



FACT SHEET

PURPOSE: The purpose of this fact sheet is to summarize the key findings of the Niagara Falls Storage Site Remedial Investigation Report (NFSS RIR).

BACKGROUND: The NFSS RIR is the first major technical product of an intensive eight-year investigation of the NFSS site. The purpose of the investigation is to identify the nature and extent of environmental contamination and associated risks resulting from past federal activities under the nation's early atomic weapons program. The NFSS RIR documents the results of three phases of field sampling and laboratory analysis to determine the nature and extent of environmental contamination at the site and groundwater modeling to determine fate and transport of these contaminants along with evaluating the safe cell life expectancy. It also includes a comprehensive assessment of human health and screening level ecological risks associated to the contaminants in air, water, and soil.

PROJECT LOCATION: The NFSS is located at 1397 Pletcher Road in the Town of Lewiston, NY approximately 19 miles north of Buffalo, NY. The NFSS is a federally owned property 191 acres in size. The NFSS was originally part of a World War II explosives plant called the Lake Ontario Ordnance Works (LOOW) which was approximately 7,500 acres in size. Through the late 1940s and 1950s, approximately 1,640 acres of the former LOOW was owned and operated by the Manhattan Engineer District (MED) and the Atomic Energy Commission (AEC). Through the 1970s the AEC gradually consolidated its operations and sold excess property to the public. The NFSS property is the last remaining parcel of former AEC property still under federal ownership.

RIR SCOPE: The NFSS RIR document consists of three separate components:

- An analysis of the nature and extent of contamination at the NFSS
- A groundwater model evaluating contaminant fate and transport
- A risk assessment including a Baseline Human Health Risk Assessment (HHRA) and a Screening Level Ecological Risk Assessment

RIR PURPOSE: The purpose of the NFSS RIR is to answer ten data quality objectives related to historical records of activities at the site, the physical features of the site, the nature and extent of both chemical and radiological contamination at the site, the potential for contaminant migration off site, and the human health and ecological risks related to environmental contamination on the site.

The emphasis of the NFSS RIR is on contamination surrounding the IWCS boundary both on and that extending off-site. The NFSS RIR did not sample inside the IWCS due to the risks of breaching the IWCS. The nature and extent of contaminants within the IWCS is well understood from USDOE reports regarding the construction of the cell. The IWCS, along with contamination surrounding the IWCS will be addressed in the Feasibility Study. The Feasibility Study will identify and evaluate long term environmental remedies for the entire NFSS.

RIR ACTIVITIES: The data collection effort included:

- Three phases of sampling and analyses of groundwater, surface water, sediment, and soil samples.
- A sitewide gamma-walkover survey to map the presence of surficial gamma-emitting radionuclides
- A background gamma-walkover survey of the Lewiston-Porter school campus to serve as a baseline for non-impacted areas in the local community.
- A geophysical survey, using a variety of scientific techniques, to identify potential underground features that could allow contaminant migration

- Ongoing environmental surveillance activities to measure the release of radon gas and gamma radiation from the IWCS

RIR KEY FINDINGS: The RIR documents USACE conclusions on the nature and extent of contaminants, and risks from environmental contamination resulting from MED and AEC activities, and the safe life expectancy of the IWCS. These include:

NATURE AND EXTENT OF CONTAMINATION

- **NFSS Soils (Radiological Contamination):** Radionuclides significantly exceeded background for site soils in both surface and subsurface soils, the degree of exceedance is dependent upon previous site history for the several defined exposure units. For surface soils, radium-226, thorium-230, uranium-238 and cesium-137 were radionuclides with the greatest frequency of exceeding background upper tolerance limits (UTLs) in surface soils. Thorium-230, uranium-238, radium-226, and uranium-234 were radionuclides with the greatest frequency of detection among background upper tolerance limits (UTLs) in subsurface soils. Radium-226 was the risk driver for the baseline risk assessment for contaminants found on site.
- **NFSS Soils (Chemical Contamination):** Chemical contamination was also found in both surface and subsurface soils, although at exceedances with smaller orders of magnitude than those found for the radionuclides. Volatile organic compounds (VOCs) including chlorinated solvents, benzene, toluene, methylene chloride, carbon disulfide and 2-butanone were found commonly in areas associated with activities near LOOW buildings. Pesticides, polychlorinated biphenyls (PCBs), Poly cyclic aromatic hydrocarbons (PAHs) and metals were also found in localized areas of the site.
- **NFSS Groundwater (Radiological and Chemical Contamination):** Groundwater plumes were found in the upper water bearing zone (UWBZ) for total uranium, thorium-230, manganese, boron, tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-DCE, trans-1,2-dichloroethene, vinyl chloride, and bis (2-ethylhexyl) phthalate. While some contamination was found in the lower water bearing zone (LWBZ), nature and extent of the contaminants did not warrant identification of a plume.
- **NFSS Sediment and Surface Water (Radiological Contamination):** Sediment and surface water are present at some limited areas on site, and in most cases surface water is only present for a limited portion of the year. Radionuclides and metals were found to exceed background UTLs, primarily in ditches.
- **NFSS Pipelines, Floor Drains and Subsurface Utilities (Radiological and Chemical Contamination):** Subsurface pipelines and underground utilities are present on most of the NFSS property, which were originally constructed in the 1940's by the US War Department for the TNT manufacturing plant. Contaminants are localized and are a function of previous operations but generally include: radionuclides, metals (lead, boron, cadmium and mercury), PAHs, VOCs, pesticides and PCBs.
- **Off Site Contamination:** Three areas of off-site contamination were identified and evaluated during the remedial investigation of the NFSS

- National Grid Property (Electrical Transmission Powerline Right of Way). This property, located to the west of the NFSS, is prone to trespassers, hunters, all-terrain vehicle riders, and others. During the 2001 site-wide gamma walkover survey of the NFSS property, gamma radiation in surface soil above background was detected on the western border of the NFSS property adjacent to the National Grid property. The USACE continued the gamma walkover survey from the NFSS fenceline westerly into the west ditch on National Grid property. A strip of ground, including the ditch, approximately 60 feet x 820 feet was surveyed. Several small spots

(several inches in diameter) in this area displayed elevated radioactivity two to three times the natural background level of approximately 9,000 to 13,000 counts per minute.

This strip of ditch has previously been remediated by the USDOE. The USACE gamma walkover survey and supplemental soil sampling was performed over this same area.

The results indicate there is no imminent threat to human health in these small isolated areas. The baseline human health risk assessment concluded that concentrations of radionuclides, primarily Ra-226 and Th-230 in the surface soil in some areas of the site could pose an unacceptable radiological dose (defined by Nuclear Regulatory Commission as 25 mrem/year) only to the future, hypothetical and most-conservative receptors evaluated, e.g., the subsistence farmer and the resident. No other receptors evaluated (workers or trespassers) would receive any unacceptable radiological doses in this area of the site.

Limited chemical data collected for waste disposal purposes from the property were also evaluated. The results of the chemical BRA indicate that no chemicals found on the National Grid property would pose an unacceptable risk.

- Modern Disposal Property (Municipal Landfill). This property is located to the east and south of the NFSS. During background sampling activities, elevated uranium was detected in groundwater near railroad tracks used by the Former LOOW and MED / AEC operations. While elevated, the levels of radioactivity were low and did not exceed USEPA Maximum Contaminant Levels (MCLs) for total uranium in drinking water or USDOE criteria.

- CWM Chemical Services, LLC Property (Hazardous Waste Treatment, Storage and Disposal Facility): This property is located to the north of the NFSS. Chemical contamination in the upper groundwater water-bearing zone is present straddling the boundary of the Waste Management property and the NFSS. Analysis of potential source and localized direction of flow was inconclusive.

The Waste Management property has been used for a variety of chemical waste storage, treatment, and disposal operations by both federal (defense) and private owners and operators. The USACE will need to evaluate this situation and make a decision on the appropriate agency response with regard to potentially responsible party liability.

GROUNDWATER MODELING (FATE & TRANSPORT OF CONTAMINANTS)

- **Groundwater Model:** A site-specific, three-dimensional, numerical groundwater flow and transport model was compiled to simulate the fate of contaminants through three hydrostratigraphic units under current site conditions; these units included the UWBZ, the upper aquitard, and LWBZ. This model is an extensive regional model going well beyond the NFSS perimeter. It incorporated data not only from over 300 USACE groundwater wells, but also data obtained from wells on the adjacent CWM Chemical Services, LLC and Modern Disposal properties.

Since the UWBZ has limited productivity, contaminant migration to the more permeable LWBZ was of primary concern. The model was used to predict the transport of current contaminant distributions through a 1,000 and 10,000-year time period, which indicated where concentration exceedences would occur in the long term. U-238, U-234, U-235, cis-1,2-dichloroethene, and vinyl chloride will exceed screening levels in the LWBZ after 1000 years. Additionally, U-238 and U-235 are predicted to exceed their screening levels at the property boundary after 1000 years.

- **Safe Life Expectancy of the IWCS:** The 10-acre interim waste containment structure (IWCS) on the NFSS property contains over 250,000 cubic yards of radioactive residues and contaminated soil and debris from a 1980's US Department of Energy waste consolidation effort. Of greatest

concern are the high activity, low-level K-65 residues that contain an average of 520,000 pCi/g of radon-generating Radium-226.

The IWCS was designed to retard radon emissions, infiltration from precipitation, and migration of contamination to groundwater. Additionally, maintenance is routinely performed on the IWCS cap and an environmental surveillance program has been conducted since 1981 to monitor radon gas emissions, external gamma radiation, and radiological constituents in sediment, surface water, and groundwater on-site. A 2001 geophysical survey of the IWCS confirmed no voids or areas of increased water saturation, within the IWCS, which indicates no significant deterioration of the landfill. Additionally, the geophysical survey did not identify any significant fractures, faults, or seismic pressure points near the landfill that would make the IWCS susceptible to earthquakes.

A study by the National Academy of Sciences commissioned by the USDOE in 1995 determined the IWCS has a baseline safe life expectancy of 25-50 years (2011 – 2036) with proper site maintenance.

The USACE conducted more in-depth assessments regarding the potential for radionuclides to leach to the upper and lower groundwater-bearing zones through a site-specific, numerical groundwater flow and transport model. This model was developed to simulate transport over a 10,000 year timeframe.

USACE transport simulations indicate that the IWCS will adequately mitigate off site contaminant migration for 200 years (until 2186), provided it is maintained to prevent erosion of the clay cap and the IWCS cap retains its current level of flow-inhibiting characteristics.

In addition to the baseline life expectancy, several simulations were conducted to model worst case scenarios of IWCS failure such as inadvertent penetration of the IWCS cap, a breach of the IWCS, and an earthquake where no emergency repairs to the IWCS cap were made after the event. It was assumed in the modeling that the damaged IWCS cap would be exposed to the elements allowing greater rainwater infiltration and leaching of contaminants. Based upon these worst case conditions, USACE transport simulations indicate that if any of the worst-case events were to occur in present day, the long-term effectiveness of the IWCS is predicted to be reduced to 50 years or less (until 2057).

BASELINE HUMAN HEALTH RISK ASSESSMENT

- A baseline human health risk assessment was conducted consistent with CERCLA, USACE Guidance (EM 200-1-4), EPA guidance (Risk Assessment Guidance for Superfund), and used industry-accepted computer modeling software (RESRAD). All environmental media (surficial and deeper soils down to 10 feet, surface water and sediment, groundwater) as well as pipeline and underground utility contents were evaluated. The evaluation included all chemical and radionuclides detected on site (and on adjacent National Grid power right-of-way) above background concentrations.
- A broad range of receptors were evaluated to encompass every possible current and future exposure and land-use scenario:
 - **Current:** Trespassers (adult and adolescent), maintenance worker
 - **Future:** Trespassers (adult and adolescent), maintenance worker, construction worker, industrial worker, residential (adult and child) and subsistence farming (adult and child)
- Exposure pathways evaluated included dermal absorption (chemicals only), external gamma (radionuclides only), inhalation (of volatiles and particulates), and ingestion (contaminated soils for all receptors, and contaminated surface water/sediment, groundwater, and food such as homegrown produce and game meat for some receptors).

- Evaluation period included the present time and extended 1,000 years into the future, to consider transport, decay and ingrowth of radionuclides.
- The IWCS was evaluated in its present state only (“baseline” state of continued maintenance), with the assumption that any significant breach of the cap would lead to an unacceptable risk, requiring evaluation in the feasibility study.
- **Results - Current Exposure Scenarios:** Current receptors evaluated included the on-site maintenance worker and trespasser.
 - **On-Site Maintenance Worker (Radiological Exposure):** The USACE evaluated the current risks to an on-site maintenance worker. The model indicates that with unrestricted access to all areas of the site a maintenance worker could receive an unacceptable radiological dose (defined by Nuclear Regulatory Commission as 25 mrem/year) due to concentrations of Ra-226 in the surface soil in some areas of the site.
 - * **Note:** This finding is based upon an assumption that the maintenance worker, with unrestricted access to the entire site, was spending every day exposed to only the most elevated radiological soil contamination present at specific locations on the site. This scenario resulted in the unacceptable radiological dose. When the risk model was run based upon the maintenance worker being exposed to average radiologic conditions throughout the site (more reflective of the actual conditions), the dose was acceptable and satisfied the NRC 25 mrem/year standard.
 - **On-Site Maintenance Worker (Chemical Exposure):** There are localized areas of PAHs and PCBs in surface soils that the model indicates could pose an unacceptable risk (as defined by EPA) to maintenance workers.
 - * **Note:** The USACE will reevaluate its occupational safety and health program at the NFSS to ensure the modeled risks and actual work activities are reviewed to ensure our workforce is adequately protected.
 - **Trespasser (Radiological Exposure):** Human health risk modeling indicates that trespassers would not receive an unacceptable radiological dose.
 - **Trespasser (Chemical Exposure):** The modeling indicates there are localized areas of PAHs and PCBs in surface soils that could pose an unacceptable risk (as defined by EPA) to trespassers. These are the same areas described in the maintenance worker scenario.
- **Results - Future Exposure Scenarios:** The future exposure scenarios evaluated risks to a wide variety of future human receptors including trespassers/recreational users, maintenance workers, construction workers, industrial workers, residents, and subsistence farmers. The baseline HHRA concluded that the following list of chemicals and radionuclides posed an unacceptable risk under at least one of the exposure scenarios. These are defined as chemicals or radionuclides of concern, and so will be carried forward to the feasibility study for development of remedial action objectives.

| Media | Chemicals of concern (COC) | Radionuclides of concern (ROC) |
|-------------|---|---|
| Soil | PAHs, PCBs, metals (including arsenic, boron, and lead), and pesticides in several localized areas onsite. | Isotopes (and some decay products) of radium, thorium, uranium, as well as cesium. Ra-226 (main constituent of the residues under the IWCS) is a risk driver throughout the site. |
| Groundwater | Chlorinated solvents (including PCE/TCE and their degradation products), metals (including arsenic, boron, and lead), one SVOC, in localized areas of the site. | Isotopes of radium, thorium, uranium, as well as cesium. Uranium is the most wide spread contaminant in groundwater across the site. |

| Media | Chemicals of concern (COC) | Radionuclides of concern (ROC) |
|--------------|----------------------------|--|
| Sediment | No COCs | No ROCs |
| Surfacewater | No COCs | No ROCs |
| Pipelines | PCBs and lead are COCs. | No ROCs (although radium, thorium, uranium, cesium, and strontium exist above background in the pipelines) |

SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT (SERA):

- A screening level ecological risk assessment is a prelude to a baseline ecological risk assessment. The baseline ecological risk assessment may only be conducted if warranted based on results of the simpler, screening level ecological risk assessment.
- The SERA was conducted consistent with CERCLA, EPA guidance, and DOE guidance for evaluating ecological impacts from radionuclides (DOE-STD-1153-2002).
- The SERA began by coordinating with the New York State Department of Environmental Conservation (NYSDEC) Natural Heritage program in order to determine whether or not threatened and endangered (T&E) species or sensitive habitat is present on site which warrants special protection. USACE regulatory personnel also evaluated the quality of on-site wetlands.
 - No T&E species exist on the site.
 - Wetlands are present but are of low function/value (resulting from physical habitat disturbance).
- The SERA includes a multi-step screen that identified areas on site where contaminant concentrations are above values deemed safe for one or more receptors (such as mice, deer, birds, etc.).
- For radionuclides, the DOE's Guide to Biota Dose Assessment indicated that there are not any concentrations of radionuclides on NFSS that would result in an unacceptable radiological dose (as defined by the International Atomic Energy Commission) to any ecological receptors.
- For chemicals, several chemicals failed the very conservative screening steps (i.e., metals in surface water).
- This led to further evaluation of the weight-of-evidence, to come to a scientific-management decision point to conclude the SERA.
- The WOE assessment evaluates information from the SERA in the broader context such as significance of ecological resources, human-dominated land use, and trade-offs from chemical risk and physical or remedial risk. This provides a holistic view of the ecological risk situation at NFSS.
- **Conclusion:** The outcome of this assessment is a recommendation of no further action for the relatively productive habitats, vegetation and wildlife at NFSS.

ADDITIONAL INFORMATION: The report is available at the Town of Lewiston Public Library, 305 South 8th Street, Lewiston, NY 14092 and the Youngstown Free Library, 240 Lockport Street, Youngstown, NY 14174. The executive summary of the report is available at

www.lrb.usace.army.mil/fusrap/nfss/index.htm.

Questions or comments may be e-mailed to fusrap@usace.army.mil or be phoned in to:

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