NBN-00478-3.05-10/1/83

MALCOLM PIRNIE

ENVIRONMENTAL ENGINEERS, SCIENTISTS & PLANNERS

# WORK AND SAFETY PLAN

# CONFIRMATION STUDY TO DETERMINE POSSIBLE DISPERSION AND MIGRATION OF SPECIFIC CHEMICALS IN SITU

## SEWELLS POINT NAVAL COMPLEX NORFOLK, VIRGINIA

## CONTRACT NO. N62470-83-C-6079

October 1983

NBN-00478-3.05-10/1/83

# WORK AND SAFETY PLAN

FOR THE

NACIP PROGRAM
CONFIRMATION STUDY

NORFOLK NAVAL BASE
NORFOLK, VIRGINIA 23511

MALCOLM PIRNIE, INC.
Consulting Environmental Engineers,
Scientists and Planners
301 Hiden Boulevard
Newport News, Virginia 23606

# CONFIRMATION STUDY

## Scope of Work

The objective of this Confirmation Study is to determine whether specific toxic or hazardous materials, earlier identified, have contaminated the environment at the Norfolk Naval Base and which may require remedial action. The work to be performed will include the identification and quantification of contaminants, the extent of that contamination, and the potential for migration. Field activities will include geotechnical investigation, the installation and sampling of ground water wells, the collection of soil samples, air sampling, and surface water sediment sampling.

## Sites to be Investigated

Sites to be investigated are listed below and shown in Figure 1:

| Site | Description |
|---|---|
| 1 | Camp Allen Landfill |
| 2 | NM Slag Pile |
| 3 | Q Drum Storage Yard |
| 4 | Transformer Storage Area P-71 |
| 5 | Pesticide Disposal Site V-95 |

## Plan of Action

A Plan of Action for the investigation of the five sites is outlined below. The project schedule (Figure 2) should be considered a guide to project activities. This schedule has been developed to meet the milestones stated in the Contract. As work proceeds, the EIC shall be contacted routinely and informed of work performed to date and any adjustments in the work schedule. The work includes the following tasks:

1. PRESITE ACTIVITIES

    1.1 Initial POA Development: Meeting with EIC to discuss POA and coordinate contractor/client responsibilities. Subsequently, a draft POA and schedule shall be submitted for EIC review.

1.2 Safety Program: Site specific health, safety and contingency plan which addresses field work procedures, indoctrination and training of facility personnel assigned to assist contractor personnel and emergency response procedures.

1.3 Drilling Specifications: Preparation of contract and specifications for drilling subcontractor.

1.4 Training: As part of the safety program, an indoctrination for the Navy on the nature of the Contractor's activities and safety requirements, including equipment, will be given. In addition, in-house training for Contractor personnel will be conducted.

2. ON-SITE INVESTIGATION ACTIVITIES

2.1 Decontamination Trailer Set-up: Includes set-up of decontamination trailers and acquisition of supplies and equipment.

2.2 Drilling and Borings: Site work will progress in the order listed below:

2.2.1 Camp Allen Landfill Area (Figure 3) - Includes installation of 6 monitoring wells to a depth of 25 feet. Also includes installation of 1 monitoring well to a depth of 100 feet located off-site, possibly in the Fleet Park area. The work will be performed concurrently with the Site Suitability Assessment being performed at this location. 3 Days

2.2.2 Q Area Drum Storage Yard (Figure 4) - Includes installation of 4 monitoring wells to a depth of 25 feet and hand augering at 4 locations to a depth of 3 feet. 2 Days

2.2.3 Pesticide Disposal Site V-95 (Figure 5) - Includes installation of 1 monitoring well to a depth of 25 feet and 2 borings to a depth of 25 feet. 1 Day

2.3 Augering:

2.3.1 Transformer Storage Area P-71 (Figure 6) - Includes hand augering at 20 locations to a depth of 5 feet. 3 Days

2.3.2 NM Area Slag Pile (Figure 7) - Includes hand augering at 1 location to a depth of 3 feet. 1 Hour

2.4 Water Quality and Soil Sampling: All groundwater and surface water samples shall be taken within a 24 hour period. Soil samples will be taken during drilling operations. The necessity for two additional sets of samples, which would extend the proposed schedule, will be determined after review of the initial sample set results.

2.4.1 Camp Allen Landfill Area - Includes 8 groundwater samples (1 existing well) and 4 surface water samples.

2.4.2 NM Area Slag Pile - Includes 1 soil sample and 1 surface water sample.

2.4.3 Q Area Drum Storage Yard - Includes 4 groundwater samples and 12 soil samples.

2.4.4 Transformer Storage Area P-71 - Includes 60 soil samples.

2.4.5 Pesticide Disposal Site V-95 - Includes 1 groundwater sample and 10 soil samples.

2.5 Surveying: Includes approximate location of all monitoring wells and borings and determination of ground water elevations.

2.6 Progress Reviews: Brief outline of monthly progress to be sent to the EIC by the fifteenth day of each calendar month.

3. EVALUATION AND REPORT

3.1 Evaluation of Results: Evaluation of laboratory analysis and geohydraulic and geophysical data.

3.2 Draft Report: Draft report to be submitted to EIC and the activity within forty-five days of completion of the on-site investigations.

3.3 Final Draft: If characterization step is not implemented, the draft report shall be finalized.

3.4 Presentation: Presentation of findings and conclusions and activity debriefing, if required.

Project Organization

Malcolm Pirnie, Inc. - Malcolm Pirnie shall be responsible for providing all personnel, material, and equipment necessary to complete the study. Recognizing that the safe containment or mitigation of hazardous waste that may be contained in soil and ground water is a highly specialized area, the persons in responsible charge of the study shall be experts in their area(s) of involvement. Malcolm Pirnie shall be responsible for development of and adherence to an appropriate safety plan to protect contractor personnel and Government personnel.

| Name | Title | Telephone No. | (Norfolk No.) |
|---|---|---|---|
| David A. Cornwell | Project Manager | 804-599-5511 | (464-4373) |
| Millard P. Robinson | Project Coordinator | 804-599-5511 | (464-4373) |
| Andrew M. Snyder | Project Engineer | 804-599-5511 | (464-4373) |
| Curtis A. Kraemer | Geologist | 201-845-0400 | (464-4373) |
| Richard G. Smith | Engineer (Field Team Coordinator) | 804-599-5511 | (464-4373) |

Herbert and Associates - Herbert and Associates will be responsible for conducting drilling operations at designated sites. Personnel of Herbert and Associates will be required to conform with safety protocols as established in this Health/Safety and Contingency Plan and as specified by the Malcolm Pirnie Field Team Coordinator. Herbert and Associates personnel assigned to the project include:

| Name | Title | Telephone No. |
|---|---|---|
| Page A. Herbert | Vice President | 804-420-2797 |
| Richard J. Seage | Driller/Geologist | 804-420-2797 |
| Robert L. Benton | Driller Assistant | 804-420-2797 |
| Larry M. Dollarhide | Driller Assistant | 804-420-2797 |
| Scott R. Emry | Driller Assistant | 804-420-2797 |
| Scott A. Herbert | Driller Assistant | 804-420-2797 |
| Page A. Herbert, Jr. | Driller Assistant | 804-420-2797 |
| Kevin L. Kelly | Driller Assistant | 804-420-2797 |

Norfolk Navy Base Personnel - Key Norfolk Navy Base individuals involved in this project include:

| POC | Title | Involvement | Telephone No. |
|---|---|---|---|
| PRIMARY CONTACT | | | |
| J. G. Wallmeyer | Env. Engr. | Engr. in Charge | 804-444-9566 |
| Stephen L. Gibson | Safety Mgr. | COMNAVBASE | 804-444-3009 |
| Roger G. Saunders | Project Mgr. | Project Manager | 804-444-9671 |
| ADDITIONAL CONTACTS | | | |
| Wayne Miller | Supervisor Chemist | PWC | 804-444-7528 |
| Jim Bradley | Safety Manager | NSC | 804-444-2425 |
| Glenda Pritchard | Safety Specialist | NSC | 804-444-2425 |
| George Byrd | Safety Specialist | NAVSTA | 804-444-2728 |
| Joe Brandon | Planning Div. Head | NAS | 804-444-2035 |
| Wally Hague | Safety Mgr. | NAS | 804-444-8511 |
| John Barris | Industrial Hygienist | NAVMEDCOM | 804-444-7599 |
| John Simak | Industrial Hygienist | NAVMEDCOM | 804-444-7599 |
| Cmdr. Rick Fisher | Public Affairs Office | COMNAVBASE | 804-444-2163 |
| Gail Tolerton | Public Affairs Office | LANTNAVFACENGCOM | 804-444-9525 |

The primary contacts will be the first notified, and only if one of these cannot be reached will contact be made with the activity POC at which facility the on-site work is being performed.

General Safety Requirements

The overall safety protocols are contained in the generalized Malcolm Pirnie Health and Safety Plan and is included in Appendix A. The personal protective equipment consistent with varying Levels of Protection is specified as are guidelines for the determination of specific levels.

Site Specific Investigation

Camp Allen Landfill (Site 1) - The Camp Allen Landfill was used for the disposal of wastes generated at SPNC from the early 1940s until about 1974. An incinerator formerly operated on the site and open burning also took place in the landfill. It is estimated that 40,000 pounds of metals plating sludge, 60,000 pounds of parts cleaning sludge and 400,000 pounds of paint stripping residues were disposed in the landfill. The majority of the site is currently covered with grass; the brig (Building CA-484) and a heliport have been constructed over a portion of the landfill.

The nature of the disposal material indicates a predominance of industrial solvents and thus the potential for volatilization. The site developments and grass cover act to mitigate this possibility.

Initial Level of Protection: C...to be verified by monitoring.

Slag Pile (Site 2) - The slag pile covers about two acres and was used for the disposal of aluminum smelting wastes in the 1950s and 1960s. The pile consists of various kinds of metals, primarily steel.

Initial Level of Protection: D...to be verified by monitoring.

Q Area Drum Storage Yard (Site 3) - The Q area drum storage yard is an open earthen yard located in the northwestern corner of SPNC. This area was created by a fill operation conducted in the early 1950s and has been in use since then to store tens of thousands of drums. The drums contain mostly new petroleum products, various chlorinated organic solvents, and paint thinners. Evidence of past spillage (dark stains on soil) was found throughout the storage yard. The northern portion of the yard has been used for storing damaged and leaking drums. The soil in this area was thoroughly saturated with what appeared to be lubricating oil.

Because of the potential for the volatilization of the solvents, initial care must be taken.

Initial Level of Protection: C...to be verified by monitoring.

Transformer Storage Area (Site 4) - The transformer storage area behind (south) Building P-71 has been used to store out-of-service and new transformers since the 1940s. Transformer oil was reportedly

drained from out-of-service transformers onto the ground surface in this area. Although much of the area is currently covered with recently laid gravel, the soil in the lowest part of the grade in the storage area is visible and exhibits dark stains, which is evidence of past spillage.

Initial Level of Protection: C...to be verified by monitoring.

Pesticide Disposal Site (Site 5) - The pesticide disposal site (Site 5) consists of a french drain located southeast of Building V-95. The french drain was used for the disposal of pesticide waste generated in the former pest control shop (Building V-95). This shop was in operation from the late 1960s until 1973, and the french drain has not been used for pesticide disposal since 1973. It was reported that approximately 100 gallons per week of pesticide rinse water was disposed of in this french drain, as well as intermittment discharges of overage concentrated pesticides. Pesticides used in this pest control shop included chlordane, malathion, and DDT.

Initial Level of Protection: C...to be verified by monitoring.

Decontamination/Disposal

Decontamination - At the lunch break and at the end of each working day, field personnel will pass through the decontamination trailer and conform with procedures established in the generic Health and Safety Plan.

The decontamination facility will be located at the Camp Allen Landfill adjacent to building CA 486 (Appendix B). Mr. Richard Smith of Malcolm Pirnie, Inc. will be responsible for the trailer and and its operation. The decontamination fluids will be: rough water rinse, soapy water clean, clean water rinse. Similarly, the cleanup of auger flights, split spoons or other drilling equipment will be accomplished with detergent and water between each hole.

Transportation of field crew members will be accomplished in designated, prepared sections of the site vehicle to prevent possible cross contamination. The passenger carrying compartments will be lined with plastic to prevent contamination of the site vehicle. Personnel and the site vehicle will be rinsed on-site prior to movement and rinse water disposed on the ground in the vicinity of the work area.

Disposal - The decontamination waste waters used at the decontamination trailer and solid wastes used in the field work (tyvek overalls, gloves, and so on) will be treated as "potentially contaminated." These wastes will be collected, classified, and properly disposed by Malcolm Pirnie. If the decontamination waste waters are classified as hazardous wastes, Malcolm Pirnie will handle and dispose of the wastes in accordance with Virginia State Hazardous Waste Regulations/USEPA Regulations as applicable. Decontamination waste waters used to rinse the drilling equipment between borings may be placed back on the ground in the vicinity of the bore hole.

Contingency Planning

Scenario Development - Two types of emergency scenarios are to be discussed in this plan:

Major Incident

- Fire or explosion requiring fire department response
- Serious injury requiring immediate attention
- Any other serious incident requiring rescue, police, fire or security support from SPNC

Minor Incident

- Minor injury not requiring immediate response
- Any other minor incident which can be handled without direct Naval facility support

Major Incident - In case of a major incident the senior Malcolm Pirnie individual at the site will be responsible to notify and effect communication with the Police/Fire dispatcher and Mr. Stephen Gibson, Project Safety Manager for the Navy. The notification list is shown below:

Notification: The following department dispatch contacts will be notified. Either contact will activate Police, Fire, Medical, COMNAVBASE and LANTNAVFACENGCOM through an existing SOP for the contract.

| | |
|---|---|
| Police: | 444-2361 |
| Fire: | 444-3333 |
| Mr. Stephen Gibson: | 444-3009 |

Malcolm Pirnie individuals who may require immediate hospitalization will be treated on base, but will be transferred to a civilian hospital upon condition stabilization.

Minor Incident - Minor incidents which would not require Navy facility support are the direct responsibility of the Malcolm Pirnie field team leader. These incidents would be expected to be those minor injuries requiring direct (but not immediate) hospital attention.

The civilian hospital supporting the field work is St. Vincent DePaul Hospital located at Granby Street and Kingsley Lane. A strip map is included as Appendix C. Telephone number is 804-489-5000.

## Logistics

Protective clothing, respiratory equipment and miscellaneous field items will be maintained in the decontamination facility.

## Communications/Reporting

Communications - Site and off-site communications will be effected using a mobile phone installed in a Malcolm Pirnie automobile which shall be on-site during performance of all work. All project personnel shall be notified of the telephone number when available.

Reporting - A weekly schedule of activities will be reviewed with the EIC, Mr. J. G. Wallmeyer (Building N-23) on the Friday prior to the week of work during the field program. More frequent situation reports will be provided to Mr. Wallmeyer by the Field Team Coordinator, as necessary.

## Visitors and Observers

Visitors and observers will not normally be permitted at the site of on-going work; i.e., drilling, boring, or sampling. Any requests for information or site access will be directed to either of the Public Affairs Officers listed above.

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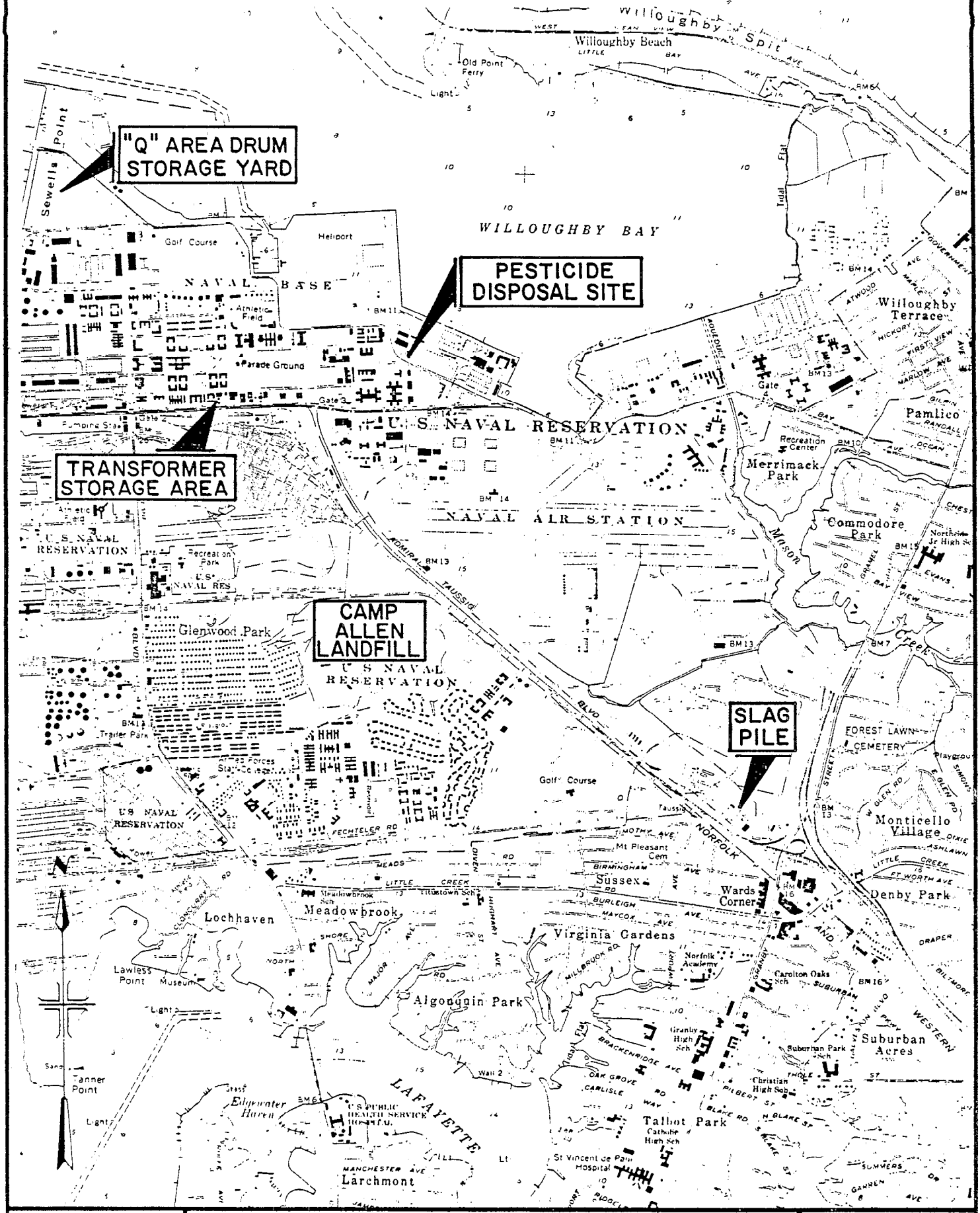


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# LOCATION PLAN

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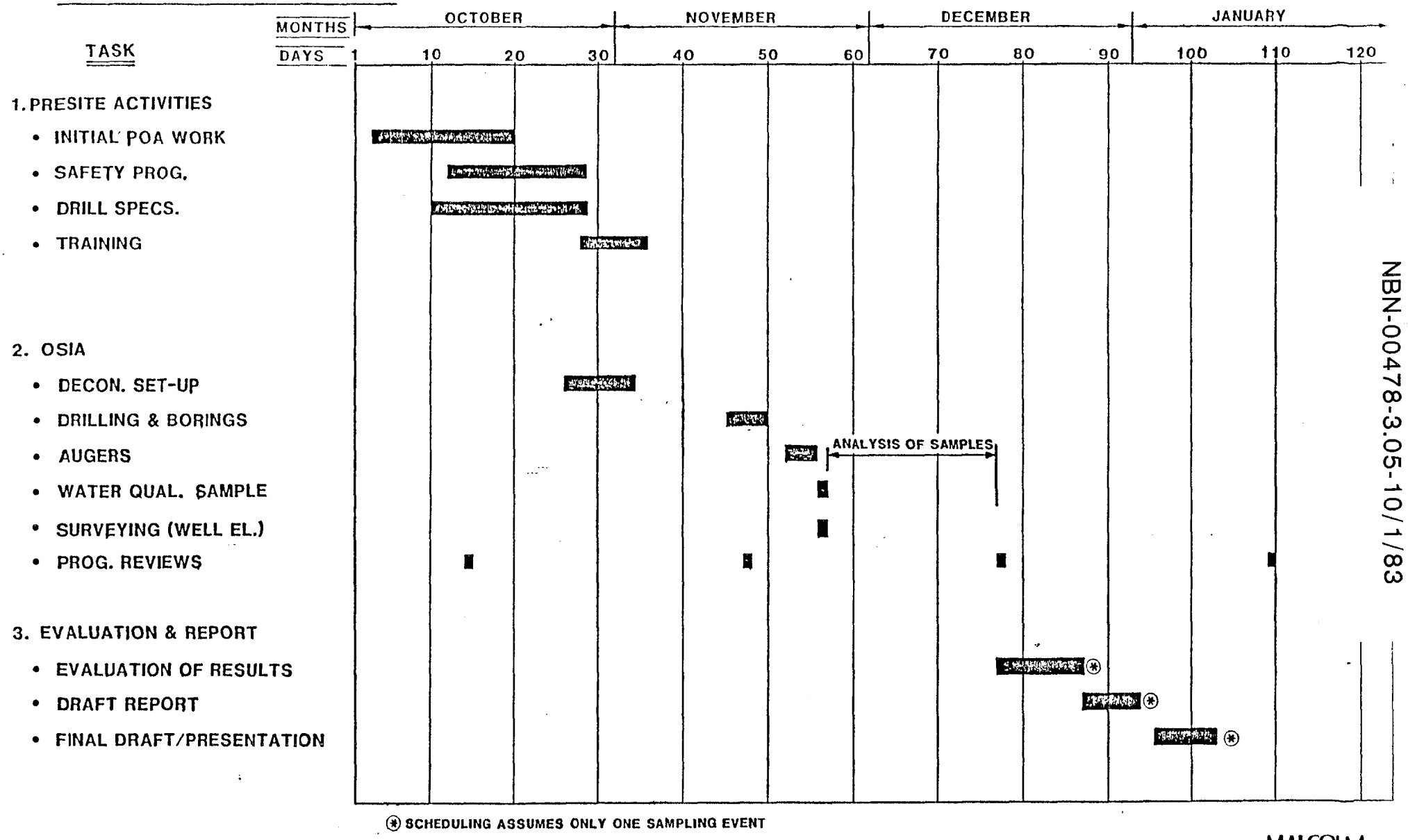
FIGURE 1

## NACIP CONFIRMATION STUDY

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**SCHEDULE OF ACTIVITIES**

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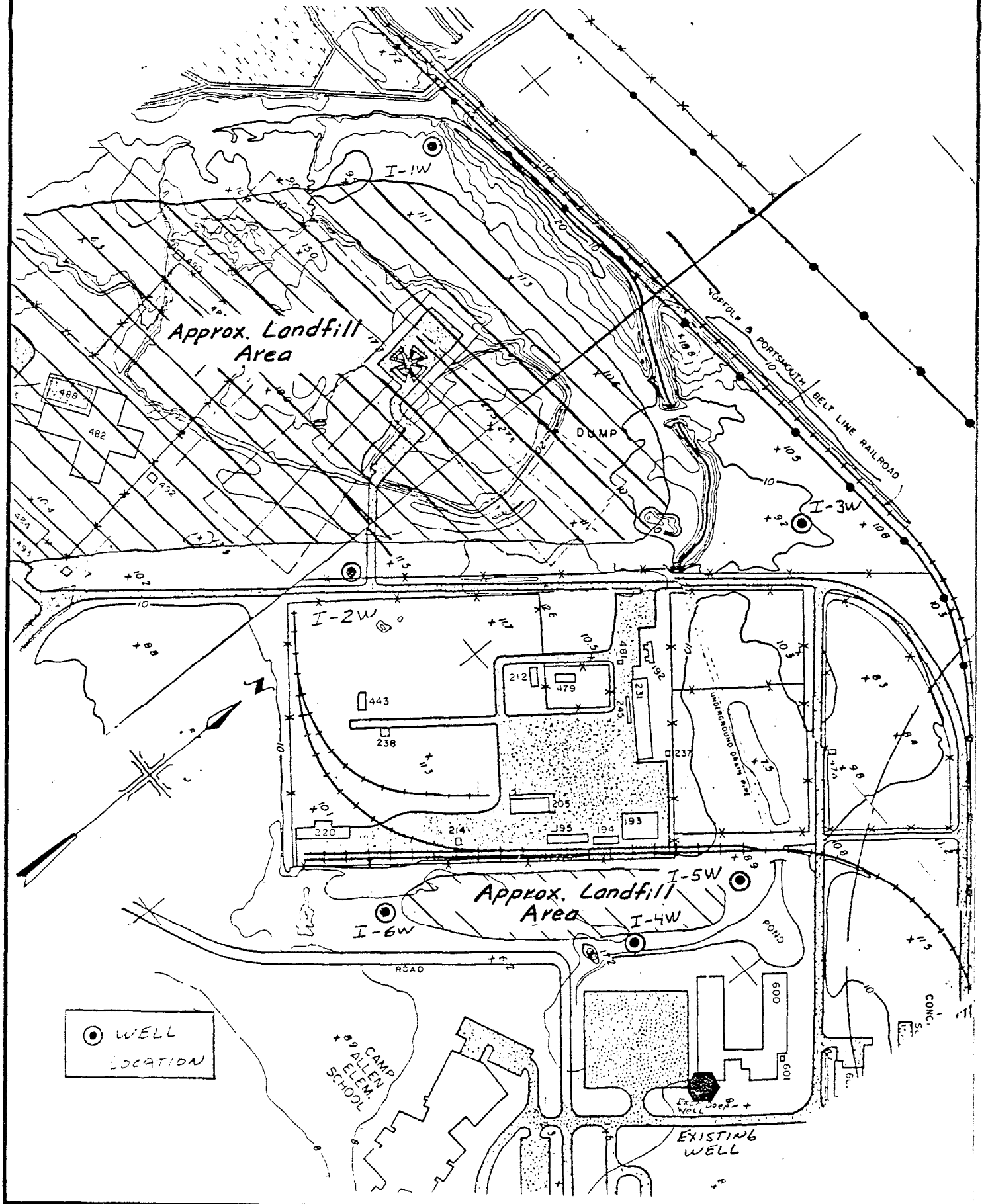
FIGURE 2

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# CAMP ALLEN LANDFILL AREA

MALCOLM PIRNIE, INC.

FIGURE 3

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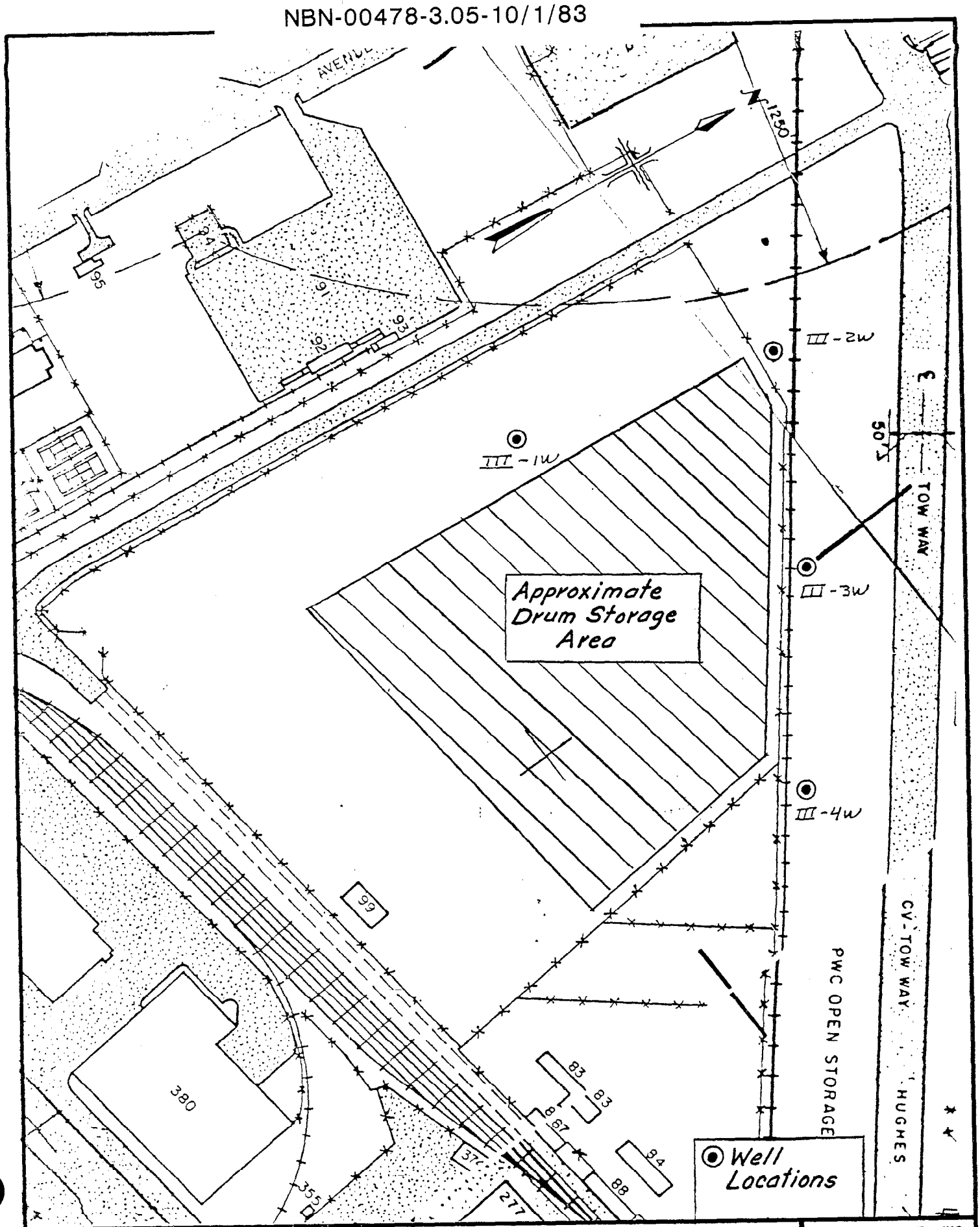


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# "Q" AREA DRUM STORAGE YARD

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FIGURE 4

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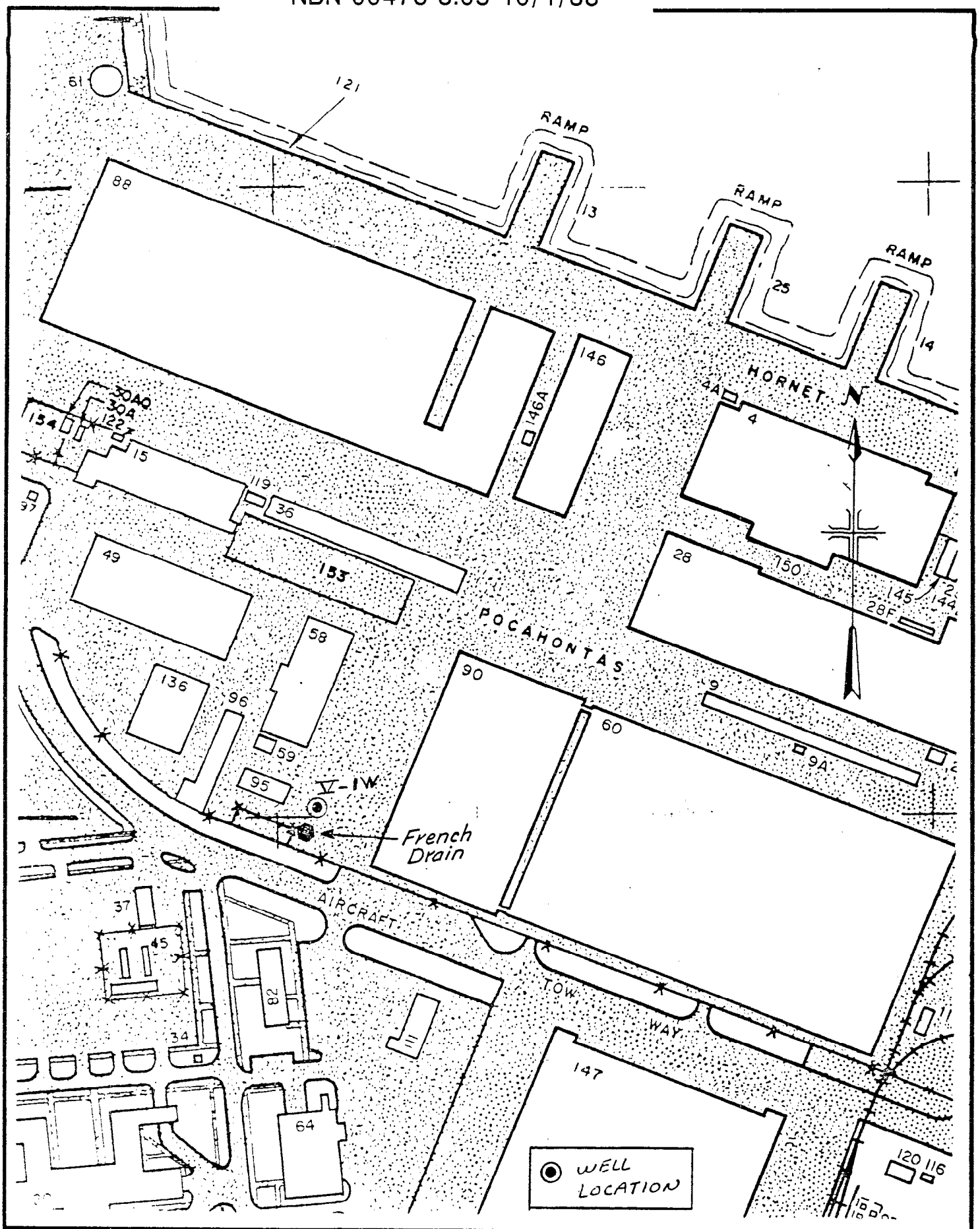


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# PESTICIDE DISPOSAL SITE V-95

MALCOLM PIRNIE, INC.

FIGURE 5

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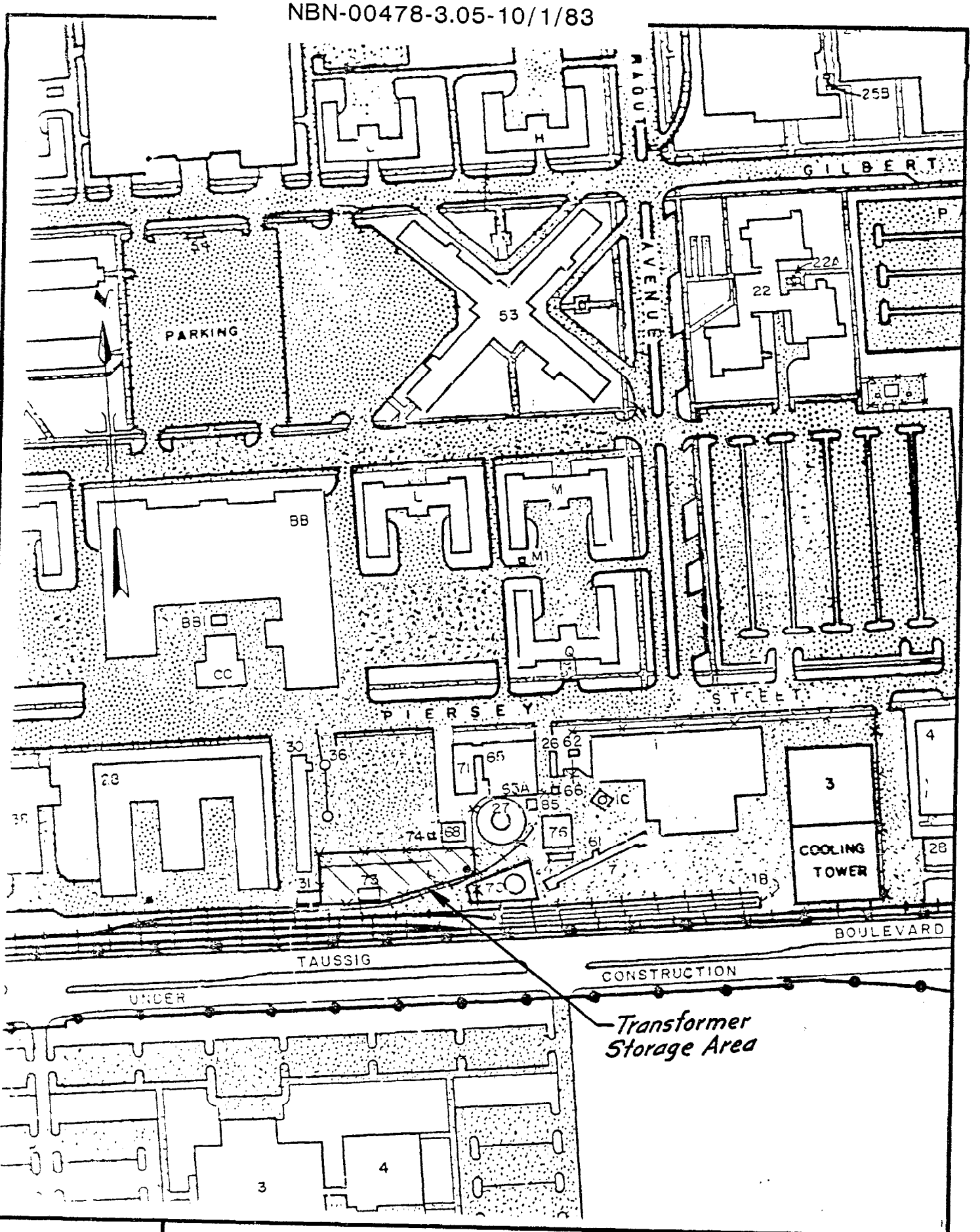


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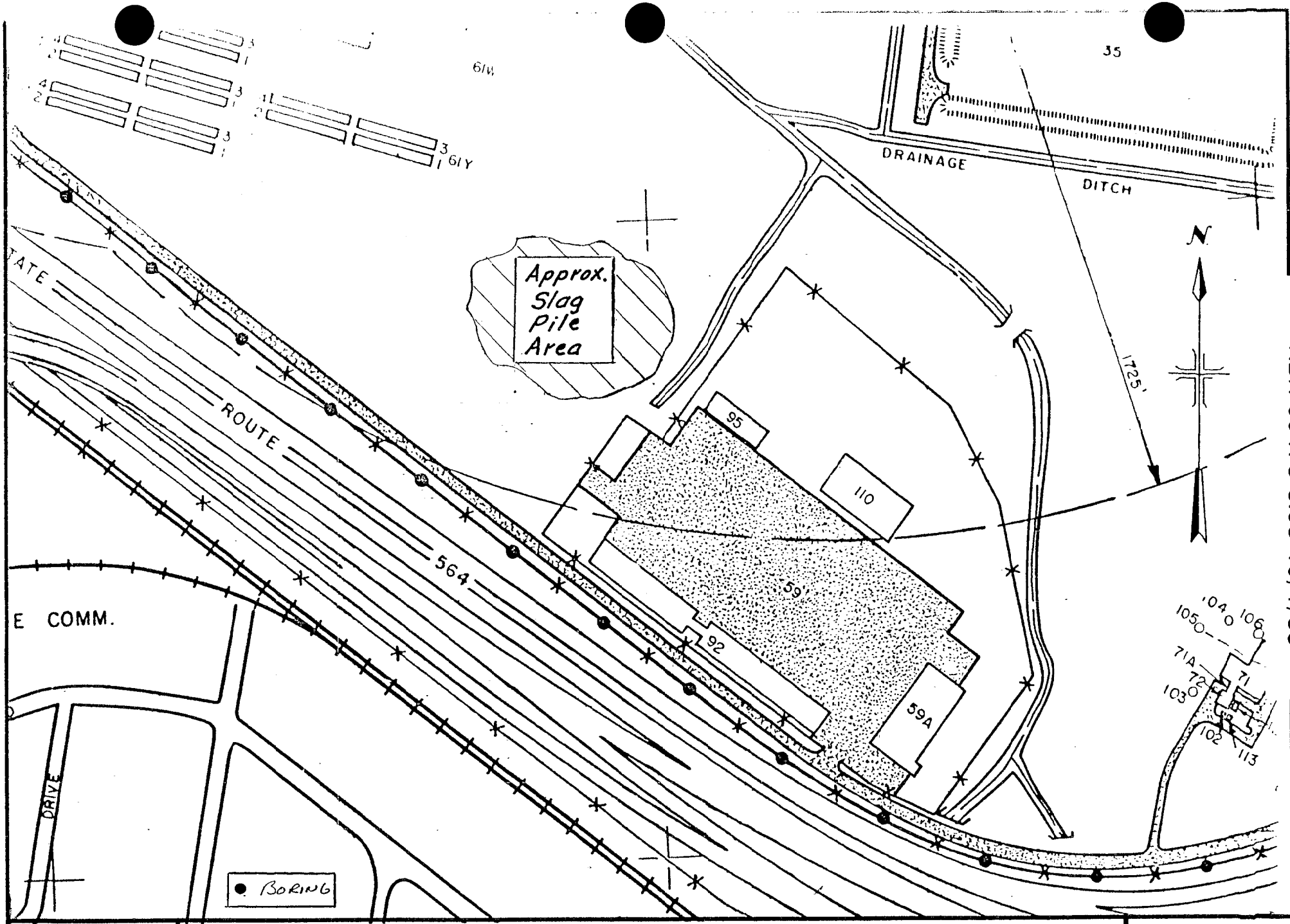
# TRANSFORMER STORAGE AREA P-71

MALCOLM PIRNIE, INC.

FIGURE 6

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# NM AREA SLAG PILE

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FIGURE 7

# APPENDIX A

## MALCOLM PIRNIE, INC.
## HEALTH AND SAFETY PLAN

### General

This Health and Safety Plan outlines procedures to be used during investigations at uncontrolled hazardous waste sites to minimize the risk of injury or illness resulting from on-site activities. The specific health and safety concerns in this plan deal with chemical and physical hazard exposure during the various phases of the site investigation. The intent is to carry out these duties to the degree that injuries, occupational illnesses and unwarranted property losses are prevented while at the same time ensuring compliance with applicable laws and regulations. Emphasis will be placed on individual awareness, personal protective equipment, and emergency response.

It is the policy of Malcolm Pirnie, Inc. that all persons involved in the various project activities be certified to perform duties in that particular category of work. In this project it is expected that the work currently identified will be in conducting geophysical studies, installing ground water monitoring wells, and collecting samples of water, leachate, soil, and air from locations of suspected hazardous conditions. In order to be certified, each worker must be properly trained in the use of appropriate safety equipment and specific operating procedures developed for the site under consideration. Notice of any violation of these procedures or questions regarding them shall be directed to the Project Manager.

This Health and Safety Plan is comprised of the following major subsections:

Medical Surveillance Plan

The level of medical surveillance required for individuals who will be involved in site investigations or remedial measures is dependent on the nature of the waste present at each waste site and the duration of exposure associated with site operations.

From a review of the available information concerning the site and the anticipated project tasks, the medical surveillance plan given below is considered appropriate to safeguard and monitor the health of project personnel.

The medical examinations instituted as part of this Health and Safety Plan are not to be considered a substitute for regular checkups designed to monitor general health. The medical examinations undertaken for this program are designed to screen for evidence of adverse effects due to exposure to toxic substances. Therefore, the examination does not provide for screening of common, nonoccupational chronic disorders.

Baseline Examination - Individuals who will work at sites where suspected toxic materials or other wastes that may be harmful are present are directed to take all precautionary measures necessary to avoid any contact with the hazardous substance, test samples and sample environment. The precautionary measures will include adequate protective clothing, proper sampling techniques, safety equipment and the cautious cleansing of soiled clothing and equipment. Barring unforeseen accidents, major concerns would be exposure to compounds caused by volatilization and contact through normal respiration and skin contact and absorption. In turn, only the more volatile organics would be of the utmost concern because protected respiration will be enacted in warranted situations (poor ventilation, dust dispersion, etc.). Thus, health surveillance will be concerned largely with the monitoring of those clinical manifestations of organic compounds, particularly volatile ones and nonabsorbable inorganic materials and gases. The basic manifestations of toxicity, after exposure to the above compounds would be:

- Liver damage
- Kidney damage
- Neurological disorders
- Heart damage
- Blood damage

- Lung damage
- Hearing disorders

Individuals working on-site are required to complete a baseline medical examination and undergo periodically scheduled surveillance examinations at the discretion of the Health and Safety Manager designated by the Project Manager. The baseline physical examinations shall provide a history of previous exposure, general health status and will serve as a baseline for comparative purposes.

The baseline examinations include the following:

1. Self-administered health history questionnaire as an aid in diagnosis.

2. General physical examination in order to assess the individual's overall health, and current heart and neurological conditions. Specific tests which will be given in this regard include:

   - Chest X-ray
   - Electrocardiogram
   - Stress test

3. Laboratory hematologic analysis to determine liver and blood functions. These clinical tests include a complete blood count with differential, VDRL, thyroid hormone, albumin, alkaline phosphatase, bilirubin-total and iron-serum, lactic acid dehydrogenase, phosphorus, potassium, protein-total, sodium, SGOT, SGPT, triglycerides, urea nitrogen (BUN) and uric acid, hemoglobin, methemoglobin, heavy metals and pesticide residues.

4. Urinalysis for urine characterization.

5. Pulmonary functions to be measured for determining lung condition. These specific tests include: forced vital capacity, forced volume, max-mid exploratory flow, maximum voluntary ventilation, functional residual volume, residual volume, and total lung capacity.

6. Hearing abilities will be determined through audiometric testing.

As part of this medical examination, tetanus vaccinations should be updated, and where exposure to infectious waste may occur, polio and gamma globulin innoculations may be given if recommended by the physician. Additional clinical tests may be included at the discretion of the physician performing the physical examination.

Periodic Examinations - Periodic examinations will be performed annually for all personnel participating in the medical surveillance program, at the completion of a continuous six-month assignment at known or suspected hazardous waste sites, and on termination of employment. Periodic surveillance provides a continuous record of health status and also assists in the early identification of advanced health effects. Periodic surveillance examinations shall include those items which are considered good indicators of acute toxicity. Specifically, these involve the clinical tests listed above for kidney, liver, and blood functions. In addition, the pulmonary function and audiometry tests will be given on an annual basis, at least.

Nonscheduled Examinations - Medical examinations shall also be conducted:

1. After acute exposure to any toxic or hazardous material.

2. At the discretion of the Health and Safety Manager when an employee has been exposed to dangerous levels of toxic or hazardous materials.

3. At the discretion of the Health and Safety Manager and at the request of an employee with demonstrated symptoms of exposure to toxic or hazardous materials.

The tests given will be the same given annually. Additional specific tests directed at determining any detrimental effects due to the particular exposure incident will be administered at the discretion of the Health and Safety Manager and/or attending physician.

Medical Records - Copies of medical records will be maintained by the medical center or clinic where the medical examination is conducted. Copies of examination results will also be kept in personnel files at the office of the persons employer. In addition, employees will be given a copy of their examination results.

Training

Hazardous waste site investigations, by their very nature, require extraordinary precautions to prevent loss of life, injury, or health hazard to investigators. Clearly, every safety hazard associated with hazardous waste investigations cannot be anticipated; and accordingly, rules cannot be developed for every contingency that could arise.

However, in order to provide guidance to field personnel to minimize the risks associated with the conduct of field operations, a training program has been developed by Malcolm Pirnie. The program provides instruction on the use of appropriate safety equipment and stresses the necessity for strict adherence to basic rules of safe, standard operating procedures at hazardous waste sites. The application of common sense and technical judgment are also heavily emphasized. Specifically, personnel are instructed in the hazards posed by chemicals in general and especially those known to be present at the particular site. Training in the proper choice and implementation of personal safety practices, procedures and equipment is given. This includes various measuring devices, respiratory protection apparatus, protective clothing, and safety equipment. Operational considerations at the site are also discussed. For example, the development and use of a site safety plan and a field sampling plan are explained. Decontamination and advanced first aid procedures are also explained and demonstrated in class room and field situations, if necessary.

A detailed safety manual has been prepared for use by trainees as a learning aid for the training program. At completion of the training program, all field personnel assigned to this project will be considered adequately trained and safety conscious for working at the site. Safety training must be a continuing part of the total response program. Periodic retraining and practice sessions on longer duration projects not only create a high degree of safety awareness, but also help to maintain proficiency in the use of equipment and knowledge of safety requirements.

It is the responsibility of all personnel to observe and check for safety equipment and practices of fellow workers. The Field Team Coordinator is responsible for adherence to this Plan.

## Initial Site Characterization

### Collection and Review of Background Information

An Initial Assessment Study (IAS) was conducted at the Sewells Point Naval Complex, final report dated February, 1983, which identified

sites posing a potential threat to human health or the environment due to contamination from past hazardous materials operations. Based on information from historical records, aerial photographs, field inspections, and personnel interviews, the study concluded six sites warranted further investigation under the NACIP program. Malcolm Pirnie will investigate five of these sites.

The information contained in the IAS will help determine what contaminants are located at the site, their quantity and location, the method of disposal, and the potential for migration, if it has not already occurred. This information will also be helpful in familiarizing project personnel with the site's natural conditions, such as topography, stream locations, hydrogeological characteristics, location of possibly impacted potable water supplies, or other public or environmental targets.

An initial site characterization shall be undertaken to determine the presence of acute health dangers. The initial on-site survey and reconnaissance, which may consist of more than one entry, is to characterize the immediate hazards and, based on these findings, establish preliminary safety requirements. As data contained in the IAS and the initial survey is reviewed, the Level of Protection and other safety procedures are adjusted. Initial data also provide information on which to base further monitoring and sampling. This survey would include testing for insufficient oxygen levels, explosive or flammable levels of gases, and high levels of chemical vapors or radiation. The minimum personal Level of Protection (discussed in the following section, "Site Procedures") will be Level "D." It should be noted that from the information presently available to Malcolm Pirnie, acute health dangers do not seem to be present at either site.

Preparation of the Site Safety Plan

Prior to entry to an uncontrolled hazardous waste site, a Site Safety Plan must be completed as fully as possible and properly reviewed by all members of the field team and approved by the Project Officer. The plan, included below, basically identifies the contaminants present,

their form, containment, and an assessment of the hazards presented by the contaminants. In addition, methods of on-site operation are given, as well as the Level of Protection required, detection and support equipment to be used, and monitoring and decontamination procedures. Finally, emergency procedures are detailed in the event of accidental exposure. While operating in the field, the Site Safety Plan will be posted in a location where it can quickly be referenced by field personnel.

Site Procedures

Personal Safety and Hygiene

Prior to site entry, the Site Investigation Plan for conducting the field work should be reviewed by each team member before arrival at the site. Each member involved must know the purpose and objectives of the site visit and obtain as much basic information as possible on:

- Nature of materials present at the site including:
  - Chemicals, their properties and potential hazards
  - Form of wastes (solids, liquids, vapors, etc.)
  - Type of containers
- Physical description of the site, its exact location, size, topography, and natural and man-made features
- Description of surrounding area, including surface waters, location of public drinking water supplies, proximity of residences, and possible public exposure

Field personnel will not enter the hazardous site alone. The buddy system will be required. All team members on the site must be familiar with the site's physical characteristics, including topography, location of nearest surface water, wind direction in relation to contaminated areas, accessibility to associates, equipment, communications systems, avenues of ingress and egress, and detailed procedures to follow should a team member suffer any adverse effects. Recommended reference training material: The U.S. EPA Safety Manual for Hazardous Waste Site Investigation.

Eating, drinking, chewing gum or use of tobacco in any form while in the designated hazard site is prohibited. These may be permitted following full decontamination and exit from the hazard site. Field personnel are to be kept fully cognizant of the need for personal cleanliness in this regard.

Personal Protective Clothing and Equipment

Personnel must wear protective equipment when response activities involve known or suspected atmospheric contamination, when vapors, gases, or particulates may be generated, or when direct contact with skin-affecting substances may occur. Respirators can protect lungs, gastrointestinal tract, and eyes against air toxicants. Chemical-resistant clothing can protect the skin from contact with skin-destructive and absorbable chemicals. Good personal hygiene limits or prevents ingestion of material.

Equipment to protect the body against contact with known or anticipated chemical hazards has been divided into four categories according to the degree of protection afforded:

- Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.

- Level B: Should be selected when the highest level of respiratory protection is needed, but a lesser level of skin protection. Level B protection is the minimum level recommended on initial site entries until the hazards have been further defined by on-site studies and appropriate personnel protection utilized.

- Level C: Should be selected when the types of airborne substances are known, the concentrations measured, and the criteria for using air-purifying respirators are met.

- Level D: Should not be worn on any site with respiratory or skin hazards. Is primarily a work uniform providing minimal protection.

The Level of Protection selected should be based primarily on:

- Types and measured concentrations of chemical substances in the ambient atmosphere and their toxicity.

- Potential or measured exposure to substances in air, splashes of liquids, or other direct contact with material due to work being performed.

In situations where the types of chemicals, their concentrations, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better characterized. Additional guidance for selecting Level of Protection utilizing air monitoring equipment is given below under "Safety Equipment and Use."

While personnel protective equipment reduces the potential for contact with harmful substances, ensuring the health and safety of response personnel requires, in addition, site entry protocols, safe work practices, proper decontamination, and other safety considerations. Together, these protocols establish a combined approach for reducing potential harm to workers.

Level A Protection

Personal Protective Equipment:

- Pressure-demand, self-contained breathing apparatus, approved by the Mine Safety and Health Administration (MSHA) and National Institute of Occupational Safety and Health (NIOSH)
- Fully encapsulating chemical-resistant suit
- Coveralls*
- Long cotton underwear*
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots, chemical-resistant, steel toe and shank (depending on suit construction, worn over or under suit boot)
- Hard hat* (under suit)
- Disposable protective suit, gloves, and boots* (worn over fully encapsulating suit)
- 2-way radio communications

*Optional

Criteria for Selection: Meeting any of these criteria warrants use of Level A protection:

- The chemical substances have been identified and require the highest Level of Protection for skin, eyes, and the respiratory system based on:
  - Measured (or potential for) high concentrations of atmospheric vapors, gases, or particulates, or
  - Site operations and work functions involving high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates
- Extremely hazardous substances (for example: dioxin, cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens, and infectious substances) are known or suspected to be present, and skin contact is possible.
- The potential exists for contact with substances that destroy skin.
- Operations must be conducted in confined, poorly ventilated areas until the absence of hazards requiring Level A protection is demonstrated.
- Total atmospheric readings on the Century OVA System, HNU Photionizer, and similar instruments indicate 500-1,000 ppm of unidentified substances (see "Safety Equipment and Use").

Guidance on Selection Criteria: The full encapsulating suit provides the highest degree of protection to skin, eyes, and respiratory system if the suit material is resistant to the chemicals of concern during the time the suit is worn and/or at the measured or anticipated concentrations. While Level A provides maximum protection, the suit material may be rapidly permeated and penetrated by certain chemicals from extremely high air concentrations, splashes, or immersion of boots or gloves in concentrated liquids or sludges. These limitations should be recognized when specifying the type of chemical-resistant garment. Whenever possible, the suit material should be matched with the substance it is used to protect against.

The use of Level A protection and other chemical-resistant clothing requires evaluating the problems of physical stress, in particular heat stress associated with the wearing of

impermeable protective clothing. Response personnel must be carefully monitored for physical tolerance and recovery.

Protective equipment being heavy and cumbersome, decreases dexterity, agility, visual acuity, etc., and so increases the probability of accidents. This probability decreases as less protective equipment is required. Thus, increased probability of accidents should be considered when selecting a higher Levels of Protection.

Many toxic substances are difficult to detect or measure in the field. When such substances (especially those readily absorbed by or destructive to the skin) are known or suspected to be present and personal contact is unavoidable, Level A protection should be worn until more accurate information can be obtained.

Level B Protection

Personal Protective Equipment:

- Pressure-demand, self-contained breathing apparatus (MSHA/NIOSH approved)
- Chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; hooded, one or two-piece chemical-splash suit; disposable chemical-resistant coveralls)
- Coveralls*
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), chemical-resistant, steel toe and shank
- Boots (outer), chemical-resistant (disposable*)
- Hard hat (face shield*)
- 2-way radio communications

Criteria for Selection: Meeting any one of these criteria warrants use of Level B protection:

- The types and atmospheric concentrations of toxic substances have been identified and require the highest level of respiratory protection, but a lower level of skin and eye protection. These would be atmospheres:

  - With concentrations Immediately Dangerous to Life and Health (IDLH) or

  - Exceeding limits of protection afforded by a full-face, air-purifying mask or

  - Containing substances for which air-purifying canisters do not exist or have low removal efficiency or

  - Containing substances requiring air-supplied equipment, but substances and/or concentrations do not represent a serious skin hazard

- The atmosphere contains less than 19.5 percent oxygen.

- Site operations make it highly unlikely that the small, unprotected area of the head or neck will be contacted by splashes of extremely hazardous substances.

- Total atmospheric concentrations of unidentified vapors or gases range from 5 ppm to 500 ppm on instruments such as the Century OVA or HNU Photoionizer, and vapors are not suspected of containing high levels of chemicals toxic to skin (see "Safety Equipment and Use").

Guidance on Selection Criteria: Level B equipment provides a high Level of Protection to the respiratory tract, but a somewhat lower Level of Protection to skin. The chemical-resistant clothing required in Level B is available in a wide variety of styles, materials, construction detail, permeability, etc. These factors all affect the degree of protection afforded. Therefore, a specialist should select the most effective chemical-resistant clothing (and fully encapsulating suit) based on the known or anticipated hazards and/or job function.

Generally, if a self-contained breathing apparatus is required, Level B clothing rather than a Level A fully encapsulating suit is selected, based on the protection needed against known or anticipated substances affecting the skin. Level B skin protection is selected by:

- Comparing the concentrations of known or identified substances in air with skin toxicity data.

- Determining the presence of substances that are destructive to and/or readily absorbed through the skin by liquid splashes, unexpected high levels of gases or particulates, or other means of direct contact.

- Assessing the effect of the substance (at its measured air concentrations or splash potential) on the small area of the head and neck unprotected by chemical-resistant clothing.

For initial site entry and reconnaissance at an open site, approaching whenever possible from the upwind direction, Level B protection (with good quality, hooded, chemical-resistant clothing) should protect response personnel, providing the conditions described in selecting Level A are known or judged to be absent. For continuous operations, the aforementioned criteria must be evaluated.

At 500 ppm total vapors/gases, upgrading to Level A protection may be advisable. A major factor for reevaluation is the presence of vapors, gases, or particulates requiring a higher degree of skin protection.

Level C Protection

Personal Protective Equipment:

- Full-face, air-purifying, canister-equipped respirator (MSHA/NIOSH approved)
- Chemical-resistant clothing (coveralls; hooded, two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls)
- Coveralls*
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant*
- Boots (outer), chemical-resistant, steel toe and shank*
- Boots (outer), chemical-resistant (disposable*)
- Hard hat (face shield*)
- 2-way radio communications

Criteria for Selection: Meeting all of these criteria permits use of Level C protection:

- Measured air concentrations of identified substances will be reached by the respirator at or below the substance's exposure limit, and the concentration is within the service limit of the canister.

*Optional

- Atmospheric contaminant concentrations do not exceed IDLH levels.

- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect the small area of skin left unprotected by chemical-resistant clothing.

- Job functions have been determined not to require self-contained breathing apparatus.

- Total vapor readings register between background and 5 ppm above background on instruments such as the HNU Photoionizer and Century OVA (see "Safety Equipment and Use").

- Air will be monitored periodically.

Guidance on Selection Criteria: Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main selection criterion for Level C is that conditions permit wearing air-purifying devices.

The air-purifying device must be a full-face mask (MSHA/NIOSH approved) equipped with a canister suspended from the chin or on a harness. Canisters must be able to remove the substances encountered. Quarter or half-masks or cheek-cartridge full-face masks should be used only with the approval of a qualified individual.

In addition, a full-face, air-purifying mask can be used only if:

- Oxygen content of the atmosphere is at least 19.5 percent by volume.

- Substances are identified and their concentrations measured.

- Substances have adequate warning properties.

- Individual passes a qualitative fit-test for the mask.

- Appropriate cartridge/canister is used, and its service limit concentration is not exceeded.

An air monitoring program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be monitored thoroughly

when personnel are wearing air-purifying respirators (Level C). Continual surveillance using direct-reading instruments and air sampling is needed to detect any changes in air quality necessitating a higher level of respiratory protection (see "Safety Equipment and Use" for guidance on air monitoring).

Total unidentified vapor/gas concentrations of 5 ppm above background require Level B protection. Only a qualified individual should select Level C (air-purifying respirators) protection for continual use in an unidentified vapor/gas concentration of background to 5 ppm above background.

Level D Protection

Personal Protective Equipment:

- Coveralls
- Gloves*
- Boots/shoes, leather or chemical-resistant, steel toe and shank
- Boots (outer), chemical-resistant (disposable*)
- Safety glasses or chemical splash goggles*
- Hard hat (face shield*)
- Escape mask*

Criteria for Selection: Meeting any of these criteria allows use of Level D protection:

- No hazardous air pollutants have been measured.
- Work functions preclude splashes, immersion, or potential for unexpected inhalation of any chemicals.

Guidance on Selection Criteria: Level D protection is primarily a work uniform. It can be worn in areas where: 1) only boots can be contaminated; or 2) there are no inhalable toxic substances.

In all site operations, selecting the appropriate personnel protection equipment is one of the first steps in reducing the potential for

*Optional

adverse health effects. Until the hazardous conditions at a site can be identified and personnel safety measures commensurate with the hazards -- real or potential -- instituted, preliminary measures will have to be based on applying experience, judgment, and professional knowledge to the particular incident at hand. Lack of knowledge concerning the hazards that could be encountered precludes selecting protective equipment by comparing environmental concentrations of known toxicants against protection afforded by each type of equipment.

One of the first considerations in evaluating the risk of an unknown environment is to measure immediate atmospheric hazards such as the concentrations (or potential concentrations) of vapors, gases, and particulates; oxygen content of the air; explosive potential; and, to a lesser degree, the possibility of radiation exposure. In addition to air measurements, visual observation and/or evaluation of existing data can help determine the degree of risk from other materials that are explosive, have a high fire potential, are extremely toxic, or exhibit other hazardous characteristics that cannot be monitored by field instruments.

Total vapor/gas concentration as indicated by instruments such as the Century OVA System or the HNU Photoionizer is a useful adjunct to professional judgment in selecting the Level of Protection to be worn in an unknown environment. It should not be the sole criterion, but should be considered with all other available information. Total vapor/gas concentration should be applied only by qualified persons thoroughly familiar with the information contained below under "Safety Equipment and Use."

Chemicals Toxic to Skin - Chemicals which cause adverse skin effects ranging from irritation to absorption into the body are identified in the Oil and Hazardous Materials Technical Assistance Data Base System (OHMTADS). Knowledge concerning the presence or absence of these materials could be useful in selecting the necessary Level of Protection. Other substances affecting the skin, but not listed in OHMTADS, may be present. Therefore, a major effort should be made to identify all substances.

Atmospheric Conditions - Atmospheric conditions such as stability, temperature, wind direction, wind velocity, and pressure determine the behavior of contaminants in air or the potential for volatile material getting in air. These parameters should be considered in determining the need for and Level of Protection required.

Air Monitoring - A program must be established for periodic monitoring of the air during site operations. Without an air monitoring program, any changes could go undetected and jeopardize response personnel. Monitoring can be done with various types of air pumps and filtering devices followed by analysis of filtering media, portable real-time monitoring instruments located strategically on-site, personal dosimeters, and periodic walk-throughs by personnel carrying survey instruments.

Escape Masks - The use of escape masks is an option in Level C and D protection. A specialist should determine their use on a case-by-case basis. Escape masks could also be strategically located on-site in areas that have higher possibilities of vapors, gases, or particulates.

Safety Equipment and Use

In addition to the items listed under Personal Protective Clothing and Equipment, Malcolm Pirnie has the following equipment available to ensure additional safety for the field personnel:

- Century Systems Model 128 Organic Vapor Analyzer (OVA)
- Enmet CGS-80 halogenated vapor detector/$O_2$/explosimeter meter
- Draeger colormetric indicator tubes
- Binoculars
- Portable eye wash
- First aid kit
- Assorted hand tools
- Decontamination items (water pumps, tubs, brushes, etc.)
- Equipment vehicle

A key aspect in providing on-site safety monitoring will be the continuous use of the Century OVA as a means of determining the Level of Protection through a numerical criterion. The OVA will be used in situations where the presence of vapors or gases is not known, or if present, the individual components are unknown. Such a scenario could occur when field personnel enter previously uninvestigated areas of a

hazardous waste site or areas of recent disturbance, as when deteriorated drums are uncovered. Another situation in which the OVA has and will be used is during drilling for the installation of monitoring wells due to the possibility of encountering and releasing toxic vapors or gases to the working area from unknown sources below the ground surface.

Although total vapor/gas concentration measurements are useful to a qualified professional for the selection of protection equipment, caution should be exercised in interpretation. An instrument does not respond with the same sensitivity to several vapor/gas contaminants as it does to a single contaminant. Also since total vapor/gas field instruments see all contaminants in relation to a specific calibration gas, the concentration of unknown gases or vapors may be over or underestimated.

Suspected carcinogens, particulates, highly hazardous substances, or other substances that do not elicit an instrument response may be known or believed to be present. Therefore, the protection level should not be based solely on the total vapor/gas criterion. Rather, the level should be selected case by case, with special emphasis on potential exposure and chemical and toxicological characteristics of the known or suspected material.

Factors for Consideration - In utilizing total atmospheric vapor/gas concentrations as a guide for selecting a Level of Protection, a number of other factors should also be considered:

- The uses, limitations, and operating characteristics of the monitoring instrument must be recognized and understood. Instruments such as the HNU Photoionizer, Century OVA, and others do not respond identically to the same concentration of a substance or respond to all substances. Therefore, experience, knowledge, and good judgment must be used to complement the data obtained with instruments.

- Other hazards may exist such as gases not detected by the OVA or HNU (i.e., phosgene, cyanides, arsenic, chlorine), explosives, flammable materials, oxygen deficiency, liquid/solid particles, and liquid or solid chemicals.

- Vapors/gases with very low toxicities could be present.

- The risk to personnel entering or working in an area must be weighed against the need for being there. Although this assessment is largely a value judgment, it requires a conscientious balancing of the variables involved and the risk to personnel against the need to enter or work in an unknown environment.

- The knowledge that suspected carcinogens or substances extremely toxic or destructive to skin are present or suspected to be present (which may not be reflected in total vapor/gas concentration) requires an evaluation of factors such as the potential for exposure, chemical characteristics of the material, limitation of instruments, and other considerations specific to the site.

- What needs to be done on-site must be evaluated. Based upon total atmospheric vapor concentrations, Level C protection may be judged adequate; however, tasks such as drilling, moving drums, opening containers, and bulking of materials, which increase the probability of liquid splashes or generation of vapors, gases, or particulates, may require a higher Level of Protection.

- Before any respiratory protective apparatus is issued, a respiratory protection program must be developed and implemented according to recognized standards (ANSI Z88.2, 1980).

Level A Protection (500 to 1,000 ppm Above Background) - Level A protection provides the highest degree of respiratory tract, skin, and eye protection if the inherent limitations of the personal protective equipment are not exceeded. The range of 500 to 1,000 ppm total vapors/gases concentration in air was selected based on the following criteria:

Although Level A provides protection against air concentrations greater than 1,000 ppm for most substances, an operational restriction of 1,000 ppm is established as a warning flag to:

- Evaluate the need to enter environments with unknown concentrations greater than 1,000 ppm

- Identify the specific constituents contributing to the total concentration and their associated toxic properties

  - Determine more precisely concentrations of constituents
  - Evaluate the calibration and/or sensitivity error associated with the instrument(s)
  - Evaluate instrument sensitivity to wind velocity, humidity temperature, etc.

- A lower limit of 500 ppm total vapors/gases in air was selected as the value to consider upgrading from Level B to Level A. This concentration was selected to fully protect the skin until the constituents can be identified and measured and substances affecting the skin excluded.
- The range of 500 to 1,000 ppm is sufficiently conservative to provide a safe margin of protection if readings are low due to instrument error, calibration, and sensitivity; if higher than anticipated concentrations occur; and if substances highly toxic to the skin are present.

With properly operating portable field equipment, ambient air concentrations approaching 500 ppm have not routinely been encountered on hazardous waste sites. High concentrations have been encountered only in closed buildings, when containers were being opened, when personnel were working in the spilled contaminants, or when organic vapors/gases were released in transportation accidents. A decision to require Level A protection should also consider the negative aspects: higher probability of accidents due to cumbersome equipment, and most importantly, the physical stress caused by heat buildup in fully encapsulating suits.

Level B Protection (5 to 500 Above Background) - Level B protection is the minimum Level of Protection recommended for initially entering an open site where the types, concentrations, and presence of airborne vapors are unknown. This Level of Protection provides a high degree of respiratory protection. Skin and eyes are also protected, although a small portion of the body (neck and sides of head) may be exposed. The use of a separate hood or hooded, chemical-resistant jacket would further reduce the potential for exposure to this area of the body. Level B impermeable protective clothing also increases the probability of heat stress.

A limit of 500 ppm total atmospheric vapor/gas concentration on portable field instruments has been selected as the upper restriction on the use of Level B. Although Level B personnel protection should be adequate for most commonly encountered substances at air concentrations higher than 500 ppm, this limit has been selected as a decision point for a careful evaluation of the risks associated with higher concentrations. These factors should be considered:

- The necessity for entering unknown concentrations higher than 500 ppm wearing Level B protection
- The probability that substance(s) present are severe skin hazards
- The work to be done and the increased probability of exposure
- The need for qualitative and quantitative identification of the specific components
- Inherent limitations of the instruments used for air monitoring
- Instrument sensitivity to winds, humidity, temperature, and other factors

Level C Protection (Background to 5 ppm Above Background) - Level C provides skin protection identical to Level B, assuming the same type of chemical protective clothing is worn, but lesser protection against inhalation hazards. A range of background to 5 ppm above ambient background concentrations of vapors/gases in the atmosphere has been established as guidance for selecting Level C protection. Concentrations in the air of unidentified vapors/gases approaching or exceeding 5 ppm would warrant upgrading respiratory protection to self-contained breathing apparatus.

A full-face, air-purifying mask equipped with an organic vapor canister (or a combined organic vapor/particulate canister) provides protection against low concentrations of most common organic vapors/gases. There are some substances against which full-face, canister-equipped masks do not protect, or substances that have very low Threshold Limit Values or Immediately Dangerous to Life or Health

concentrations. Many of the latter substances are gases or liquids in their normal state. Gases would only be found in gas cylinders, while the liquids would not ordinarily be found in standard containers or drums.

Every effort should be made to identify the individual constituents (and the presence of particulates) contributing to the total vapor readings of a few parts per million. Respiratory protective equipment can then be selected accordingly. It is exceedingly difficult, however, to provide constant, real-time identification of all components in a vapor cloud with concentrations of a few parts per million at a site where ambient concentrations are constantly changing. If highly toxic substances have been ruled out, but ambient levels of a few parts per million persist, it is unreasonable to assume only self-contained breathing apparatus should be worn. The continuous use of air-purifying masks in vapor/gas concentrations of a few parts per million gives a reasonable assurance that the respiratory tract is protected, provided that the absence of highly toxic substances has been confirmed.

Full-face, air-purifying devices provide respiratory protection against most vapors at greater than 5 ppm; however, until more definitive qualitative information is available, concentrations greater than 5 ppm indicates that a higher level of respiratory protection should be used. Also, unanticipated transient excursions may increase the concentrations in the environment above the limits of air-purifying devices. The increased probability of exposure due to the work being done may require Level B protection, even though ambient levels are low.

Instrument Sensitivity

Although the measurement of total vapor/gas concentrations can be a useful adjunct to professional judgment in the selection of an appropriate Level of Protection, caution should be used in the interpretation of the measuring instrument's readout. The response of an instrument to a gas or vapor cloud containing two or more substances does not provide the same sensitivity as measurements involving the individual pure constituents. Hence, the instrument readout may overestimate or underestimate the concentration of an unknown composite

cloud. This same type of inaccuracy could also occur in measuring a single unknown substance with the instrument calibrated to a different substance. The idiosyncrasies of each instrument must be considered in conjunction with the other parameters in selecting the protection equipment needed.

Using the total vapor/gas concentration as a criterion used to determine levels of protection should provide protection against concentrations greater than the instrument's readout. However, when the upper limits of Level C and B are approached, serious consideration should be given to selecting a higher Level of Protection. Cloud constituents must be identified as rapidly as possible and levels of protection based on the toxic properties of the specific substances identified.

Special Medical Emergency Procedures

Basic Considerations - Part of overall planning for on-site investigations is managing medical emergencies. The following procedures will be provided for:

- All response team members will review this Site Safety Plan.
- Some response team members fully trained in first aid and CPR.
- Arrangements with the nearest medical facility for transportation and treatment of injured, and for treatment of personnel suffering from exposure to chemicals.
- Consultation services with a toxicologist.
- Emergency eye washes, showers, and/or wash stations.
- First aid kits.

In addition, methods for decontaminating personnel with medical problems and injuries will be established. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt life-saving first aid and/or medical treatment is required, decontamination procedures should be omitted. Whenever possible, response personnel should accompany contaminated victims to the medical facility to advise on matters involving decontamination.

Emergency First Aid - Emergency first aid treatment is only administered by trained individuals as a means of providing relief from injury and preventing further damage until professional treatment can be obtained. The members of the project team shall be trained in emergency first aid and should be consulted as available.

The following first aid equipment shall be provided at each work site:

- American National Red Cross First Aid Handbook
- Compresses
- Gauze and gauze roller bandage
- Triangular bandages
- Eye dressing packet
- Smelling salts
- Baking soda
- Salt or other emetic
- Portable eye wash unit
- Safety rope and harness
- Oxygen bottles, valves, etc.
- Soap or waterless hand cleaner and towels
- Back brace
- Band aids
- Tape
- Scissors
- Tweezers
- Razors

The following emergency first aid shall be administered as required.

Physical Injury - Physical injuries can range from a sprained ankle to a compound fracture, from a minor cut to massive bleeding. Depending on the seriousness of the injury, treatment may be given at the site by trained response personnel. For more serious injuries, additional assistance may be required at the site or the victim may have to be treated at a medical facility.

Life-saving care should be instituted immediately without considering decontamination. The outside garments can be removed (depending on the weather) if they do not cause delays, interfere with treatment, or aggravate the problem. Respiratory masks and backpack assemblies must always be removed. Fully encapsulating suits or chemical-resistant clothing can be cut away. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in plastic, rubber, or

blankets to help prevent contaminating the inside of ambulances and/or medical personnel. Outside garments are then removed at the medical facility. No attempt should be made to wash or rinse the victim. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life. For minor medical problems or injuries, the normal decontamination procedure should be followed.

Chemical Exposure - Exposure to chemicals can be divided into two categories:

- Injuries from direct contact, such as acid burns or inhalation of toxic chemicals
- Potential injury due to gross contamination on clothing or equipment

For the contaminant inhaled, treatment can only be by a qualified physician. If unconscious, the victim should be pulled from the contaminated area immediately. Rescuers must wear appropriate respiratory and protective equipment. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect. First aid treatment usually is flooding the affected area with water; however, for a few chemicals, water may cause more severe problems.

When protective clothing is grossly contaminated, contaminants may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed. A shower should be used immediately if available and contaminated clothing removed while showering.

Injestion - Should toxic materials be ingested, vomiting will be induced using a tablespoon of salt or powdered mustard in a glass of warm water or syrup of ipecac except when the ingested substance presents an aspiration hazard, such as from a petroleum product; or when the substance is a strong acid or alkali. Vomiting may also be induced by placing a finger down the throat of the victim. Treatment should continue until vomit is clear.

Heat Stress - Heat-related illnesses range from heat fatigue to heat stroke, the most serious. Heat stroke requires prompt treatment to prevent irreversible damage or death. Protective clothing may have to be cut off. Less serious forms of heat stress require prompt attention or they may lead to a heat stroke. Unless the victim is obviously contaminated, decontamination should be omitted or minimized and treatment begun immediately.

Incident Reports - In the event of injury to or exposure to any field personnel, the Project Manager will be responsible for the preparation and submission of an Incident Report. The Project Manager will be required to follow up on treatment and recovery as required. A sample Incident Report is shown below.

MALCOLM PIRNIE, INC.
INCIDENT REPORT

Project _____ Health & Safety Mgr. _____

Site Location _____ Project Mgr. _____

Incident Summary _____

_____

_____

Date and Time of Incident _____

Exposed Individuals _____

_____

_____

Exposed to _____

_____

Actions Taken:

First Aid Administered
Doctor Examination
Other _____

_____

_____

_____

## Decontamination Procedures

### General

Personnel working at hazardous waste sites may become contaminated in a number of ways, including:

- Contacting vapors, gases, mists, or particulates in the air
- Being splashed by materials while sampling or opening containers
- Walking through puddles of liquids or on contaminated soil
- Using contaminated instruments or equipment

Protective clothing and respirators help prevent the wearer from becoming contaminated or inhaling contaminants, while good work practices help reduce contamination on protective clothing, instruments, and equipment.

Even with these safeguards, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. Or in removing contaminated clothing, personnel may contact contaminants on the clothing and/or inhale them. To prevent such occurrences, methods to reduce contamination and decontamination procedures must be developed and implemented before anyone enters a site and must continue (modified when necessary) throughout site operations.

Decontamination consists of physically removing contaminants and/or changing their chemical nature to innocuous substances. How extensive decontamination must be depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant the more extensive and thorough decontamination must be. Less harmful contaminants may require less decontamination. Combining decontamination, the correct method of doffing personnel protective equipment, and the use of site work zones minimizes cross-contamination from protective clothing to wearer, equipment to personnel, and one area to another. Only general guidance can be given on methods and techniques for decontamination. The exact procedure to use must be determined after evaluating a number of factors specified to the site.

### Preliminary Concerns

Initial Planning - The initial documentation plan assumes all personnel and equipment leaving the Exclusion Zone (area of potential

contamination) are grossly contaminated. A system is then set up to wash and rinse, at least once, all the personal protective equipment worn. This is done in combination with a sequential doffing of equipment, starting at the first station with the most heavily contaminated item and progressing to the last station with the least contaminated article. Each piece of clothing or operation requires a separate station.

The spread of contaminants during the washing/doffing process is further reduced by separating each decontamination station by a minimum of 3 feet. Ideally, contamination should decrease as a person moves from one station to another farther along in the line.

While planning site operations, methods should be developed to prevent the contamination of people and equipment. For example, using remote sampling techniques, not opening containers by hand, bagging monitoring instruments, using drum grapplers, watering down dusty areas, and not walking through areas of obvious contamination would reduce the probability of becoming contaminated and require a less elaborate decontamination procedure.

The initial decontamination plan is based on a worst-case situation (if no information is available about the incident). Specific conditions at the site are then evaluated, including:

- Type of contaminant
- The amount of contamination
- Levels of Protection required
- Type of protective clothing worn

The initial system is modified, eliminating unnecessary stations or otherwise adapting it to site conditions. For instance, the initial plan might require a complete wash and rinse of chemical protective garments. If disposable garments are worn, the wash/rinse step could be omitted. Wearing disposable boot covers and gloves could eliminate washing and rinsing both gloves and disposable boots and reduce the number of stations needed.

Contamination Reduction Corridor - An area within the Contamination Reduction Zone is designated the Contamination Reduction Corridor (CRC).

The CRC controls access into and out of the Exclusion Zone and confines personnel decontamination activities to a limited area. The size of the corridor depends on the number of stations in the decontamination procedure, overall dimensions of work control zones, and amount of space available at the site. Whenever possible, the corridor should be a straight path.

The CRC boundaries should be conspicuously marked, with entry and exit restricted. The far end is the hotline -- the boundary between the Exclusion Zone and the Contamination Reduction Zone. Personnel exiting the Exclusion Zone must go through the CRC. Anyone in the CRC should be wearing the Level of Protection designated for the decontamination crew. Another corridor may be required for the entrance and exit of heavy equipment needing decontamination. Within the CRC, distinct areas are set aside for decontamination of personnel, portable field equipment, removed clothing, etc. These areas should be marked and personnel restricted to those wearing the appropriate Level of Protection. All activities within the corridor are confined to decontamination.

Personnel protective clothing, respirators, monitoring equipment, sampling supplies, etc., are all maintained outside of the CRC. Personnel don their protective equipment away from the CRC and enter the Exclusion Zone through a separate access control point at the hotline.

Modifications of Initial Plan - The original decontamination plan must be adapted to specific conditions found at particular sites. These conditions may require more or less personnel decontamination than planned, depending on a number of factors:

- Type of Contaminant: The extent of personnel decontamination depends on the effects the contaminants have on the body. Contaminants do not exhibit the same degree of toxicity (or other hazard). The more toxic a substance is the more extensive or thorough decontamination must be. Whenever it is known or suspected that personnel can become contaminated with highly toxic or skin-destructive substances, a full decontamination procedure should be followed. If less hazardous materials are involved, the procedure can be downgraded.

- Amount of Contamination: The amount of contamination on protective clothing is usually determined visually. If it is badly contaminated, a thorough decontamination is generally required. Gross material remaining on the protective clothing for any extended period of time may degrade or permeate it. This likelihood increases with higher air concentrations and greater amounts of liquid contamination. Gross contamination also increases the probability of personnel contact. Swipe tests may help determine the type and quantity of surface contaminants.

- Level of Protection: The Level of Protection and specific pieces of clothing worn determine on a preliminary basis the layout of the decontamination line. Each Level of Protection incorporates different problems in decontamination and doffing of the equipment. For example: decontamination of the harness straps and backpack assembly of the self-contained breathing apparatus is difficult. A butyl rubber apron worn over the harness makes decontamination easier. Clothing variations and different Levels of Protection may require adding or deleting stations in the original decontamination procedure.

- Work Function: The work each person does determines the potential for contact with hazardous materials. In turn, this dictates the layout of the decontamination line. Observers, photographers, operators of air samplers, or others in the Exclusion Zone performing tasks that will not bring them in contact with contaminants may not need, for example, to have their garments washed and rinsed. Others in the Exclusion Zone with a potential for direct contact with the hazardous material will require more thorough decontamination. Different decontamination lines could be set up for different job functions, or certain stations in a line could be omitted for personnel performing certain tasks.

- Location of Contamination: Contamination on the upper areas of protective clothing poses a greater risk to the worker because volatile compounds may generate a hazardous breathing concentration both for the worker and for the decontamination personnel. There is also an increased probability of contact with skin when doffing the upper part of clothing.

- Reason for Leaving Site: The reason for leaving the Exclusion Zone also determines the need and extent of decontamination. A worker leaving the Exclusion Zone to pick up or drop off tools or instruments and immediately returning may not require decontamination. A worker leaving to get a new air cylinder or change a respirator or canisters, however, may require some degree of decontamination. Individuals departing the CRC for a break, lunch, end of day, etc., must be thoroughly decontaminated.

Effectiveness of Decontamination - There is no method to immediately determine how effective decontamination is in removing contaminants. Discolorations, stains, corrosive effects, and substances adhering to objects may indicate contaminants have not been removed. However, observable effects only indicate surface contamination and not permeation (absorption) into clothing. Also many contaminants are not easily observed.

A method for determining effectiveness of surface decontamination is swipe testing. Cloth or paper patches -- swipes -- are wiped over predetermined surfaces of the suspect object and analyzed in a laboratory. Both the inner and outer surfaces of protective clothing should be swipe tested. Positive indications of both sets of swipes would indicate surface contamination has not been removed and substances have penetrated or permeated through the garment. Swipe tests can also be done on skin or inside clothing. Permeation of protective garments requires laboratory analysis of a piece of the material. Both swipe and permeation testing provide after-the-fact information. Along with visual observations, results of these tests can help evaluate the effectiveness of decontamination.

Equipment - Decontamination equipment, materials, and supplies are generally selected based on availability. Other considerations are ease of equipment decontamination or disposability. Most equipment and supplies can be easily procured. For example, soft-bristle scrub brushes or long-handle brushes are used to remove contaminants. Water in buckets or garden sprayers is used for rinsing. Large galvanized wash tubs or stock tanks can hold wash and rinse solutions. Children's wading pools can also be used. Large plastic garbage cans or other similar containers lined with plastic bags can store contaminated clothing and equipment. Contaminated liquids can be stored temporarily in metal or plastic cans or drums. Other gear includes paper or cloth towels for drying protective clothing and equipment.

Decontamination Solution - Personnel protective equipment, sampling tools, and other equipment are usually decontaminated by scrubbing with detergent-water using a soft-bristle brush followed by rinsing with

copious amounts of water. While this process may not be fully effective in removing some contaminants (or in a few cases, contaminants may react with water), it is a relatively safe option compared with using a chemical decontaminating solution. This requires that the contaminant be identified. A decon chemical is then needed that will change the contaminant into a less harmful substance. Especially troublesome are unknown substances or mixtures from a variety of known or unknown substances. The appropriate decontamination solution must be selected in consultation with an experienced chemist.

Establishment of Procedures - Once decontamination procedures have been established, all personnel requiring decontamination must be given precise instructions (and practice, if necessary). Compliance must be frequently checked. The time it takes for decontamination must be ascertained. Personnel wearing SCBAs must leave their work area with sufficient air to walk to the CRC and go through decontamination.

Decontamination of Equipment

Insofar as possible, measures should be taken to prevent contamination of sampling and monitoring equipment. Sampling devices become contaminated, but monitoring instruments, unless they are splashed, usually do not. Once contaminated, instruments are difficult to clean without damaging them. Any delicate instrument which cannot be decontaminated easily should be protected while it is being used. It should be bagged, and the bag taped and secured around the instrument. Openings are made in the bag for sample intake.

Decontamination Procedures:

- Sampling Devices: Sampling devices require special cleaning. EPA Regional Laboratories can provide information on proper decontamination methods.

- Tools: Wooden tools are difficult to decontaminate because they absorb chemicals. They should be kept on site and handled only by protected workers. At the end of the project, wooden tools should be discarded. For decontaminating other tools, Regional Laboratories should be consulted.

- Respirators: Certain parts of contaminated respirators, such as the harness assembly and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap

and water and scrubbed with a brush. Regulators must be maintained according to manufacturer's recommendations. Persons responsible for decontaminating respirators should be thoroughly trained in respirator maintenance.

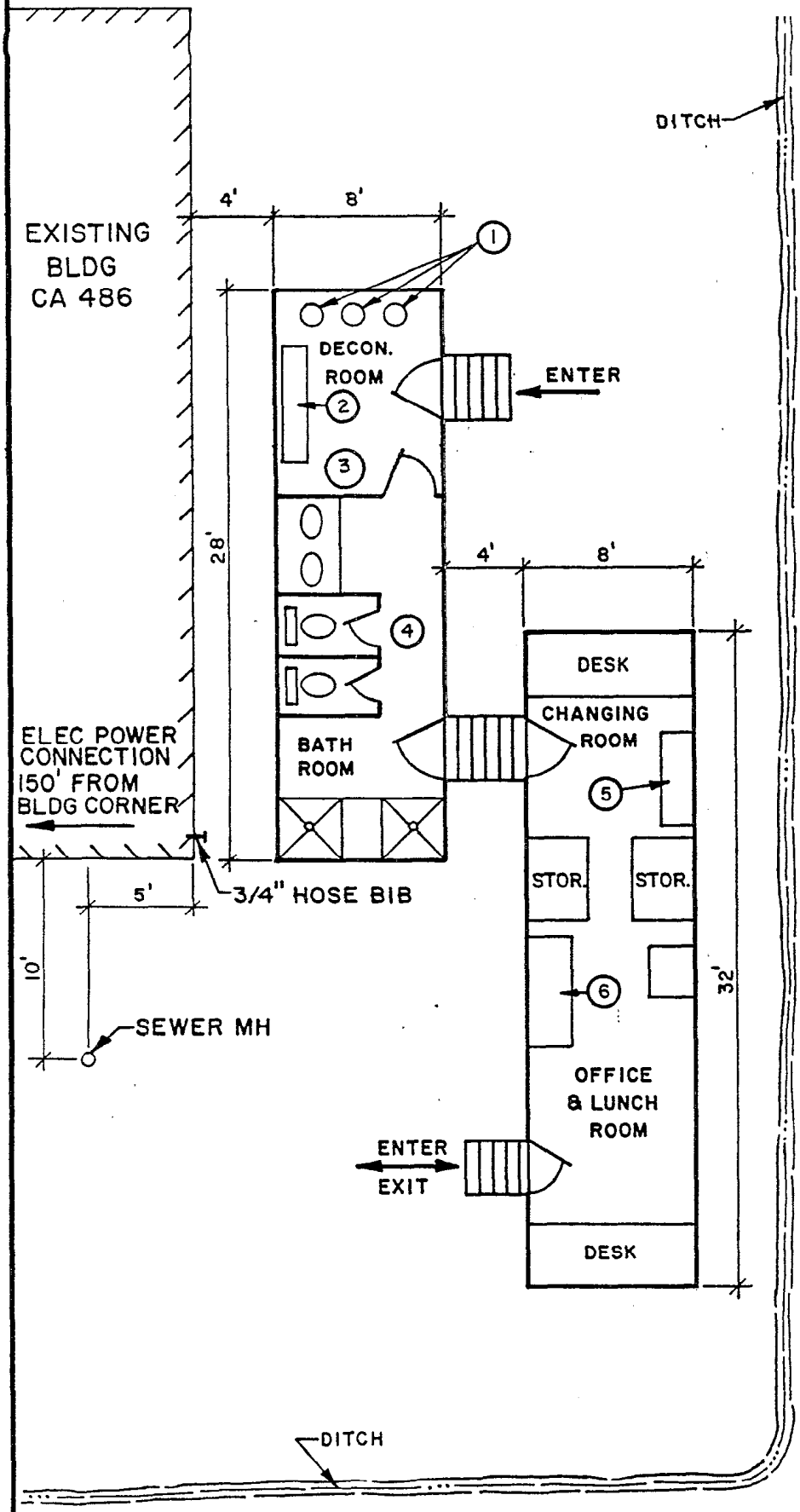
- Heavy Equipment: Bulldozers, trucks, back-hoes, bulking chambers, and other heavy equipment are difficult to decontaminate. The method generally used is to wash them with water under high pressure and/or to scrub accessible parts with detergent/water solution under pressure, if possible. In some cases, shovels, scoops, and lifts have been sand blasted or steam cleaned. Particular care must be given to those components in direct contact with contaminants such as tires and scoops. Swipe tests can be utilized to measure effectiveness.

Sanitizing of Personnel Protective Equipment - Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being used, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. The manufacturer's instructions should be used to sanitize the respirator mask. If practical, protective clothing should be machine washed after a thorough decontamination; otherwise it must be cleaned by hand.

Persistent Contamination - In some instances, clothing and equipment will become contaminated with substances that cannot be removed by normal decontamination procedures. A solvent may be used to remove such contamination from equipment if it does not destroy or degrade the protective material. If persistent contamination is expected, disposable garments should be used. Testing for persistent contamination of protective clothing and appropriate decontamination must be done by qualified laboratory personnel.

Disposal of Contaminated Materials - All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and all other equipment that is contaminated must be secured in drums or other containers and labeled. Clothing not completely decontaminated on-site should be secured in plastic bags before being removed from the site.

Contaminated wash and rinse solutions should be contained by using step-in-containers (for example, child's wading pool) to hold spent solutions. Another contaminant method is to dig a trench about 4 inches deep and line it with plastic. In both cases the spent solutions are transferred to drums, which are labeled and disposed of with other substances on site.




## ITEMS SUPPLIED BY DRILLER

1. 20 GAL. PLASTIC PAILS FOR DECON. SOLN.
2. STORAGE AREA FOR BOOTS BOOTS/GLOVES/ETC. (HANGERS OR SHELVES)
3. 55 GAL. DRUM FOR WASTE DISPOSAL
4. BATHROOM PAPER GOODS, SOAP, ETC.
5. LOCKERS
6. LUNCH TABLE

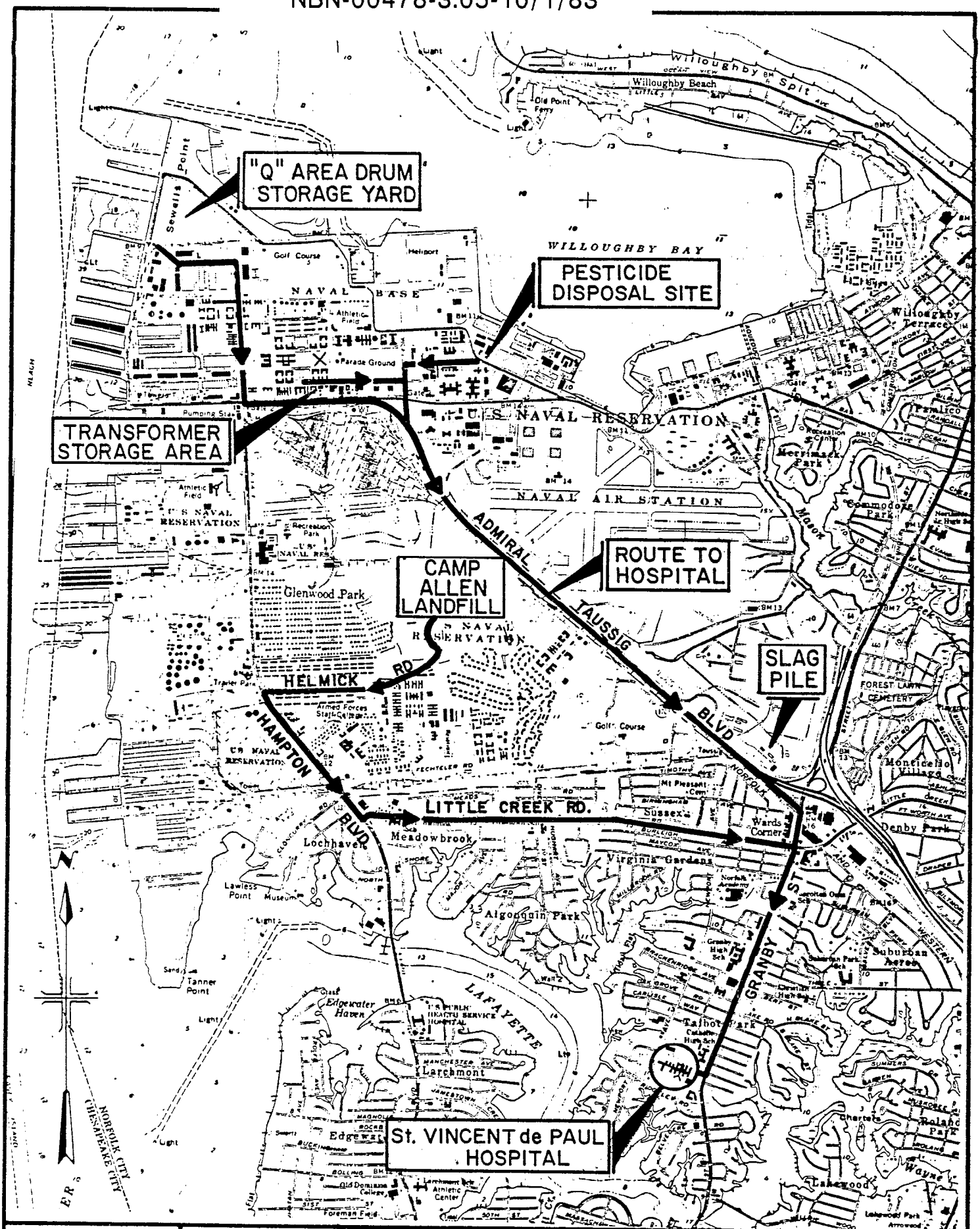
MALCOLM PIRNIE

# DECONTAMINATION TRAILERS

MALCOLM PIRNIE, INC.

APPENDIX B

NBN-00478-3.05-10/1/83

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|---|---|---|
| MALCOLM PIRNIE | **ROUTE TO St. VINCENT de PAUL HOSPITAL** | MALCOLM PIRNIE, INC.<br>**APPENDIX C** |