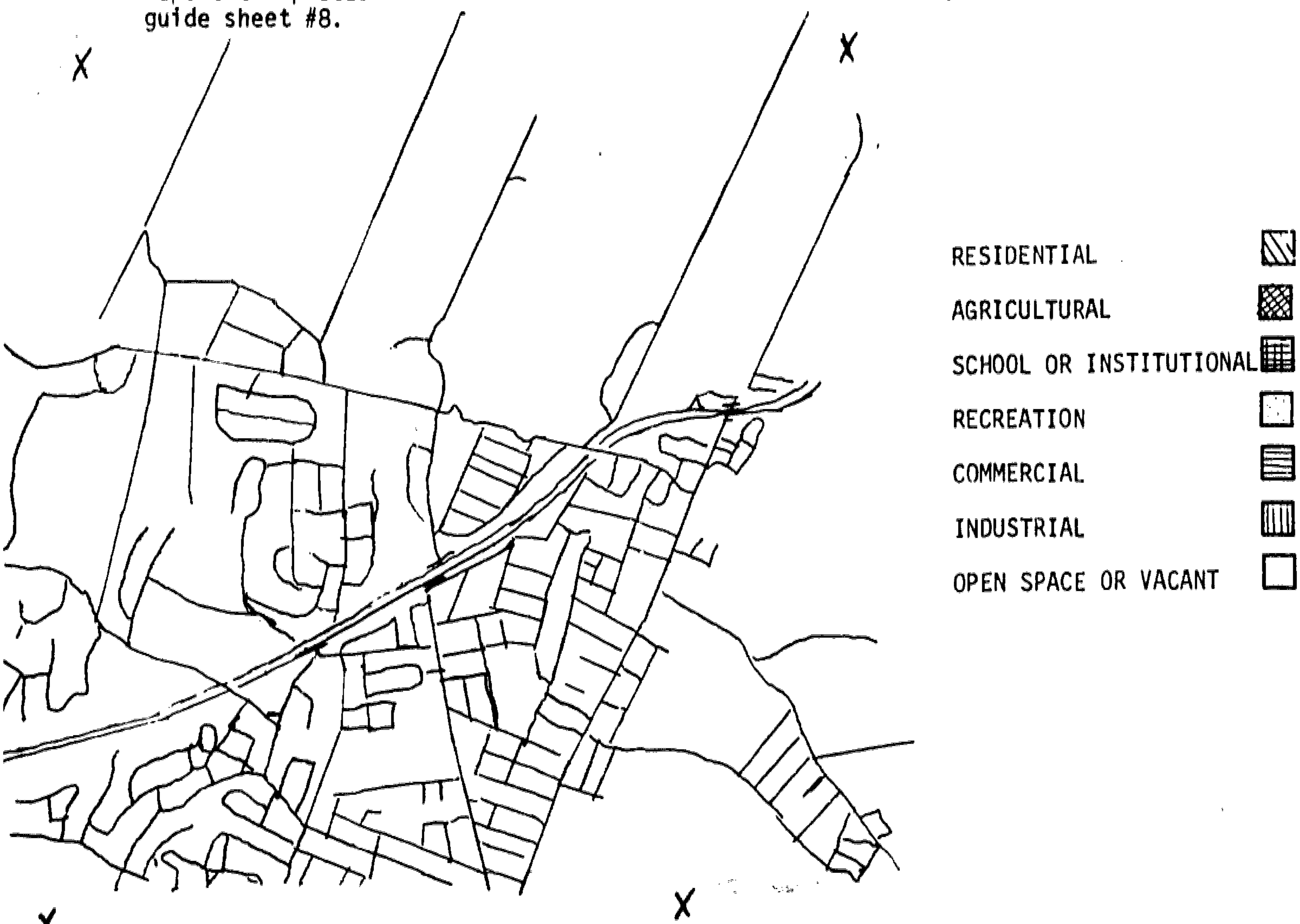
2. Attach the clear acetate sheet to guide sheet #8 with the paper clips.

3. Locate the area on the map which is included in the aerial photograph. Use key landmarks and street patterns to help locate the boundaries. Draw lines to indicate the borders of this area. You now have a square area on the map that includes the area on the aerial photograph. Note, the two squares differ in size since the map and the photograph are at different scales.

4. On Guide Sheet #8 is a list of land uses. Begin your land use analysis by transfering the information these land uses from the aerial photographs in guide sheet #7 to the map on guide sheet #8.

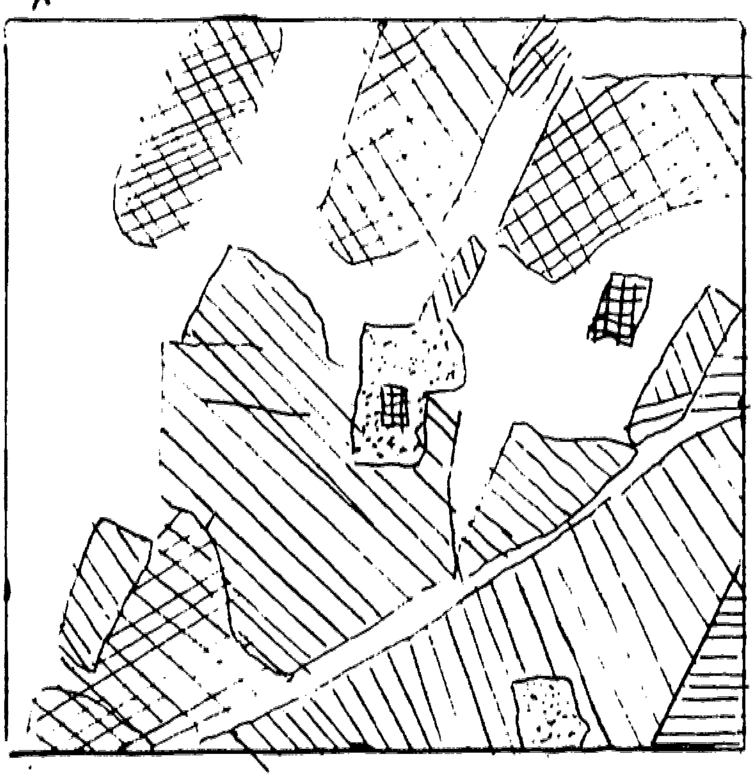
   For example, outline the residential areas on the map based on the information on the photograph. After you are finished outlining the residential areas, fill in the area with slashes as indicated by the key on guide sheet #8.

5. Repeat the process for each of the other land uses in the key at the bottom of guide sheet #8.

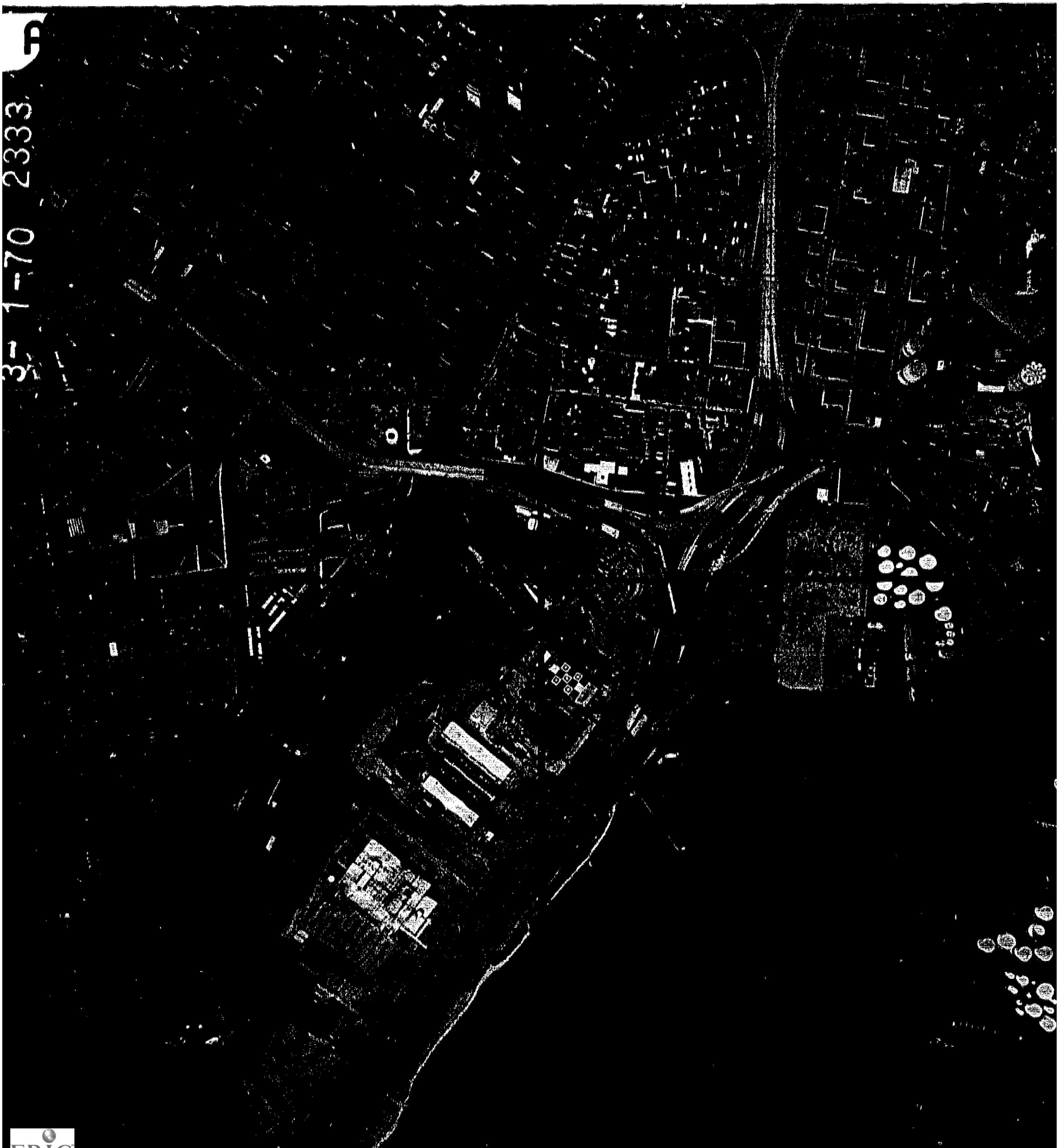


Compare your analysis to the result on guide sheet #8A. Return to the narrative by turning on the tape recorder after you are finished.

Sample Outcome to Guide Sheet No. 8



GUIDE SHEET NO. 9



Guide Sheet No. 10

WORKSHEET FOR ACTIVITIES ON GUIDE SHEET #9

SAVE THIS PAGE FOR THE NEXT PERSON. WRITE YOUR ANSWERS ON SCRAP PAPER.

1. Identify the land uses and major objects in each quadrant. Work carefully.

   A B C D

2. What is the actual length of the oil tanker (ship) at the dock in section D? (The scale of the photograph is 1:12,000.)

3. How many oil storage tanks are there in section D?

4. Do you see any areas where the water quality may be impaired? Where are they located?

5. Can you find the smoke plume? Where is it located?

6. In section B, what is the approximate length of the north - south interstate highway from the lower border of section B to the upper border of section B?

When you are finished, check your answers on guide sheet #11.

Guide Sheet No. 11

ANSWERS TO GUIDE SHEET #10.

1. Identify the land uses and major objects in each quadrant. Work carefully.

Section A

- central green or park
- three churches
- central business district
- taller buildings
- major highway
- highway terminates into parking lot
- railroad tracks

Section B

- light industry
- highway
- railroad
- power plant on island
- storage tanks
- highway interchange

Section C

- old residential area
- railroad yards
- new industrial area
- highway

Section D

- harbor
- oil storage tanks
- boats

2. What is the actual length of the oil tanker (ship) at the dock in section D? (The scale of the photo is 1:12,000.)

   5/8 inches or .625 inches

   Remember 1 inch equals 1,000 feet. The ship is approximately 625 feet.

3. How many oil storage tanks are there in section D?

   38

4. Do you see any areas where the water quality may be impaired? Where are they located?

   Yes, in section B around the island with the power plant. Also, in section D, around the ship at the top of the section.

5. Can you find the smoke plume? Where is it located?

   In section B, above the power plant on the island.

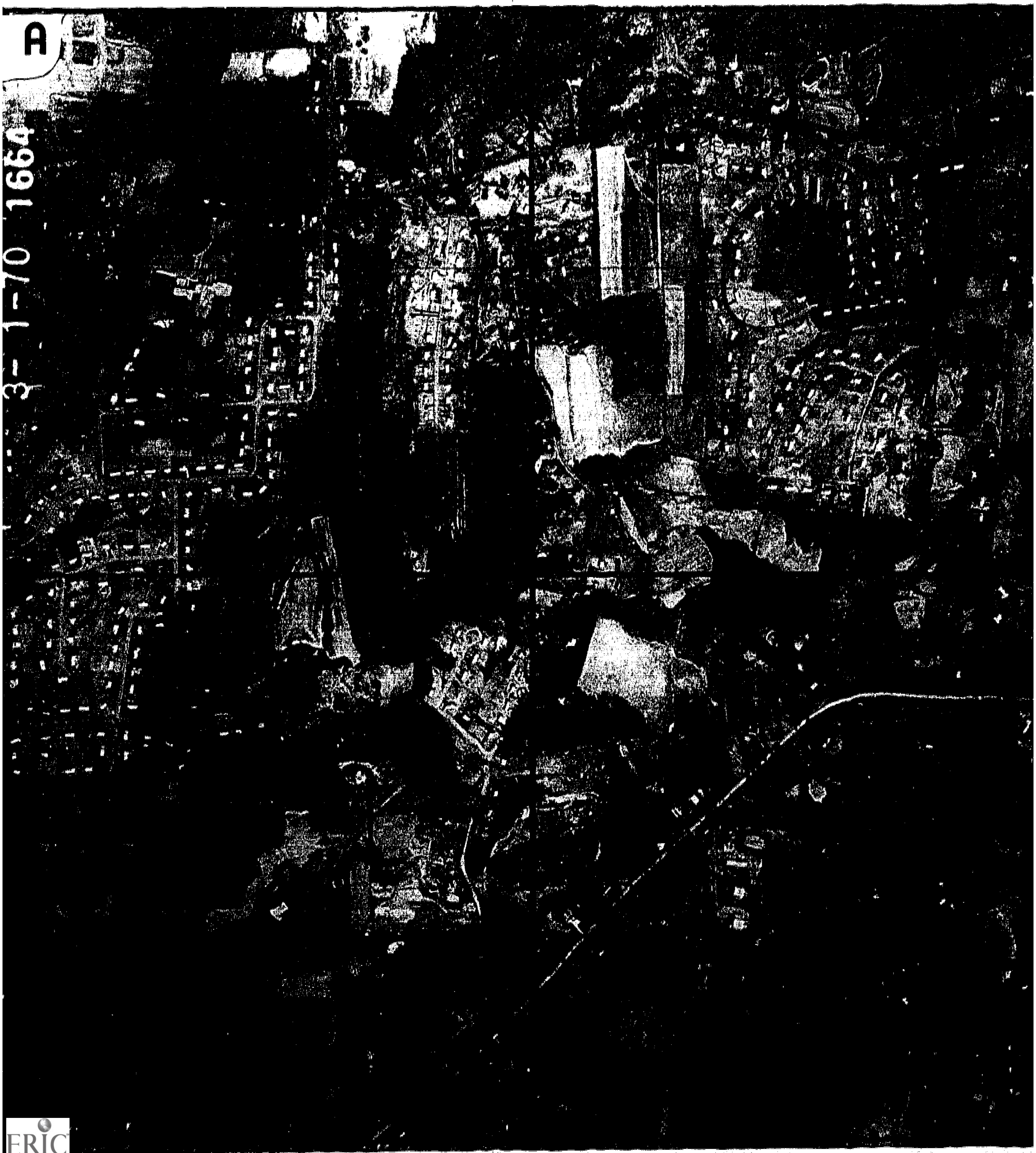
6. In section B, what is the approximate length of the north - south interstate highway from the lower border of section B to the upper border of section B?

   4 5/8" or 4.625 inches Remember 1" = 1,000 ft. Then 4.625" = 4,625 ft.

   1 mile = 5,280 ft. $4{,}625 \text{ ft.} \times \frac{1 \text{ mile}}{5{,}280 \text{ ft.}}$ is approximately 9/10 mile.

After completing your work, turn the tape recorder on again.

GUIDE SHEET NO. 12



Guide Sheet No. 13

RESIDENTIAL DENSITY

INSTRUCTIONS:

1. Locate guide sheets #7, #12 and also the 5X7 index card with the holes in it. The card is stamped with the title of the unit - aerial photography.

2. Place the index card over the residential area in guide sheet #7, section C. Count the number of homes inside the circle. Record the number of homes under site #1 under 1st reading.

3. Place the card down randomly twice more in the same residential area. Count the number of homes in the circle each time. Record your result each time in the appropriate place.

4. Finally, calculate the average residential density by averaging the three numbers and dividing by three.

5. Repeat the process for the two other area's listed under site #2 and site #3 at the bottom of this guide sheet.

6. Compare and contrast the residential density with the visual density and with the relative age of the residential area.

Site #1: Guide Sheet #7 - section C

1st reading

2nd reading

3rd reading

Total =

Divide by 3

Average Residential Density = ______

Site #2: Guide Sheet #7 - section D (below the highway)
Be sure to pick areas where you can clearly see the houses.

1st reading

2nd reading

3rd reading

Total =

Divide by 3

Average Residential Density = ______

Site #3: Guide Sheet #12 - section B

1st reading

2nd reading

3rd reading

Total =

Divide by 3

Average Residential Density = ______

After completing your work, turn the tape recorder on.

GROUND RULES FOR THE HIGHWAY CONSTRUCTION ACTIVITY

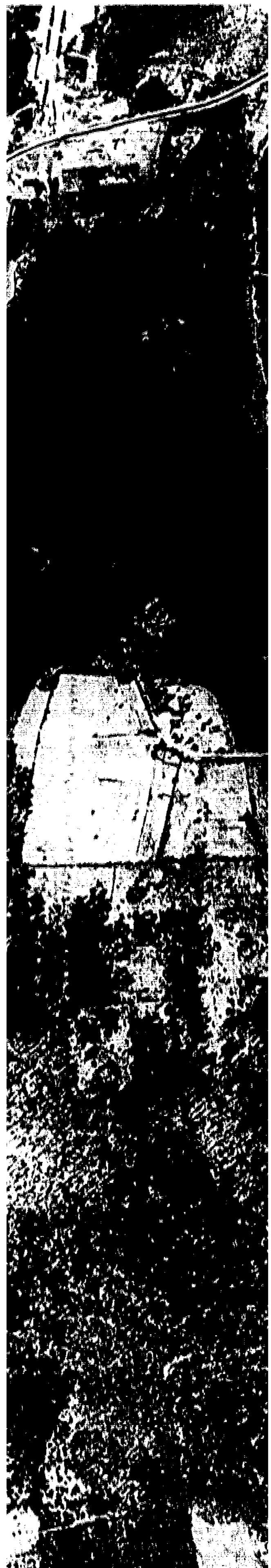
ON GUIDE SHEET #14

Place a piece of clear acetate over the map on guide sheet #14 and attach it to the map using several paper clips. Use a water soluble (non-permanent) felt tip pen or wax pencil to draw on the acetate...

TASK: As chief highway planner for the state, you are to study the region included in the aerial photograph on guide sheet #14 and propose a right-of-way for interstate 75. Interstate 75 will pass through the area from the south or southwest corner of the map to the north or north east corner of the map. You must select the route and draw lines on the acetate, representing the boundaries of the right-of-way. Since the right of way will allow for a six-lane highway, the drawing on the acetate should show a right-of-way 3/8 inch wide.

BACKGROUND INFORMATION: The area shown on the aerial photograph is in a remote part of the state. An existing state highway runs diagonally across the photograph. The existing highway goes in the general direction of the proposed interstate, but it is not capable of handling present and projected traffic flow. The most prominent feature in the area is a large lake in the lower section of the photograph. There is a large ridge abutting the lake on the eastern boundary.

* When you complete the drawing of the 3/8 inch wide right-of-way, turn the recorder back on!



Guide Sheet No. 17

I. SOURCES OF AERIAL PHOTOGRAPHS

A. Local Level
We suggest you start by contacting any of the following local agencies for copies of the aerial photographs of your town:

Town Assessor	Conservation Commission
Town Planner	Inland Wetlands Commission
Planning and Zoning Commission	Redevelopment Agency

B. Regional Level
The following regional agencies are often good sources:

Regional Planning Agency (See list in Introduction Unit.)
Soil Conservation Service - County Office (See list in Introduction Unit.)

C. State Level
The Natural Resource Center of the Department of Environmental Protection has a complete set of aerial photographs for the state.

Natural Resource Center
Department of Environmental Protection
State Office Building
Hartford, Ct. 06115

The U. S. Geological Survey Office in Connecticut has a set of computer corrected aerial photographs (ortho-photos) for the Connecticut River Valley. The principal advantage is that they are the same scale as the topographic maps.

United States Geological Survey
291 Main Street
Middletown, CT

The state transportation department often has aerial photographs for many areas of the state for use in highway planning. Their address is:

Connecticut State Transportation Department
24 Wolcott Road
Wethersfield, Ct. 06109

D. Federal Level
Most of the United States has been photographed in recent years for various federal agencies. The key to this photography is available - free - in map form as the "Status of Aerial Photography in the U. S." Copies may be obtained by writing to:

Map Information Office
U. S. Department of the Interior
Geological Survey
Washington, D. C.

or, in some cases

Soil Conservation Service
Cartographic Division
U. S. Department of Agriculture
Hyattsville, Maryland 20251

E. Commercial Sources of Vertical Photographs:

Keystone Aerial Surveys, Inc.
P. O. Box 217
Glenside, Pa. 19038

or, in Connecticut

Keystone Aerial Surveys, Inc.
P. O. Box 353
Glastonbury, Ct. 06033

F. Commercial Source of Oblique Photographs - aerial and documentary photography:

William and Virginia Welch
4 Boyce Road
Danbury, Ct. 06810

II. OTHER USES OF AERIAL PHOTOGRAPHS

Agronomy	Geologic Applications
Atmospheric Investigations	Highway Planning
Cartography	Natural Resource Inventories
Coastal Zone Planning and Management Studies	Ocean Investigations
Disease and Insect Detection	Recreation Planning
Erosion Problems	Regional Planning and Development
Flood Control	Soil Surveys
Forestry	Watershed Management

WORDS WORTH KNOWING

1. AERIAL PHOTOGRAPH. Any photograph taken from the air, whether or not of mapping quality.
2. FISHING. A technique of photo interpretation involving study of each object on a photograph.
3. FLIGHT LINE. Track along which aircraft has flown in obtaining aerial photographs.
4. LITHOLOGICAL. Derived from lithology, the science of studying the mineral composition and and structure of rocks.
5. OBLIQUE PHOTOGRAPH. An aerial photograph taken with the camera axis directed between horizontal and vertical.
6. OVERLAP. Amount - percentage - of aerial coverage common to successive photographs.
7. PHOTO ANALYSIS. Similar to photo reading but expanded to include a determination of feature interrelationships and qualitative evaluations.
8. PHOTO INTERPRETATION. Act of examining photographic images for the purpose of identifying objects and distributional patterns and assessing their significance to a particular study.
9. PHOTO MOSAIC. An assemblage of overlapping photographs matched to form a photographic representation of a portion of the earth's surface.
10. PHOTO READING. Lowest level of photo interpretation. Use of an aerial photograph or photo mosaic in identification of objects and distributional patterns.
11. PLANIMETER. An instrument for measuring the area of a plane surface.
12. SIDE LAP. Amount - percentage - of aerialcoverage common to photographs on adjacent flight lines.
13. VERTICAL PHOTOGRAPH. An aerial photograph taken with the camera axis perpendicular to the earth's surface and the film horizontal to the earth's surface.

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Audio Tape Script

Welcome to the audio-tutorial unit on aerial photography. In this unit, we will work together to develop your ability to read and interpret aerial photographs. Later in the unit, we will use the aerial photographs to update planning maps. In addition, we will see how aerial photographs can be used as a planning aid in making land use decisions. Before proceeding with the unit, turn the recorder off and review the objectives and instructions on guidesheet #1. (Pause) G.S. #1

Look at guidesheet #2. (Pause) Guidesheet #2 contains a reproduction of a topographic quadrangle map. This topographic map is similar to the one used in the map reading unit. The map on G.S. #2 does not have the color coding system of a regular topographic map. The colors have been deleted by the reproduction process. G.S. #2

While the map is informative, it does not contain as much information about this area as we might like to have, if we were employed as planners. Since the map represents an urban area most of the buildings or other land uses are not represented on the topographic map.

A planner interested in working on a project in this area might turn to a pictorial representation called an aerial photograph. Guidesheet #3 contains a standard aerial photograph used by many planners.

Aerial photographs utilized by planners are generally black and white and are taken by a camera mounted in the floor of a fixed wing aircraft. The plane flies in a constant direction and at a constant altitude above mean ground level, generally less than 10,000 feet. The photographs may be taken vertically, that is, with the camera pointed directly at the earth's surface, or obliquely, that is, with the camera pointed at a pre-determined angle of departure from vertical.

The State of Connecticut is completely covered by mapping quality photographs taken in 1970 at the scale of 1:12,000. Some local areas are covered by more recent photographs, which may have been taken at a scale different from that of the complete coverage of the state.

To facilitate communication about locations on the aerial photographs, we have arbitrarily divided each aerial photograph into four quadrants. As you look at G.S. #3, you see that dividing lines have been drawn on the photograph. Normally quadrant lines and letters are not found on aerial photographs.

When I suggest that an object is located in section A, I am referring to the upper left hand section of the photograph. Section B refers to the upper right hand section, while sections C and D are the lower left and right hand quadrants respectively.

The dominant feature of the aerial photograph or guide sheet #3 is the airport with its two runways. By inference, we might expect to find an airport terminal and hangar near the runway. If you look carefully you will see the terminal in section A at the left end of the diagonal runway. Notice the small planes parked near the terminal. (Pause) Look closely! Look at the opposite side of the vertical runway. In quadrant B, can you see a hangar and an airplane tie down area? (Pause) Now look at the area surrounding the airport. (Pause) G.S. #3

What are the land uses in the area? (Pause) Correct. The primary land use in the area is residential housing. Note the extensive housing in sections A, B, and C especially along the shoreline in sections A and C. From the information content of the photograph, can you suggest a potential environmental problem for this residential area? (Pause) Correct, noise. Noise is a significant environmental problem. The frequency of take-offs and landings determines the level of annoyance the airport creates.

Compare the information content of the photograph on G.S. #3 to the topographic map on guide sheet #2. (Pause) Note that the topographic map does not represent each house. Why do you think the houses have been left off the topographic map? On the original topographic map this area was colored red. As you recall, the color red on a topographic map indicates a built up area. Because of the large number of buildings in these areas each individual building is not represented by a symbol on the map.

To the planner, aerial photographs offer many advantages over other data forms. An aerial photograph, when properly taken, captures reality in every visible detail. By contrast, a topographic map, is selective and frequently generalized because of scale limitations. Thus, an aerial photograph, while it may contain more detailed information than you need, is more reliable and provides more useful information than a topographic map. The only major deficiency aerial photographs present is the absence of elevation information.

However, aerial photographs provide the planner with a permanent and unbiased record of all reality visible to the camera. Finally, since individual photographs are fixed in time, they provide the planner the facility for stepping backward in history as a situation may require. For example, "before and after" photographs of an area in which the environment has been misused by a developer might become essential evidence in a court case. Or, a zoning decision could, conceivably, be based upon evidence of a particular condition having existed in the past.

Compare the size of the airport on the reproduced topographic map with the size of the airport on the aerial photograph. (Pause) The airport on the aerial photograph is larger...it is larger because of a difference in scale between the map and the aerial photograph.

In the unit on maps and mapping, we are told that topographic maps are generally drawn at a scale of 1:24,000. The vertical aerial photographs we are using in this unit are taken at a scale of 1:12,000. The ratio 1:12,000 means that one foot on the photograph represents 12,000 feet on the ground. Because there are some distortions of scale with changes in the altitude at which aerial photographs are taken, we will use scale to provide approximate distance on the earth's surface.

while keeping Guide Sheet's #2 and 3 in front of you.
Look at guide sheet 3A. Measure the length of the diagonal runway on the topographic map. Then measure the length of the same runway on the aerial photograph. Write your measurements on G.S. 3A. (Pause) Finally, determine the relationship between the two measurements? If you wish, turn the recorder off while you perform these tasks. (Pause) Now compare your measurements to mine. The diagonal runway in the photograph is 4 inches long while on the map it is only two inches long. In other words, the length of the runway on the aerial photograph is twice as long as the representation of the runway on the map. This is consistent with the scale of the photograph being 1:12,000 and the map being 1:24,000. Because of the differences in scale, care must be taken in transferring information from the photograph to the map or vice versa. G.S.#3A

Given the scale of an aerial photograph and a ruler, it is possible to approximate the size of real objects on the earth's surface. For example, the actual length of the runway in the aerial photo can be approximated from the scale of the photograph and our measured length of the runway in the photograph. Follow the exercise on guide sheet #3A part II. A scale of a:12,000 indicates 1 foot or 12 inches on the photograph represents 12,000 feet in reality. If 12 inches on the map is equal to 12,00 feet on the earth's surface, then one inch will equal 1,000 feet. We measured the length of the diagonal runway on the photograph as 4 inches. If 1 inch equals 1,000 feet, then the runway must be approximately 4,000 feet in length. Have you been able to follow the exercise II on guide sheet 3A. Stop the recorder and review the exercise. Then use the space provided on guide sheet 3A to approximate the length of the main or vertical runway shown in the aerial photograph. (Pause) How did you make out? According to our calculations, the main runway is approximately 5,750 feet long. The same procedure we have just followed can be used to approximate distances or size on the topographic map. The major difference is scale. On the topographic map 1 inch equals 24,000 feet, or 1 inch equals 2,000 feet.

Now let's take some time to compare the topographic map with the aerial photograph. The topographic map can provide important information which may not be obtained from aerial photographs of a given area. Locate the area in section D of the aerial photo on the topographic map. As you study the map, you will find that it indicates that section D in the aerial photo should have extensive marshes. Try to find the marshes on the photograph. Without the map information, would you have identified the marshes or would you have assumed the area to be dry open space? Can you find St. Bernadettes School on the aerial phot? Try locating St. Bernadettes school on the map. Then locate it on the aerial photo. Take some time to compare the map and the aerial photo. Try to locate the beach, the Nathan Hale School, the Nathan Hale park and a few other sites from the list at the bottom of guidesheet 3A. Try to locate them both on the map and the aerial photograph. Turn off the recorder while you carry out this activity. (Pause)

Now that you have learned to identify specific sites on an aerial photograph, let's turn to some more demanding tasks. Guide sheet #4 contains a complex aerial photograph which we will analyze by carefully assembling recognition clues. The recognition clues are outlined on guide sheet #5. (Pause) G.S. #4 G.S. #5

Interpreting aerial photographs by features recognition and identification is difficult when first attempted, but becomes relatively easy as you acquire a "recognition vocabulary" through practice and experience. As is true with map reading, a series of recognition clues exist that facilitate the work of photo interpretation. In time, the sifting of evidence for a clue will become automatic; however, for the foreseeable future, you will need to make a conscious effort to insure that every possible alternative has been explored.

The characteristic of size, the first recognition clue on guide sheet #5 is sufficient to enable you or a photo interpreter to recognize many features on an aerial photograph. Certainly, you would never confuse an interstate highway with a secondary road, or a high rise apartment with a single family dwelling. Size must, of course, be interpreted in terms of the scale of the photograph. Once you become accustomed to dealing with scaled images, the problem of scale relationships largely disappears.

Section D of guide sheet #4 presents a good area for a study of size relationships. Try to locate the industrial complex in section D of guide sheet #4. It is relatively easy to identify the large industrial complex since the buildings in the complex are not the same size as the homes surrounding the complex. In this aerial photograph, we can identify and note the size of the buildings. In addition, we can detect air contaminants coming from the industrial smokestacks and moving toward the bottom right corner of the photo.

Shape is the second important clue for recognition of objects on a photograph. Anyone who has ever seen an aerial photograph of the Pentagon in Washington recognizes it again immediately. No clue other than the shape of the structure and the knowledge of its existence is necessary.

Similarly, less dramatic but more common shapes such as athletic fields can help us identify a school. In section C, you will see an oblong track and football field. Below the field on the photograph is a complex of buildings that comprise a high school campus.

The relationships which exist among sets of objects gives us another recognition clue called site and situation. Site and situation provide acceptable evidence for the identification of many objects. For example, the fact that a large building is visible in a photograph does not establish its identity. However, when an athletic field can be recognized in the adjacent area, the combination suggests a school complex. Similarly, large storage tanks located in a port area indicate oil storage facilities; while identical tanks away from the port, and at elevation, suggest water storage. Errors are possible when undue reliance is placed on evidence of site and situation, but the site and situation can help significantly in photo interpretation.

Contrast, or photographic tone as it is called by some experts, is a particularly valuable clue to the identification of certain features. Those objects that absorb light, such as water saturated soil, appear dark on an aerial photograph; whereas, those that reflect light, such as frozen ponds and concrete roads, are relatively light in tone. An experienced photo interpreter can, with a high degree of accuracy, use tone differences as an index for classifying roads and vegetation types, and for carrying out certain water quality studies.

Section C of the photograph on guide sheet #4 provides a good demonstration of how photographic tone can be used in identifying an area. Remember, objects which absorb light, such as water, appear dark. Notice the small dark circular area stradling sections A & C and the larger dark area which starts in section A and meanders down by the athletic field. The small circular area is a small body of water known as Beaver Pond. The large dark area is a body of water in Beaver Point Park.

The other recognition clues will be discussed only briefly at this point since they are not present in sufficient detail on this photograph. We will illustrate them as they arise on other photographs.

The texture of the photographic image, which is one indication of the nature of the object itself, assists in the differentiation of vegetation types, and in assigning agricultural land use categories. Effective use of texture as a clue for photo interpretation requires considerable experience: however, even the beginner can detect texture variation.

The presence of shadow on a photograph may be either a help or a hindrance, or both at the same time. Individual oil derricks, bridge columns, and industrial smokestacks that defy recognition by other means can often be identified by the shadow they cast. On the other hand, the shadow may . so obscure detail at ground level that it becomes difficult to conduct an interpretation. Most aerial photography for analyric purposes is taken at midday to avoid shadows.

Relative elevation, drainage patterns and other topographic evidence are used by the skilled photo interpreter in evaluating soil conditions and delineating vegetation zones. In some situations, topographic evidence may combine with tone and other clues to indicate water conditions. When adequate evidence is available, professionally sound conclusions with respect to planning can be drawn.

For the recognition of many urban and physical features, pattern offers an important clue. Visualize for a moment the pattern associated with a suburban residential development -- the winding streets, two car garages, similarity of house configuration and, increasingly, the backyard swimming pool. All of these features can be distinguished on an aerial photograph and assist in the delineation of residential areas. Orchards, with the regular spacing of trees, are especially easy to identify on a photograph. Similar examples could be drawn from a list of physical features. For example, streams are classified by pattern, which is important in determining terrain conditions.

All of the above are clues to be used, but not abused, in interpreting an aerial photograph. Possibly more important than anyone of these to the planner or concerned citizen are local knowledge and experience. When the interpreter uses his accumulated knowledge and experience in conjunction with photographic evidence, the results are greatly enhanced. The significance of this statement will become increasingly apparent as you progress through the other units in the series.

On the bottom of guide sheet #5, we have arranged some additional clues in another fashion. In this section, the land use is identified first and then clues associated with it are noted. Both techniques have value in aerial photo interpretation. Choose the combination that makes you the best detective.

Now turn to guide sheet #6. You may want to use the list of recognition clues from guide sheet #5 as we go through the exercise. (Pause 5sec.) Before we go any further, stop the recorder and spend a few minutes familiarizing your self with the aerial photograph. When you are ready to proceed, turn the recorder back on. (Pause) G.S. #6

The most dramatic feature in this aerial photo is the large interstate highway. Note the highway interchange in section C. Highway interchanges usually indicate that there is some commercial or industrial development in the area. The interchange empties onto a major feeder road. On both sides of this road, we find large buildings. These are probably commercial or industrial establishments.

In section A, try to locate the following: the meandering stream, (pause) the forested area around it, (pause) the large industrial building, (pause) the railroad tracks, (pause) a residential area, (pause) and an oval track (pause). Section B contains some residential land, but the most prominent feature is the golf course on the right side of the interstate highway in the upper corner of section B. The major recognition clue to this was the shape of the fairways and greens. Information from a topographic map confirmed our decision. Section C provides a contrast between old and more recent residential housing developments. Notice that the housing on the left hand side of section C is surrounded by thick heavy vegetation. (Pause) In contrast, the housing on the right hand side of section C has more open space, fewer trees and more lawns. Another clue to the relative ages of the housing areas is the grid like pattern of streets in the older residential neighborhood versus the less patterned more curvilinear streets of newer housing developments.

In section D we find another good illustration of pattern. Can you find an orchard or nursery in section D? The recognition clue is orderly rows of trees or shrubs. Such a pattern indicates an orchard or nursery. An orchard is located at the center of the top of section D. An on site visit confirmed our decision.

Let's continue with guide sheet #7. (Pause) Begin by doing your own analysis G.S. #7 of the aerial photograph. Keep notes on scrap paper of your identifications. We will make use of them in the next exercise. Turn the recorder off while you work. (Pause).

Let's compare notes on guide sheet S7. Section A and B are primarily composed of agricultural land. There is a major four lane highway going through sections C and D. The residential areas of section C appear to be relatively new when compared to the residential area in the right hand side of section D. The recognition clues used in reaching this conclusion were street pattern, distance between houses, and vegetation around the individual homes. At the intersection of sections A,B,C, and D there is a school. It was identified by its proximity to the baseball field. Another point of interest on this aerial photograph is the complex of apartments near the right hand edge of the photo, straddling the boundary between sections B and D.

By now, I am sure that you have observed the numbers in the upper left hand corner of each aerial photograph. For instance, as in this photograph, 3-1-70, 1426. 3-1-70 is the date of the photograph -- March 1, 1970. The last four digits - 1426 - are an index number to help locate the aerial photograph on a base map. Do you have any idea why the photograph was taken in March. (Pause) Right. There are no leaves on the trees in March. Consequently, we can see more detail since the leaves will not camoflage objects from the photo interpreter.

If you want more time to study and interpret the aerial photograph on guide sheet #7, do this now. Then, turn to guide sheet #8, to complete the land use analysis activity. Turn off the recorder. G.S. #8

Welcome back! How did you make out? (Pause)

I am glad you did so well.

Why would a planner want to complete a land use analysis for this area? A detailed discussion of the rationale for land use analysis will be found in the cultural unit. However, a simple question will illustrate the point. If you lived in a residential neighborhood in section C, would you want a large industrial complex located near you? Would you want a recreation area such as a park located near you? Adjacent land uses do make a difference. Maps such as the one you just prepared fulfill that function.

Now that you have acquired some skills and experience at photo reading, we will give you a chance to exercise your abilities. Guide sheet #9 contains an aerial photo of an urban area. G.S. #9
Guide sheet #10 contains a series of questions and exercises. Turn off the recorder and complete guide sheet #10. (Pause). G.S. #10

While guide sheet #9 is in front of you let's look at some new recognition clues that we have not seen before. Did you identify the oil storage tanks in section D? This is a site and situation clue. The site is the harbor with tankers and tanks. Since the tanks are situated close to shore we conclude that these are oil storage tanks. Did you notice the tall buildings in section A? The length of the shadows cast by the buildings is a clue to their height. Did you notice how some of these seem to stick up at you? If you have not studied the clues for a central business district, focus your attention on section A and study the recognition clues. (Pause - 3 sec.) Finally, let us look at the city green in section A. There are three structures on the green. The tall steeples indicate the two upper structures are churches. What do you suppose the lower structure is? Could it be a church too? The answer is yes. But it is hard to tell! The clue that leads us to recognition is the shadow of the building. If you look at the aerial photograph closely, you will see the shadow of the steeple. Properly used, shadows can be valuable clues.

Aerial photographs can also tell a story. Look at guide sheet #12. (Pause) As you will G.S. #12
hear many times in the Land Use Decision Making Kit and in articles in many states about land use planning, the loss of prime agricultural land is a critical problem. The aerial photograph on guide sheet #12 dramatically illustrates the cause of this loss.

Let's begin by studying section B. It is easy to see that once this was mostly agricultural land but has recently been converted to suburban, low density housing. We will discuss the problem of the loss of agricultural land in the Uplands Unit. You may want to refer back to this photograph when you complete the Uplands Unit.

Another concept that can be illustrated by an aerial photograph is differences in residential G.S. #13
density patterns. Turn the recorder off and complete the activity on guide sheet #13.

How did you calculations go? My results were as follows: guide sheet #7, section C __________, guide sheet #7, section D__________, and guide sheet #12, section D________. Did you find the same results?

Your experience with aerial photographs would not be complete without an opportunity to utilize an aerial photograph for planning purposes. To give you some experience in the planning process, we have designed an activity in which you will assume the role of a planner in the highway department. Under the direction of the department of transportation, a series of surveys have been conducted to determine whether or not a new interstate highway is needed by the state citizenry. Based upon survey information, the governor has concluded that it is necessary to build Interstate Highway 75. The highway will pass through the region shown in aerial photograph on guide sheet #14. G.S. #14

Your task as the highway department planner is to select the best route for the highway right of way. Specific instructions for the activity can be found on the page opposite guide sheet #14. Turn the recorder off while you complete the activity. (Pause)

Welcome, back! How did you enjoy the role of a highway planner? (Pause) Compare your results in the hypothetical planning exercise to an actual decision rendered on the project.

The aerial photograph in guide sheet #14 was taken in 1930. On guide sheet #15 is an aerial photograph taken in 1975 of the same area showing a complete interstate highway through the area. Please note the two photographs are at different scales. How did your decisions compare with those of the State Dept. of Transportation? Based upon your present knowledge, would you modify the plan which was carried out by the state highway dept. in 1930? G.S. #15

We will use the subject of highways to examine one other aspect of aerial photography. Up until now, we have concerned ourselves with vertical aerial photographs. That is photographs taken with the cameras line of sight perpendicular to the earths surface. For most purposes, vertical photos are most useful. However, on occasion oblique aerial photographs prove to be of value? An oblique aerial photograph gives us a birds eye view of an area...It is taken on an angle rather than vertically. To classify the difference between the obique and vertical aerial photograph consider the following situations: an oblique aerial photograph is taken from the perspective of the pilot looking out of the front or side of the airplane cockpit or a standard aerial photograph from the perspective of an individual sitting in an airplane looking out the bottom cargo door straight down. Guidesheet #16 contains two oblique photographs. Compare the oblique photograph to the standard vertical aerial photographs shown on earlier guidesheets. Can you see the difference between oblique and vertical aerial photographs? To emphasize the difference compare the interchange in the top photograph on guide sheet #16 with the interchange in the vertical aerial photograph in guide sheet #16. (Pause) G.S. #16

Oblique aerial photographs are generally used for documentation and are not suitable for planning or mapping purposes.

The final topic covered by this introductory unit on aerial photographs is a discussion of the proper method for carrying out a photo interpretation. The initial requirement is a definition of the problem, with respect to both the subject to be investigated and the geographic area to be covered. After the problem has been defined, you should obtain as much information from non-photographic sources as possible in order to acquire the knowledge that will be necessary to proceed. If the geographic area to be investigated is one in which you live, or nearby, the task is simplified. Local government agencies, libraries and persons knowledgable about the area are all resources that can be exploited. Guide sheet #17 contains a suggested list of resources for your area. G.S. #17

Since you will normally be working with both maps and aerial photographs, it is recommended that you plot, either on the map or on a sheet of transparent paper placed over the map, the area covered by each photograph, indicating the photograph number for easy reference. When this has been done, a cursory examination should be carried out on all photographs. The purpose of the cursory examination is to familiarize yourself with the broad characteristics of the area, and to acquire a measure of confidence.

The detailed photo interpretation, which follows, may take either one of two forms. In the first approach, which is referred to as the "fishing" method, every item on the photograph is investigated, whether or not is seems to be relevant to the study. The advantages inherent in this approach are that it provides a safeguard against future surprises and enhances the quality of the final report. The primary disadvantage is that the method is slow.

The second approach is predicated upon probability. The photo interpreter proceeds directly to those areas in which the answer is apt to be found, and examines only this items of detail that are likely to contribute to the final answer. The advantage is that the method is fast. The disadvantages are that the photo interpreter must be relatively experienced and surprises are more frequent.

Photo interpretation has a broad application to land use planning, and is a technique that can be used effectively at the local level without the necessity of spending a large amount of money.

Thank you for joining us!