

# Aerial Infrared HTHW Loop System Surveying

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0111, 3550.364N, 07840.699W,



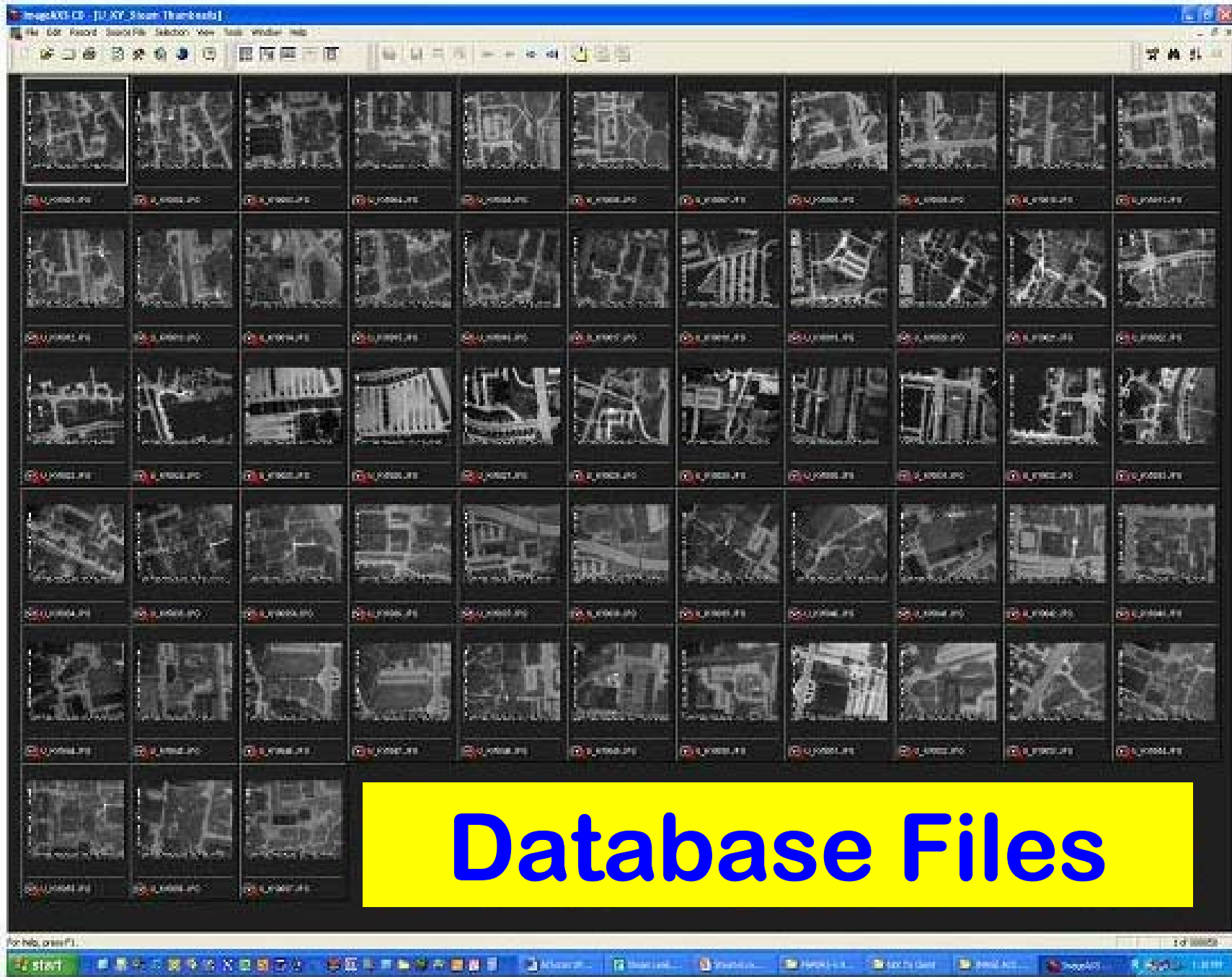
**Aerial Infrared Thermographers  
present...**

**A Qualitative  
Aerial Infrared Survey  
of the HTHW Loop  
At the  
*Example State University***



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0111, 3550.30

9/00, 02151F  
, 49KTS, 139



**Database Files**

# Aerial Infrared HTHW Loop System Survey Report

## Example State University

The Example State University HTHW Loop System was the subject of an aerial infrared (IR) survey on the night of April 19, 2001. The weather was cool and dry with clear skies with light surface winds, providing good infrared imaging conditions. Daylight hours were sunny and warm. The imaging began at 2200 and ended at 0015 on April 20, 2001. An additional period of imaging occurred between 0530 and 0600 on April 20, 2001 when air temperatures dropped to approximately  $-1$  degree Celsius. This report includes:

- Digital image files of selected infrared images on CD-ROM,
- ImageAXS-CD image viewing and keyword search software,
- Previously delivered VHS videotapes of the IR imagery,
- MiniDV digital videotape copy of the IR imagery
- PowerPoint Presentation with images that we selected as needing further investigation.

### Analysis

Example State University seems to have a HTHW system that is comparatively good condition with few leaks and generally good insulation. The HTHW line thermal signatures are always less bright than steam systems.

The imaging flight of Example State University HTHW system occurred under good conditions and was flown at average altitudes of 1000 to 2500 feet above ground level. The images were captured from the original digital video tape and subjected to light brightness and contrast adjustments prior to being recorded on CD-ROM and assigned key words in the ImageAXS-CD software program to assist in identifying locations of the hot water/steam lines and searching the collection of images. Key words are principally street and building names and are assigned to the images when the image contains a given street or building.

### Recommendations

We recommend the Brown University maintenance team carefully review the videotape, infrared digital images and the images contained herein. Then, with reference to the IR images provided, the underground lines that appear to have faults or unusually bright signatures should be physically located and given a thorough visual examination for signs of heat loss or insulation breakdown. When test results are noted, a maintenance decision can be made concerning repairs.

All original videotape is maintained at our offices for historical record keeping purposes and may be used for comparison with future aerial infrared surveys.

*Greg Stockton*

# ***Understanding HTHW Infrared Imagery***

***Thermal infrared (IR) imagery is imagery that shows heat. It is often in the form of a grayscale picture whose scales (shades of gray) indicate the differences in temperature and emissivity of objects in the image. As a general rule, objects in the image that look lighter are warmer and those that look darker are cooler. Bright white objects are the warmest in the images. Black objects are the coolest.***

***The infrared picture only shows objects which emit infrared wavelengths in the 3000-5000 nanometer (3-5 micrometer) range; objects in the visible light wavelengths of 400 to 700 nanometers (i.e., normally visible to the human eye) are only detected because they also emit heat. An example of this would be a street light that can be seen in the imagery. Any object with a temperature above absolute zero (0 Kelvin or -273 degrees Celcius) emits infrared radiation.***

***We record infrared imagery on digital videotape and may later copy it to a VHS videotape or a JPEG digital image file. We may modify the image to enhance its value to the end user, such as creating a false-color image or adjusting the brightness and contrast of a gray scale image. The digital images are captured directly to BMP or JPEG format and placed on a CD-ROM. The digital videotape and CD-ROM usually have the highest resolution and contain the most easily viewed infrared images.***

***Underground HTHW Loop system lines are almost always readily visible with infrared imaging, even when no notable problems exist. This is due to the fact that no matter how good the insulation, there is always heat loss from the lines which makes its way to the surface. Problem areas are generally quite evident, having brighter white IR signatures that exceed the norm. Typically, steam line faults appear as an overheated line or as a large hotspot in the form of a bulge or balloon along the line. Overheated lines often occur when the steam line is located in a conduit or tunnel. If there is a leak in the line it will heat up the whole conduit with escaping heat. If a line is buried directly in the ground with an insulating jacket, a leak will usually saturate the insulation, rendering it largely ineffective and will begin to transfer heat into the ground around the leak, producing the classic bulge or balloon-like hot area straddling the line.***

***Finally, some leaks may show up as an overheated manhole or vault cover. Manholes or vaults that contain steam system control apparatus which are leaking will often heat the covers to warmer than normal temperatures. Unless these leaks are severe enough to significantly raise the manhole temperature above their normally slightly elevated temperatures, these leaks can be difficult to identify. HTHW line imagery can be a little misleading, unless one understands and interprets the relative brightness/temperature of a given line correctly. A steam line that is the same temperature from one end to the other that passes under different surfaces and materials can exhibit numerous grayscale or pseudocolor variations. For example, five different apparent temperatures will result from the same temperature line that runs under a grass-covered field, an asphalt parking lot, a concrete loading dock, a gravel-covered area and bare earth pathway.***

Stonehouse Hall



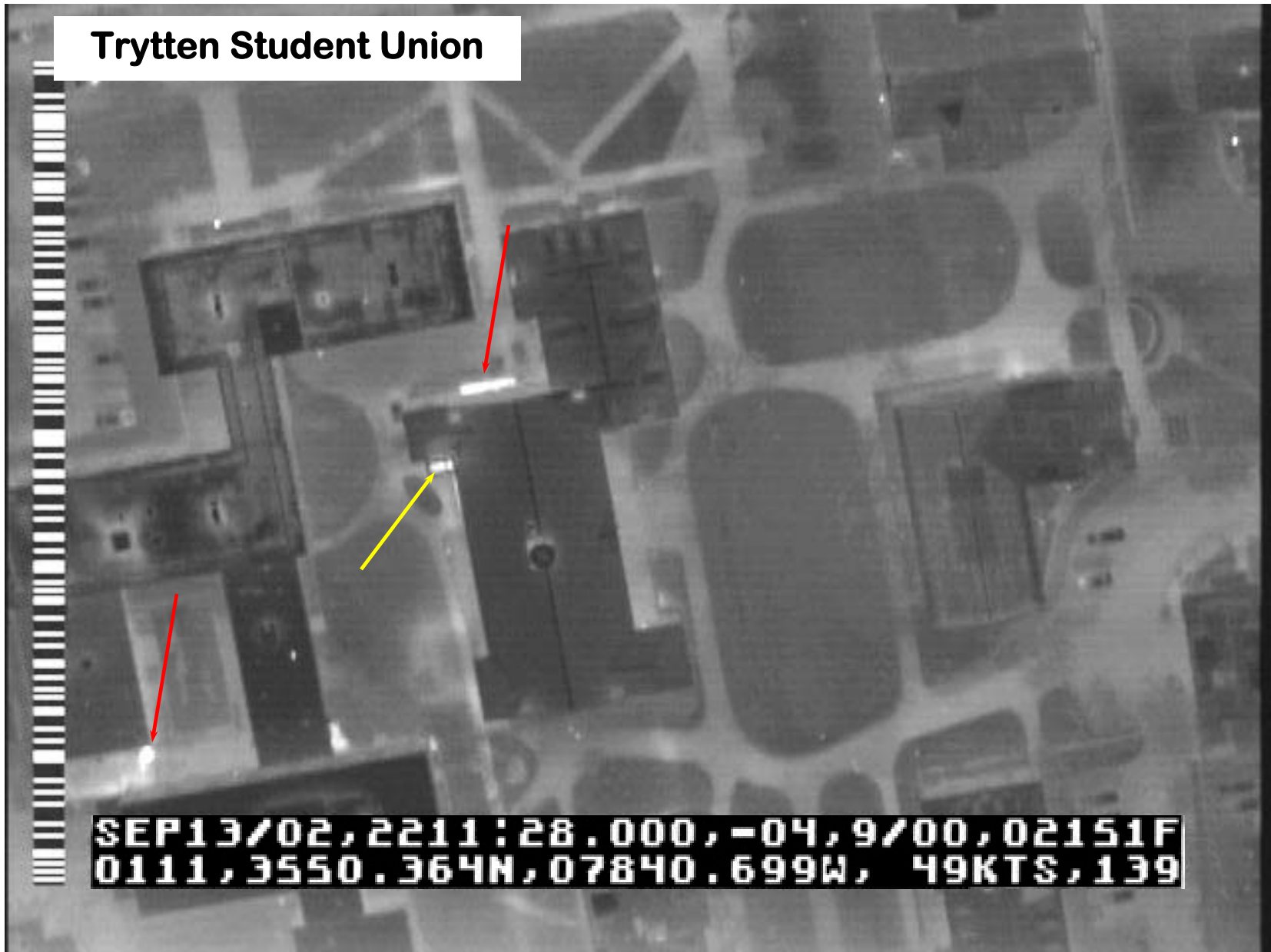
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**Example State University**

*✈ Flight of April 19, 2001*



# Trytten Student Union



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**Example State University**

*✦ Flight of April 19, 2001*



Stackowski Drive



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**Example State University**

*✈ Flight of April 19, 2001*



# Musiol & Gentile Streets



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**Example State University**

*✈ Flight of April 19, 2001*



# Bramlett and Adcock Streets



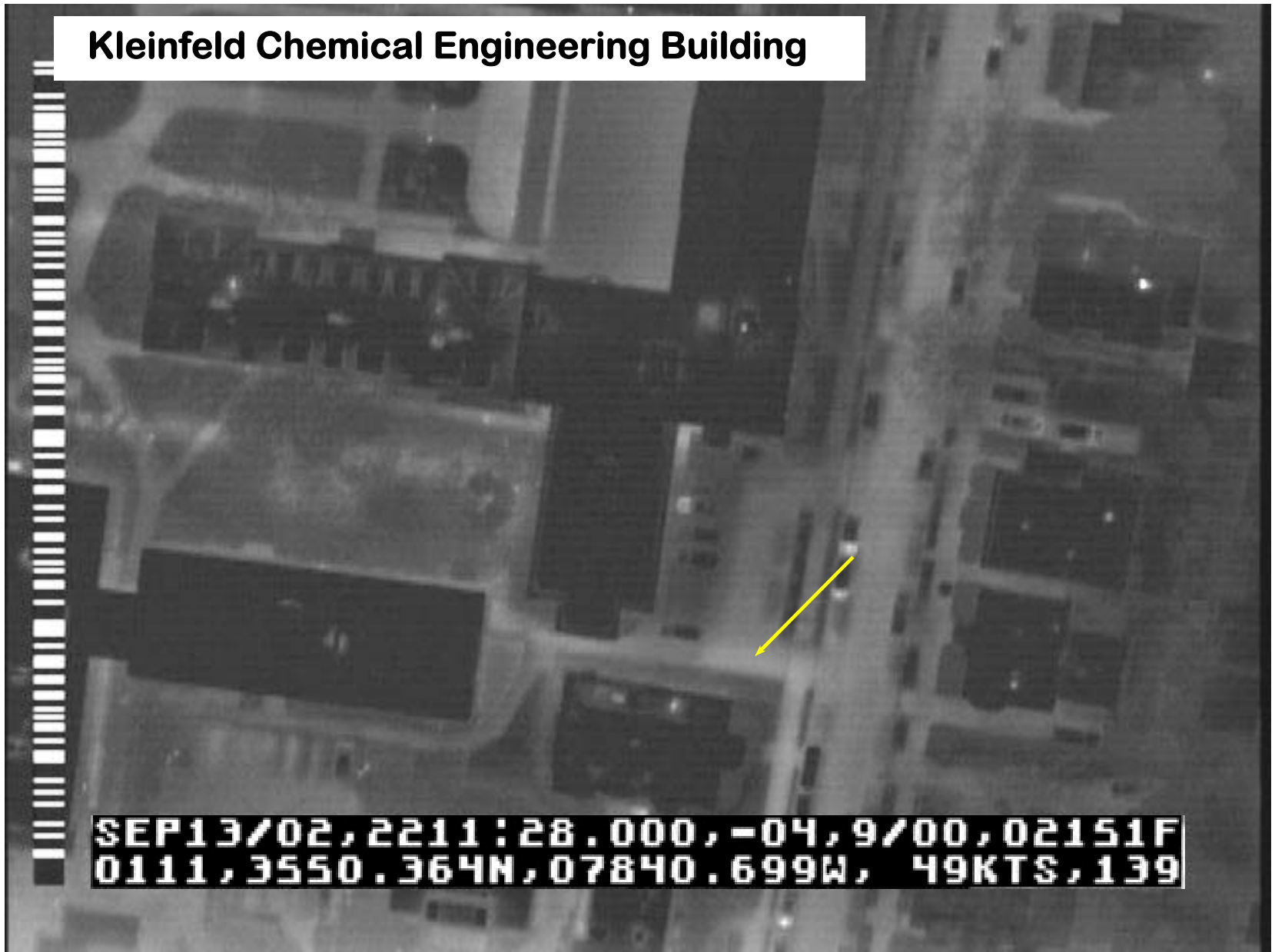
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**Example State University**

*✈ Flight of April 19, 2001*



# Kleinfeld Chemical Engineering Building



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**Example State University**

*✈ Flight of April 19, 2001*



Malarkey Street



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**Example State University**

*✈ Flight of April 19, 2001*



Davis Psychological Hospital



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Lee R. Allen College



Example State University

✈ *Flight of April 19, 2001*



# Lumnitzer Quad



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**Example State University**

*✈ Flight of April 19, 2001*



Mansfield Grad Center



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Example State University

✈ *Flight of April 19, 2001*



Logsdon St. & Tache Rd.



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# Bernie Central Plant



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