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November 4, 2002

Gary Kline, P.E.
Project Manager
New York State Department of Environmental Conservation
625 Broadway, 11th Floor
Albany, New York 12233-7017

Re: Justifications for Alternative Remedy and Detailed Scope of Work
Buffalo Outer Harbor/Radio Tower Area Sites

Dear Mr. Kline:

On behalf of Honeywell, Roux Associates, Inc. (Roux Associates) has prepared this detailed scope of work to describe Honeywell's alternative remedial approach for the Buffalo Outer Harbor/Radio Tower Area (Site). The method by which the proposed alternative remedy would achieve the goals of the March 1999 Record of Decision (ROD) for the Site (i.e., through in-situ chemical oxidation versus ex-situ bioremediation), is considered a significant but not fundamental change to the ROD. Administratively, therefore, it is anticipated that the ROD would be modified through the issuance of an Explanation of Significant Differences (ESD). To support the development of an ESD, this letter additionally provides a comparison between the alternative remedy and the ROD remedy selected by the New York State Department of Conservation (NYSDEC). This comparison addresses differences in scope, performance, cost and protectiveness of human health and the environment with regard to the two remedies.

In summary, the alternative remedy is believed to be safer, cheaper, equally effective, and more easily implemented as compared to the ROD-selected remedy. Specifically, the alternative remedial approach utilizes a combination of proven in-situ technologies to aggressively reduce nitrobenzene concentrations in soil, to the degree practicable (i.e., within one construction season), to the ROD-selected soil remediation goal for nitrobenzene of 14 parts per million (ppm). This would be accomplished by the following:

- Performing an initial pre-remediation delineation and baseline sampling round to refine the area of concern, collect baseline data to evaluate the effectiveness of the remedy, and collect design data to support the design of the remedy.
- Performing in-situ chemical oxidation using auger mixing technology to ensure uniform introduction of the chemical oxidant (permanganate) into the "treatment zone.

- Monitoring the effectiveness of the in-situ treatment by performing post-treatment sampling.
- If concentrations of nitrobenzene still remain above the ROD-specified 14 ppm cleanup goal, a second injection round would be performed, again followed by performance monitoring.
- If residual nitrobenzene concentrations still remain above 14 ppm following the completion of the second round of chemical oxidation treatment, a final in-situ stabilization round (e.g., using auger mixing technology to introduce a stabilizer into the zone of concern) would be performed to immobilize any remaining contaminants that exceed respective cleanup goals. It is noted that an added benefit of this final stabilization round would be that inorganics (e.g., antimony) as well as nitrobenzene would be rendered immobile.
- Following the in-situ stabilization round, the area would be capped with 6-inches of soil. Hydro-seed would then be placed on the 6-inches of soil.
- Groundwater monitoring would be conducted during the remediation efforts and continue for two years following completion of the remediation activities.

The combined application of in-situ chemical oxidation and stabilization technologies provides, to the 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 of human health and the environment as compared to the ROD-selected remedy.

Background information regarding the Outer Harbor Site, followed by a detailed comparison of the alternative remedy and the ROD-selected remedy is provided below. This is followed by a scope of work to implement the proposed alternative remedy.

GENERAL SITE BACKGROUND AND DESCRIPTION OF ROD REMEDY

The Radio Tower Site is located in the southeast corner of a larger parcel of land known as the Buffalo Outer Harbor. The entire Buffalo Outer Harbor property was listed as a Class 2 Inactive Hazardous Waste Disposal Site in the early 1990s. To characterize environmental conditions at the Buffalo Outer Harbor property, a Remedial Investigation and Feasibility Study (RI/FS) was completed by the NYSDEC in the mid 1990s. Based upon the results of the RI/FS, the NYSDEC in 1997 removed over 100 acres of the property from the Registry of Inactive Hazardous Waste Disposal Sites (Registry). The Radio Tower Area Site was found by the NYSDEC "*to contain a significant and consequential amount of hazardous waste that requires further action*" (ROD; pg. 7), and therefore remained on the Registry.

The 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 VOCs and 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. The most prominent (from a concentration standpoint) contaminant encountered in these soils was nitrobenzene, which was detected at concentration levels as high as 13,000 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 characteristic hazardous waste, based upon the leachable concentrations of nitrobenzene measured.

Regarding groundwater, the RI/FS also found elevated levels of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). However, the NYSDEC concluded that "*the contamination is localized and groundwater flow is limited by the minimal hydraulic gradients present in this area of 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).

Following 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. Specifically, as stated on the Declaration page of the ROD, the "*components of the remedy*" are as follows:

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.*
2. *Excavation of an estimated 8,000 yd3 of soil of which approximately 3,500 yd3 requires remediation.*
3. *Treatment of nitrobenzene contaminated soil on-site utilizing bioremediation techniques consistent with treatability studies conducted during the RI/FS.*
4. *Redeposition of soil on-site after sampling confirms that the site cleanup objectives of 14 ppm nitrobenzene has been met.*
5. *Placement of 24 inches of clean soil over the treated soil redeposition areas, site regrading and restoration consistent with intended future use of the property.*
6. *Monitoring of site groundwater to verify the effectiveness of the site remedy.*
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 NYSDEC determined that groundwater remediation was not necessary to meet the remedial objectives.

The ROD estimated that approximately 3,500 cubic yards of soil at the Site contained nitrobenzene concentrations above 14 ppm. These soils are located in a zone that extends from approximately 8 to 22 feet below land surface within a 100 ft by 100 ft area. This area is shown in Figure 1. To access these soils, the ROD envisioned 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 only, 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 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.

COMPARISON OF THE ALTERNATIVE REMEDY AND THE ROD REMEDY

To support the development of an ESD document, a comparison of the alternative remedy and the ROD remedy has been performed. This comparison provides the information that led to proposing an alternative remedy, and identifies differences in scope, performance, cost and protectiveness between the two remedies.

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.

1. **Excavation Below the Water Table Would Be Very Difficult and Prohibitively Expensive**
   Accessing the soils containing nitrobenzene concentrations above 14 ppm would be technically challenging, if not impracticable 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 actually fill material used to fill in the former lake bottom that was once present in this area. This fill is very loosely compacted, and

contains voids and other high permeability pathways. 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. And these 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.

2. **Handling, Treating 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 (conservatively low estimates) would generate approximately 29 million gallons of water that would require treatment. Treating this huge volume of contaminated water with temporary facilities is expected to be technically challenging and prohibitively expensive. Moreover, once treated this groundwater would need to be discharged somewhere. Considerable difficulty is anticipated in identifying an appropriate discharge point, and receiving approval(s) from the regulatory agencies and other local authorities, in connection with this discharge.

3. **Excavating and Handling the Contaminated Soils Poses an Unnecessary Health Risk**
   Any ex-situ remediation approach requires excavating and, in turn, exposing these 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 costs consider 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.

Meanwhile, over the last several years 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 organics in subsurface soils *in place* without having to excavate, dewater or handle the impacted material. This technology would therefore alleviate any of the concerns discussed above in connection with having to excavate the impacted soils.

In light of the difficulties and challenges expected in implementing the ex-situ remedy selected in the ROD, and given the advent of new, proven in-situ technologies that avoid these problems, Honeywell and the NYSDEC investigated the applicability of this alternative technology to the Outer Harbor Site over the last two years. Simply put, the NYSDEC and Honeywell were evaluating whether there was a simpler, equally effective, safer, and less costly way of achieving the objectives of the ROD.

A discussion of the significant differences between the two remedies follows.

Differences In Scope Between the Two Remedies
As stated previously, the ROD-selected remedy consists of the following components:

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.*
2. *Excavation of an estimated 8,000 yd3 of soil of which approximately 3,500 yd3 requires remediation.*
3. *Treatment of nitrobenzene contaminated soil on-site utilizing bioremediation techniques consistent with treatability studies conducted during the RI/FS.*
4. *Redeposition of soil on-site after sampling confirms that the site cleanup objectives of 14 ppm nitrobenzene has been met.*
5. *Placement of 24 inches of clean soil over the treated soil redeposition areas, site regrading and restoration consistent with intended future use of the property.*
6. *Monitoring of site groundwater to verify the effectiveness of the site remedy.*
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 components of the alternative remedy are the same as those specified above with the following exceptions.

- **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.

- **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 (above 14 ppm) remaining after two possible treatment rounds, would be immobilized in place using in-situ stabilization techniques.

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

- **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 six inch thick layer of clean soil followed by hydroseeding.

Comparison of Performance Between the Two Remedies
Both remedies are considered to be equally effective in reducing nitrobenzene concentrations. The ROD remedy, ex-situ bioremediation, would reduce nitrobenzene concentrations through the biological metabolism of the organic contaminant. Whereas the alternative remedy, in-situ chemical oxidation, would reduce nitrobenzene concentrations through the introduction of an oxidant (permanganate), which would chemically destroy the organic contaminant.

Also, both remedies provide contingencies to address any soils containing residual concentrations of nitrobenzene above 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 (i.e., 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.

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 remedy, including the in-situ stabilization contingency, is approximately $2,100,000.

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

The reasons for replacing the ROD-selected remedy with the alternative remedy described in this Scope of Work are provided below.

- 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 than the ROD-selected remedy.

Most of all, 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.

ALTERNATIVE REMEDY IMPLEMENTATION SCOPE OF WORK

The following subsections provide a detailed scope of work to implement the in-situ oxidation alternative remedy.

Pre-Remediation Delineation and Baseline Soil Sampling

The initial step prior to beginning the first in-situ chemical oxidation injection round would be collecting delineation/baseline soil samples from the 100 ft by 100 ft area of concern. The objectives of this work would be to:

- Refine the area of soil requiring treatment (i.e., containing nitrobenzene concentrations above 14 ppm);

- Determine baseline (pre-remediation) concentrations of nitrobenzene that would be used to evaluate the effectiveness of each round of treatment; and
- Collect data necessary to support the design of the remedy.

A Geoprobe™ unit would be used to drill soil borings at regular (e.g., 10-foot or 20-foot) intervals located in a radial pattern outward from the "hot spot" borings that currently define the 100 ft by 100 ft area of concern (i.e., SB-73, SB-75, SB-75A, SB-81, and SB-82). For sampling locations where nitrobenzene results exceed 14 ppm, delineation would continue radially outward from each existing soil boring until nitrobenzene results are below 14 ppm. For example, as shown in Figure 2, initial soil borings would be drilled in a radial pattern around each existing soil boring. Sampling would be conducted outward incrementally (e.g., 10-foot intervals) in a phased approach from the initial soil borings until nitrobenzene results are below 14 ppm. The outermost borings would define the limits of the area requiring treatment.

One soil sample would be selected for nitrobenzene analysis at each borehole location from the depth interval exhibiting the highest level of contamination, based upon field screening results (photoionization detector [PID] readings, visual, etc.). The sample for total organic carbon (TOC) would be collected from a composite of the borehole from 10 ft to 20 ft below land surface (bls). The soil samples would be sent to a laboratory for rush analysis (i.e., 24-hour turnaround time) for nitrobenzene using the United States Environmental Protection Agency (USEPA) Method 8270 (base neutral extractable hydrocarbons) and TOC analysis using USEPA Method 415.1. The laboratory would be a certified New York State Department of Health (NYSDOH) Environmental Laboratory Approved Program (ELAP) laboratory and will follow the analytical procedures from the 1991 NYSDEC Analytical Services Protocol (ASP).

The pre-remediation delineation soil boring locations would be surveyed using a New York State-licensed surveyor. In addition, during the soil sample collection activity, the proximity to the existing radio tower will be assessed and any implications to the proposed remedy will be evaluated.

In-Situ Chemical Oxidation Injection(s)

TOC data collected during the pre-remediation delineation sampling would be used to determine the amount of permanganate necessary to oxidize the nitrobenzene. No other treatability data or pilot testing is contemplated, given that in-situ chemical oxidation is a widely accepted and relatively straightforward technology used for destroying (oxidizing) organic contaminants such as nitrobenzene.

The first round of injection would be accomplished using a crane-mounted vertical blade soil mixing system designed 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 orifices at the rear of the auger blades. A series of tanks, piping, etc. would be placed adjacent to the rig for permanganate storage and mixing. Mobilization of the rig and ancillary equipment would take approximately one week.

Based upon previous investigations of the Site, the impacted soil appears to be located at an approximate depth of 8 to 20 ft bls. To target this zone, the 8 ft diameter augers would initially be pushed through the overlying, cleaner soil without the addition of permanganate. At approximately 7 ft bls (just above the impacted soil), permanganate would be introduced into the auger until the auger reaches 20 ft bls. The auger would then be pulled back to the surface and would begin at another location adjacent to the previous borehole in an overlapping pattern to provide complete coverage. This process would be repeated until the entire 100 ft by 100 ft area has been treated. It is estimated that approximately 15 injection points could be completed per day. Based on the area to be treated, approximately 230 injection points would be needed. The exact number of injection points needed to provide coverage would be determined once the area of concern is refined as a result of the pre-remediation delineation efforts. Preliminarily, it is anticipated that the in-situ soil mixing injections would take approximately three to four weeks to complete.

Approximately two weeks after the first round of permanganate injections, 15 post-treatment soil samples would be collected from selected locations using 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 remaining). The soil mixing rig and auger equipment would also demobilize during this two-week period.

The post-treatment soil samples would be analyzed for nitrobenzene and TOC. Additionally, soil would be collected at this time for a treatability study for the contingency in-situ stabilization step. The purpose for collecting soil at this time for the treatability study is that the permanganate would react with any organic material thus changing the characteristics of the soil.

Based upon the results of the post-treatment sampling event, the need for a second round of permanganate injections would be evaluated using a 90% statistical confidence interval level, to show that the cleanup goal of 14 ppm of nitrobenzene has been achieved. If, based on the results and the statistical analysis, the 14 ppm has been achieved, a completion report would be prepared and no further remedial work would be performed.

If the post-treatment results remain above the cleanup goal of 14 ppm for nitrobenzene, 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 ft by 100 ft area. Because of the expected smaller area, a Geoprobe™ unit would be used to provide a more focused application of permanganate in the area(s) with nitrobenzene levels above 14 ppm. An estimated 50 close-spaced injection points would be completed over a two to three week period. This two to three week period also would include the mobilization of the Geoprobe™ unit and ancillary equipment (permanganate mixing tanks, etc.). As with the first round of injections, post-treatment soil samples would be collected utilizing a Geoprobe™ unit 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 (to a 90% statistical confidence interval, a completion report would be completed and no further remedial work would be performed.

In-Situ Stabilization (Contingency Additional Treatment)
If the second permanganate injection round post-treatment soil samples indicates that the cleanup goal of 14 ppm of nitrobenzene has not been achieved, the area(s) with nitrobenzene-impacted soil above 14 ppm would be treated using in-situ stabilization techniques. The goal of the stabilization round would be to immobilize any remaining constituents of concern. Specifically, the objective of the stabilization round would be to prevent nitrobenzene from leaching at concentrations exceeding the Toxicity Leaching Procedure (TCLP) levels. Although the primary focus of this additional remediation step would be to immobilize nitrobenzene, an added benefit would be that any residual inorganics (e.g., antimony) would also be immobilized. No follow-up soil sampling of the stabilized material will be collected.

If necessary, depending on the post-treatment sampling results following the chemical oxidation treatment, the method to be used to perform the in-situ stabilization would be evaluated. Preliminarily, it is anticipated that the in-situ stabilization process would utilize the crane-mounted 8 ft diameter auger. It is possible, however, that the results may indicate that very limited stabilization is required, in which case, it would be accomplished through Geoprobe™ injections in a manner similar to the second round of chemical oxidation. If the stabilization is conducted through the auger-based in-situ soil mixing, the process would be identical to the chemical oxidation application, with the exception of the mixing agent applied. A series of tanks, piping, etc. would be placed adjacent to the rig for the stabilization/fixation agent storage and mixing. Mobilization of the rig and ancillary equipment is estimated to take approximately one week, and the in-situ stabilization process is estimated to require three to four weeks to complete.

Following completion of the in-situ stabilization process, restoration of the remediated area would be accomplished by capping the area with 6-inches of clean imported fill. The fill would be covered with hydro-seed to minimize erosion of the cap.

Treatability Study for In-Situ Stabilization
In order to determine the appropriate stabilization/fixation agents and to provide an additional degree of quality assurance, two independent treatability studies would be performed by two reputable subcontractors. The treatabililty studies would include the following tasks:

1. **Soil Collection**
   The soil for the treatability studies would be collected following the first permanganate injections and provided to the treatability study subcontractors. To provide the volume of soil necessary to perform the treatability studies, and to ensure that the soil is representative of the overall zone to be treated, a composite soil sample would be collected from 10 to 20 ft bls from representative locations within the 100 ft by 100 ft area. The precise sampling locations would be determined based upon the results of the pre-remediation sampling round, and modified, if necessary, based upon field inspections (e.g. visual, PID, etc.) of samples during the soil collection task. The precise number of locations to be sampled would be based on the requirements of each subcontractor.

2. **Treatability Testing**
   Once collected, the soil sample composites would be subjected to a series of tests using various dosages and/or combinations of Portland cement, bentonite and fly ash. The appropriate mixing procedures (i.e., mechanical mixing) would also be used to closely simulate the proposed field mixing technique. Once mixed, each "batch" of soil plus stabilizer additive(s) would be analyzed using the Toxicity Characteristic Leaching Procedure (TCLP) for nitrobenzene and antimony.

3. **Evaluation of Results**
   The "batch" from either treatability study that yields the lowest resulting TCLP concentration for nitrobenzene and antimony would be selected as the basis for designing (i.e., selecting the dosage and mixture of stabilizer(s)) the in-situ stabilization component of the proposed remedy.

4. **Reporting**
   The results of each treatability study will be provided in a report prepared by each treatability subcontractor. These reports would then be submitted to the NYSDEC, along with a cover letter that identifies the selected dosage/mixture of stabilizer(s) to be used in the in-situ stabilization component of the remedy.

Preparation of Completion Report
A remediation completion report would be prepared following the completion of the remediation work. The completion report would summarize the work completed and discuss the results of the soil samples and treatability studies.

Implementation Schedule
Based on the work described above and in consideration of the construction season in the Buffalo area, we estimate completing the proposed remedial approach in approximately eight to nine months. A preliminary implementation schedule is shown in Figure 3.

Groundwater Monitoring
Groundwater would be monitored for a three-year period beginning at the start of the remedy (which is anticipated to require one year to complete), and then continuing for two years after the completion of the remedy. The first year of monitoring is intended to

determine pre-remediation, or baseline conditions. The post-remediation monitoring would be designed to monitor groundwater after the remedy has been completed.

Semi-annual (twice annually) groundwater monitoring would be conducted for the first two years and annual monitoring would be performed during the last year of the three year period, for a total of five monitoring rounds. The groundwater monitoring would be conducted from two existing monitoring wells (GW-19 and GW-21) and two new monitoring wells. Two new monitoring wells would be required because existing wells GW-18 and GW-18B are located within the remediation zone and would be "lost" during implementation of the in-situ chemical oxidation round using the augers. The locations of the two new monitoring wells are shown on Figure 4. The groundwater would be sampled for nitrobenzene using USEPA Method 8270 (base neutral extractable hydrocarbons) and antimony using USEPA Method 6000-7000 Series. Following the completion of each groundwater sampling event and the receipt of analytical results, a summary letter would be prepared and submitted to the NYSDEC and would include the sampling data, along with findings and conclusions.

Sincerely,

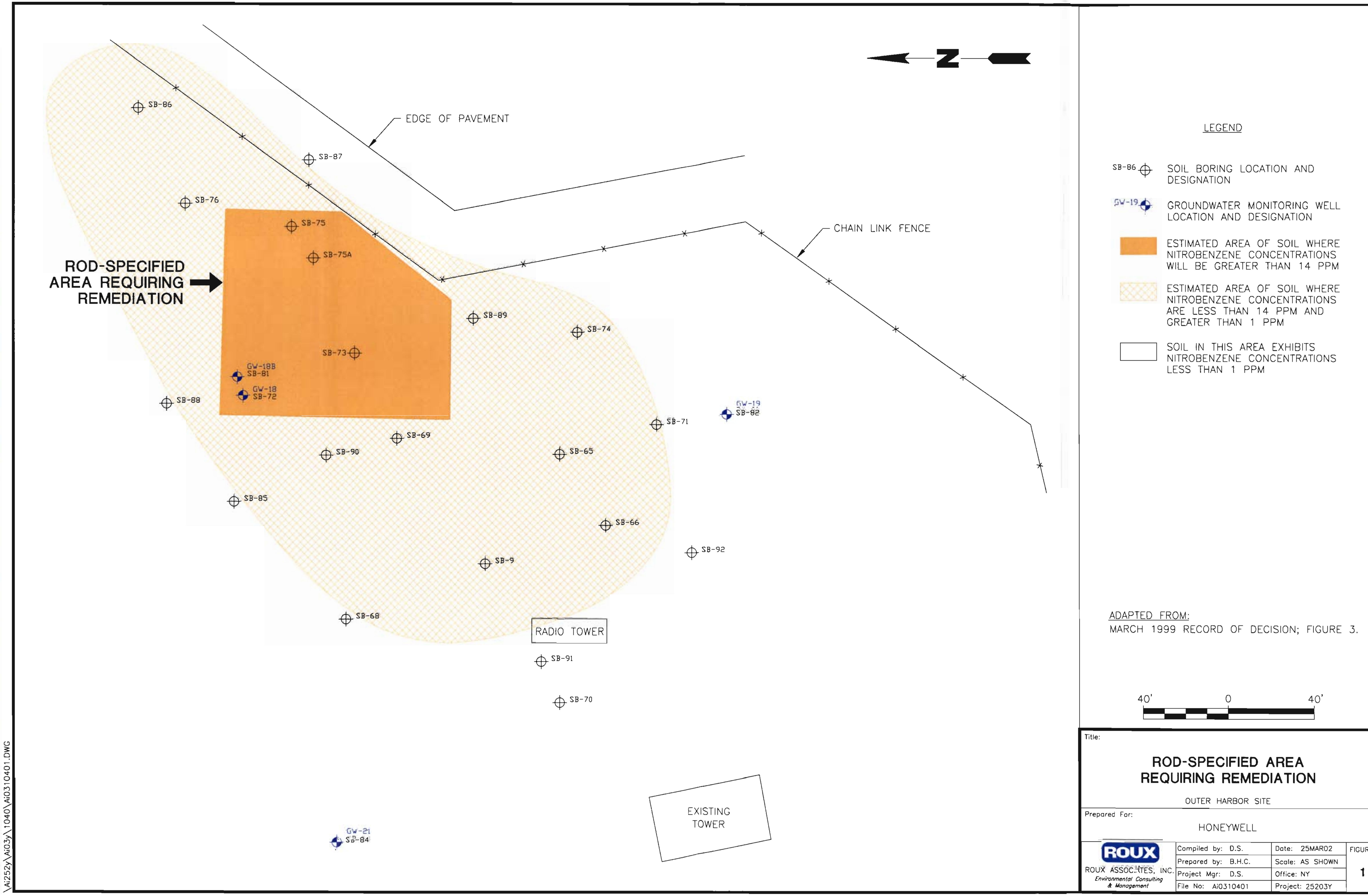
ROUX ASSOCIATES, INC.

Glenn Netuschil, P.E.
Senior Engineer

Douglas J. Swanson
President

Enclosure

cc: Maria Kaouris, Honeywell
David Flynn, Esq., Phillips Lytle et al
Pam Cissik, Esq., Honeywell



Title:

ROD-SPECIFIED AREA REQUIRING REMEDIATION

OUTER HARBOR SITE

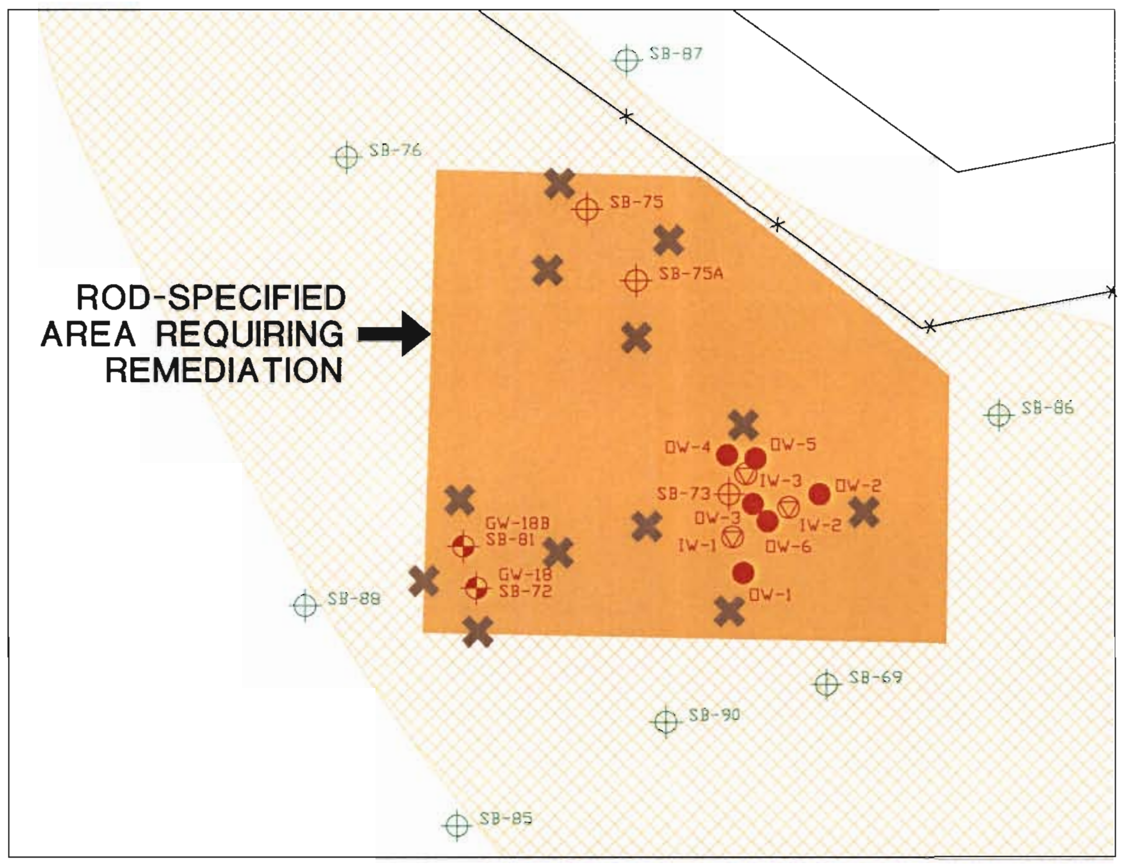
Prepared For:

HONEYWELL

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: D.S.	Date: 25MAR02	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	1
Project Mgr: D.S.	Office: NY	
File No: Ai0310401	Project: 25203Y	

PHASE 1



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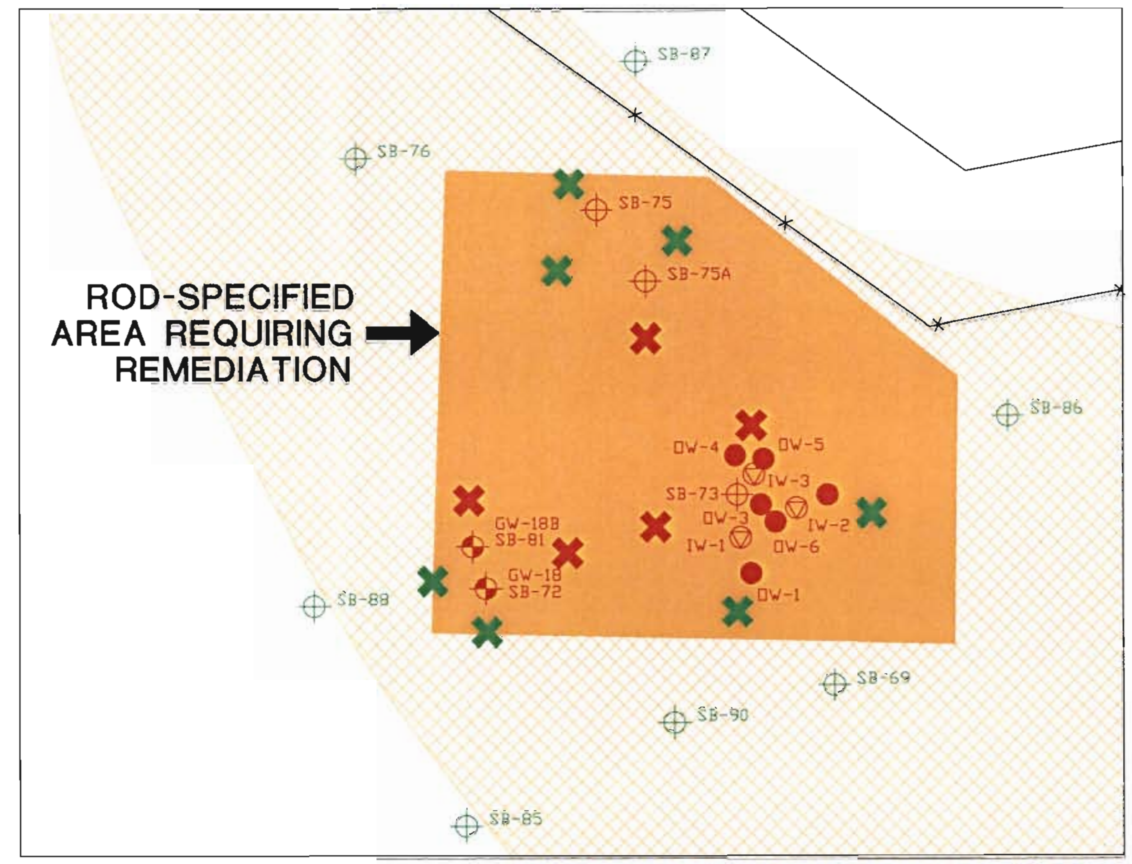

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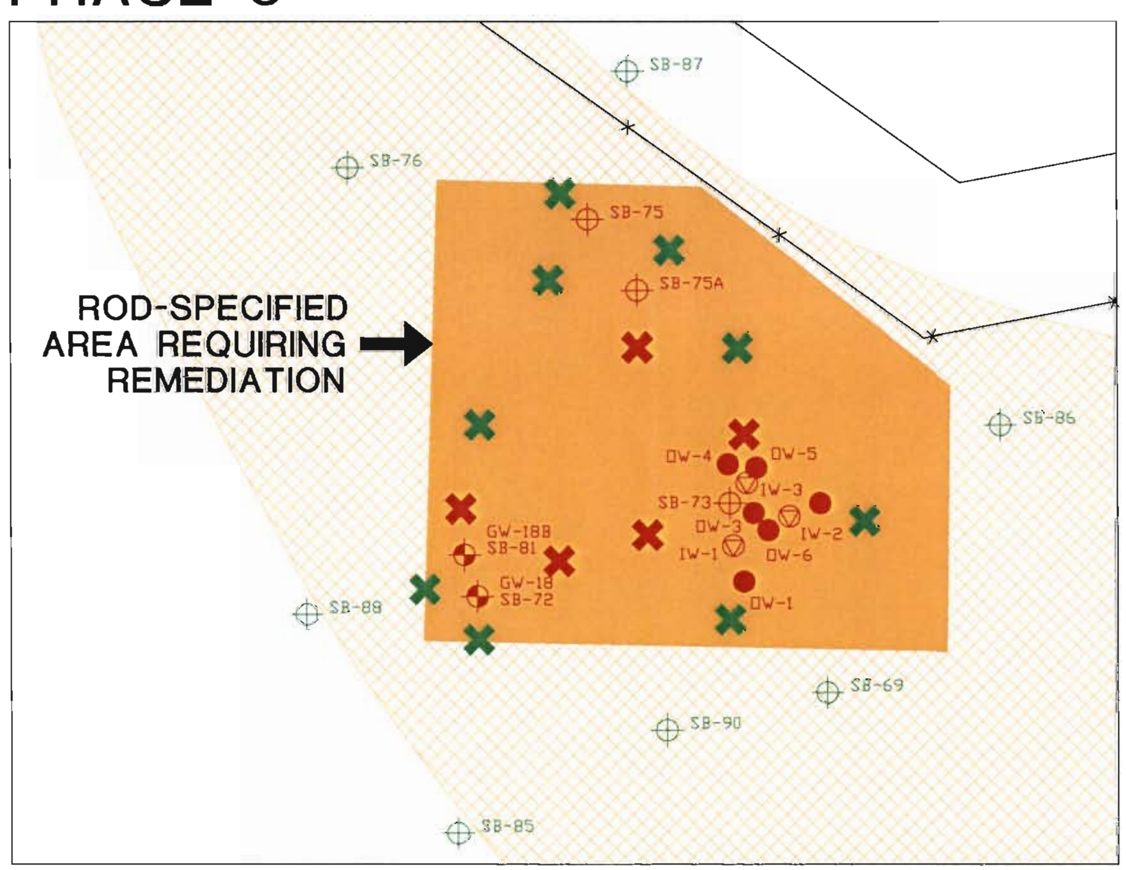
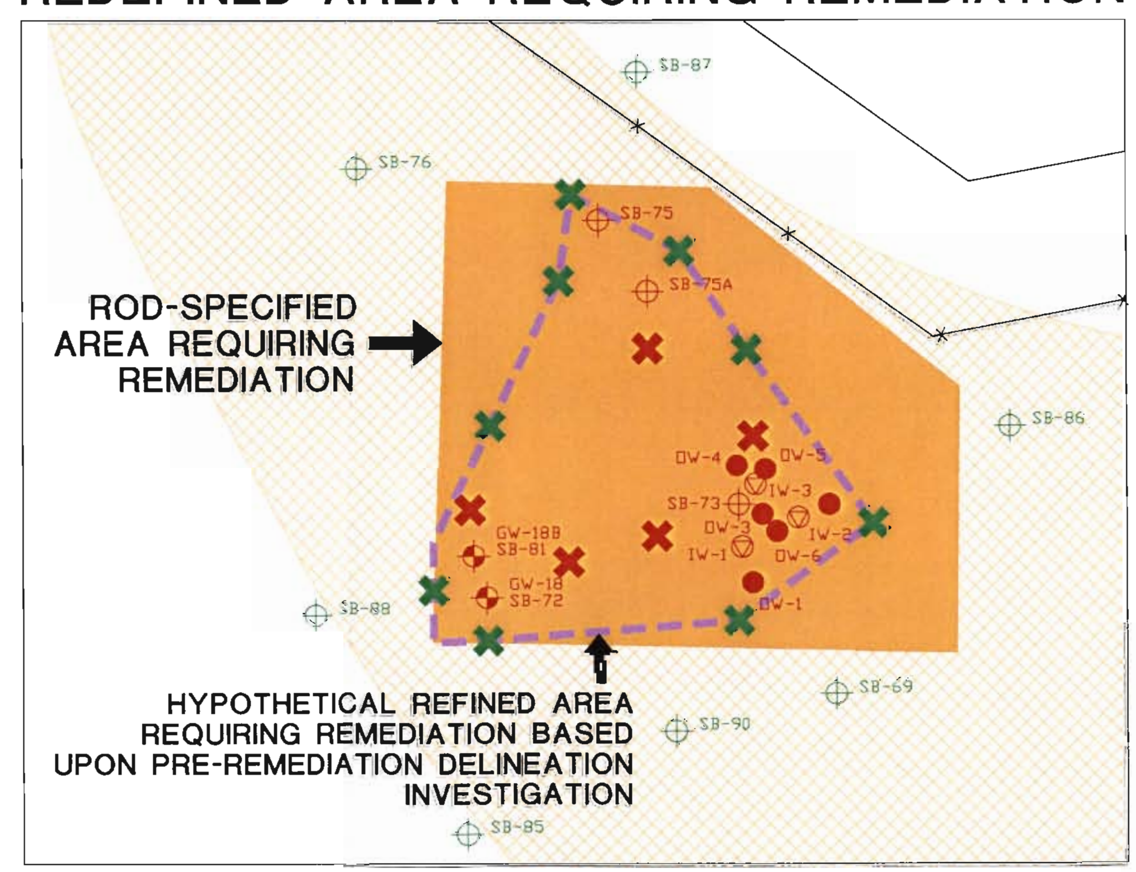


REDEFINED AREA REQUIRING REMEDIATION



LEGEND

PROPOSED PRE-REMEDIATION DELINEATION SOIL BORING LOCATION

HYPOTHETICAL DELINEATION SOIL BORING LOCATION WHERE NITROBENZENE CONCENTRATIONS EXCEED 14 PPM

HYPOTHETICAL DELINEATION SOIL BORING LOCATION WHERE NITROBENZENE CONCENTRATIONS ARE LESS THAN 14 PPM

SB-86 — SOIL BORING LOCATION AND DESIGNATION

GW-19 — GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION

OW-1 — PILOT TEST OBSERVATION WELL LOCATION AND DESIGNATION (LOCATIONS ARE APPROXIMATE)

IW-1 — PILOT TEST INJECTION WELL LOCATION AND DESIGNATION (LOCATIONS ARE APPROXIMATE)

ROD-ESTIMATED AREA OF SOIL WHERE NITROBENZENE CONCENTRATIONS WILL BE GREATER THAN 14 PPM

ROD-ESTIMATED AREA OF SOIL WHERE NITROBENZENE CONCENTRATIONS ARE LESS THAN 14 PPM AND GREATER THAN 1 PPM

SOIL IN THIS AREA EXHIBITS NITROBENZENE CONCENTRATIONS LESS THAN 1 PPM

ADAPTED FROM:
MARCH 1999 RECORD OF DECISION; FIGURE 3.

40' 0 40'

Title:

PRE-REMEDIATION DELINEATION AND BASELINE SOIL BORING INVESTIGATION

OUTER HARBOR SITE

Prepared For:

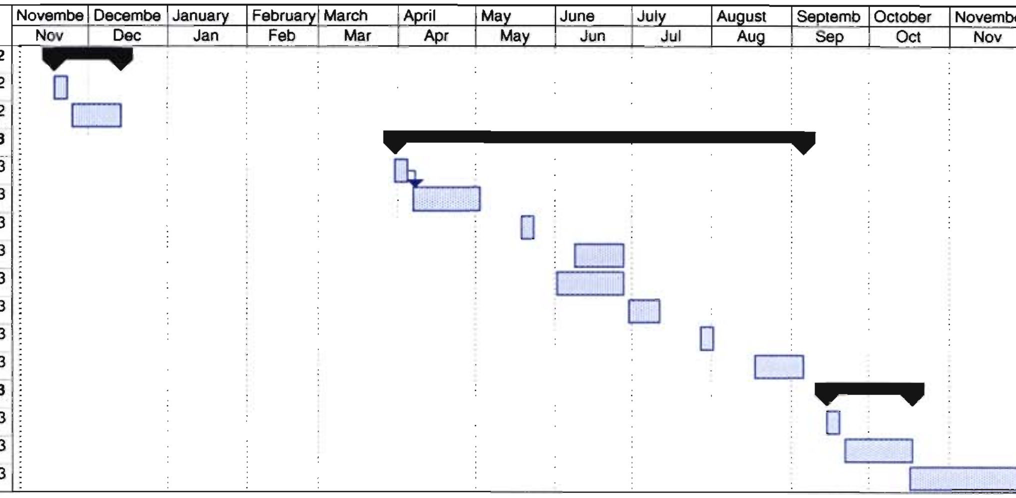
HONEYWELL

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: D.S.	Date: 25OCT02	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	2
Project Mgr: D.S.	Office: NY	
File No: AI0310403	Project: 25203Y	

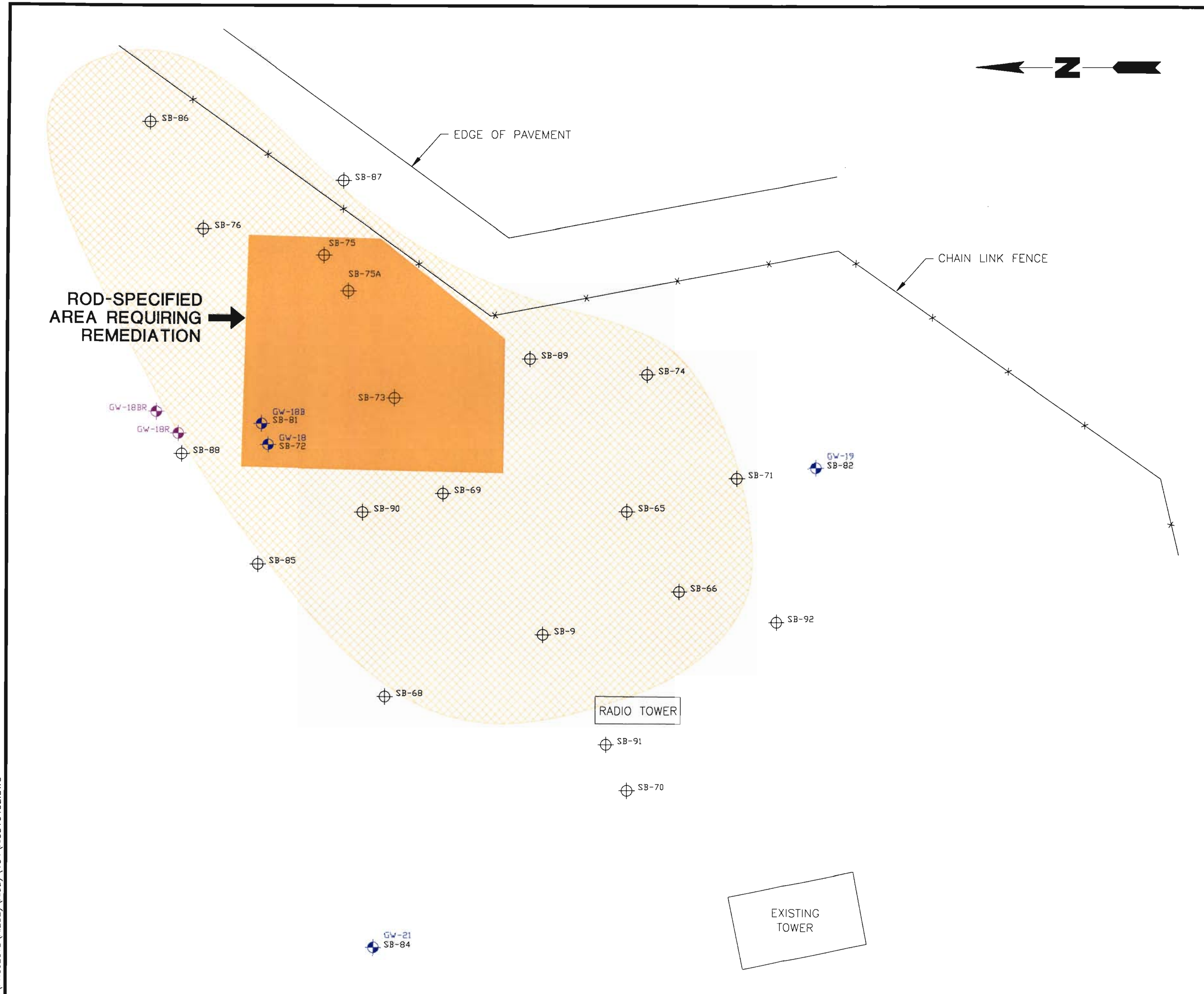
Figure 3. Implementation Schedule for the Proposed Remedial Approach, Buffalo Outer Harbor/Radio Tower Site, Buffalo, New York.

ID	Task Name	Duration	Start	Finish
1	**Pre-Remediation Delineation/Baseline Sampling**	**20 days**	**Mon 11/18/02**	**Fri 12/13/02**
2	Pre-Remediation delineation/baseline soil sampling	1 wk	Mon 11/18/02	Fri 11/22/02
3	Receipt/evaluation of soil sample results	3 wks	Mon 11/25/02	Fri 12/13/02
4	**In-Situ Chemical Oxidation Injections**	**115 days**	**Mon 3/31/03**	**Fri 9/5/03**
5	Mobilization for in-situ soil mixing chemical oxidation	1 wk	Mon 3/31/03	Fri 4/4/03
6	In-situ soil mixing mixing with chemical oxidation	4 wks	Mon 4/7/03	Fri 5/2/03
7	Post treatment sampling	1 wk	Mon 5/19/03	Fri 5/23/03
8	Receipt/evaluation of soil sample results	3 wks	Mon 6/9/03	Fri 6/27/03
9	Performance of treatability study for in-situ stabilization	4 wks	Mon 6/2/03	Fri 6/27/03
10	Geoprobe injections	2 wks	Mon 6/30/03	Fri 7/11/03
11	Post treatment sampling	1 wk	Mon 7/28/03	Fri 8/1/03
12	Receipt/evaluation of soil sample results	3 wks	Mon 8/18/03	Fri 9/5/03
13	**In-Situ Stabilization**	**25 days**	**Mon 9/15/03**	**Fri 10/17/03**
14	Mobilization for in-situ stabilization	1 wk	Mon 9/15/03	Fri 9/19/03
15	In-situ soil mixing with stabilization agents	4 wks	Mon 9/22/03	Fri 10/17/03
16	**Preparation and submission of completion report**	6 wks	Fri 10/17/03	Thu 11/27/03



Project: Outerharborrev1
Date: Mon 11/4/02

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline



LEGEND

- SB-86 EXISTING SOIL BORING LOCATION AND DESIGNATION
- GW-19 EXISTING GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- GW-18R PROPOSED GROUNDWATER MONITORING WELL LOCATION AND DESIGNATION
- ESTIMATED AREA OF SOIL WHERE NITROBENZENE CONCENTRATIONS WILL BE GREATER THAN 14 PPM
- ESTIMATED AREA OF SOIL WHERE NITROBENZENE CONCENTRATIONS ARE LESS THAN 14 PPM AND GREATER THAN 1 PPM
- SOIL IN THIS AREA EXHIBITS NITROBENZENE CONCENTRATIONS LESS THAN 1 PPM

ADAPTED FROM:
MARCH 1999 RECORD OF DECISION; FIGURE 3.

40' 0 40'

Title:

ROD-SPECIFIED AREA REQUIRING REMEDIATION

OUTER HARBOR SITE

Prepared For:

HONEYWELL

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: G.N.	Date: 28OCT02	FIGURE	
Prepared by: G.M.	Scale: AS SHOWN	4	
Project Mgr: G.N.	Office: NY		
File No: Ai0310402	Project: 25203Y		

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