Department of Environmental Conservation

Division of Environmental Remediation

Explanation of Significant Difference

Buffalo Outer Harbor/Radio Tower Area Site
City of Buffalo, Erie County
Site Number 9-15-026

January 2003

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* ERIN CROTTY, *Commissioner*

Buffalo Outer Harbor / Radio Tower Area
Site #9-15-026
City of Buffalo, Erie County
Explanation of Significant Difference (ESD)

SECTION 1: INTRODUCTION

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) is modifying the remedy selected by the March 1999 Record of Decision for the Buffalo Outer Harbor/Radio Tower Area Site based on new information. The Buffalo Outer Harbor/Radio Tower Area Site is located in the City of Buffalo in Erie County, New York. The Radio Tower Area (RTA) is located in the southeast corner of a larger parcel of land known as the Buffalo Outer Harbor property. (Figure 1) The property is located approximately 1 mile south of downtown Buffalo, and is bordered to the east by Fuhrmann Boulevard and to the west by Lake Erie.

The Buffalo Outer Harbor property is owned by the Niagara Frontier Transportation Authority (NFTA) and was listed as a Class 2 Inactive Hazardous Waste Disposal Site in the early 1990's. To characterize environmental conditions at the Buffalo Outer Harbor property, a Remedial Investigation and Feasibility Study (RI/FS) was completed by the NYSDEC. Based upon the results of the RI/FS, the NYSDEC removed over 100 acres of the property from the Registry of Inactive Hazardous Waste Disposal Sites in 1997. The RI/FS also concluded that a 100 feet by 100 feet area in the southeast corner of the property in the vicinity of NFTA's radio communication tower was found to contain a significant and consequential amount of hazardous waste. This area, commonly referred to as the Radio Tower Area, remains on the State Registry of Inactive Hazardous Waste Disposal Sites and requires remediation.

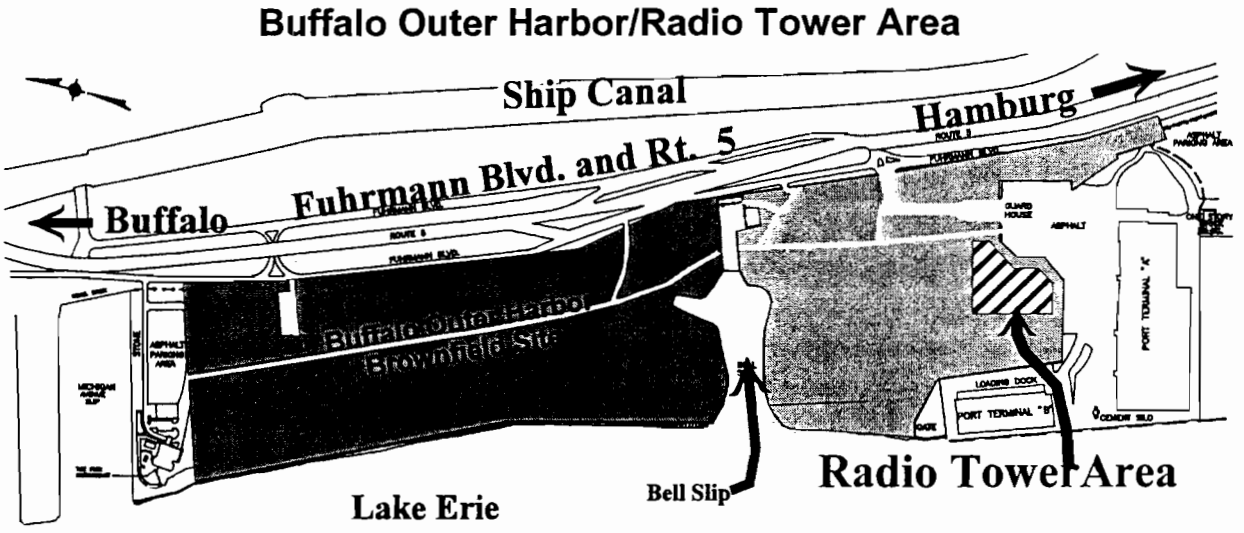

FIGURE 1.

1.1: Statement of Purpose

As more fully described in Section 2 of this document, historic filling operations at the Buffalo Outer Harbor have resulted in the disposal of sludge like material containing high levels of nitrobenzene. The 1999 ROD chose *ex situ* bioremediation using a proprietary soil amendment technique to remediate contaminated soil at the RTA. In August 2000, Honeywell International Inc. signed an Interim Order on Consent with the NYSDEC to conduct a pre-design pilot study to evaluate the use of *in situ* chemical oxidation as a means to address contamination at the site. For this pilot study, Honeywell injected contaminated site soil with a strong oxidizing agent and successfully demonstrated that *in situ* chemical oxidation as an alternative remediation technology is as effective, costs less, provides a greater degree of protection to human health, and is more easily implemented as compared to the ROD remedy.

This Explanation of Significant Difference (ESD) has been prepared to provide the public with an explanation of the nature of the modification to the remedial treatment component of the selected remedy as set forth in the ROD, to summarize the information that supports this modification, and to affirm that the modified remedy complies with State and Federal requirements that are legally applicable or relevant, and is cost effective. This ESD is incorporated into the Administrative Record for the Site.

1.2: Summary of ROD Modification

The modified remedial approach utilizes a combination of proven *in situ* technologies to aggressively reduce nitrobenzene concentrations in site soils to the ROD specified remediation goal of 14 ppm. A first round of injection would be accomplished using a crane-mounted vertical blade soil mixing system to mix the subsurface soil using 8 ft diameter augers. The advantage of mixing the soil and permanganate with the augers would be to maximize homogeneity (i.e., increase contact area with the nitrobenzene-impacted soil and the permanganate). During the *in situ* soil mixing process, permanganate would be injected through a vertical hollow shaft into the soil through openings at the rear of the auger blades.

Approximately two weeks after the first round of permanganate injections, post-treatment soil samples would be collected from selected locations using a direct push drill rig such as a geoprobe unit. This two-week "waiting period," after the first round of permanganate injections, would be necessary to allow the chemical oxidation reaction to be complete (i.e, no residual permanganate). The post-treatment soil samples would be analyzed for nitrobenzene and Total Organic Carbon (TOC).

Based upon the results of the post-treatment sampling, the need for a second round of permanganate injections would be evaluated. If, the 14 ppm cleanup goal has been achieved, a completion report would be prepared and no further remedial work would be performed.

If the post-treatment results show nitrobenzene levels above the cleanup goal of 14 ppm, a second round of in-situ permanganate injections would be performed. The area to be treated would be

expected to be smaller than the initial 100 feet by 100 feet area. A more focused application of permanganate using direct injection methods would take place in the area(s) with nitrobenzene levels above 14 ppm. As with the first round of injections, post-treatment soil samples would be collected approximately two weeks after the second round of injections. The second injection post-treatment soil samples would be analyzed for nitrobenzene only. If the post-treatment results indicate that the cleanup goal of 14 ppm of nitrobenzene has been achieved, a completion report would be prepared and no further remedial work would be performed.

If the second permanganate injection round post-treatment soil samples indicate that the cleanup goal of 14 ppm of nitrobenzene has not been achieved, the area(s) with nitrobenzene-impacted soil above the 14 ppm would be treated using *in situ* stabilization techniques. The goal of the stabilization round would be to immobilize any remaining contaminants of concern. Soil samples would be collected for a treatability study of the stabilization process following the first round of permanganate injection. Stabilization would be conducted using the auger-based *in situ* soil mixing process similar to the chemical oxidation application. However, instead of permanganate, a mixture of cement and/or flyash will be injected into the area where the remedial cleanup goal has not been achieved. Although the primary focus of this additional remediation step would be to immobilize nitrobenzene, an added benefit would be that any residual inorganics would also be immobilized. No follow-up soil sampling of the stabilized material would be collected.

The combined application of the in-situ chemical and stabilization technologies provides, to the highest degree practicable, the most cost effective and best approach to satisfy the requirements of the ROD. Furthermore, this alternative would be equally or more protective to human health and the environment as compared to the ROD-selected remedy.

SECTION 2: SITE HISTORY AND SUMMARY OF ROD REMEDY

The Buffalo Outer Harbor RI/FS found soil (fill) and groundwater contamination in the Radio Tower Site soils that exceeded applicable standards, criteria and guidelines (SCGs) for the site. With respect to soil (fill), the RI/FS found elevated concentrations of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), as well as metals. The soil contamination was associated with a zone of stained subsurface soils ("stained with a shoe polish like sludge" [ROD; pg.8]) that were encountered at an approximate depth of from 8 to 20 feet below grade. Samples collected from this area contained nitrobenzene as high as13,000 milligrams per kilogram (mg/kg), or parts per million (ppm). Toxicity Characteristic Leaching Procedure (TCLP) testing found that these soils would be characterized as a hazardous waste, based upon the leachable concentrations of nitrobenzene measured.

The RI/FS also found elevated levels of VOCs and SVOCs in groundwater. However, the ROD concluded that "the concentration is localized and groundwater flow is limited by the minimal hydraulic gradients present in this area of filled lake bottom and generally low permeability of fill material. Sample results from downgradient monitoring wells verify that groundwater contamination is not readily migrating at this time" (ROD; pg. 9). At the conclusion of the RI/FS, a ROD was

issued in March 1999 to present the remedial action selected by the NYSDEC for the site. The ROD focused on addressing the nitrobenzene-contaminated soils at the site. As stated on the Declaration page of the ROD, the "components of the remedy" are as follows:

- **ROD Item 1**
  A remedial design program to verify the conclusions of the conceptual design and provide the details necessary for the construction, operation, maintenance and monitoring of the remedial program;

- **ROD Item 2**
  Excavation of an estimated 8,000 cubic yards of soil of which approximately 3,500 cubic yards require remediation;

- **ROD Item 3**
  Treatment of nitrobenzene contaminated soil on-site, utilizing bioremediation techniques consistent with treatability studies conducted during the RI/FS;

- **ROD Item 4**
  Redeposition of soil on-site after sampling confirms that the site cleanup objective of 14 ppm nitrobenzene has been met;

- **ROD Item 5**
  Placement of 24 inches of clean soil over the treated soil redeposition areas, site regarding and restoring consistent with intended future use of the property;

- **ROD Item 6**
  Monitoring of site groundwater to verify the effectiveness of the site remedy; and

- **ROD Item 7**
  Institutional controls are recommended to restrict shallow groundwater usage beneath the site, to ensure the continued integrity of the soil cover and to restrict inappropriate future use of the site.

The ROD estimated that approximately 3,500 cubic yards of soil contained nitrobenzene concentrations above the site cleanup goal of 14 ppm. These soils are located in a zone that extends from approximately 8 to 20 feet below the ground surface within a 100 feet by 100 feet area. To access these soils, the ROD estimated the excavation of approximately 8,000 cubic yards of soil, including the 3,500 yards of nitrobenzene-contaminated soil, plus 4,500 cubic yards of overlying soil. The water table is approximately 8 to 12 feet below grade; therefore, dewatering and treatment of water would be necessary.

The 3,500 cubic yards of soil exhibiting nitrobenzene concentrations exceeding 14 ppm would be treated on-site utilizing a proprietary bioremediation technique known as aerobic/anoxic cycling. The remaining 4,500 cubic yards of soils would be tested, stockpiled and ultimately re-deposited back into the excavation.

The aerobic/anoxic treatment process was selected based upon a limited, laboratory treatability study, which showed that soils containing 433 ppm nitrobenzene were reduced to 3 ppm after 56 days of treatment. In the event the aerobic/anoxic technology was determined to be unavailable or otherwise ineffective, the ROD specified that "a proven alternative, low temperature thermal desorption, will be utilized to meet the remedial objectives" (ROD; pg. 9). Following treatment, treated soils would be returned to the excavation and covered with two feet of clean backfill.

The total present wort cost of the *ex situ* bioremediation alternative presented in the ROD was $3,415,000. The total present worth of the low temperature thermal desorption (LTTD) alternative was $3,972,000.

SECTION 3: DESCRIPTION OF SIGNIFICANT DIFFERENCES

To support the selection of an *in situ* remedial technology, a comparison of the alternative remedy and the ROD remedy has been performed. The comparison provides the information that led to proposing the alternative remedial approach, and identifies differences in scope, performance, cost and protectiveness between the two remedies.

3.1: Description of Information that Led to Proposing an Alternative Remedy

The ROD essentially selected two *ex situ* remedies (i.e., *ex situ* bioremediation and LTTD as a contingency) to address soils containing nitrobenzene concentrations above 14 ppm. However, this remediation approach, which would require excavating the subsurface zone of concern and treating above ground, poses the following engineering and health concerns:

a) Excavation below the water table would be more difficult and more expensive

Accessing the soils containing nitrobenzene concentrations above 14 ppm would be technically challenging, because these soils are situated at a depth significantly below the water table at the site. It is noted that the soils at the Outer Harbor Site are predominantly dredge material used to fill in the lake that was once present in this area. To excavate this material, sheet piles would have to be driven 20 to 30 feet below land surface to shore up the sidewalls of the excavation. More importantly, extensive dewatering and treatment of the water would be necessary in order to lower the water table. Significantly lowering the water table in this area of the site would be extremely difficult, if not impossible, based upon the experiences of other excavation work performed at the Outer Harbor Site. At a minimum, it is expected that lowering the water table would require extremely high pumping rates (e.g. hundreds of gallons per minute or greater) to dewater this loosely compacted fill material. The dewatering efforts would have to be maintained for a period of months to keep the excavation open while soils are being removed, treated and redeposited back within the excavation.

b) Handling, treatment and discharging huge volumes of contaminated groundwater during excavation efforts would be impracticable

Any groundwater pumped from the excavation as part of the dewatering efforts would be contaminated and therefore would require treatment prior to discharge. For example, a 200 gallon per minute pumping rate over a 100 day period (conservative low estimates) would generate approximately 29 million gallons of water that would require treatment. Treating this huge volume of contaminated water with temporary facilities constructed on-site is expected to be technically challenging and prohibitively expensive. Once treated, this groundwater would need to be discharged to an appropriate discharge location. Considerable difficulty is anticipated in identifying a discharge location, and receiving approval(s) from the regulatory agencies and other local sewer authorities.

c) Excavating and handling contaminated soils poses an increased health risk

Any *ex situ* remediation approach requires excavating and, in turn exposing nitrobenzene-contaminated soils to the atmosphere. This poses a potential air quality concern both to the remediation workers and the local community. To address this, the ROD considers implementation of a health and safety plan, a community monitoring plan and the potential construction of a temporary, negative air pressure building over the remediation area in an effort to contain fugitive emissions. Although this approach would significantly reduce any fugitive emissions, it cannot be expected to prevent any emissions from occurring. Also, although this approach may offer greater protection to the general public, it would likely increase health risks to the remediation workers (e.g. from heat exhaustion associated with having to wear "confined space" personal protective equipment). Finally, having to operate within a contained facility would significantly lengthen the time to complete the remedy because of the obvious work inefficiencies that would result from performing work in a confined space with added personal protective equipment.

Since the ROD was issued, significant technological advances have occurred in connection with the use of *in situ* methods for treating organics in subsurface soils. Specifically, *in situ* chemical oxidation has been proven to be an effective means for destroying organic contaminants in subsurface soils in place without having to dewater, excavate, and handle the contaminated material. This technology would therefore alleviate any of the concerns discussed above in connection with having to excavate site soils.

3.2: Differences In Scope Between the Two Remedies

The components of the alternative remedy are the same as those specified in Section 2 above with the following exceptions:

- **ROD Item 2**
  The proposed alternative remedial approach would not require any excavation of soils. Instead, the proposed alternative remedial approach would treat the targeted soils in place.

- **ROD Item 3**
  The proposed alternative remedial approach would treat the nitrobenzene contaminated soil utilizing widely accepted *in situ* chemical oxidation techniques to destroy the organic contaminants. Any residual nitrobenzene concentrations (above14 ppm) remaining after two possible treatment applications, would be immobilized in place using *in situ* stabilization techniques.

- **ROD Item 4**
  The proposed alternative approach is an *in situ* remedy; therefore treated soil would not have to redeposited in the excavation.

- **ROD Item 5**
  The proposed alternative remedial approach does not require any excavation or redeposition of treated soil. Therefore, a 24 - inch thick soil cap is unnecessary. Instead the proposed alternative remedial approach would include the placement of a one foot thick layer of clean soil followed by hydroseeding to restore the site surface.

- **ROD Item 7**
  Institutional controls are now required to restrict shallow groundwater usage beneath the site, to ensure the continued integrity of the soil cover and to restrict inappropriate future use of the site. Model institutional controls for Buffalo Outer Harbor/Radio Tower Area are as follows:

  1) The property owner will place a deed restriction prohibiting the use of groundwater as a potable source, or as process water without the necessary water quality treatment as determined by the Erie County Department of Health. An annual certification by the property owner will be submitted to NYSDEC to verify that the restriction has been maintained.

  2) NYSDEC will be notified in writing at least 30 days prior to site development.

  3) If post remedial development or excavation occurs, any soils that are excavated from the treatment zone from below the soil cover must be managed, characterized and properly disposed of off-site in an approved and permitted landfill in accordance with the NYSDEC regulations and directives, or redeposited on-site and covered by a fabric demarcation and at least two feet of clean soil cover. A soil excavation and management plan must be submitted to and approved by the NYSDEC before and development or excavation proceeds. In the event that excavation involves the redepositing of soil from the treatment zone, the soil management plan shall include detailed plans for sampling, staging and covering the excavated soils.

  4) The owner or any subsequent property owner, shall annually certify to the NYSDEC that the cover material in the remediated area has been maintained and that the conditions of the site are fully protective of public health and the environment in accordance with the Record of Decision and the Explanation of Significant Difference.

3.3: Comparison of Performance Between the Two Remedies

Both remedies are considered equally effective in reducing nitrobenzene concentrations. The ROD remedy, *ex situ* bioremediation, would reduce nitrobenzene concentrations through the biological metabolism of the organic contaminant. The alternative remedy, *in situ* chemical oxidation, would reduce nitrobenzene concentrations through the introduction of an oxidant (sodium permanganate), which would chemically destroy the organic contaminant.

Both remedies provide contingencies to address any soils containing residual concentrations of nitrobenzene above the 14 ppm following treatment. The ROD-selected remedy identifies LTTD as a contingency technology to thermally destroy the organic contaminant, should the bioremediation technology prove ineffective. It is noted, however, that LTTD would not treat any inorganic constituents of concern, such as antimony.

The alternative remedy provides *in situ* stabilization as a contingency technology to immobilize any residual soils (following chemical oxidation treatment) that contain nitrobenzene concentrations above 14 ppm. An added benefit of this contingency technology is that the in-situ stabilization would also immobilize any inorganic constituents of concern such as lead and antimony. From a performance perspective, the alternative remedy contingency technology (*in situ* stabilization) is considered to be superior over the ROD remedy contingency technology (LTTD), because the *in situ* stabilization would also immobilize inorganics, while LTTD cannot.

a. Comparison of Cost Between the Two Remedies

The total present worth cost of the *ex situ* bioremediation alternative presented in the ROD was $3,415,000. The total present worth of the low temperature thermal desorption (LTTD) alternative was $3,972,000. The total present worth of the alternative *in situ* remedy, including the stabilization contingency, is approximately $2,100,000.

b. Reasoning Behind the Change and Why the Alternative Remedy Remains Protective of Human Health and the Environment

- The *in situ* nature of the alternative remedy avoids the constructability problems (sheeting/shoring, dewatering, water treatment and water disposal) presented by the ROD remedy.
- The alternative remedy eliminates the air quality and worker health and safety concerns associated with exposing and handling the contaminated soil.
- The alternative remedy has become a widely accepted technique for treating organic contamination in place and is considered equally effective to the ROD remedy in reducing nitrobenzene concentrations in site soils.

- The *in situ* stabilization contingency measure included as part of the alternative remedy has the added benefit of immobilizing inorganic constituents of concern such as antimony whereas the ROD remedy would only address organic contaminants.

- The alternative remedy could be implemented at a lower cost that the ROD- selected remedy.

SECTION 4: ESD DETERMINATION

The alternative remedy is equally, if not more protective of human health and the environment, as compared to the ROD remedy. First, *in situ* chemical oxidation is a widely accepted remediation technology that is considered to be equally effective as the ROD- selected remedy in reducing nitrobenzene concentrations in site soils. Secondly, the alternative remedy contains a contingency stabilization step that would also treat inorganic constituents of concern such as antimony, whereas the ROD remedy would not treat inorganics. Thirdly, the alternative remedy is more protective of the general public and the remediation worker because it eliminates the air quality and worker health and safety concerns associated with exposing and handling the contaminated soil.

Based upon NYSDEC review of the new information concerning the remedial treatment technology that was submitted by the Honeywell International Inc., and in light of the nature and extent of the proposed modification to the scope of the remedy selected by the March 1999 ROD, NYSDEC believes that the modified remedy remains protective of human health and the environment, complies with State and Federal requirements and is cost-effective. In addition the remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable at this site and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

SECTION 5: PUBLIC PARTICIPATION

The ESD, Honeywell's Justification Report, the site ROD and other related documents are available for public review, at;

NYSDEC's Region 9 Office
270 Michigan Avenue
Buffalo, N.Y.

If you would like to review any site related documents at the NYSDEC's Buffalo Office, please phone Mr. David Locey at (716) 851-7220 for an appointment.

The next step in the remedial process will include completing a remedial design prior to the start of remedial construction. It is anticipated that the design will be completed by Honeywell this winter to allow for the start of the *in situ* remediation in early spring 2003. Both the design and remedial construction are contingent on public notification of this ESD and executing a Remedial Order on Consent between the NYSDEC and Honeywell.

If you have any questions regarding the site, the *in situ* remediation plan or site related health issues; please contact the following individuals:

Remediation Issues

Mr. Gary E. Kline, P.E.
NYSDEC - Project Manager
Division of Environmental Remediation
625 Broadway 11th Floor
Albany, NY 12233-7010
(518) 402-9669 or (800) 342-9269

Health-Related Concerns

Mr. Cameron O'Connor
Regional Toxics Coordinator
NYSDOH
584 Delaware Avenue
Buffalo, New York 14202
(716) 847-4385