US Army Corps of Engineers®
Buffalo District
BUILDING STRONG®

PROPOSED PLAN

FOR THE

LANDFILL OPERABLE UNIT OF THE

TONAWANDA LANDFILL VICINITY PROPERTY

TONAWANDA, NEW YORK

AUTHORIZED PROJECT UNDER THE

FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM

September 2015

Prepared by:

U.S. Army Corps of Engineers
Buffalo District
1776 Niagara Street
Buffalo, New York 14207-3199

ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

ARARs	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	constituent of concern
ft	foot (feet)
FUSRAP	Formerly Utilized Sites Remedial Action Program
km	kilometer(s)
m	meter(s)
mi	mile(s)
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
pCi/g	picocuries per gram
PRG	preliminary remediation goals

CORPS OF ENGINEERS ANNOUNCES PROPOSED PLAN

The public is invited to review and comment on this *Proposed Plan for the Landfill Operable Unit of the Tonawanda Landfill Vicinity Property*. The U. S. Army Corps of Engineers prepared this document as part of its investigations of the vicinity property under the Formerly Utilized Sites Remedial Action Program (FUSRAP). FUSRAP was initiated in 1974 to identify, investigate, and if necessary, clean up or control sites that were contaminated as a result of activities conducted in support of the nation's early atomic energy program. The Corps of Engineers executes FUSRAP in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Public Comment Period
September 14, 2015 – November 14, 2015
The Corps will accept written comments on the proposed plan during the public comment period.

Public Meeting
Thursday, October 15, 2015 @ 6:00 PM
Philip Sheridan Building, Community Room
3200 Elmwood Avenue, Kenmore, NY 14217

For more information, the administrative record file is publicly accessible on the Tonawanda Landfill FUSRAP website at:

http://www.lrb.usace.army.mil/Missions/HTRW/FUSRAP/TonawandaLandfill.aspx

Or by appointment only:

U.S. Army Corps of Engineers Buffalo District
1776 Niagara Street
Buffalo, NY 14207

1-800-833-6390 (Option 4)

The purpose of this document is to solicit input from the public regarding the Corps of Engineers' preferred alternative, Alternative 3, Targeted Shallow Removal and Off-site Disposal of FUSRAP-related Material, to address contaminated soils in the Landfill Operable Unit (OU) of the Tonawanda Landfill Vicinity Property. The preferred alternative may be modified based on any new information acquired during the designated public comment period. Therefore, the public is encouraged to review and comment on all the alternatives presented in this proposed plan.

Members of the public who wish to comment on this proposed plan may submit their comments in writing to the Corps of Engineers at the following address:

U.S. Army Corps of Engineers, Buffalo District
Special Projects Branch, Environmental Project Management Team
1776 Niagara Street
Buffalo, NY 14207-3199

Comments may also be submitted electronically by sending an email to *fusrap@usace.army.mil*. Please refer to this proposed plan, or the Tonawanda Landfill Vicinity Property, in any comments. If there are any questions regarding the comment process or the proposed plan, please direct them to the address noted above or telephone 1-800-833-6390 (Option 4).

SITE HISTORY

The Tonawanda Landfill Vicinity Property is located in the Town of Tonawanda, New York, approximately 16 kilometers (km) (10 miles [mi]) north of downtown Buffalo and 2.4 km (1.5 mi) north of the Linde FUSRAP Site (Figure 1). The Tonawanda Landfill Vicinity Property consists of two parcels owned by the Town of Tonawanda; the Town of Tonawanda Landfill, and the mudflats, now known as the North Youngmann Commerce Center (Figure 2). In the early 1900s, a quarry was located in the western portion of the town's landfill property. During the 1920s, the quarry was reportedly abandoned at a depth of 18 meters (m) (60 feet [ft]) when water was encountered. Waste disposal at the landfill by the Town of Tonawanda began during the 1930s and continued through 1989. Landfill wastes disposed of in the former quarry included ash generated by the town's incinerators, construction/demolition debris, and yard refuse (leaves, branches, etc.) collected from town residents. The landfill occasionally accepted municipal solid waste and wastewater sludge from the Town of Tonawanda's wastewater treatment plant when the incinerators were temporarily inoperable.

In 1992 the U.S. Department of Energy designated the landfill and mudflats properties together as a FUSRAP Vicinity Property to the nearby Linde Site. The designation was based upon a radiological survey conducted in 1991 to determine whether FUSRAP-related material from the Linde FUSRAP Site was placed in the Town of Tonawanda's municipal solid waste landfill. In 2008 the Corps signed a no action record of decision for the mudflats after it was determined that risks were within acceptable limits established in the NCP.

In 2007, the Town of Tonawanda began the process of closing the municipal solid waste landfill in accordance with the current Title 6 of the New York Code of Rules and Regulations. This action is being undertaken by the Town of Tonawanda with regulatory oversight from the New York State Department of Environmental Conservation. The Town of Tonawanda installed a cap over the 10-hectare (25-acre) eastern portion of the solid waste municipal landfill in 2011. In 2013, the Town of Tonawanda began constructing the final cap over the western portion of the solid waste municipal landfill (Figure 2).

SITE CHARACTERISTICS

The Landfill OU is comprised of approximately 22 hectares (55 acres) located at the northern end of East Park Drive, and is bordered by residential developments to the north and northwest, a railroad line to the east, and a parcel containing National Grid transmission lines to the south. The Landfill OU is owned by the Town of Tonawanda and is zoned commercial/industrial. The residential development to the north and northwest of the Landfill OU lies within the City of Tonawanda. The Corps of Engineers has conducted a two-phase remedial investigation and a feasibility study at the Landfill OU. The remedial investigation and feasibility study identified the types, quantities, and locations of contaminants and developed ways to address the potential risks posed by the contamination. This proposed plan only addresses constituents of concern (COCs) in soil. Although other media at the site (i.e., surface water, sediment, and groundwater) were also investigated and evaluated, only soil has been identified as a medium of concern based on risk analysis.

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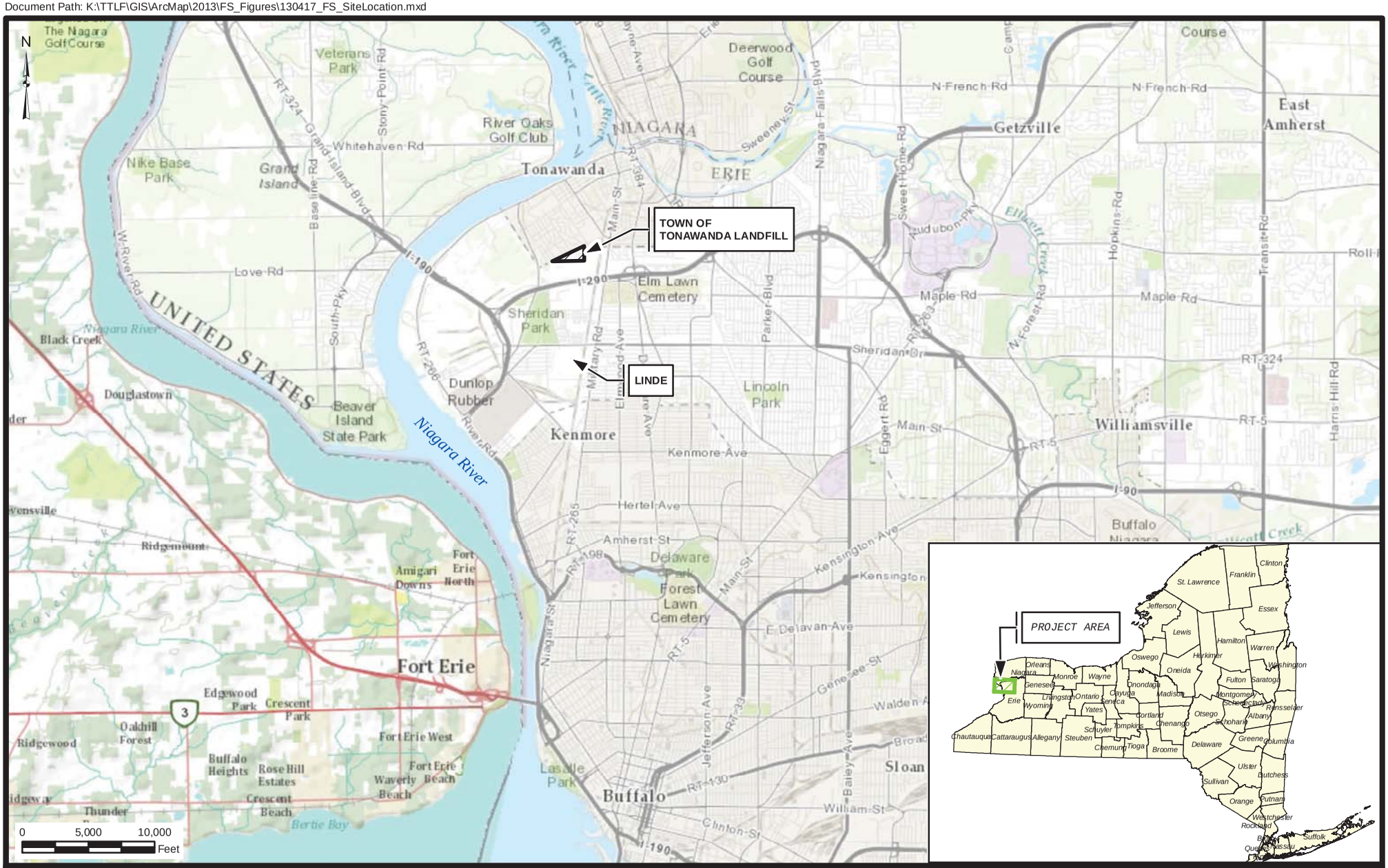

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS BUFFALO, NY	SITE LOCATION MAP	
Document Name: 130417_FS_SiteLocation.mxd Drawn By: H5TDESPM Date Saved: 21 Jan 2014 Time Saved: 3:03:40 PM	TONAWANDA LANDFILL FUSRAP VICINITY PROPERTY TONAWANDA, NEW YORK	FIGURE 1

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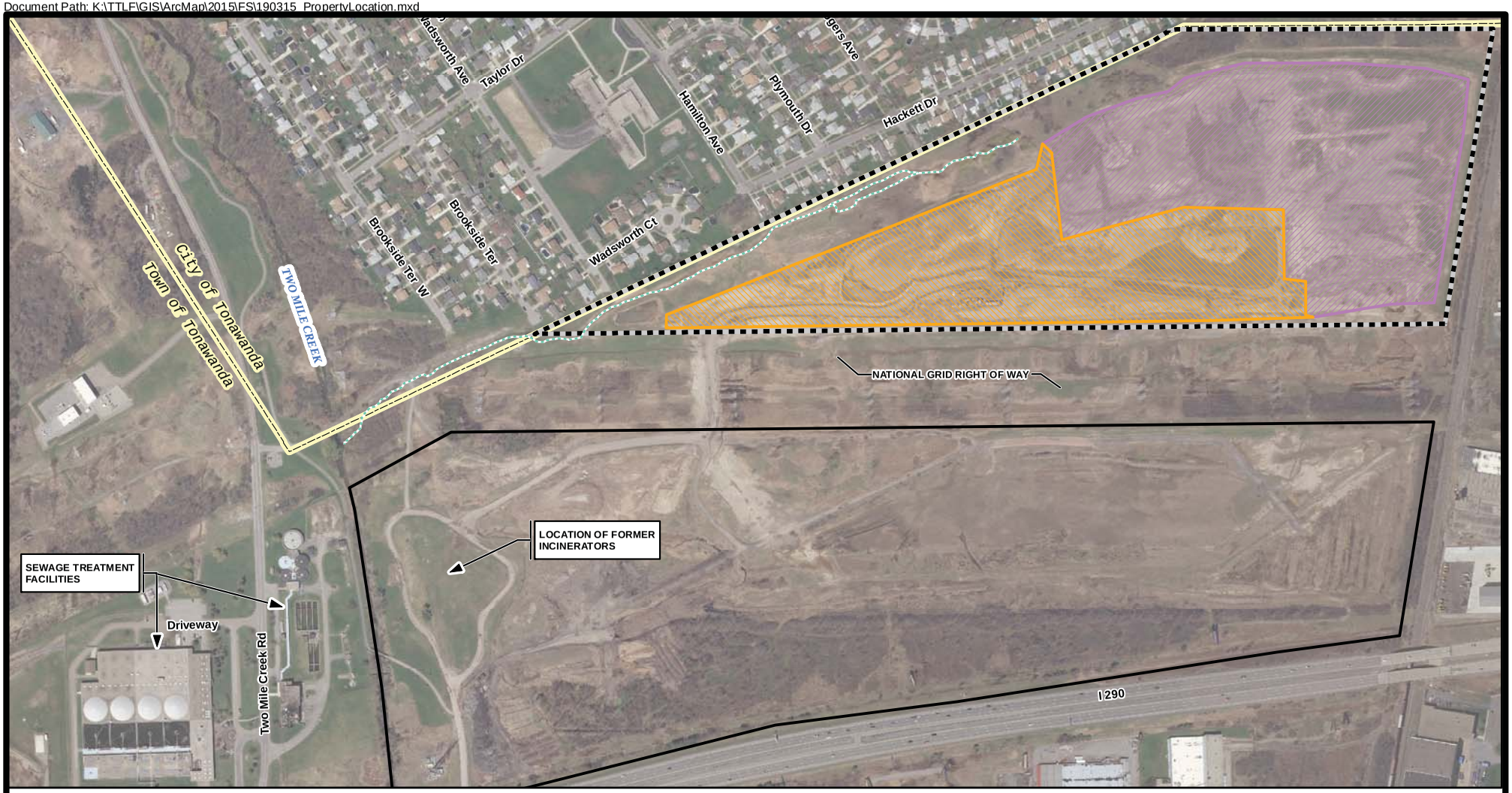

Legend

- Northern Drainage Ditch
- Phase I Landfill Cap (Environmental Solutions - Jan 2011)
- Phase II Landfill Cap (Environmental Solutions - Jan 2011)
- Landfill Operable Unit Boundary
- Mudflats Boundary
- Municipal Boundary

0 400 800 1,600 Feet

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
BUFFALO, NY

US Army Corps of Engineers
Buffalo District

TONAWANDA LANDFILL VICINITY
PROPERTY APPROXIMATE LOCATIONS

Document Name: 190315_PropertyLocation.mxd
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TONAWANDA LANDFILL
FUSRAP VICINITY PROPERTY
TONAWANDA, NEW YORK

FIGURE 2

The various FUSRAP soil sampling efforts identified soils in the Landfill OU containing elevated levels of the FUSRAP constituents of concern (COCs): radium-226, thorium-230 and uranium. Maximum detected concentrations included 3,485 picocuries per gram (pCi/g) for radium-226, 4,300 pCi/g for thorium-230, and 2,048 pCi/g for uranium-238. Soils with elevated FUSRAP constituents were generally confined to an area in the northwestern portion of the Landfill OU, near the center of and roughly paralleling the northwestern fence line separating the Landfill OU from the adjacent residential properties. The highest detected levels were generally detected 0.6 m (2 ft) or more below ground surface, with elevated levels detected as deep as 7.6 m (25 ft) below ground surface (Figure 3).

What are the "Constituents of Concern"?

The Corps of Engineers has identified three FUSRAP-related contaminants that pose the greatest potential risk to human health in the Landfill OU.

Radium: Radium is a naturally-occurring radioactive metal. Radium is a radionuclide formed by the decay of uranium and thorium in the environment. It occurs at low levels in virtually all rock, soil, water, plants, and animals. Long-term exposure to radium increases the risk of developing several diseases. Inhaled or ingested radium increases the risk of developing such diseases as lymphoma, bone cancer, and diseases that affect the formation of blood, such as leukemia and aplastic anemia. These effects usually take years to develop. External exposure to radium's gamma radiation increases the risk of cancer to varying degrees in all tissues and organs.

Thorium: Thorium is a naturally-occurring radioactive metal found at very low levels in soil, rocks, and water. It has several different isotopes all of which are radioactive. The principal concern from low to moderate level exposure to ionizing radiation is increased risk of cancer. Studies have shown that inhaling thorium dust causes an increased risk of developing lung cancer, and cancer of the pancreas. Bone cancer risk is also increased because thorium may be stored in bone.

Uranium: Uranium is a naturally-occurring radioactive element. Uranium is commonly found in very small amounts in rocks, soil, water, plants, and animals (including humans). Uranium is weakly radioactive and contributes to low levels of natural background radiation in the environment. Intakes of uranium can lead to increased cancer risk, kidney damage, or both. Long-term chronic intakes of uranium isotopes in food, water, or air can lead to internal irradiation and/or chemical toxicity.

The surface-water hydrology in the Landfill OU is controlled by the man-made features that characterize the site. FUSRAP surface water investigations focused on a drainage ditch running parallel to the northeastern property boundary, which eventually discharges into Two Mile Creek. The combined results of all of the surface-water sampling efforts found concentrations of radium and thorium at or near background levels for all surface-water sampling locations. Concentrations of uranium in surface water from the drainage ditch are elevated above background. However, the drainage ditch is temporary in nature and is not a drinking water source, and it does not provide significant habitat for aquatic life. Samples collected from Two Mile Creek, the most likely aquatic habitat into which the ditch discharges, exhibited uranium levels that were below the ecological screening level for aquatic life. Therefore, surface water is not a medium of concern for the Landfill OU of the Tonawanda Landfill Vicinity Property, and is not addressed in this proposed plan.

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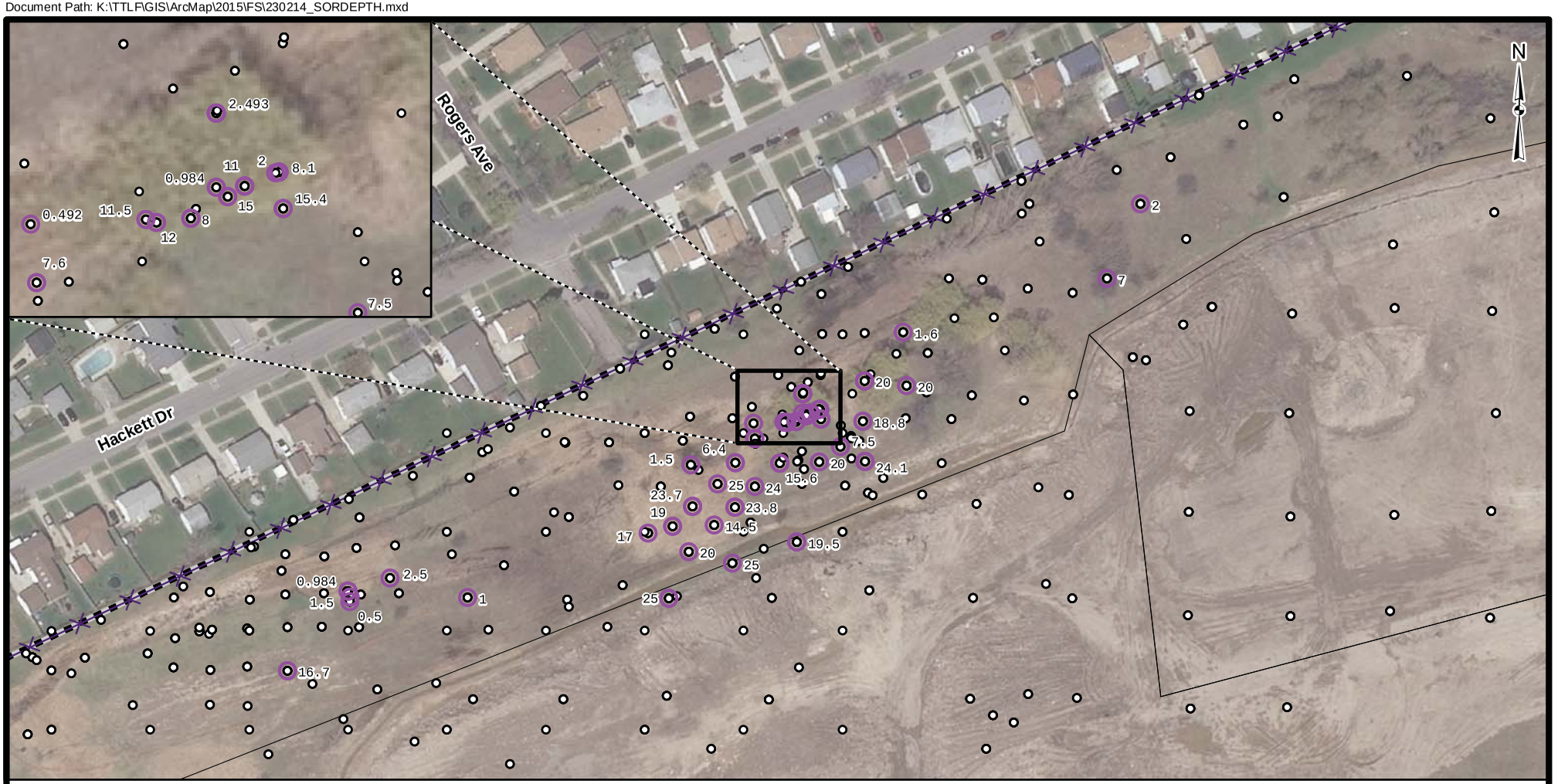

Legend

- 2.5 Soil Sample Location Above PRGs *(with Maximum Depth in feet where PRG Exceeded)*
- Soil Sample Below PRGs
- Town's Landfill Cap (Designed)

0 75 150 300 Feet

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS BUFFALO, NY	SOIL SAMPLES EXCEEDING PRELIMINARY REMEDIATION GOALS	
Document Name: 230214_SORDEPTH.mxd Drawn By: H5TDESPM Date Saved: 18 Jun 2015 Time Saved: 2:09:49 PM	TONAWANDA LANDFILL FUSRAP VICINITY PROPERTY TONAWANDA, NEW YORK	FIGURE 3

Sediment samples were collected by the Corps of Engineers from the same drainage ditch as the surface water samples. The combined results of all of the sediment sampling efforts found concentrations of radium and thorium at or near background levels. Uranium concentrations were elevated compared to background in five on-site sediment sample locations; however, uranium concentrations in samples collected from all of the remaining sediment sample locations, including from off-site portions of the drainage ditch, were at or near background levels, indicating that uranium is not migrating off-site in the drainage ditch sediment. Therefore, sediment is not a medium of concern for the Landfill OU of the Tonawanda Landfill Vicinity Property, and is not addressed as part of this proposed plan.

The Corps of Engineers collected several rounds of groundwater samples from permanent and temporary monitoring wells installed in and surrounding the Landfill OU. The combined results of all of the groundwater sampling efforts found concentrations of radium and thorium at or near background levels for all permanent monitoring well and temporary well point sampling locations. Uranium concentrations in groundwater samples collected from several of the permanent monitoring well and temporary well point sampling locations were elevated above background levels. However, site groundwater is not a current drinking water source, as there are no receptors currently utilizing the groundwater beneath the vicinity property as a potable water source. In addition, the Town of Tonawanda Landfill is a state-listed, chemically-impacted landfill, which precludes groundwater use by near-term future receptors (construction workers and recreational users) and long-term use under the reasonable future land-use assumptions. Groundwater was also excluded as a potential future drinking water source based on current site-specific characteristics including:

- Current groundwater conditions in the two uppermost aquifers beneath the Tonawanda Landfill Vicinity Property exhibit high salinity, sulfate, and total dissolved solids concentrations, as well as organic contamination due to landfill operations, that preclude its use without significant treatment.
- The Landfill OU of the Tonawanda Landfill Vicinity Property is not within the capture zone of current municipal or private drinking water well systems and it is unlikely that it would be in the future due to the availability of fresh drinking water from off-site sources (i.e. the upper Niagara River).

Therefore, groundwater is not a medium of concern for the Landfill OU of the Tonawanda Landfill Vicinity Property, and is not addressed as part of this proposed plan.

SCOPE AND ROLE OF THE RESPONSE ACTION

This response action will address impacted soils at the Landfill OU of the Tonawanda Landfill Vicinity Property. Under FUSRAP, the Corps of Engineers is authorized to remediate only those COCs that are FUSRAP-related. At the Landfill OU, these COCs include radioactive residuals only. Constituents that are not FUSRAP-related may be remediated only if mixed with FUSRAP-related COCs. If these constituents are comingled with FUSRAP-related COCs, they will be remediated and addressed in terms of proper disposal and other actions. The scope of this response action addresses the following constituents: radium-226, thorium-230, and uranium in soils.

SUMMARY OF SITE RISKS

The Corps of Engineers conducted both a human health baseline risk assessment and a screening-level ecological risk assessment, to determine the current and potential future effects of FUSRAP-related constituents on human health and the environment. The current and reasonably anticipated future receptors identified for the Landfill OU of the Tonawanda Landfill Vicinity Property are trespasser (current user), construction worker (current user), and recreational user (reasonable future user). It is the Corps of Engineers' current judgment that the preferred alternative identified in this proposed plan, or one of the other active measures considered in this proposed plan, is necessary to protect human health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

What is "risk" and how is it calculated?

A FUSRAP baseline risk assessment is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. The Corps of Engineers follows the process developed by the U. S. Environmental Protection Agency:

Step 1: Analyze Contamination (hazard identification) occurs during the remedial investigation phase. The Corps of Engineers collects samples from site soils, groundwater, sediments, surface water, and building materials, where appropriate. These samples are analyzed for hazardous substances that are likely present as a result of past FUSRAP-related activities. For example if a site processed uranium compounds, the site would be tested for uranium and the hazardous materials uranium decays to, such as thorium-230.

Step 2: Estimate Exposure (exposure assessment) the risk assessor considers different ways people might be exposed to the FUSRAP-related radionuclides and chemicals identified in Step 1 by developing a conceptual site model which identifies current and potential future land users and maps out the different ways in which each could be exposed to hazardous materials at the site. For example, someone who traverses the site occasionally could be exposed approximately two hours a day, up to seven days a week. They would likely not come in contact with groundwater or soils below a certain depth. By comparison, a construction worker might come in contact with deeper soils through excavation activities. The exposure assessment considers the concentrations that people might be exposed to in environmental media, and the potential frequency and duration of exposure. Using this information, the risk assessor identifies reasonable and likely future land-use scenarios, and computes reasonable maximum exposure values for them, which is the highest level of human exposure that could reasonably be expected to occur.

Step 3: Assess Potential Health Dangers (toxicity assessment) the risk assessor compiles information on the toxicity of each FUSRAP-related constituent to assess potential health risks. The risk assessor considers two types of health risk: cancer risk and non-cancer risk. The likelihood of the occurrence of cancer resulting from exposures at remediation sites is generally expressed as an upper bound probability; for example, a one in 10,000 chance of cancer occurrence over a lifetime. In other words, for every 10,000 people that could be exposed at the reasonable maximum exposure level, at most, one extra cancer would be expected to occur over a lifetime. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, the risk assessor calculates a hazard index.

Step 4: Characterize Site Risk (risk characterization) the results of the three previous steps are combined, evaluated, and summarized. The risk assessor determines whether the potential health risks are acceptable for people at or near the site according to relevant benchmarks promulgated by the U. S. Environmental Protection Agency or other agencies such as the Nuclear Regulatory Commission.

Human Health Risks

The trespasser/recreational user on the Landfill OU is only exposed to soils in the top 0 - 0.6 m (0 - 2 ft) below ground surface. As the FUSRAP-related constituents are primarily buried under more than 0.6 m (2 ft) of soil, the baseline risk assessment concluded that for the current use of the Landfill OU, as it is currently configured, risks to human health from potential exposures to FUSRAP-related material are within the acceptable limits established in the NCP. However, if the surface of the landfill is not maintained, and the top 0.6 m (2 ft) of soil is allowed to erode over time exposing FUSRAP-related material that is currently buried, then risks to future recreational users of the site could increase above the NCP acceptable risk range approximately 600 years into the 1,000-year evaluation period. Potential cancer risks that exceed the one in 10,000 ($1x10^{-4}$) upper bound of the acceptable risk range are the future youth and lifetime recreational users (risks of $4x10^{-4}$ and $5x10^{-4}$ respectively).

Ecological Risks

The screening-level ecological risk assessment concluded that ecological risks are negligible and no further action is warranted for protection of ecological life. The Landfill OU is not currently managed for ecological purposes and is not expected to be so managed in the future. Current habitat at the site consists of disturbed low quality habitat areas, and the on-site ditch is characterized by invasive species and currently does not afford a high quality habitat to aquatic receptors. Given the proximity of the site to Two Mile Creek, where better aquatic habitat is available for foraging, the actual use of this ditch by riparian and aquatic receptors is likely to be very limited. A current terrestrial ecological exposure to deeper levels of soil radioactivity is likely not occurring. Finally, the current ditch habitat will likely be altered or could be eliminated (i.e. culvert or tiled) when the town's landfill is closed, removing accessibility to riparian receptors. If the site will not be managed as a landfill (as is the presumed remedy), then further evaluation of terrestrial organism exposure and action to protect on-site aquatic exposures from dissolved uranium may be appropriate.

REMEDIAL ACTION OBJECTIVES

The remedial action objective for soil at the Landfill OU of the Tonawanda Landfill Vicinity Property is to prevent human exposure to FUSRAP-related COCs in soil above applicable or relevant and appropriate requirement (ARAR)-based preliminary remediation goals (PRGs).

In order to meet this objective the Corps of Engineers developed PRGs for each of the FUSRAP COCs, based on a review of federal requirements that are applicable or relevant and appropriate to the situation or COCs at the site. The PRGs developed for the Landfill OU are based on the requirements contained in Appendix A of Title 10 of the Code of Federal Regulations, Part 40 (10 CFR 40), *Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material From Ores Processed Primarily for Their Source Material Content*, which specifies criteria for developing cleanup goals for radionuclides in surface and subsurface soils.

The PRGs for the Landfill OU were developed to be protective of human health for the recreational reasonable future land use, and are presented in the following table.

Preliminary Remediation Goals for Soil at the Landfill OU of the Tonawanda Landfill Vicinity Property

FUSRAP-related COC	Units	Background[a]	Recreational Surface Soil PRG[b]	Recreational Subsurface Soil PRG[c]
Radium-226	pCi/g	0.95	5	15
Thorium-230	pCi/g	0.92	14	42
Total Uranium[d]	pCi/g	1.75	152	457
Uranium-238	pCi/g	0.86	75	224

a. Average background values for the Landfill OU (Reference: Table 2-7 of the *Updated Baseline Risk Assessment for the Landfill Operable Unit of the Tonawanda Landfill Vicinity Property, Tonawanda, NY*).
b. The depth and area requirements as specified in 10 CFR Part 40 Criterion 6(6). Surface soil is defined as 0-15 centimeters (0-6 inches) below ground surface. The PRGs must be achieved (on average) over a 100 m^2 (1,076 ft^2) area.
c. The depth and area requirements as specified in 10 CFR Part 40 Criterion 6(6). Subsurface soil is defined as soil below 15 centimeters (6 inches). The PRGs must be achieved (on average) over a 100 m^2 (1,076 ft^2) area.
d. Total uranium is a sum of the isotopes (uranium-234, uranium-235, and uranium-238).

SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives for the Landfill OU are presented below. The alternatives are numbered to correspond with the numbers in the feasibility study.

The Corps of Engineers identified four remedial action alternatives for detailed analysis to address FUSRAP-related COCs in soil at the Landfill OU of the Tonawanda Landfill Vicinity Property based upon the above PRGs. These alternatives were developed by combining general response actions, technology types, and process options retained from the screening process. The following alternatives were identified in the feasibility study to be carried forward through detailed evaluation.

Alternative 1: No Action

The no-action alternative is considered in the detailed analysis in accordance with requirements as a baseline against which all other alternatives are compared. Under this alternative, no remedial actions would be undertaken to address radiological FUSRAP-related COCs in soil at the Landfill OU of the Tonawanda Landfill Vicinity Property. It was assumed that all activities, including basic site maintenance and environmental monitoring currently performed, would be discontinued under this alternative. Engineering and land-use controls would not be implemented and those currently in place at the site would not be maintained. The construction, annual operations and maintenance, and present worth costs for Alternative 1 are all $0.

Alternative 2: Single-layer Capping of FUSRAP-related Material

Alternative 2 assumes that the impacted soil exceeding PRGs, outside of the bounds of the capped portions of the Town of Tonawanda municipal landfill, would be capped by the Corps of

Engineers using a single-layer cap. Land-use controls, including prohibitions on excavation and building construction, would be implemented. Remedial action would require approximately 76 weeks to implement. A 1,000-year post-closure monitoring and maintenance program is also included in this alternative, which includes five-year reviews to ensure the remedy remains protective. The construction cost of Alternative 2 is $8,038,999; the annual operations and maintenance cost is $81,884; and the present worth cost is $10,550,838.

Alternative 3: Targeted Shallow Removal and Off-site Disposal of FUSRAP-related Material

Alternative 3 consists of the targeted removal of impacted soil exceeding PRGs within the first 1.5 m (5 ft) below ground surface, transportation off site for disposal in a facility permitted to receive such materials, and restoration of the excavations with clean backfill and reseeding. Land-use controls, including prohibitions on excavation and building construction, would be implemented. Remedial action would require approximately 73 weeks to implement. A 1,000-year post-closure monitoring program is also included in this alternative, which includes five-year reviews to ensure the remedy remains protective. The construction cost of Alternative 3 is $10,341,038; the annual operations and maintenance cost is $62,237; and the present worth cost is $12,157,626.

Alternative 4: Deep Excavation and Off-site Disposal of FUSRAP-related Material

Alternative 4 consists of the excavation of all impacted soil exceeding PRGs, transportation off site for disposal in a facility permitted to receive such materials, and restoration of the excavations with clean backfill and reseeding. After a determination has been made, based on post-excavation sampling and analysis, that the PRGs have been attained, the Landfill OU would not require any further long-term action with respect to the FUSRAP-related contamination. Remedial action would require approximately 122 weeks to implement. The construction cost of Alternative 4 is $55,400,759; the annual operations and maintenance cost is $0; and the present worth cost is $55,400,759.

EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the proposed plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. The “Detailed Analysis of Alternatives” can be found in the feasibility study.

Both threshold criteria (overall protectiveness of human health and the environment, and compliance with ARARs) must be met by any remedial alternative for it to be considered a viable remedy.

The five balancing criteria (long-term effectiveness and permanence; short-term effectiveness; reduction of toxicity, mobility, or volume through treatment; implementability; and cost) represent the primary criteria upon which the detailed analysis was based.

The remaining two of the nine CERCLA criteria (state acceptance and community acceptance), referred to as modifying criteria, are typically evaluated following the public comment period on the proposed plan, and will be addressed during preparation of the record of decision.

EVALUATION CRITERIA FOR CERCLA REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to human health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets cleanup criteria, standards of control, or other requirements from other environmental laws and regulations that pertain to the contamination, or whether a waiver is justified.
Long-Term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-Term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support Agency Acceptance considers whether the state agrees with the Corps of Engineers' analyses and recommendations, as described in the remedial investigation/feasibility study and proposed plan.
Community Acceptance considers whether the local community agrees with the Corps of Engineers' analyses and preferred alternative. Comments received on the proposed plan are an important indicator of community acceptance.

1. Overall Protection of Human Health and the Environment

All remedial alternatives, except Alternative 1, are protective of human health and the environment. If no action is taken and soil at the surface of the Landfill OU is allowed to erode over time, exposing FUSRAP-related material that is currently buried, the risks to trespassers or other users of the site would exceed the NCP acceptable risk range within the 1,000-year evaluation period. Alternatives 2, 3, and 4 all effectively prevent exposure to FUSRAP-related COCs above PRGs.

Because Alternative 1 is not protective of human health and the environment, it is eliminated from consideration under the remaining eight criteria.

2. Compliance with ARARs

Alternatives 2, 3 and 4 would comply with ARARs since they will meet the ARAR-based performance standards.

3. Long-Term Effectiveness and Permanence

The deep excavation and off-site disposal of FUSRAP-related material alternative (Alternative 4) provides the greatest long-term effectiveness because it would remove, for permanent off-site

disposal, all soils above ARAR-based PRGs. The targeted shallow removal and off-site disposal of FUSRAP-related material alternative (Alternative 3) is effective at minimizing exposure as it would remove all contamination that could possibly become exposed due to natural forces within the 1,000-year evaluation period; but relies on land-use controls to continue to be protective in the long term. The single-layer capping of FUSRAP-related material alternative (Alternative 2) is effective at minimizing exposure to soils above ARAR-based PRGs by placing a barrier between those soils and site users; but relies on land-use controls, cap maintenance, and environmental monitoring to continue to be protective in the long term.

4. Reduction in Contaminant Volume, Toxicity, or Mobility through Treatment

None of the alternatives incorporate the treatment of soil to reduce contaminant volume, toxicity, or mobility. However, waste minimization practices during excavation (radiological scanning and sorting) under Alternative 3 and Alternative 4 may reduce the volume of soil requiring off-site disposal; and potential treatment of characteristically hazardous waste as required for disposal purposes may reduce the toxicity and mobility of those soils.

5. Short-Term Effectiveness

Alternative 2 is rated as high in short-term effectiveness, Alternative 3 is rated as moderate, and Alternative 4 is rated as low. The biggest difference in short-term effectiveness is due to the potential for accidents from the excavation/removal and transportation of soil. The potential for exposure to contaminated media, as well as encountering unknown chemical hazards, odor issues, and nuisance pest issues in the landfill, also increases under soil excavation, handling, and transportation scenarios. Though they both involve excavation within the landfill, Alternative 3 is rated higher than Alternative 4 due to the shallower excavation and smaller excavated soil volume associated with implementing the alternative.

6. Implementability

Alternative 3 is rated highest in implementability because the targeted shallow removal and off-site disposal activities use common equipment, materials, and supplies, and are readily implemented; and it does not impede the town's ability to complete their closure of the landfill. No significant problems related to coordinating remediation activities with the landowner or other agencies are anticipated. Alternative 2 is rated as moderate in implementability. No technical difficulties are anticipated for Alternative 2 since most materials for the cap would be available from local sources and capping activities use readily available resources. However, administrative implementability issues are anticipated for Alternative 2 since it may impede the Town of Tonawanda’s ability to comply with New York State landfill closure requirements. While Alternative 4 uses common equipment and materials like Alternative 3, it is rated low in implementability, due to the challenges posed by the much deeper excavation. The high water table in the areas of concern could generate significant groundwater collection and control implementability challenges. In addition there would be an increased difficulty in maintaining sidewall stability due to the depth of the excavation along with the uncertainty and variability in the composition of the landfill.

7. Cost

Alternative 2 has the lowest capital and total present worth costs, but the highest annual operation and maintenance cost, over a duration of 1,000 years. Alternative 4 has the highest capital and total present worth cost, but no annual operation and maintenance costs. Alternative 3 is between Alternatives 2 and 4 with respect to capital, annual operation and maintenance, and total present worth costs.

8. State/Support Agency Acceptance

State/support agency acceptance of the preferred alternative will be evaluated after the public comment period ends and will be considered in the record of decision for the site.

9. Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the record of decision for the site.

The table below summarizes the comparative analysis of the four remedial alternatives.

Comparative Analysis of Remedial Alternatives

Criteria	Alternative 1: No Action	Alternative 2: Single-layer Capping of FUSRAP-related Material	Alternative 3: Targeted Shallow Removal and Off-site Disposal of FUSRAP-related Material	Alternative 4: Deep Excavation and Off-site Disposal of FUSRAP-related Material
Threshold Criteria				
Overall Protection of Human Health and the Environment	Not Protective	Protective	Protective	Protective
Compliance with ARARs	Not Compliant	Compliant	Compliant	Compliant
Balancing Criteria				
Long-Term Effectiveness and Permanence	Low	Low	Moderate	High
Reduction in Toxicity, Mobility, or Volume through Treatment	None	None	None[a]	None[a]
Short-Term Effectiveness	High	High	Moderate	Low
Implementability	High	Moderate	High	Low
Capital Cost	$0	$8,038,999	$10,341,038	$55,400,759
Annual Operation and Maintenance Cost	$0	$81,884	$62,237	$0
Total Present Worth Cost	$0	$10,550,838	$12,157,626	$55,400,759

a. Waste minimization practices and treatment of characteristically hazardous waste for disposal purposes under this alternative may reduce the volume of contaminated soil requiring disposal or mobility of contaminants, respectively.

SUMMARY OF THE PREFERRED ALTERNATIVE

The Corps of Engineers has selected Alternative 3, Targeted Shallow Removal and Off-site Disposal of FUSRAP-related Material, as the preferred alternative to address contaminated soils in the Landfill OU of the Tonawanda Landfill Vicinity Property. All on-site soils exceeding PRGs within the first 1.5 m (5 ft) below ground surface will be removed and shipped off site for disposal at a licensed/permitted disposal facility (or facilities) as shown in Figure 4 on the next page. Alternative 3 is considered protective in the long term because all contaminated soils exceeding the PRGs that could become exposed due to natural means within the 1,000-year evaluation period will be removed from the Landfill OU of the Tonawanda Landfill Vicinity Property. Alternative 3 ensures compliance with the identified ARARs. Alternative 3 provides the best balance of long-term effectiveness, short-term effectiveness and cost, and the highest implementability of the three considered alternatives.

The Corps of Engineers expects the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) utilize permanent solutions that will preclude any future environmental impact. Remediation of the Landfill OU of the Tonawanda Landfill Vicinity Property would only be with respect to soils contaminated with FUSRAP-related COCs.

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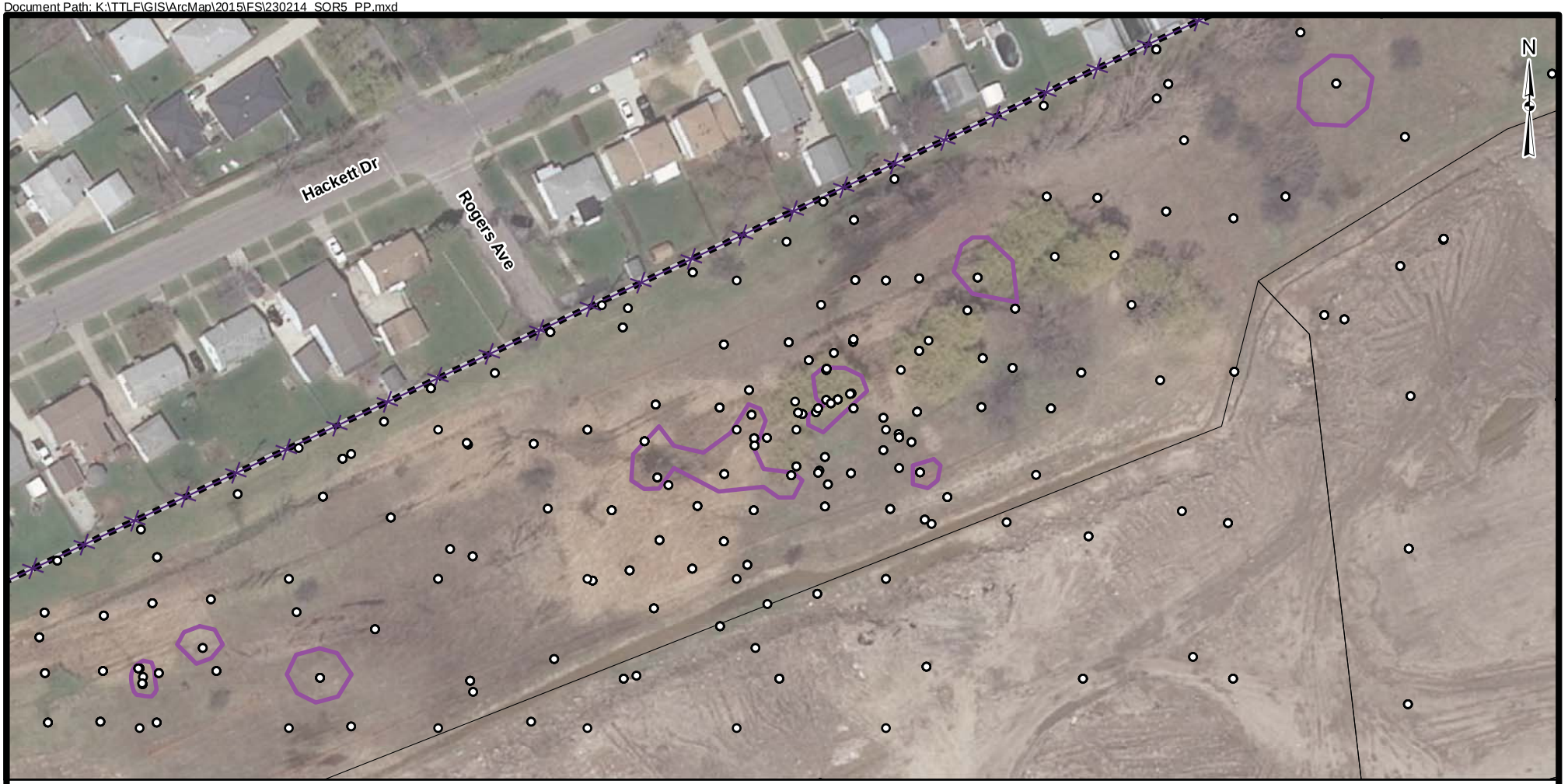

Legend

- Soil Sample Location
- Spatial Extent of Excavation
- Town's Landfill Cap (Designed)

0 50 100 200 Feet

U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS BUFFALO, NY	CONCEPTUAL ILLUSTRATION OF ALTERNATIVE 3 TARGETED SHALLOW REMOVAL AND OFF-SITE DISPOSAL OF FUSRAP-RELATED MATERIAL	
Document Name: 230214_SOR5_PP.mxd Drawn By: H5TDESPM Date Saved: 27 Aug 2015 Time Saved: 8:24:58 AM	TONAWANDA LANDFILL FUSRAP VICINITY PROPERTY TONAWANDA, NEW YORK	FIGURE 4

Tear off sheet

Dear Buffalo District FUSRAP Team,

I would like to provide you with the following comments on the *Proposed Plan for the Landfill Operable Unit of the Tonawanda Landfill Vicinity Property*:

Submitted by

Name: _____

Organization: _____

Address: _____

_____

_____

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Please
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Class
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U.S. Army Corps of Engineers, Buffalo District
Special Projects Branch
Environmental Project Management Team
1776 Niagara Street
Buffalo, NY 14207-3199

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