RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: **Dyno Nobel**
Facility Address: **161 Ulster Avenue, Ulster Park, NY 12487-5019**
Facility EPA ID#: **NYD000799122**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   __X__ If yes - check here and continue with #2 below.

   _____ If no - re-evaluate existing data, or

   _____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI's developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Site Description

The Dyno Nobel Port Ewen Plant is located one mile south of the Village of Port Ewen in Ulster County, New York (figure 1). This site is in a small valley bordered by Hussey Hill on the west (figure 2) and a low-lying ridge adjacent to the Hudson River to the east. To the east, northeast, and southeast of the site are wetlands that drain to several unnamed tributaries of the Plantasie Creek which flows northward into Rondout Creek which flows into the Hudson north of Port Ewen. A map of this 350 acre site is shown in Figure 3. Only 100 of the 350 acres are developed at this time for the purpose of manufacturing explosives, primers, and igniter. This facility has been manufacturing these devices since 1912 when the facility was built by Brewster Explosives Company. The plant was purchased by Hercules in 1922. Hercules owned and operated the facility until 1985. IRECO, Inc. purchased the facility in June of 1985 and has been operating it until the present. In July of 1993, IRECO changed its name to Dyno Nobel, Inc.
The only surface water at the plant site is located in the "Shooting Pond" Area and some of the wetlands surrounding that unit. The unit was used to destroy off-specification explosives including PETN, DDNP, HMX, PBX, RDX, lead azide, lead styphnate, detonation caps and devices, and sump powder waste. Soil and sediment contaminated with metals (primarily mercury and lead) were found in the pond sediment and in the surrounding wetlands.

The manufacturing area has been contaminated with metals and organic contaminants from the disposal of waste products in several Solid Waste management Units (SWMUs), including a Shooting Pond, four land disposal units, and a wetland area. Also, air emissions of chemicals that settled on the soil from building vents, piles of construction debris, and hazardous waste disposal operations, resulted in the formation of more than 50 small SWMUs, several of which may require corrective action.

The company is currently in the process of moving most of its operations to another facility in Connecticut and is closing down this plant.

Cleanup Approach and Progress:
The 6NYCRR Part 373 permit requires the submission of an RCRA Corrective Measures Study (CMS) to evaluate potential remedies for the contaminated groundwater, the waste and soil in the Shooting Pond and the waste material in the two land disposal units. The permit also requires a focused CMS and interim corrective measure (ICM) removal action design plan for the approximately 25 SWMUs and 4 AOCs located within the manufacturing area, as well as for any SWMUs which may be identified in the future. The Draft CMS which has yet to be finalized was submitted in December of 2000 and an addendum was submitted in September 2003.

In addition to the 1996 work performed by UXB, other Interim Corrective Measures have included the removal of explosive materials from a sump of Building 2075, and construction of a large chain-link fence immediately east of the main manufacturing area surrounding the Shooting Pond, Stone Fence Dump and the contaminated wetland areas.

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

_X_ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

_____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

_____ If unknown - skip to #8 and enter "IN" status code.

Potential Threats and Contaminants:

The groundwater was shown to be contaminated primarily with VOCs and selenium, with the most heavily contaminated area of VOCs localized near the shell manufacturing building (SWMU's 30 & 37) where trichloroethene values indicate the presence of DNAPL. The use of trichloroethene at the facility was stopped around 1980. The selenium contaminated groundwater is located at the northeast corner of the plant (SWMU 26G). The contaminated areas are shown on figure 4.

TABLE 1

Highest levels of most recent sampling of Organic Contaminants of concern found in the facility's groundwater adjacent to the Shell Plant Building vs. Groundwater Standards

Compound	**Facility Groundwater (ug/l)**	**Groundwater Standard (ug/l)**
chloroform	**27**	**7.0**
1,1-Dichloroethene	**20000**	**5.0**
1,2 -Dichloroethane	**86**	**5.0**
1,2 -Dichloroethene	**44**	**5.0**
Trichloroethene	**730000**	**5.0**
Tetrachloroethene	**220**	**5.0**
1,1,1-Trichloroethane	**33000**	**5.0**
1,1,2-Trichloroethane	**16**	**5.0**

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

TABLE 2
Highest levels of Inorganic Contaminants found in the Facility's Groundwater.

Compound	Facility Groundwater (ug/l)	Groundwater Standard (ug/l)
Aluminum	12000	NA
Antimony	ND	3
Arsenic	100	25
Barium	1500	1000
Cadmium	43	5
Chromium	300	50
Cobalt	140	NA
Copper	470	200
Lead	140	15
Mercury	0.72	0.7
Selenium	398	10

RATIONALE: Groundwater monitoring data collected under the site's Part 373 Permit indicate exceedances of New York State Groundwater Quality Standards (Part 703).

KEY CONTAMINANTS: Trichloroethene; 1,1,1-Trichloroethane; 1,1-Dichloroethene; Tetrachloroethene

Potential Threats From Contaminated Groundwater.

Groundwater flow in the overburden is toward the northeast and the discharge area is represented by the wetlands. Groundwater movement within the shallow overburden (silt and clay) is predominantly vertical, while flow in the deep overburden (sand and gravel) is predominantly horizontal. Groundwater flow in the bedrock occurs within a highly fractured upper zone, which behaves as one hydrostratigraphic unit with the overlying sand and gravel deposits.

The overburden at the site consists of silt and clay deposits underlain by a sand and gravel layer. The upper 15 feet of the silt and clay can generally be described as a moist, brown silty clay, trace of sand. This then grades to a wet gray silty clay to clay, trace of sand. The gray silty clay layer ranges in thickness from 3.5 feet to 66.8 feet. Underlying the silty clay is a sand and gravel layer ranging from 3.5 feet below ground surface (bgs) to 66.8 feet bgs. Within the Shell Plant Area, the brown silty clay is present from ground surface to approximately 15

to 18 feet bgs. This is underlain by the gray silty clay to clay to approximately 44 to 49 feet bgs, sand and gravel to approximately 54 to 60 feet bgs, and bedrock. The extensive clays at the site play a critical role in the attenuation of the contaminants.

REFERENCES: NYSDEC Part 373 Permit-issued 9/22/2000
Semi-Annual Groundwater Monitoring Reports - most recent 4/2004
Groundwater RCRA Facility Investigation - 12/1999

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

__X__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2])

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown - skip to #8 and enter "IN" status code.

RATIONALE:

There are two plumes of contaminated groundwater at the facility (See Table 1 and Table 2). These two contaminated groundwater plumes show significant contamination in excess of New York State Part 703 Groundwater Standards and are currently being monitored. In the northern portion of the facility (SWMU 26G) is a plume containing selenium and in the Shell plant area (SWMU's 30 & 37) is a plume of volatile organic contaminants. Additional wells have been installed (August 2002) downgradient of the known plumes

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

approximately fifty feet east of the railroad tracks to further delineate them and ascertain the degree to which natural attenuation may be playing a role in remediation of the plumes. Natural attenuation means that factors such as distance from the plume to the property line, the ability of the clay in the overburden to absorb contamination and the effects of wetlands on contaminants reduces the concentration of contaminants that would otherwise flow beyond the facility property. Subsequent sampling of the downgradient wells for both plume areas have shown that groundwater standards are being met and that natural attenuation is effective at preventing the contamination from advancing beyond the site boundaries.

Groundwater is not used as a source of drinking water on site; bottled water is available in each building. Groundwater obtained from an upgradient well about 1000 feet southwest of the Shell Plant Building plume, is used for showers, sinks and sanitation. According to communications from the Environmental Manager at Dyno Nobel, this groundwater source is tested each month for chlorinated compounds and coliform, and at least once a year for lead and other VOCs. The most recent data from these tests show no detection of organics in the well water and only trace amounts of lead and copper at the tap.

Trespassers are discouraged from entering the site by a combination of fencing and security personnel, and they would not be expected to come in contact with contaminated groundwater. Workers sampling and managing contaminated groundwater are required to follow appropriate health and safety procedures.

REFERENCES: Corrective Measures Study - 12/2000
Semi-Annual Groundwater Monitoring Reports - most recent 4/2004
Groundwater RCRA Facility Investigation - 12/1999

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_X_ If yes - continue after identifying potentially affected surface water bodies.

_____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

_____ If unknown - skip to #8 and enter "IN" status code.

RATIONALE:

The groundwater ultimately discharges to the wetlands on the site as well as the shooting pond. Sampling of the surface waters performed during the RCRA Facility Investigation indicated non-detect for volatile organic chemicals which means that either natural attenuation has removed the contaminants prior to entering the surface waters or the dilution factors are great enough to result in the non-detect results.

REFERENCES: Groundwater RCRA Facility Investigation - 12/1999

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_X_ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

RATIONALE:
See # 4 above.

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be **"currently acceptable"** (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

Not applicable, see #5.

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be "currently acceptable") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to #8 and enter "IN" status code.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

__X__ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no - enter "NO" status code in #8.

_____ If unknown - enter "IN" status code in #8.

RATIONALE: The site's NYSDEC Part 373 permit and Groundwater Monitoring Plan require ongoing long-term monitoring at this site at appropriate locations to continue to monitor groundwater plumes.

REFERENCES: NYSDEC Part 373 Permit -issued 9/22/2000

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

_X_ ***YE - Yes.*** "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Dyno Nobel facility, EPA ID # NYD 000799122 located at Port Ewen, New York. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater". This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Approved by (signature) _____ Date September 29, 2004
(print) Keith H. Gronwald
(title) Engineering Geologist 2

Supervisor (signature) _____ Date 9/30/04
(print) Edwin Dassatti
(title) Director, Bureau of Solid Waste and Corrective Action
(EPA Region or State) NYSDEC

Locations where References may be found:
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Contact telephone and e-mail numbers:

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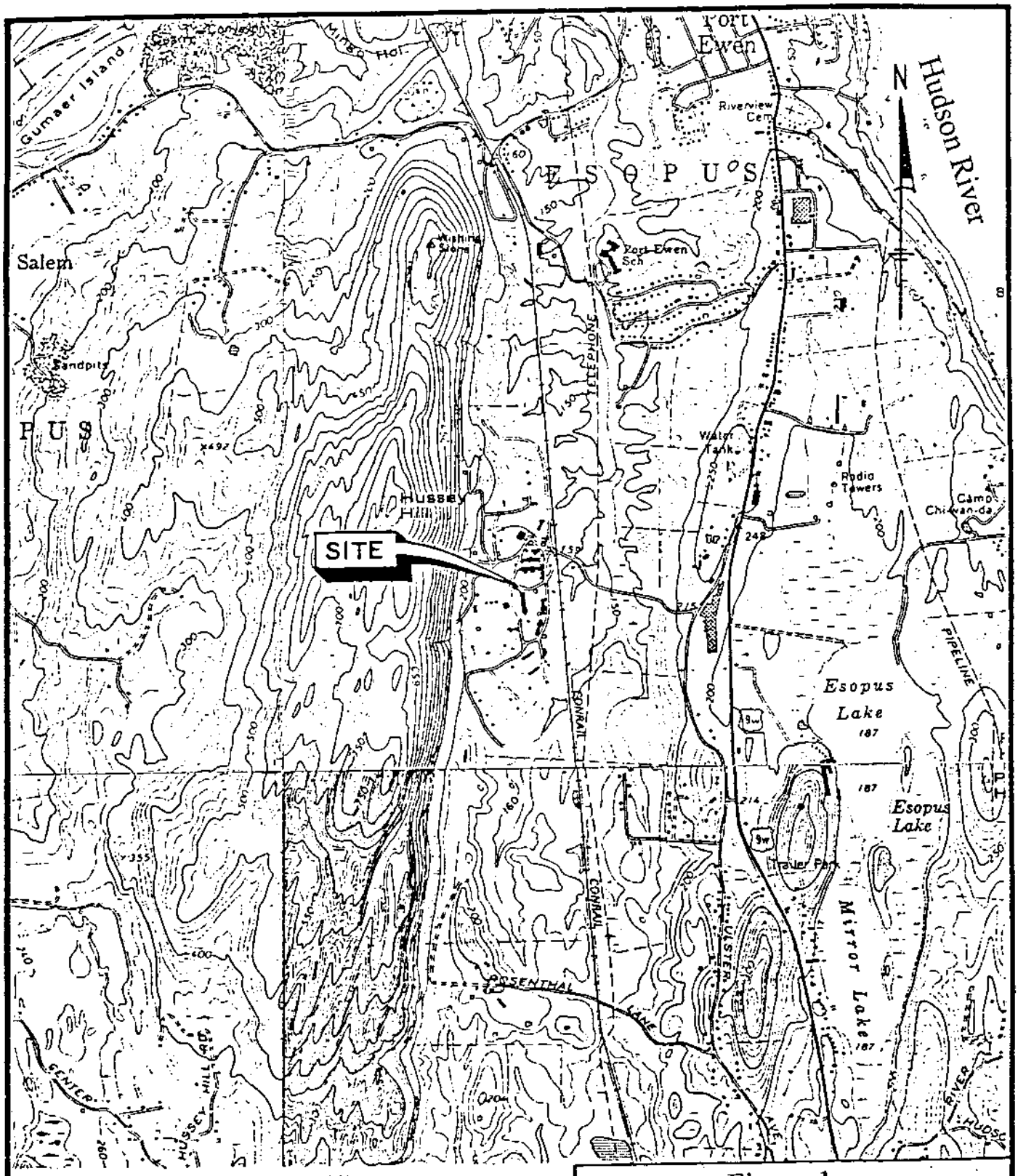


SOURCE: KINGSTON WEST, N.Y. (1964) REVISED 1980
KINGSTON EAST, N.Y. (1963) REVISED 1980
ROSENDALE, N.Y. (1964) REVISED 1980
HYDE PARK, N.Y. (1963) REVISED 1980
7.5' QUADRANGLE

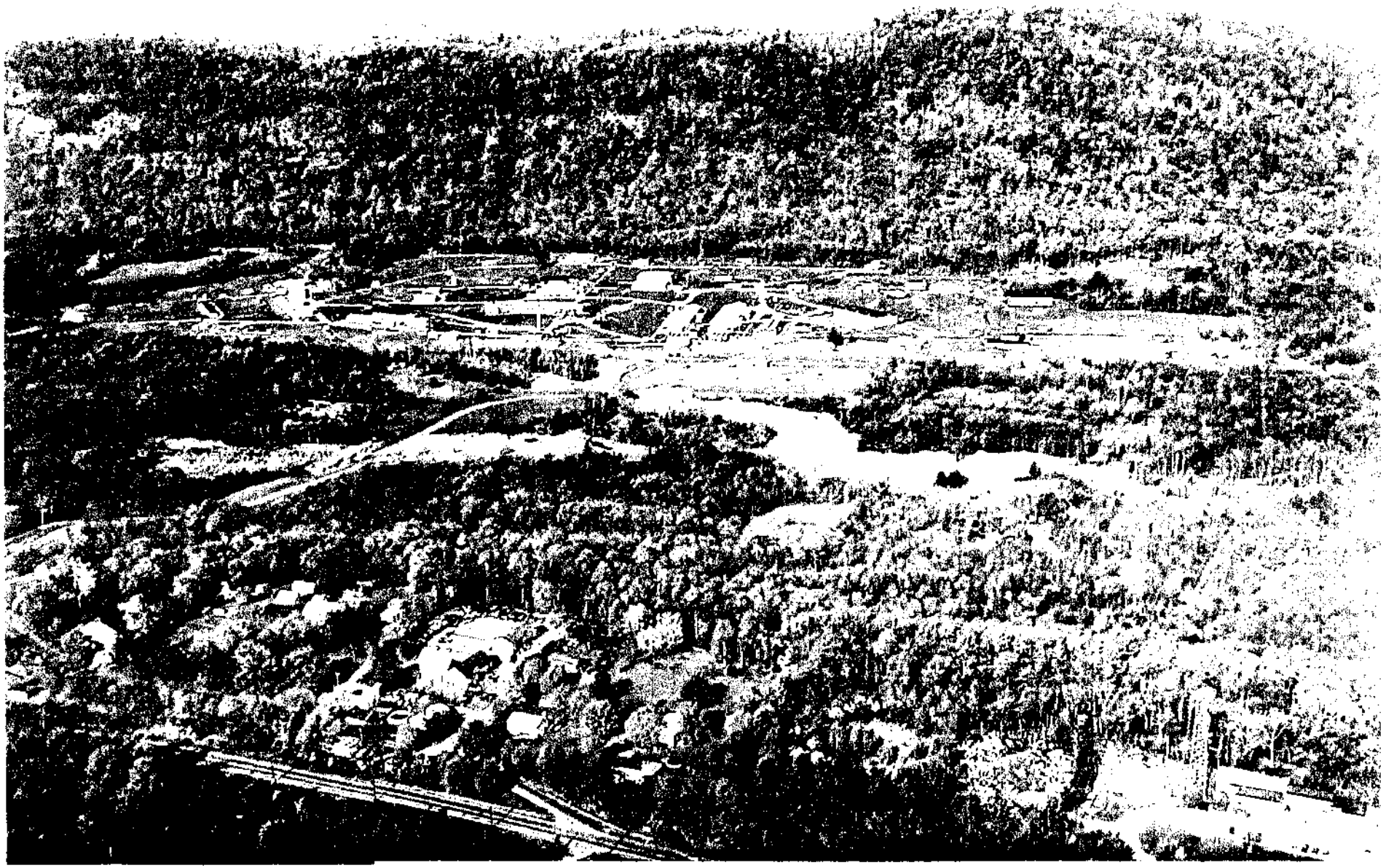
2000 0 2000
scale feet

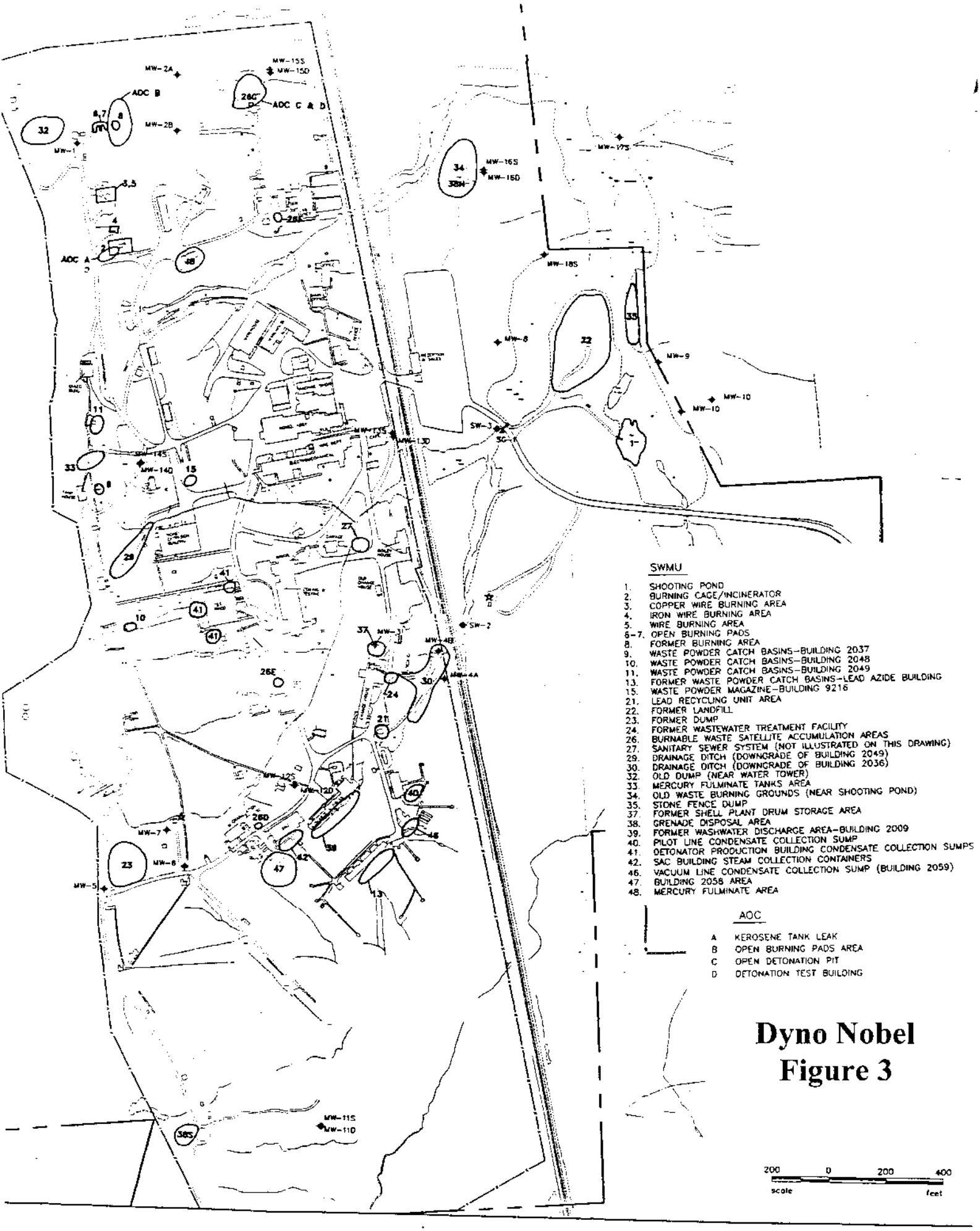
Figure 1

SITE LOCATION MAP

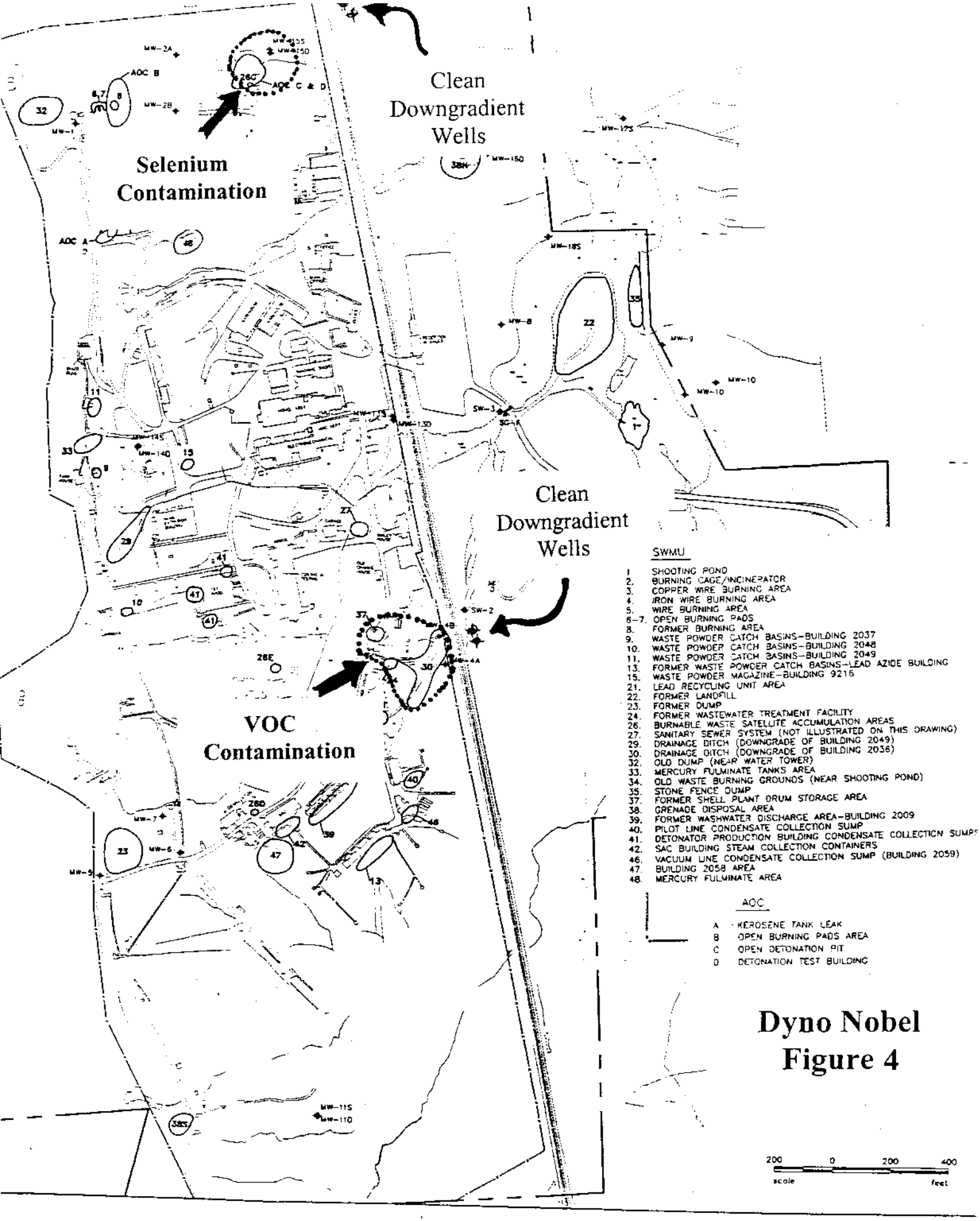
HERCULES/DYNO NOBEL
PORT EWEN, NEW YORK

DYNO NOBEL - Looking West





Dyno Nobel
Figure 3



Dyno Nobel
Figure 4