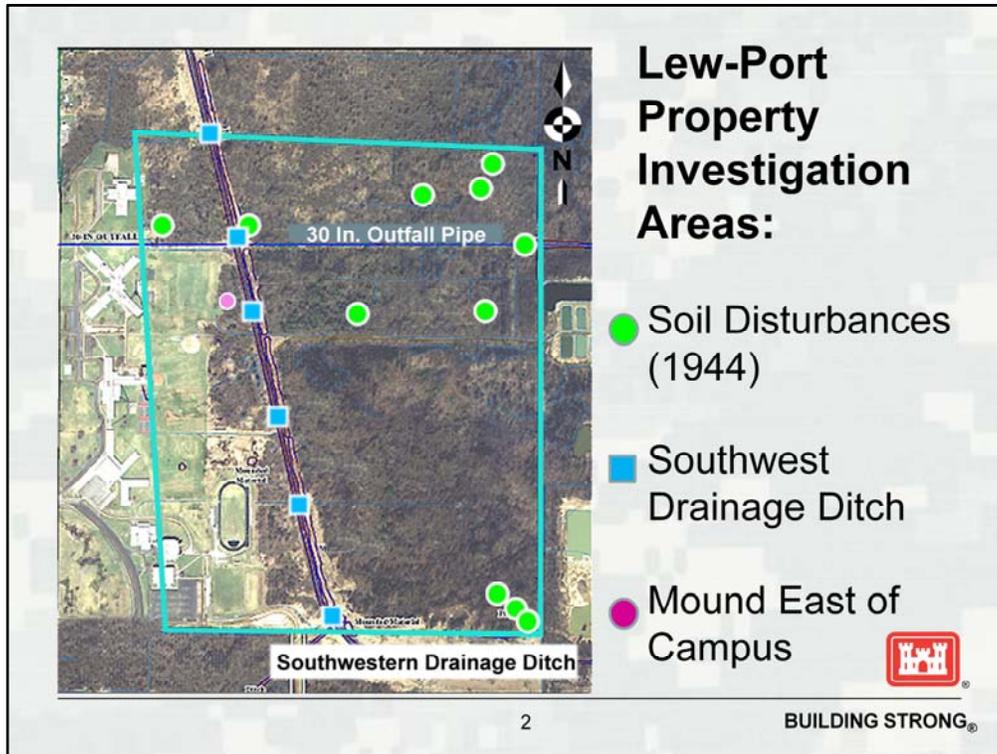




The US Army Corps of Engineers (USACE) conducted an investigation in 2010 to evaluate potential impacts on the Lewiston-Porter (Lew-Port) School District property from former activities of the Department of Defense (DoD), Manhattan Engineering District (MED), and the Atomic Energy Commission (AEC).

The figure on this slide shows the former Lake Ontario Ordnance Works (LOOW) Site (in green), the Lew-Port School District property, and the Niagara Falls Storage Site. The Lew-Port District campus is located within a portion of the former LOOW that was not developed by the DoD.

The USACE investigations evaluated the potential for chemical and radionuclide contamination attributed to DoD, MED, and AEC activities. I will discuss the scope and results associated with an investigation to assess chemical contamination and Dr. Keil will discuss the scope and results associated with an investigation to assess radionuclide contamination.



The investigated area of the Lew-Port School District property is outlined in turquoise on the figure. The school campus is located on the western portion of the figure. The purple line that bisects the figure from southeast to northwest is the Southwest Drainage Ditch (SWDD) as it flows north to Four Mile Creek. A 30-inch diameter outfall pipe associated with a former wastewater treatment plant on the LOOW is shown as a blue colored line that extends from east to west.

Three general areas were investigated in 2010: 1) soil disturbances that were identified from historical aerial photos, 2) the SWDD, and 3) a soil mound near the school campus and west of the SWDD. The green circles shown on the figure represent areas where previous soil disturbances were investigated. The blue squares represent sampling locations within the SWDD that were located between the north (downstream) and south (upstream) property boundaries. The magenta circle represents a mound east of the school campus where elevated radioactivity was previously identified from a gamma walkover survey at the school.

The work plan, field investigation, and results associated with these investigations were discussed or shared with Lew-Port school representatives or the public on 12 separate occasions:

- August 27, 2009 – a meeting was held at USACE offices with Lew-Port school representatives to discuss the scope of the investigation.
- February 26, 2010 – a proposed sampling strategy memo was issued to Lew-Port school representatives.
- May 7, 2010 – a meeting between USACE and Lew-Port school representatives was held to discuss the sampling plan.
- May 20, 2010 – a site walkover was performed by USACE and Lew-Port school representatives.
- June 15, 2010 – the investigation work plan was presented at a Lew-Port School Board meeting.
- June 23, 2010 – the investigation work plan was presented at a public workshop.
- July 2010 – the investigation work plan was posted on USACE’s website.
- August 23 – 27, 2010 – the field work was conducted.
- September 22, 2010 - a meeting was held with Lew-Port school representatives to discuss field observations and field screening results.
- November 3, 2010 - field observations and field screening results were presented at a public workshop.
- May 20, 2011 – the site inspection report was issued to Lew-Port school representatives.
- May 23, 2011 - the site inspection report was issued to the New York State Department of Environmental Conservation (NYSDEC).
- July 21, 2011 – a meeting was held with Lew-Port school representatives to discuss the investigation results.

Soil Disturbances Investigation

- 11 locations sampled
 - ▶ Soil boring(s) drilled at each location
 - ▶ 2 soil samples collected from each location
 - Surface Soil (0-6 inches)
 - Subsurface Soil (> 2 feet)
 - ▶ Field screening
 - Volatile organic compounds (VOCs)
 - Explosives
 - Radiation (for worker health and safety)



Eleven (11) soil disturbances were evaluated, which represented mounds, pits, or a trench that were identified from previous historical aerial photographs.

Soil borings were drilled at each disturbance using a mechanical rig. Continuous soil core samples were collected at each location and completed at the interface of disturbed and undisturbed soil or at a depth of four feet. All soil samples were inspected for evidence of potential environmental impacts including: staining, discoloration, and odors. The samples were screened for volatile organic compounds (VOCs) and field test kits were used to determine if explosive residues were present. Radiological screening was conducted for worker health and safety. Surface and subsurface soil samples from each location were submitted for laboratory analysis for chemical contaminants.

Soil Disturbances Investigation

- **Laboratory analysis**
 - ▶ 22 primary soil samples and 2 field duplicates analyzed
 - ▶ Volatile organic compounds, semi-volatile organic compounds, PCBs, explosives, and metals
 - ▶ 188 analytes per sample
- **Data comparisons**
 - ▶ US Environmental Protection Agency (USEPA) Regional Screening Levels (residential soil)
 - ▶ Background data for Lake Ontario Ordnance Works and Niagara Falls Storage Site



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22 soil samples and 2 field duplicates were analyzed for Target Compound List parameters, consisting of:

- Volatile organic compounds (68)
- Semi-volatile organic compounds (74)
- PCBs (7)
- Explosives (14)
- Metals, including lithium and boron (25)

A total of 188 analytes per sample were analyzed.

Analytical results were compared to:

- US Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) for residential use. Non-carcinogenic analytes, except lead, were evaluated against 1/10 of the corresponding USEPA RSL to account for possible cumulative effects from other analytes.
- Background threshold values for LOOW and NFSS.

Soil Disturbances - Results

- Field observations
 - ▶ All areas contained native soils (topsoil and clay)
- Field screening
 - ▶ All field screening measurements were either non-detect or below background
- Analytical results
 - ▶ 22 primary soil samples and 2 field duplicates analyzed (188 analytes per sample)
 - ▶ 99.9% (4,485 of 4,488) of the results were below the residential screening levels
 - ▶ Dibenz(a,h)anthracene was detected at 3 surface soil sample locations slightly above the residential screening levels



Field observations and field screening results associated with the soil disturbances indicate that:

- All recovered soil samples consisted of native materials, either topsoil or clay.
- All explosives field test results were non-detect.
- All VOC and radiological screening measurements were below background levels.

Analytical results:

- 22 primary soil samples and 2 field duplicates were analyzed.
- 99.9% (4,485 of 4,488) analytical results were below the residential screening levels and background values.
- Dibenz(a,h)anthracene, a polycyclic aromatic hydrocarbon (PAH), was detected in three surface soil samples (locations A01, A08, and A10) at concentrations (17 to 19 parts per billion [ppb]) that were slightly above the USEPA RSL of 15 ppb.
 - The USEPA RSL is based on a residential exposure scenario, which is not present at these locations.
 - The presence of dibenz(a,h)anthracene has been interpreted to indicate that its source is not related to DoD activities due to: (1) sporadic distribution on the property and (2) there are multiple potential sources for PAHs.

Southwest Drainage Ditch Investigation – Chemical Contaminants

- 6 locations sampled
 - ▶ 3 samples collected from each location
 - Surface water
 - Sediment
 - Soil beneath the sediment
 - ▶ Field screening
 - VOCs, explosives, radiation (for worker health and safety)
 - Water quality measurements



Six (6) locations within the SWDD were sampled.

Three samples (surface water, sediment, and soil) were collected at each location.

Sediment and soil samples were screened for VOCs and explosive residues. Radiological screening was performed for worker health and safety. Field measurements were taken from the water samples for temperature, pH, conductivity, dissolved oxygen, turbidity, and oxidation reduction potential.

Southwest Drainage Ditch Investigation – Chemical Contaminants

- Laboratory analysis
 - ▶ Volatile organic compounds, semi-volatile organic compounds, PCBs, explosives, and metals (188 analytes per sample)
 - ▶ Radionuclides
- Data comparisons
 - ▶ USEPA Regional Screening Levels (tap water and residential soil)
 - ▶ Ecological risk-based screening levels
 - ▶ Background data for Lake Ontario Ordnance Works and Niagara Falls Storage Site



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Each surface water, sediment, and soil sample was analyzed for Target Compound List parameters, consisting of:

- Volatile organic compounds (68)
- Semi-volatile organic compounds (74)
- PCBs (7)
- Explosives (14)
- Metals, including lithium and boron (25)
- Radionuclides

A total of 188 chemical analytes per sample were analyzed.

Analytical results were compared to:

- USEPA Regional Screening Levels (RSLs) for residential use. Non-carcinogenic analytes, except lead, were evaluated against 1/10 of the corresponding USEPA RSL to account for possible cumulative effects from other analytes.
- Ecological screening levels taken from USEPA.
- Background threshold values for LOOW and NFSS.

South West Drainage Ditch Results – Chemical Contaminants

- Field Observations
 - ▶ Sediment and soil samples consisted of clay, silt, sand, and natural organic deposits
- Field Screening
 - ▶ Field screening measurements were either non-detect or below background
 - ▶ All field water quality measurements were within normal ranges
- Analytical Results
 - ▶ 18 primary samples and 2 field duplicates analyzed (188 analytes per sample)
 - ▶ 98.7% (1,299 of 1,316) surface water results were below the screening levels



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Field observations and field screening results from the SWDD indicate that:

- All recovered sediment and soil samples consisted of muck, silt, sand, and gravel or clay soil.
- All explosives field test results were negative.
- All VOC and radiological screening measurements were below background levels.
- Water quality measurements taken in the field were within normal ranges.

Analytical results:

- 18 primary samples and 2 field duplicates were analyzed.
- 1,299 of 1,316 (98.7%) of the surface water results were below the screening levels and background values.

South West Drainage Ditch

Results – Chemical Contaminants

- Analytical Results (continued)
 - ▶ 99.1% (1,304 of 1,316) sediment results were below the residential screening levels
 - ▶ 99.9% (1,127 of 1,128) soil results were below the residential screening level
 - ▶ 2-nitrotoluene was detected (2.1 parts per billion) in one surface water sample above the residential screening levels
 - ▶ Lithium and magnesium were detected in surface water above the screening levels
 - Neither element is hazardous
 - Lithium is “marker” element used to evaluate potential DoD activities
 - ▶ PAHs were detected in soil and sediment samples above the residential screening levels



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Analytical results (continued):

- 1,304 of 1,316 (99.1%) of the sediment results were below the screening levels and background values.
- 1,127 of 1,128 (99.9%) of the soil results were below the screening levels and background values.

2-nitrotoluene was detected in one surface water sample. 2-nitrotoluene was not detected in other water samples and was not detected in corresponding sediment and soil samples. This compound was detected at a location (SWDD-03) that is between the upstream and downstream boundaries of the Lew-Port property. No other explosives were detected (i.e. 279 of 280 explosive compounds were not detected).

Lithium was detected in 6 surface water locations and magnesium was detected in 4 surface water locations at concentrations that exceeded background values. Neither lithium or magnesium are hazardous elements. Lithium is a marker element that is used to evaluate whether other DoD contaminants might be present. The analytical data indicates that other DoD contaminants are not present.

PAHs were detected in 5 of 6 sediment samples. The highest relative concentration of PAHs occurs at SWDD-03, which is between the upstream and downstream boundaries of the Lew-Port property. The distribution and occurrence of the PAHs suggests that these compounds are present due to sources that are not related to previous DoD activities at LOOW.

SWDD Radiological Samples

- 6 locations sampled
 - ▶ 3 solid samples obtained from each location
 - 0-6" sediment
 - 6-12" sediment
 - Soil below 12"
 - ▶ 1 surface water sample obtained from each location
- 24 primary samples analyzed
- 4 quality assurance/quality control samples
- 14 different radionuclides per sample

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The samples obtained from the SWDD and analyzed for radiological constituents under FUSRAP corresponded with sampling locations analyzed for chemicals under DERP-FUDS, discussed by Jim. They are shown by the blue squares on this map.

Each sample matrix from the SWDD and the mounded material was analyzed for radiological constituents by a Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP) certified environmental analytical laboratory. The data also underwent data review to verify the data quality prior to further evaluation. Samples were analyzed for gross alpha, gross beta, radium-226, radium-228, thorium-228, thorium-230, thorium-232, uranium-234, uranium-235, uranium-238, cesium-137, strontium-90, plutonium-238, and plutonium-239/240.

Additional quality control sample volumes were collected at select locations to verify field collection methods, laboratory analytical methods and ensure sample chain of custody integrity. Quality control samples collected included matrix spike (MS), matrix spike duplicate (MSD) and field duplicates (for each sample matrix) to ensure project data quality objectives were met.

As Jim mentioned, radiological screening was conducted for all samples collected, and no elevated readings were detected in the SWDD.

Radiological Results from SWDD Samples

- Results compared to:
 - ▶ Naturally occurring levels of radionuclides
 - ▶ Screening criteria developed for protection of human health and the environment
- Results:
 - ▶ 99.7% (335 of 336) radiological results were below screening values
 - ▶ There was a single, isolated, subsurface soil sample with radium-226 activity above the conservative screening level but less than half of the Department of Energy's cleanup level
- Conclusion:
 - ✓ No risk to human health or the environment



Radiological results were compared to reference or background levels of radiation established in previous FUSRAP studies. In addition, results were compared to screening levels developed for protection of human health and the environment.

For surface water, results were compared to safe drinking water maximum contaminant levels established by the USEPA. All results were well below these values.

Surface water results were also compared to screening levels developed to demonstrate compliance with acceptable radiological dose levels established by the International Atomic Energy Agency for protection of the environment (plants and animals). No surface water results exceeded these acceptable environmental concentrations. Sediment and subsurface soil samples from the SWDD were also compared to these environmental protection screening levels, and all results were within acceptable environmental limits.

The sediment and subsurface soil samples were also compared to screening levels developed by the Nuclear Regulatory Commission to assist in releasing licensed sites for unrestricted use (i.e., protective of human health). One of the subsurface soil results had a slight exceedance of this screening level for radium-226. The human health screening value was established to be protective in an agricultural setting in which someone has intense and chronic exposure to the soil, i.e., is living on and growing most of his/her food on the soil. The potential for occasional exposure that may occur at this area of the school property is much less than what is assumed in developing the screening level. Furthermore, the sample was collected over a foot below ground and exposures to soil at this depth/location do not currently exist. The slight exceedance of the screening level is localized. Therefore, the concentration that is slightly above the screening level does not indicate any potential risk and should not be a concern to the school community.

Therefore, based on the results of these samples, there is no risk to human health or the environment.

Radiological Investigation of Mound



Mounded material on Lew-Port School District property, east of soccer field

- 2 locations sampled
- 3 solid samples obtained from each location
 - 0-6"
 - Depth having the highest radiological screening measurement
 - Bottom of the boring (down to 4 feet)
- Rocks from the mound also sampled
- 7 samples analyzed total
- 14 different radionuclides per sample
- 98 results total



The location of the mound is indicated by the yellow circle in the map on slide 5.

Soil sampling was conducted to investigate mounded material (previously named Anomaly D), where elevated readings were encountered during the NFSS background gamma walkover survey (GWS), documented in *Final Gamma Walkover Survey Report, Lewiston-Porter School Property, Youngstown, New York, U.S. Army Corps of Engineers Buffalo District, February 6, 2002*.

The mound of debris located at the Lew-Port school property is comprised of fine textured soils (silt and clay) and rocks that encompass an area of approximately 20 ft x 30 ft and reach a maximum height of approximately 4 ft. USACE personnel performed a gamma walkover survey to verify elevated readings encountered during the background gamma walkover survey and collected samples at the two locations exhibiting the highest instrument readings.

Based on the historical GWS and the new GWS, the two locations with the highest radiological detector measurements were selected for soil boring advancement. These two locations were called Soil Boring 1 and Soil Boring 2 with surface count rates of 45,000 cpm and 43,000 cpm respectively, which were consistent with historical count rates identified in 2002. The two soil borings were advanced using a hand auger, which removed soil at six-inch intervals. Recovered soil samples were logged by a geologist and scanned with the gamma walkover survey instrument. Each boring was terminated at the interface of the mounded soil/rocks and the native ground surface. Soil Boring 1 was advanced to a depth of 4 ft and Soil Boring 2 was advanced to a depth of 2.5 ft below ground surface, which refers to the depth below the surface of the mound.

Radiological Results from Mound Samples

- Results compared to:
 - ▶ Naturally occurring levels of radionuclides
 - ▶ Screening criteria developed for protection of human health and the environment
- Results:
 - ▶ Low levels of naturally occurring radioactivity detected in rocks and associated soil samples
 - ▶ Radiation not detectable more than a few feet away
- Conclusions:
 - ✓ No risk to human health or the environment



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Radiological results were compared to reference or background levels of radiation established in previous FUSRAP studies.

The soil and rock samples were also compared to screening levels developed by the Nuclear Regulatory Commission (as was done for the samples from the SWDD).

The slightly elevated results in the samples exhibit characteristics of naturally occurring radioactivity. No evidence of radioactivity from Manhattan Engineering District, and/or Atomic Energy Commission activities was found in this mound.

The radioactivity in this mound are not detectable when a gamma radiation detector is used more than a few feet away from the surface.

There is no risk to human health or the environment from the mound.

Overall Conclusions

- ✓ Extensive sampling and analysis performed based on previous investigations, school input, and historical aerial photograph review.
- ✓ No chemicals or radionuclides attributed to former DoD, MED, and AEC activities were found that would pose a risk to human health and the environment.
- ✓ No need for further investigations or action on behalf of the Corps of Engineers on the Lew-Port School District property.



No concerns from any past Department of Defense, Manhattan Engineering District, and/or Atomic Energy Commission activities on the Lewiston-Porter School District property.

The Lew-Port school property has been thoroughly tested and no environmental health risks were identified.