



# Niagara Falls Storage Site

Lewiston, New York

## Feasibility Study Technical Memorandum Overview: Preliminary Evaluation of Health Effects for Hypothetical Exposures to Contaminants from the Interim Waste Containment Structure

**U.S. Army Corps of Engineers**

**Buffalo District**

**Formerly Utilized Sites Remedial Action Program (FUSRAP)**

February 2012

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### Overview

The U.S. Army Corps of Engineers has prepared this Technical Memorandum to evaluate potential health effects associated with hypothetical exposures to contaminants in the Interim Waste Containment Structure (IWCS). This Technical Memorandum is one of several technical reports being developed to support the Feasibility Study (FS) for the IWCS, and being released during the FS process to support public access to important information.

The primary objective of this Technical Memorandum is to provide information that will support the FS evaluations of short-term effectiveness, long-term effectiveness, and overall protection of human health and the environment for the different remedial alternatives being considered for the IWCS. This Technical Memorandum considers contaminants that could be released to air, as well as potential direct exposures to uncovered wastes, during remedial activities at the IWCS. Since detailed remedial alternatives have not yet been developed, this Technical Memorandum considers a wide range of potential remedial alternatives, including no action and partial/complete removal of IWCS contents alternatives.

The focus of the evaluation in the Technical Memorandum is on the near term (10 years), to complement previous risk analyses that have assessed exposures extending into the long term. This information will help frame the development and detailed evaluation of the remedial alternatives in the Feasibility Study, and support practical planning for source and exposure control measures to assure appropriate protection of workers and the public.

This is accomplished in this Technical Memorandum by:

- Summarizing previous risk estimates for the IWCS, including estimates from the 1980s and 1990s.
- Providing radiological doses and cancer risks for the radon emissions estimated in the Radon Assessment Technical Memorandum.
- Offering a preliminary conceptual model for the IWCS that indicates mechanisms by which contaminants could be released to air and the potential for on-site and off-site exposures, considering remedial alternatives that are expected to range from no action to full excavation.
- Providing preliminary estimates of doses, cancer risks, and the potential for noncarcinogenic health effects from various hypothetical exposures.

## Project Background

The Niagara Falls Storage Site (NFSS) is a 191-acre Federal property in Lewiston, New York. The Manhattan Engineer District and Atomic Energy Commission brought radioactive wastes to the site during the 1940s and 1950s, and in the 1980s the U.S. Department of Energy consolidated these wastes into the IWCS, a 10-acre structure in the southwest portion of the site (Figure 1). Wastes being stored in the IWCS include the K-65 residues that contain high concentrations of radium-226. The IWCS was engineered to inhibit radon emissions (notably radon-222), infiltration of precipitation, and contaminant migration to groundwater. The Corps is evaluating the final disposition of the NFSS, including the IWCS, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. The site has been organized into three operable units (OUs) for this process: the IWCS (which is being addressed first); the balance of plant (BOP), which includes all contaminated materials not contained in the IWCS, excluding groundwater; and groundwater. The Corps completed the Remedial Investigation Report (RIR) for NFSS and the Addendum to this report in 2007 and 2011, respectively, and the site is now in the FS phase of the CERCLA process for the IWCS OU.



**Figure 1:**  
**IWCS at the Niagara Falls Storage Site**  
(looking south)

## Approach for Estimating Health Effects

The standard process established by the U.S. Environmental Protection Agency for assessing risks at contaminated sites was followed in this Technical Memorandum. Potential exposures to contaminants released during implementation of remedial alternatives involving waste excavation were evaluated for six receptors. By looking at this range of potential exposures and receptors, the full range of possible affects of opening the IWCS and removal of waste are evaluated. The main elements of this preliminary evaluation are summarized below:

- IWCS cover is opened, either intentionally due to potential excavation of wastes or unintentionally due to hypothetical cap breach (e.g., burrowing animal).
- Breach of the IWCS cap leads to release of radon gas, gamma emissions, and particulates to air and surface soil (particulates are assumed to consist of radon progeny, metals, and polychlorinated biphenyls, which are collectively referred to as chemicals).
- Exposure estimates are calculated for six receptors, including on-site remedial worker, maintenance worker, and trespasser, and off-site residents (adult and child) and landfill worker.
- Exposure routes consist of inhalation, gamma irradiation, and incidental ingestion of particulates.
- Results of the evaluation determine the radiological dose and chemical risk for each of the receptors for several cap breach scenarios, both with and without emission controls.

## Results

Health effects from exposures to the IWCS contents were estimated under two different scenarios to better understand potential risks and needed controls for remedial alternatives being considered for the IWCS that involve waste excavation; one assuming that typical engineering controls would be in place during remedial activities, and another assuming that no controls are in place during excavation of the wastes. Results were compared to health-based benchmarks set by Federal agencies including the Environmental Protection Agency, Nuclear Regulatory Commission, Occupational Safety and Health Administration, and American Conference of Governmental Industrial Hygienists.

Detailed results can be found in the report at <http://www.lrb.usace.army.mil/fusrap/nfss/> This fact sheet is designed only to provide an overview of findings and conclusions.

Results of evaluations assuming engineering controls are in place during excavation:

- The preliminary estimates for an excavation indicate that radiation doses for all three off-site receptors are below 1 millirems (mrem) (which is below all health-based limits) and chemical air concentrations and corresponding risks and hazards are also within acceptable limits.
- For the three types of on-site receptors, emissions controls alone may not be fully protective. Additional personal protective equipment might be necessary to fully protect any on-site workers who come into close proximity with the excavation site. This would be further analyzed in the development of detailed remedial alternatives and during the remedial design phase of any planned remedial action.
- Estimates of chemical emissions and exposures indicate that chemicals should not pose adverse health effects and that engineering controls designed to protect against radiological exposures (radon gas and particulate emissions and external gamma) should also provide sufficient protection against chemical exposures.
- The engineering controls designed to protect on-site workers during excavation would also be sufficient to protect any potential receptors off-site.

Results of evaluations assuming no engineering controls were to be used during excavation:

- If the wastes were uncovered, someone at the IWCS without exposure protection would incur an external gamma dose of 1,000 mrem (1 rem) in a number of days or a few weeks, depending on whether the exposure was continuous or not. Results for exposures to radon gas and its progeny would likely be lower but in some cases could be comparable. This level of exposure would present an unacceptable health risk.
- Emissions and inhalation of particulates could also cause unacceptable radiological doses to on-site workers if these emissions were not controlled during excavation.
- Radionuclides dominate the risk estimates with the K-65 residues warranting the most rigorous controls because of their high radium-226 concentrations. Other than potential issues associated with lead, exposure to chemicals does not appear to present a significant health risk.

Off-site radiological exposures, even without engineering controls in place during excavation, are estimated to be below acceptable limits set by Federal regulatory agencies.

### **Interpretation of Preliminary Results**

Preliminary results are summarized as follows:

- Wastes in the IWCS are safely contained, and they will remain safe for as long as the IWCS cap and walls remain intact to prevent inadvertent exposures.
- Once the IWCS cap is breached, on-site exposures are a major concern. If the wastes were uncovered and someone remained on the IWCS for a number of days to weeks, substantial doses and serious health effects could result. The main contributors would be external gamma irradiation and inhalation of radon gas and its short-lived progeny.
- Any remedial action that involves exposure of and/or excavating wastes from the IWCS would require stringent engineering and exposure controls to assure protection of onsite individuals during the cleanup period.
- With appropriate engineering controls in place, the wastes can be safely removed from the IWCS with minimal off-site impact.
- Engineering controls will need to be augmented with personal protection for on-site workers. If wastes were excavated with typical controls, inhalation by on-site workers would still present a health risk without further protection. Direct (accidental) ingestion of waste would also be a major concern particularly for high-activity residues.

## Public Input Regarding this Technical Memorandum

The Corps is preparing a number of technical memoranda that will be made available to the public prior to the development and release of the IWCS OU Feasibility Study. The Corps encourages input from the public regarding the analyses and findings of each Technical Memorandum. Public response to this Technical Memorandum document should be provided to the Corps by April 28, 2012, to allow the Corps to consider the input during development of the IWCS OU Feasibility Study Report. Responses to public comments on this Technical Memorandum will be made available on the project website. Input can be sent via e-mail to [fusrap@usace.army.mil](mailto:fusrap@usace.army.mil) (please be sure to note "Health Effects Technical Memorandum" in the subject of the e-mail) or mail your comments to the FUSRAP Team at the address noted below.

## Public Workshop

In addition to the opportunity to provide written comments, the Corps is hosting a public workshop on **March 28, 2012**, beginning at **6 pm** to present and discuss the results of this Technical Memorandum with the community. The workshop will be held at the **Lewiston Senior Center** located at **4361 Lower River Road, Youngstown, NY 14174**. The Corps will send out a 'News from the Corps' and post a notice in the local newspapers detailing the agenda for this public workshop by the end of February.

## Administrative Record File

The Administrative Record File for the NFSS FUSRAP Site contains the RIR, RIR Addendum, Baseline Risk Assessment, Waste Disposal Options and Fernald Lessons Learned Technical Memorandum, this Technical Memorandum and two other reports being released in November 2011 to support the Feasibility Study for the IWCS OU, as well as other CERCLA-related documents for the site. Documents in the Administrative Record can be viewed at the following locations:

### Electronic and Paper Versions:

Town of Lewiston Public Library  
305 South 8th Street  
Lewiston, NY 14092  
Phone: 716-754-4720

*(By appointment only)*

U.S. Army Corps of Engineers  
1776 Niagara Street  
Buffalo, NY 14207  
Phone: 800-833-6390 (Option 4)

### Electronic Version:

Youngstown Free Library  
240 Lockport Street  
Youngstown, NY 14174  
Phone: 716-745-3555

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