

# Environmental Surveillance Program Enhancements Niagara Falls Storage Site Lewiston, NY

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

**Building Strong®**

March 2011

## Formerly Utilized Sites Remedial Action Program (FUSRAP)

FUSRAP was initiated in 1974 to identify, investigate, and cleanup or control sites throughout the United States that were part of the Nation's early atomic weapons and energy programs during the 1940s, 1950s, and 1960s. When implementing FUSRAP, the Corps follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan.

## Site Description and History

The Niagara Falls Storage Site (NFSS) is a Federally owned, 191-acre property which was originally part of a World War II explosives manufacturing plant called the Lake Ontario Ordnance Works (LOOW), that was approximately 7,500 acres in size.

Between 1943 and 1954, the Manhattan Engineer District (MED) and the Atomic Energy Commission (AEC) brought radioactive residues and wastes to the LOOW site. Throughout the 1970s, the AEC gradually consolidated its operations and sold excess property.

In 1974, the Formerly Utilized Sites Remedial Action Program (FUSRAP) was initiated to identify, investigate and clean up or control sites that were part of the Nation's early atomic energy and weapons program. In the 1980s, the United States Department of Energy (USDOE) constructed a 10-acre Interim Waste Containment Structure (IWCS) on the NFSS property to contain the radioactive residues and wastes.

In October 1997, Congress transferred the responsibility for FUSRAP from the USDOE to the Corps. In addition to investigating and remediating site contaminants at the NFSS, the Corps is responsible for maintaining the site and conducting the Environmental Surveillance Program (ESP).

## Brief History of the Environmental Surveillance Program at NFSS

The Environmental Surveillance Program (ESP) at NFSS was initiated by the USDOE in 1981 prior to the construction of the on-site IWCS. Air, water, and external gamma radiation (and later streambed sediments) were monitored to ensure protection of human health and the environment from radioactive residues and wastes stored throughout the NFSS.

In 1997, when responsibility for FUSRAP was transferred to the Corps, the Corps' Buffalo District continued to follow the USDOE ESP with some revisions over the years. The Corps reports its findings annually in the form of a Technical Memorandum.

The data from approximately 30 years of environmental monitoring at the NFSS show that the measured parameters of the surveillance program satisfy USDOE guidelines for protection of human health and the environment. The results of ESP activities and a detailed analysis of ESP data are presented in an Annual ESP Technical Memorandum that the Corps posts to the following website:

<http://www.lrb.usace.army.mil/fusrap/nfss/index.htm#Documents>

## NFSS Environmental Surveillance Program

Environmental surveillance activities initiated in 1981 have evolved over the years to ensure that radioactive residues and wastes buried within the IWCS, as well as other on-site soil and groundwater contamination, are not a threat to human health and the environment.

Environmental media currently monitored by the Corps include groundwater, surface water, and streambed sediment for radiological and chemical parameters and air for radon and external gamma radiation dose. Currently, the Corps performs:

- Annual Radon-222 monitoring through the placement of radon flux canisters on the IWCS protective cap.
- Semi-annual radon and external gamma radiation monitoring through the placement of detectors around the IWCS and the perimeter of the site.
- Semi-annual surface water and sediment sampling at points along the west drainage ditch, central drainage ditch, and east (upstream) of the central drainage ditch.
- Semi-annual groundwater monitoring for radiological, metals, anions, and water quality parameters.
- Semi-annual groundwater monitoring on select wells for volatile organic compounds (VOCs).
- Quarterly water level measurements in groundwater wells throughout the site to monitor the groundwater flow directions in the upper and lower water-bearing zones.



***Biannual exchange of radiation monitors by Corps and New York State Department of Environmental Conservation (NYSDEC) personnel to support the ongoing Environmental Surveillance Program at the Niagara Falls Storage Site.***

As additional data is collected through the ESP and site investigations, the Corps reassesses the scope of the ESP to ensure that the IWCS is functioning as designed and is fully protective of human health and the environment. Changes made to the ESP over time are detailed on Tables 1, 2, and 3. Figures showing the NFSS ESP surveillance monitoring locations are also attached. The latest enhancements to the ESP were implemented during the ESP Fall 2010 sampling event and are presented in the following section.

### Enhanced ESP for the Fall of 2010

- ***Addition of one streambed surface water and sediment location to be sampled quarterly.*** This additional sampling location (SWSD025) is situated in the Central Drainage Ditch, north (or directly downstream) of the IWCS.
- ***Addition of 21 groundwater-monitoring well locations, 12 of which monitor the lower water bearing zone.*** Since poor groundwater recharge is common at the NFSS, groundwater wells may not produce sufficient sample volume to analyze for the full suite of parameters. If this occurs, the parameters will be collected in a pre-determined order of priority (i.e. radiological prior to chemical, etc).
- ***Expansion of the list of radiological parameters for water and an increased number of groundwater samples analyzed for chemical parameters and metals.***
- ***Quarterly sampling of wells OW04A and OW04B that are located downgradient from the IWCS to provide additional assurance that the IWCS is functioning as designed.***

---

**U.S. ARMY CORPS OF ENGINEERS – BUFFALO DISTRICT FUSRAP TEAM**

1776 NIAGARA STREET, BUFFALO, N.Y. 14207

Phone: 800-833-6390 (Option 4)

Email: [fusrap@usace.army.mil](mailto:fusrap@usace.army.mil)

Website: [www.lrb.usace.army.mil/fusrap/nfss/index.htm](http://www.lrb.usace.army.mil/fusrap/nfss/index.htm)

**Table 1: Evolution of NFSS Environmental Surveillance Plan**

White background: annual sampling frequency  
 Blue background: quarterly measurement frequency  
 Yellow background: semi-annual sampling frequency

Parameter	1997	2000	2003	2008	2009	2010 (fall) (spring 2010 same as 2009)
Radon Flux (Radon-222 emissions)	180 monitoring locations	180 monitoring locations	183 monitoring locations	183 monitoring locations	183 monitoring locations	183 monitoring locations
TLDs (external gamma dose)	18 locations 2 duplicates 2 blanks	20 locations 2 duplicates 2 blanks	20 locations 2 duplicates 2 blanks	20 locations 2 duplicates 2 blanks	26 locations 2 duplicates 2 blanks	26 locations 2 duplicates 2 blanks
Radon-222, -220	18 locations 2 duplicates	20 locations 2 duplicates	20 locations 2 duplicates	20 locations 2 duplicates	26 locations 2 duplicates	26 locations 2 duplicates
Groundwater level measurements	66 wells	66 wells	91 wells	91 wells	91 wells	101 wells
Groundwater Sampling	8 wells: BO2W20S, A45, A50, OW04B, OW06B, OW07B, OW15B, OW17B  <u>Field Parameters:</u> Dissolved oxygen, redox potential, turbidity, temperature, specific conductivity, pH <u>Water quality analytes:</u> calcium, magnesium, potassium, sodium alkalinity, bicarbonate, carbonate, chloride, nitrate-nitrogen, nitrite-nitrogen, phosphate, sulfate, Total Dissolved Solids, sulfate  <u>Radionuclides:</u> Total uranium, radium, thorium  <u>Metals:</u> Copper, lead, vanadium	8 wells (same)  <u>Field Parameters:</u> Same  <u>Water quality analytes:</u> Same  <u>Radionuclides:</u> Same  <u>Metals:</u> Same	8 wells (same)  <u>Field Parameters:</u> Same  <u>Water quality analytes:</u> Same  <u>Radionuclides:</u> Same  <u>Metals:</u> Same	18 wells: The 10 groundwater wells added to the ESP include: OW18B, 313, 505, 302A, A42, BH49A, OW04A, OW11B, 415A, and 201A (VOCs only) NOTE: OW13B replaced OW07B in 2004  <u>Field Parameters:</u> Same  <u>Water quality analytes:</u> alkalinity(calcium carbonate) and total dissolved solids  <u>Anions:</u> chloride, fluoride, nitrate, nitrite, ortho-phosphate, sulfate  <u>Radionuclides:</u> Same (except analysis for Iso Uranium only for wells OW18B, 313, 505, 302A, A42, BH49A, OW04A, OW11B, and 415A and no radionuclide analysis for well 201A) Also added thorium-228  <u>Metals:</u> Target analyte list, boron, and lithium  <u>Volatile Organic Compounds (VOCs):</u> Only wells 415A and 201A	18 wells (same)  <u>Field Parameters:</u> Same  <u>Water quality analytes:</u> Same  <u>Anions:</u> Same  <u>Radionuclides:</u> Same  <u>Metals:</u> Same  <u>VOCs:</u> same	Spring 2010 - Same as 2009  Fall 2010 - See Table 2 for schedule

Table 1 Continued: Evolution of NFSS Environmental Surveillance Plan

Parameter	1997	2000	2003	2008	2009	2010
Surface water:	<p>SWSD009, SWSD010, SWSD011, SWSD021, SWSD022</p> <p><u>Field Parameters:</u> Dissolved oxygen, redox potential, turbidity, temperature, specific conductivity, pH</p> <p><u>Radionuclides:</u> total uranium radium-226, -228 thorium-230, -232</p>	<p>Same 5 locations</p> <p><u>Field Parameters:</u> Same</p> <p><u>Radionuclides:</u> Uranium-234, -235, -238 radium-226, -228 thorium-230, -232</p>	<p>Same 5 locations</p> <p><u>Field Parameters:</u> Same</p> <p><u>Radionuclides:</u> Same</p>	<p>Same 5 locations plus 5 additional locations: SWSD023, SWSD024, WDD1, WDD2, WDD3,</p> <p><u>Field Parameters:</u> Same</p> <p><u>Radionuclides:</u> Uranium-234, -235, -238 radium-226, -228 thorium-228 (new), -230, -232</p> <p><u>Metals:</u> TAL metals, lithium, boron</p> <p><u>Organics:</u> Polychlorinated Biphenyls (PCBs), pesticides, VOCs, Polycyclic Aromatic Hydrocarbons (PAHs)</p>	<p>Same 10 locations</p> <p><u>Field Parameters:</u> Same</p> <p><u>Radionuclides:</u> Same</p> <p><u>Metals:</u> same</p> <p><u>Organics:</u> same</p>	<p>Spring 2010 - Same as 2009</p> <p>See Table 3 for Fall 2010 sampling schedule</p>
Sediment:	<p>SWSD011, SWSD021, SWSD010, SWSD022, SWSD009</p> <p><u>Radionuclides:</u> total uranium radium-226, -228 thorium-230, -232</p>	<p>Same 5 locations</p> <p><u>Radionuclides:</u> Uranium-234, -235, -238 radium-226, -228 thorium-230, -232</p>	<p>Same 5 locations</p> <p><u>Radionuclides:</u> Same</p>	<p>Same 5 locations plus 5 additional locations: WDD1, WDD2, WDD3, SWSD023, SWSD024</p> <p><u>Radionuclides:</u> Uranium-234, -235, -238 radium-226, -228 thorium-228 (new), -230, -232</p> <p><u>Metals:</u> TAL metals, lithium, boron</p> <p><u>Organics:</u> PCBs, pesticides, VOCs, PAHs</p>	<p>Same 10 locations</p> <p><u>Radionuclides:</u> Same</p> <p><u>Metals:</u> same</p> <p><u>Organics:</u> same</p>	<p>Spring 2010 - Same as 2009</p> <p>See Table 3 for Fall 2010 sampling schedule</p>

Table 2  
Environmental Surveillance Program Initiated in the Fall of 2010  
Groundwater Sampling

Well Location	UWBZ or LWBZ Well	Purpose	*Laboratory Analytical Parameters													**Field Parameters	
			Iso Uranium	Iso Thorium	Radium -226	Radium -228	Strontium-90	Technetium-99	Cesium-137	Iso Plutonium	Tritium (H-3)	Metals	VOCs	Alkalinity	TDS	Anions	
A45	UWBZ	N (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW04A	LWBZ	N (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW04B	UWBZ	N (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
BH49A	UWBZ	N (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
BH49	LWBZ	N (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW05A	LWBZ	N (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW05B	UWBZ	N (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
A50	UWBZ	E (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
MW862	UWBZ	E (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
MW863	LWBZ	E (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW11A	LWBZ	E (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW11B	UWBZ	E (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW12A	LWBZ	E (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW12B	UWBZ	E (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW06A	LWBZ	S (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW06B	UWBZ	S (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW13A	LWBZ	S (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW13B	UWBZ	S (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW07A	LWBZ	S (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW07B	UWBZ	S (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW03A	LWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW03B	UWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW15A	LWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW15B	UWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
A42	UWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW17A	LWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW17B	UWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
OW18B	UWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
A55	LWBZ	W (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
505	UWBZ	EU 1	X	X	X	X	X	X	X	X	X	X		X	X	X	X
415A	UWBZ	EU 4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW934	UWBZ	EU 4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
411A	UWBZ	EU 4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
BO2W20S	UWBZ	EU 5	X	X	X	X	X	X	X	X	X	X		X	X	X	X
MW313	UWBZ	EU 8	X	X	X	X	X	X	X	X	X	X		X	X	X	X
302A	UWBZ	EU 8	X	X	X	X	X	X	X	X	X	X		X	X	X	X
MW921 or MW922 <sup>1</sup>	UWBZ	NW (off-site)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
MW935	UWBZ	NW (IWCS)	X	X	X	X	X	X	X	X	X	X		X	X	X	X
201A	UWBZ	EU13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Field Duplicate	-	-	X	X	X	X	X	X	X	X	X	X		X	X	X	X

**\*Laboratory Analytical Parameters**

- VOC - Volatile Organic Compounds
- TDS - Total Dissolved Solids
- Anions: Chloride
- Fluoride
- Nitrate
- Nitrite
- Phosphate
- Sulfate

**\*\*Field Parameters:**

- pH
- Temperature
- Specific conductivity
- Oxidation-Reduction Potential
- Dissolved oxygen
- Turbidity (If the turbidity reading for a sample is 50 NTUs or greater, the sample will be filtered in the field and both filtered and unfiltered samples at that location will be submitted to the lab for analysis.)

UWBZ - upper water bearing zone  
LWBZ - lower water-bearing zone

indicates new well and/or parameter (Fall 2010)  
indicates not sampled

<sup>1</sup> MW921 was dry during the Fall 2010 sampling event so well MW922 was sampled as a substitute

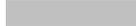
Table 3

Environmental Surveillance Program Initiated in the Fall of 2010  
 Surface Water and Sediment Sampling  
 Niagara Falls Storage Site

*Laboratory Analytical Parameters															**Field Parameters
Sample Location	Iso Uranium	Iso Thorium	Radium -226	Radium -228	Strontium-90	Technetium-99	Cesium-137	Iso Plutonium	Tritium (H-3)	Metals	PAHs	PCBs	Pesticides	VOCs	
SWSD009	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SWSD010	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SWSD011	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SWSD021	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SWSD022	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SWSD023	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SWSD024	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
SWSD025 <sup>1</sup>	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WDD1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WDD2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WDD3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Field Duplicate	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

**\*Laboratory Analytical Parameters:**

- PAH - Polyaromatic Hydrocarbons
- PCB - Polycyclic Biphenyls
- VOC - Volatile Organic Compounds

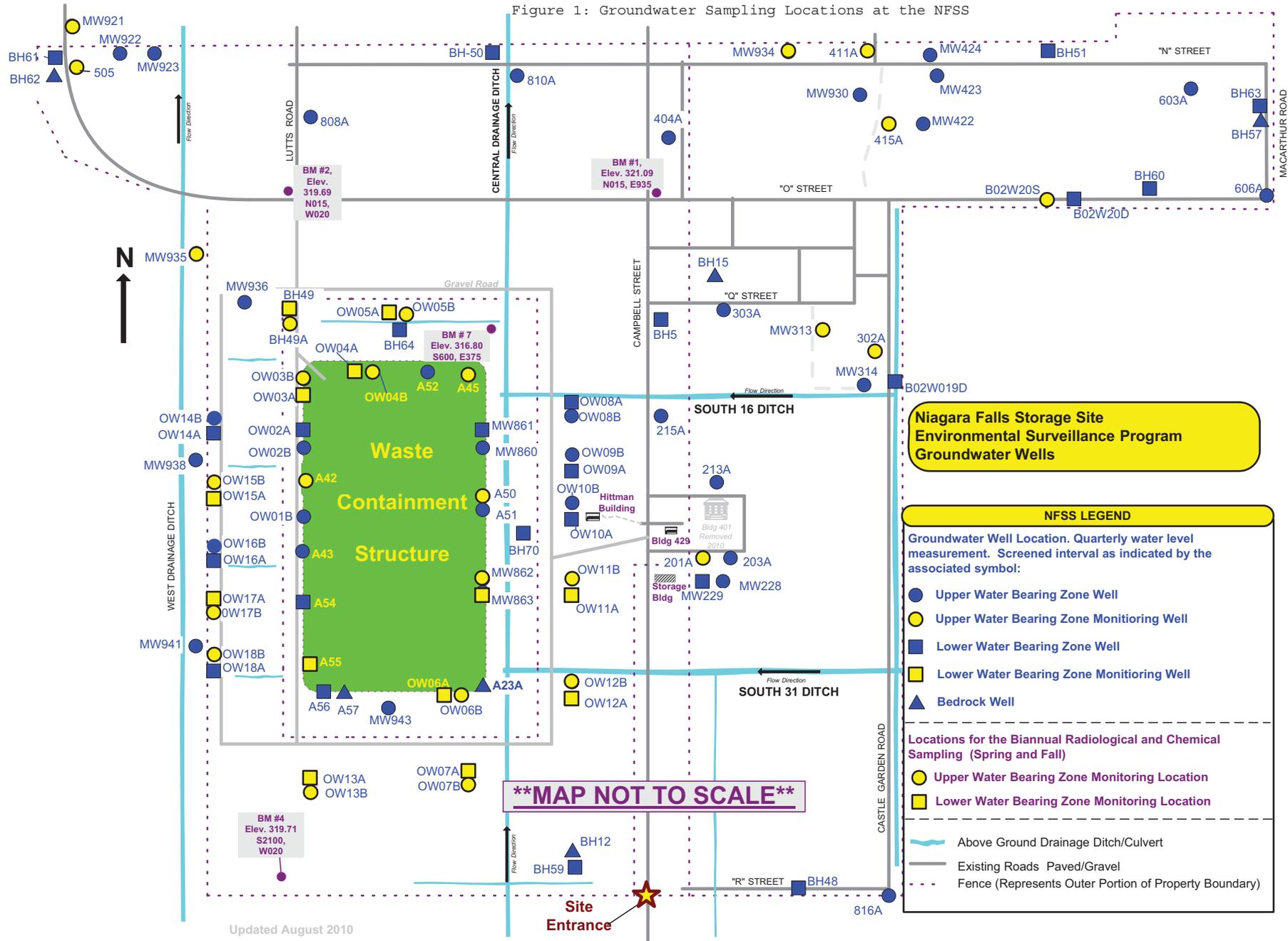
 indicates new location and/or parameter  
 indicates not sampled

<sup>1</sup>SWSD025 is located north of the IWCS and is sampled quarterly.

**\*\*Field Parameters:**

- pH
- Temperature
- Specific conductivity
- Oxidation-Reduction Potential
- Dissolved oxygen
- Turbidity (If the turbidity reading for a sample is 50 NTUs or greater, the sample will be filtered in the field and both filtered and unfiltered samples at that location will be submitted to the lab for analysis.)

Figure 1: Groundwater Sampling Locations at the NFSS



**Niagara Falls Storage Site  
Environmental Surveillance Program  
Groundwater Wells**

**NFSS LEGEND**

- Groundwater Well Location. Quarterly water level measurement. Screened interval as indicated by the associated symbol:
- Upper Water Bearing Zone Well
  - Upper Water Bearing Zone Monitoring Well
  - Lower Water Bearing Zone Well
  - Lower Water Bearing Zone Monitoring Well
  - ▲ Bedrock Well
- Locations for the Biannual Radiological and Chemical Sampling (Spring and Fall)
- Upper Water Bearing Zone Monitoring Location
  - Lower Water Bearing Zone Monitoring Location
- Above Ground Drainage Ditch/Culvert  
 — Existing Roads Paved/Gravel  
 - - - Fence (Represents Outer Portion of Property Boundary)

**\*\*MAP NOT TO SCALE\*\***

Updated August 2010

