

# HAZARDOUS WASTE INVESTIGATION AND CLEANUP IN WASHINGTON



DEPARTMENT OF ECOLOGY  
OFFICE OF HAZARDOUS SUBSTANCES  
AND AIR QUALITY PROGRAMS

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ANDREA BEATTY RINIKER  
Director



STATE OF WASHINGTON  
DEPARTMENT OF ECOLOGY

Mail Stop PV-11 • Olympia, Washington 98504-8711 • (206) 459-6000

July 1985

Dear Reader:

In recent years, we have come to realize that Washington is not quite the "clean and green" Evergreen State that we've long thought it to be. The discovery that there are many abandoned or poorly-controlled hazardous waste sites in our state has forced us to reassess our image of Washington's environmental character.

News stories about hazardous waste problems at sites such as Western Processing Company in Kent, about contamination at Eagle Harbor and elsewhere in Puget Sound, even about threats to our drinking water, have shocked us into a new awareness of our vulnerability. We are, in fact, more vulnerable than many other states. The Pacific Northwest's abundant rainfall and glacial soils transmit pollutants readily over long distances. And it takes very little hazardous waste to contaminate large areas.

Solving the complex problems associated with hazardous waste won't be easy. The Washington Department of Ecology, however, in our state program or with the federal Environmental Protection Agency under the Superfund program, has begun preventing the spread of contamination and cleaning up hazardous wastes that pose a threat to health or the environment. During the last legislative session, approximately \$14 million in state revenue was appropriated for the department to begin cleanup activities.

This report summarizes the work of the Ecology Department's Remedial Action Section, which has responsibility for carrying out the cleanup program. Even though significant progress has been made, the job of cleaning up hazardous waste sites in Washington is a long-term effort that will require many millions of dollars and the constant attentiveness of the department.

Sincerely,

Andrea Beatty Riniker  
Director



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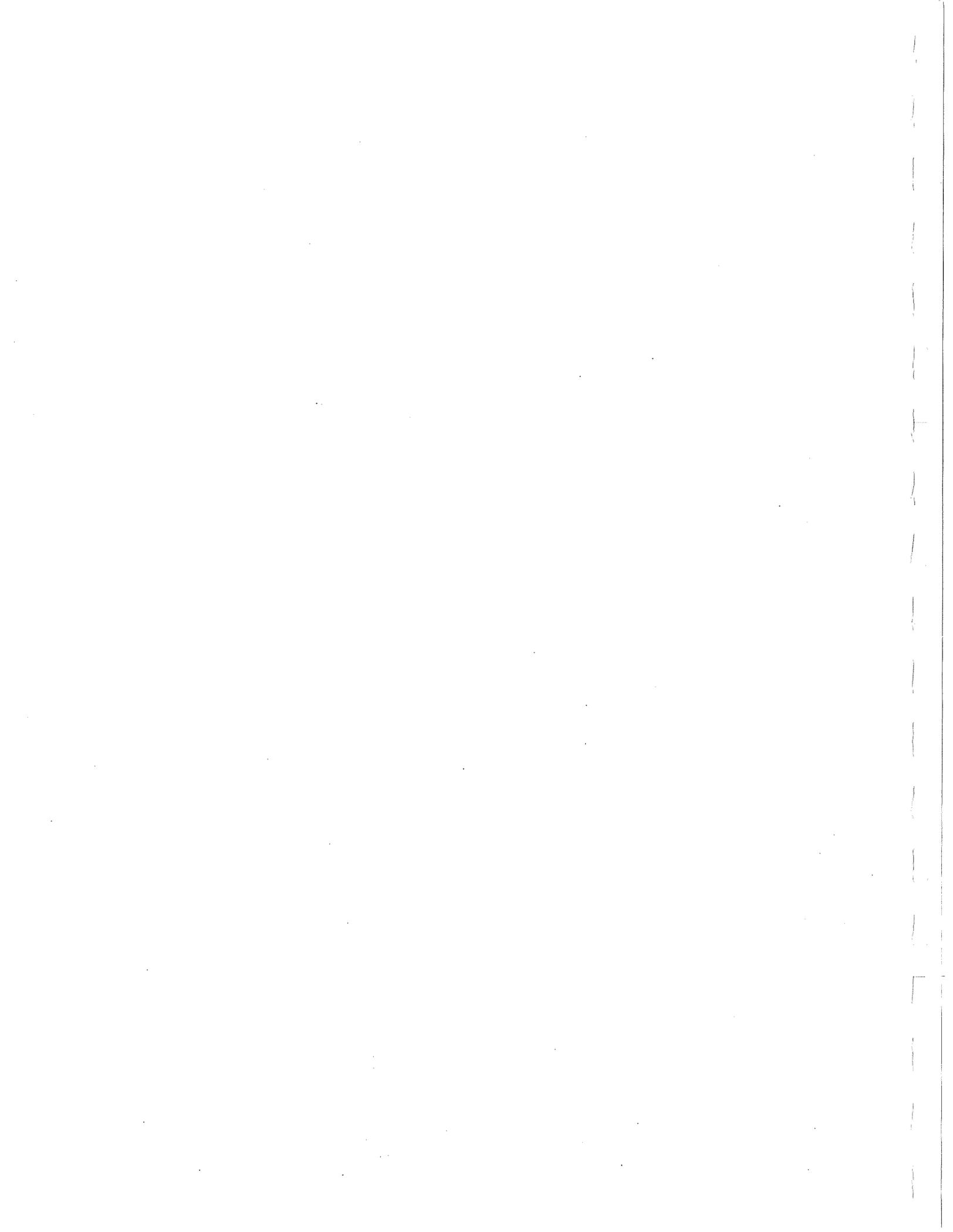
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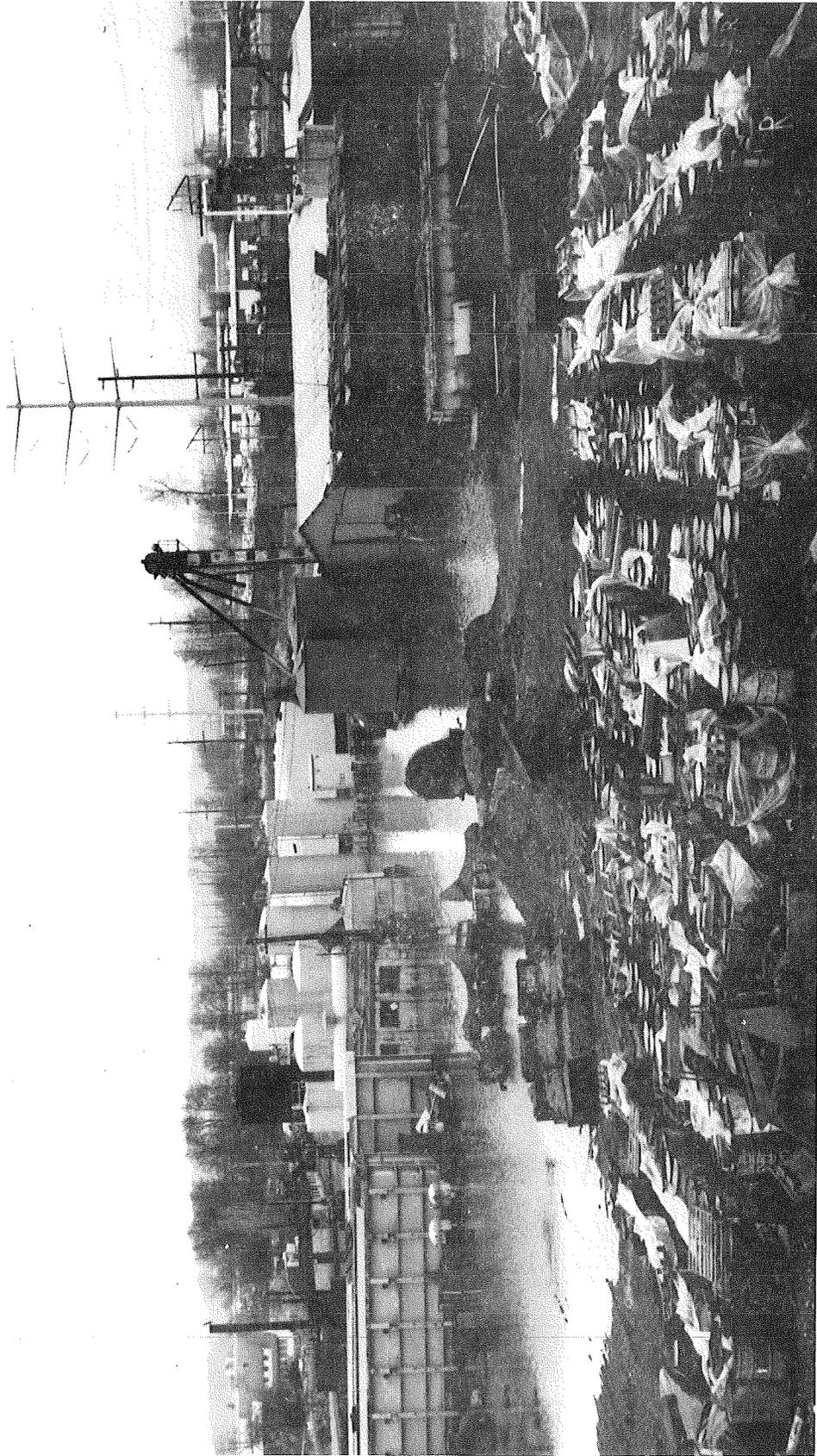
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PHOTOS

Courtesy of the Environmental Protection Agency







**WESTERN PROCESSING** A drum staging area. Pallets of drums are covered with plastic to protect them. Several buildings and large tanks were inundated by storm water during the winter.

## I. INTRODUCTION

For many years, chemical substances in Washington and the rest of the country were handled and discarded with little or no concern for their ultimate effects on our environment. Disposal methods that once were considered acceptable we now know were unwise. The indiscriminate dumping of hazardous materials has endangered our health and contaminated our environment, including the surface waters we use for transportation and recreation and even the water we drink.

This legacy of improvident disposal of hazardous substances has created one of the most serious health and environmental challenges of the decade. Washington, like so many other states, now faces a variety of pollution problems due to past and present practices of dealing with potentially harmful products.

## II. EXECUTIVE SUMMARY

Since the late 1970's, industries that produce hazardous substances have been required to meet stringent regulations to make sure these toxic wastes are managed in a proper and safe manner, under the Washington Department of Ecology's hazardous waste program.

This report examines the Ecology Department's efforts to deal with the problems created by past practices of unregulated hazardous waste disposal and how the Remedial Action Section of the department is correcting these problems through its cleanup program.

Since late 1983, the section has accomplished the following:

- o A preliminary assessment program to identify potential cleanup sites from among a list of about 500 possible sites is well under way. More than 162 assessments have been completed, while work has started on another 240 site assessments, five site inspections and the "hazard ranking" of 17 other sites.
- o Work began at 13 sites on the National Priority (or Superfund) list, all of which qualify for partial federal funding under Superfund rules. Ten additional sites were nominated for the list, including three on military property. Cleanup work was actually contracted for at a number of sites on, or nominated for, the list, including: Frontier Hard Chrome, Vancouver; Tacoma Landfill; Harbor Island, Seattle; Midway Landfill, Seattle; Greenacres and Northside Landfills, Spokane; Eagle Harbor, Bainbridge Island, and the Restover Truck Stop, Tumwater. Other work included development of a community relations policy and a public information program. Eleven site management plans for Superfund sites were also completed.

- o An emergency action to control storm water at the Western Processing Company site in Kent was conducted by the Ecology Department at a cost of \$450,000.
- o In cooperation with the federal Environmental Protection Agency and responsible parties, Ecology aided in a \$9 million surface removal and storm water control project at Western Processing. This was an essential interim step that is now complete. Ecology continues to work with the federal government and responsible parties to effect a final cleanup.
- o Independent cleanup actions were initiated by the state at the Tacoma Spur highway construction site, the Argonne Road site in Spokane, the Rosch site in Roy, the Restover Truck Stop in Tumwater, the Lynden Airport, and Eagle Harbor on Bainbridge Island.
- o Small-scale cleanups were initiated by the state at ten other sites.
- o Contractors were hired to give immediate cleanup assistance for limited hazardous waste problems, such as abandoned chemical drums and contaminated soils.
- o A hazardous waste health, safety and training program was instituted for Ecology Department employees.
- o The first phase of organization staffing was completed.

The Ecology Department intends to aggressively pursue the cleanup of hazardous waste sites in the coming biennium and to halt the further spread of contamination from these sites. New legislation may be needed to assure better cost recovery from those responsible for producing and transporting the hazardous wastes, to clean up high-priority waste sites and to protect groundwater supplies. It is expected that at least \$15 million will be required during the coming biennium to fund this effort. As costly cleanups are undertaken in subsequent biennia, this figure will increase. The overall cost of cleanups in Washington is estimated at \$500 million over 10 years.

### III. BACKGROUND

#### A. The Federal Superfund Law

The cornerstone of the national hazardous waste cleanup effort is the Federal Comprehensive Environmental Response, Compensation and Liability Act of 1980, better known as the "Superfund" program. The initial Superfund program provided \$1.6 billion over a five-year period to clean up hazardous waste sites where responsible parties could not be identified or were unable or unwilling to conduct the cleanup. Funding for the program came from taxes on

petroleum and chemical products. Although the Superfund law is due to expire in September of 1985, a re-authorized version is expected to be signed into law this year.

Before a hazardous waste site is eligible for the federal Superfund program, it must be nominated and placed on the National Priority List. In nominating sites for the list, the Ecology Department and the federal Environmental Protection Agency rank them according to the following.

- o Potential risk to people.
- o Potential for contaminating drinking water supplies or other "pathways" that can affect human health.
- o Potential for destruction of sensitive ecosystems such as wetlands and wildlife refuges.

The first federal Superfund list was released in late 1982, and it has been upgraded regularly. Of the more than 400 national hazardous waste sites originally listed, 10 were in Washington State. In early 1984, three more state sites were added to the list. Ten new sites, including three on military reservations, are now proposed for addition to the Superfund program list.

After a site is added to the Superfund list and becomes eligible for federal money, either the state or federal environmental agency assumes the lead role in the cleanup effort. As long as state and federal representatives agree, either of these arrangements is acceptable.

- o Cooperative Agreements - The state is responsible for development of a work plan, budget, schedule, and contracting for any services to complete the project.
- o Superfund/State Contracts - The Environmental Protection Agency assumes major responsibility and undertakes the cleanup action.





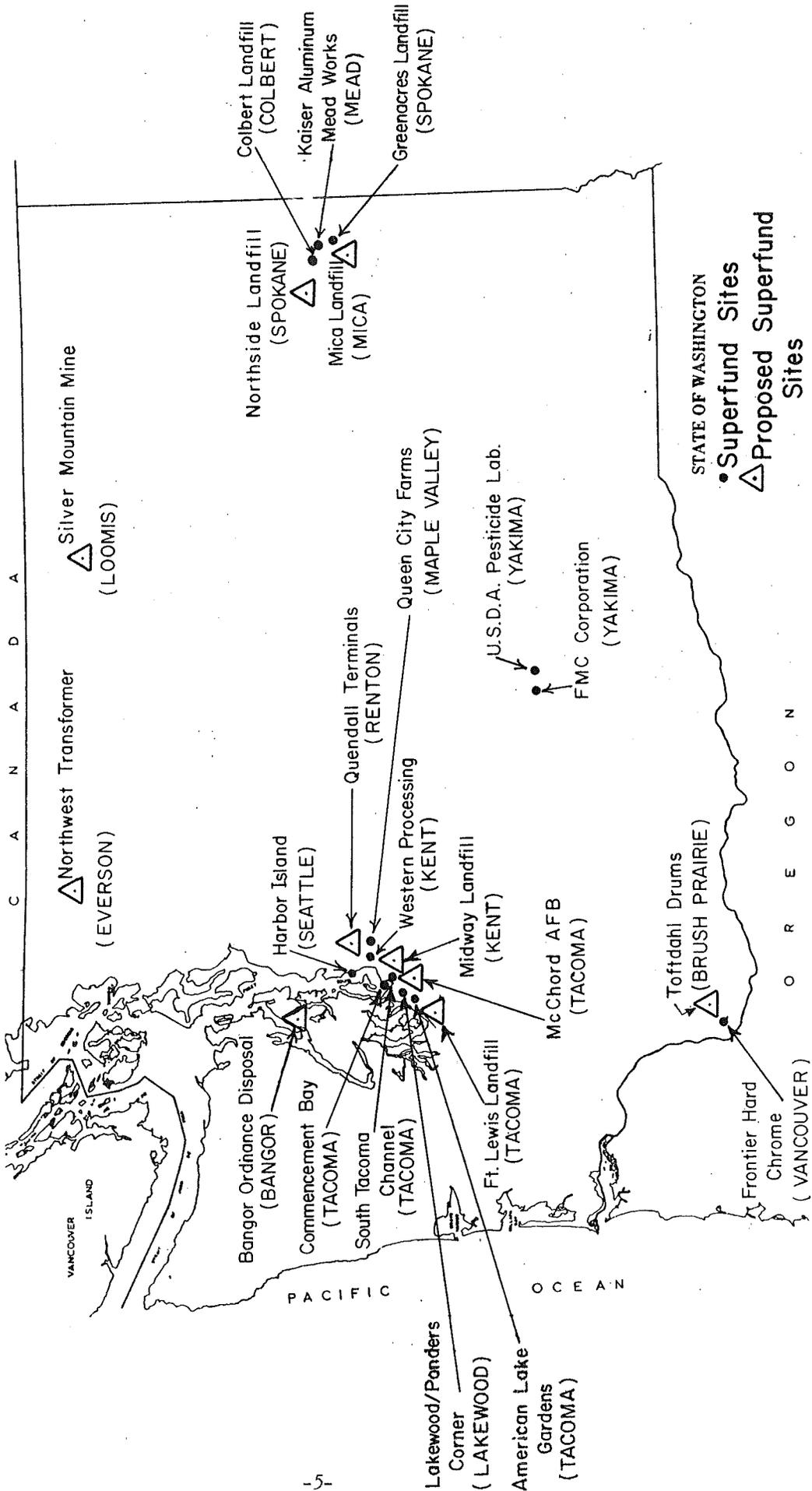
**WESTERN PROCESSING** Drums found to be leaking or damaged were placed in larger drums called overpacks and their contents labeled. Miscellaneous scrap was decontaminated and recycled.



TABLE 1  
 SUPERFUND SITES IN WASHINGTON  
 January 1985

<u>SITES</u>	<u>COUNTY</u>
American Lake Gardens, Tacoma	Pierce
Colbert Landfill, Colbert	Spokane
Commencement Bay, Tacoma	Pierce
FMC Corporation, Yakima	Yakima
Frontier Hard Chrome, Vancouver	Clark
Greenacres Landfill, Spokane	Spokane
Harbor Island, Seattle	King
Kaiser Aluminum Mead Works, Mead	Spokane
Lakewood/Ponder's Corner, Lakewood	Pierce
Queen City Farms, Maple Valley	Yakima
South Tacoma Channel, Tacoma	Pierce
USDA Pesticide Lab, Yakima	Yakima
Western Processing Company, Kent	King
 <u>PROPOSED SITES</u>	
	<u>COUNTY</u>
Bangor Ordnance Disposal, Bangor	Kitsap
Ft. Lewis Landfill	Pierce
McChord AFB, Washington Rack Treatment Area	Pierce
Mica Landfill, Mica	Spokane
Midway Landfill, Kent	King
Northside Landfill, Spokane	Spokane
Northwest Transformer, Everson	Whatcom
Quendahl Terminals, Renton	King
Silver Mountain Mine, Loomis	Okanogan
Toftdahl Drum Site, Brush Prairie	Clark

# SUPERFUND SITES IN WASHINGTON



The Superfund law recognizes that individual cleanup activities must be tailored to the specific needs of each site, whether the chief responsibility for action is assumed by the federal or state agency. The first step in cleaning up a hazardous waste site is to try to find the individuals or firms responsible for the waste and allow them to take the necessary cleanup actions. When those responsible cannot be found, cannot afford the cleanup or won't agree to it, then federal or state funds may be used for that purpose.

The agency assuming the main responsibility for the cleanup will evaluate the problem to determine its scope and the potential for recovery of cleanup expenses, then determine if any action should be delayed for inclusion on a long-term study or national priority cleanup list. If it is determined that rapid cleanup action is necessary, the activities are usually held to a \$1 million expenditure limit and a time limit of within six months of the initial response. Additional time and money may be approved if the lead agency finds there is still an immediate risk to the public health and welfare, if a continuing response is necessary or an emergency exists. If it is found that an immediate response is not needed, the remedial action, or cleanup phase may begin.

- o Remedial actions are cleanup activities that are more long-range and usually more expensive, but aimed at permanent solutions. Specific actions may include removal of drums containing wastes from the site, the construction of ditches and dikes to control surface water contamination, providing of alternative water supplies or the temporary or permanent relocation of residents.

Remedial actions qualifying for Superfund designation must meet certain conditions or limitations, including the following:

- State matching funds are required (10 percent on private sites, 50 percent on public sites).
- Remedial actions are taken only on sites that have been named on the Superfund list.
- Can include four phases: 1) investigation; 2) feasibility studies; 3) design; and 4) final recommendations which may be construction and implementation, soil removal, etc.

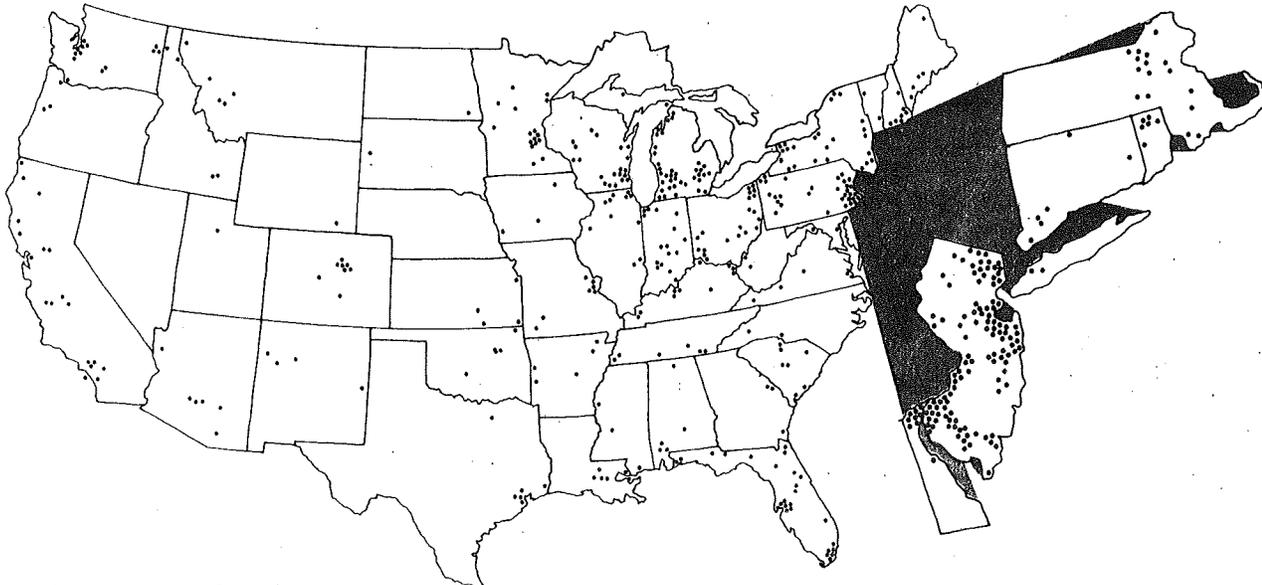
B. The State's Hazardous Waste Cleanup Authority

The Washington State Legislature saw the need for our state to be able to respond to hazardous waste cleanups on its own and to be able to produce the state funds necessary to attract available

federal money for Superfund cleanups. The Legislature appropriated \$4.3 million for the Department of Ecology in late 1983 for these purposes and also gave the department the authority to investigate and clean up hazardous waste sites not major enough to warrant federal funding. The money was also used to provide personnel and consulting help necessary to conduct the cleanup work and to carry out state regulations that may be more strict than federal rules.

Under authority of the state Hazardous Waste Regulation Act (Chapter 70.105A RCW), the Ecology Department's job is to clean up and restore those sites where improper disposal of hazardous wastes has occurred. The law authorizes the agency to contract for gathering and analysis of technical data and to carry out or contract for the removal of hazardous substances and wastes where there is a potential threat to public health or the environment.

**546 SITES ARE ON THE NATIONAL PRIORITIES LIST FOR SUPERFUND**



Source: EPA's Office of Emergency and Remedial Response

TABLE 2

WASHINGTON DEPARTMENT OF ECOLOGY  
STATE REMEDIAL ACTION SITES

	CITY	COUNTY	WASTE TYPE
1. Argonne Road	Spokane	Spokane	Solvents
2. Eagle Harbor	Bainbridge	Kitsap	Organics
3. Everett Tire Fire	Everett	Snohomish	Petrochemicals
4. Gas Works Park	Seattle	King	Petrochemicals
5. Lynden Airport	Lynden	Whatcom	Pesticides
6. Site A (Enforcement Case)	Washougal	Clark	Solvents
7. Melco Manufacturing	Oak Harbor	Island	Heavy Metals
8. Ostrom Mushroom Farms	Lacey	Thurston	Pesticides
9. Peshastin Creek	Dryden	Chelan	Mercury
10. Rosch Property	Roy	Pierce	Solvents
11. Spokane Steel Foundry	Spokane	Spokane	Heavy Metals
12. Tacoma Spur/24th and A	Tacoma	Pierce	Petrochemicals
13. Tulalip Landfill	Marysville	Snohomish	Heavy Metals
14. Restover Truck Stop	Tumwater	Thurston	Petrochemicals
15. Parkland Gas Spill	Parkland	Pierce	Petrochemicals

Ecology cooperates with the Environmental Protection Agency in the Superfund program, providing support, or in many cases taking the lead role in responding at sites in Washington that the federal agency considers to have national priority importance. When more efficient, the Ecology Department will coordinate, finance or take action at sites independent of federal involvement. This may involve overseeing investigative or cleanup activities of individuals or firms responsible for the problem, or actually conducting the work. Since federal priorities are different from those of the state, the Ecology Department must have authority and resources to deal with problems on its own. State actions often have a quicker response time, although the need still exists to involve various governmental agencies, responsible and affected parties and area citizens.

#### IV. THE REMEDIAL ACTION PROGRAM

The Ecology Department's hazardous waste cleanup program is modeled after the federal Superfund program and includes cleanup planning or immediate removal of hazardous materials, as well as longer-term solutions. The program allows for using state money for clean up of emergency situations, smaller hazardous waste sites or sites not eligible for federal funds.

The goal of the program is to stabilize and clean up contaminated, hazardous waste sites. More than 500 such sites in the state that may eventually require some cleanup have been identified, and the department identifies about one new site per month in addition to dealing with other waste sites and quick cleanups such as abandoned chemical storage drums. The program staff consists of 23 people working in geohydrology, geology, engineering, toxicology, waste water engineering, water supply, program management, community relations, site assessment and budget planning. Support also comes from other department personnel, particularly in the budget and grant office and at the joint federal and state laboratory in Manchester.

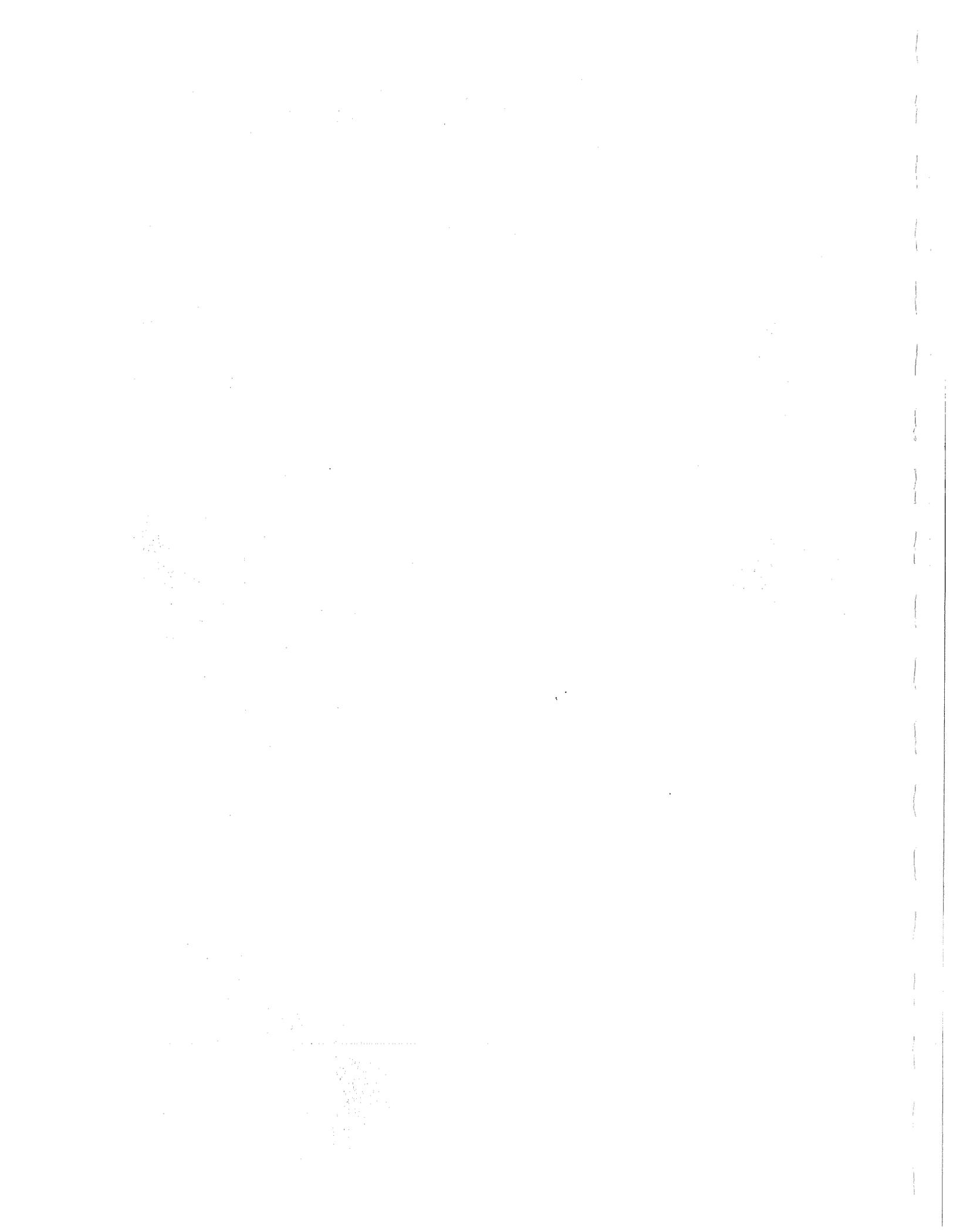
The main activities this biennium included contracting for cleanups and other work at many sites, conducting preliminary assessments at 162 sites (with another 240 to be completed by the end of September), working out cooperative agreements with the Environmental Protection Agency on their Superfund priority list, putting community relations plans to work and developing program policies and guidelines.

With federal money, the state program is able to augment its resources by contracting for engineering, community relations, or technical field work such as drilling sample wells at sites or analyzing hazardous waste samples.

Cleanup activities to prevent the release and spread of contamination from hazardous wastes at any site where human health or the environment are threatened is a major responsibility of the program, and the overall



**WESTERN PROCESSING** Over 2,800 drums were sampled. Once characterized drums of similar material were grouped together, other drums were decontaminated and removed from the site.



emphasis is on managing sites to achieve effective control or elimination of the problem. All cleanup work done by the state at hazardous waste sites goes through a planning process that includes investigation and feasibility studies, a design stage and an action stage.

During 1984, the Ecology Department took independent action at several sites and more are planned (see Table 2). The first independent action taken by the department with money appropriated under the state hazardous waste cleanup law was the construction of storm water control measures at the Western Processing Company site in Kent during the fall of 1983. Another project, completed in June 1984, was a limited site cleanup of the Rosch property near Roy, including removal of insulating oil and transformers containing PCBs (polychlorinated biphenyls, a toxic substance found to cause cancer in laboratory animals) along with asbestos and drums of other toxic chemicals (trichloroethylene and triaryl phosphate).

One independent action planned by the state will be at the Toftdahl property in Brush Prairie, where buried drums and contaminated soil will be removed and the problems at the site "stabilized" or brought under control (see site information page 18). Independent actions taken at other sites will include providing alternative water supplies. Two site cleanup contractors have been hired by the state for numerous jobs to be performed the rest of this fiscal year and into the 1985-87 biennium.

#### A. Site Investigations

In September 1983, the Ecology Department received \$261,000 from the Environmental Protection Agency to assess the potential hazards presented by 162 suspected historical hazardous waste sites. They were selected from a list of about 500 sites on the federal Emergency and Remedial Response Information System. Sites on this list may have come to the attention of the Environmental Protection Agency in a variety of ways and their appearance on the list indicates their real significance isn't known, not that they present an actual environmental or health hazard.

The federal funding was authorized by Section 3012 of the federal Resource Conservation and Recovery Act. That section of the act allowed the Environmental Protection Agency to provide money for state programs to develop an inventory giving the location of every site where hazardous waste has ever been stored or disposed of, and to determine the extent of any health hazard associated with such sites.

Preliminary assessments consist of reviews of existing information on particular sites. They may include a search of federal, state and local records for background information, possibly a "windshield" or drive-by inspection of the site, a recommendation on whether an on-site inspection is needed and a documentation of the findings. It takes about 20 to 30 hours of work to complete, plus

another five to 10 hours to review and work out the final report with the Environmental Protection Agency.

After completion of the preliminary assessment, if a site is found to have a potential hazardous waste problem or there are still questions remaining, the site is scheduled for first-hand inspection and possibly sampling. An on-site inspection takes about 175 hours for one person to complete, in addition to the time necessary for chemists to conduct sample analyses. These procedures should provide enough information to allow the site to be ranked according to the federal Hazard Ranking System, which determines if the site qualifies for nomination to the Superfund list.

Through the end of 1984, all 162 sites that had been selected from the original list of 500 had received their preliminary assessments. Eighteen of them had also had on-site inspections and 14 had been proposed by the state for addition to the Superfund list. More than 300 sites remain on the original list of potentially hazardous sites agreed on by the federal and state agencies. These still need to be evaluated, and a new agreement worked out between Ecology and the Environmental Protection Agency will provide funding to allow preliminary assessments on most of them this year. The agreement also provides for federal assistance in beginning several years of performing on-site inspections.

#### B. Field Assessment

The field assessment team responds statewide to certain types of hazardous waste reports. These personnel are often first to investigate hazardous spills or releases and provide an invaluable first-hand assessment of the situation. The team is specifically trained to evaluate hazardous waste situations and their analyses have alerted decontamination and removal experts on what to expect and the amount of cleanup efforts needed at a site.

The team also has the ability to sample material and to perform some initial cleanup work. They will also monitor the work of state hazardous waste cleanup contractors or potential responsible parties.

The field assessment team receives up-to-date training in the use of new equipment and can be a source of qualified professional response personnel when necessary. Site inspections and enforcement actions are increasingly a responsibility of the group.

#### C. Community Relations

Citizen concern is often very high surrounding hazardous waste sites and there are many cases on record where government agencies have failed to react with sensitivity to those concerns. Under the

state program, however, questions, comments and advice from concerned citizens living near hazardous waste sites is encouraged.

The Remedial Action Program staff evaluates each site to determine what community relations activities may be needed, including on-site discussions with local officials and citizens to get their views about the complexity of the problem and what needs to be done.

Before certain key cleanup or investigative steps of the program begin, the people to be affected are notified and the proposed activities discussed with them. Sometimes a simple "factsheet" may be all that is needed, but some situations require further research or holding meetings to receive public input on technical solutions.

It is critical that citizens be aware of what steps are being taken to contain, study or clean up toxic wastes in their area. This helps prevent misunderstandings and provides an atmosphere in which community leaders and local citizens can discuss these complex issues in an objective and purposeful manner.

Community relations at sites where the federal government assumes the lead are more structured and formal, but the state retains an active role. The state is able to provide suggestions for the community relations plan and expertise regarding technical solutions proposed by the Environmental Protection Agency at sites inside Washington.

D. Fiscal Status

The cleanup of hazardous waste sites is a new program that began during 1983. For the 1983-85 biennium, the Ecology Department was appropriated \$4.3 million to develop an administrative organization and begin cleanups (see Table 3). The federal commitment to the remedial action program has been \$6.1 million, not including the millions more spent independently of the state program.

For the 1985-87 biennium, the department will be spending a significant amount of time and money on 30 to 35 sites per year. Cleaning up a hazardous waste site, from the initial investigation through final action, is an expensive job. Nationally, the average cleanup cost per site is about \$8 million, but at sites such as Western Processing (see page 13 for description), the ultimate costs may reach \$50 million or more.

E. Cost Recovery

Under both the federal Superfund law and the state hazardous waste law, costs incurred by the government to clean up, stabilize or study a site may be recovered from a responsible party.

The Western Processing surface cleanup is an example of the type of private cleanup activities the department encourages. The department is prepared to clean up sites, however, if the responsible parties do not. Several cleanup contractors have been retained by the state for this purpose and are currently conducting cleanups at some sites.

TABLE 3  
BUDGET SUMMARY STATE REMEDIAL ACTION

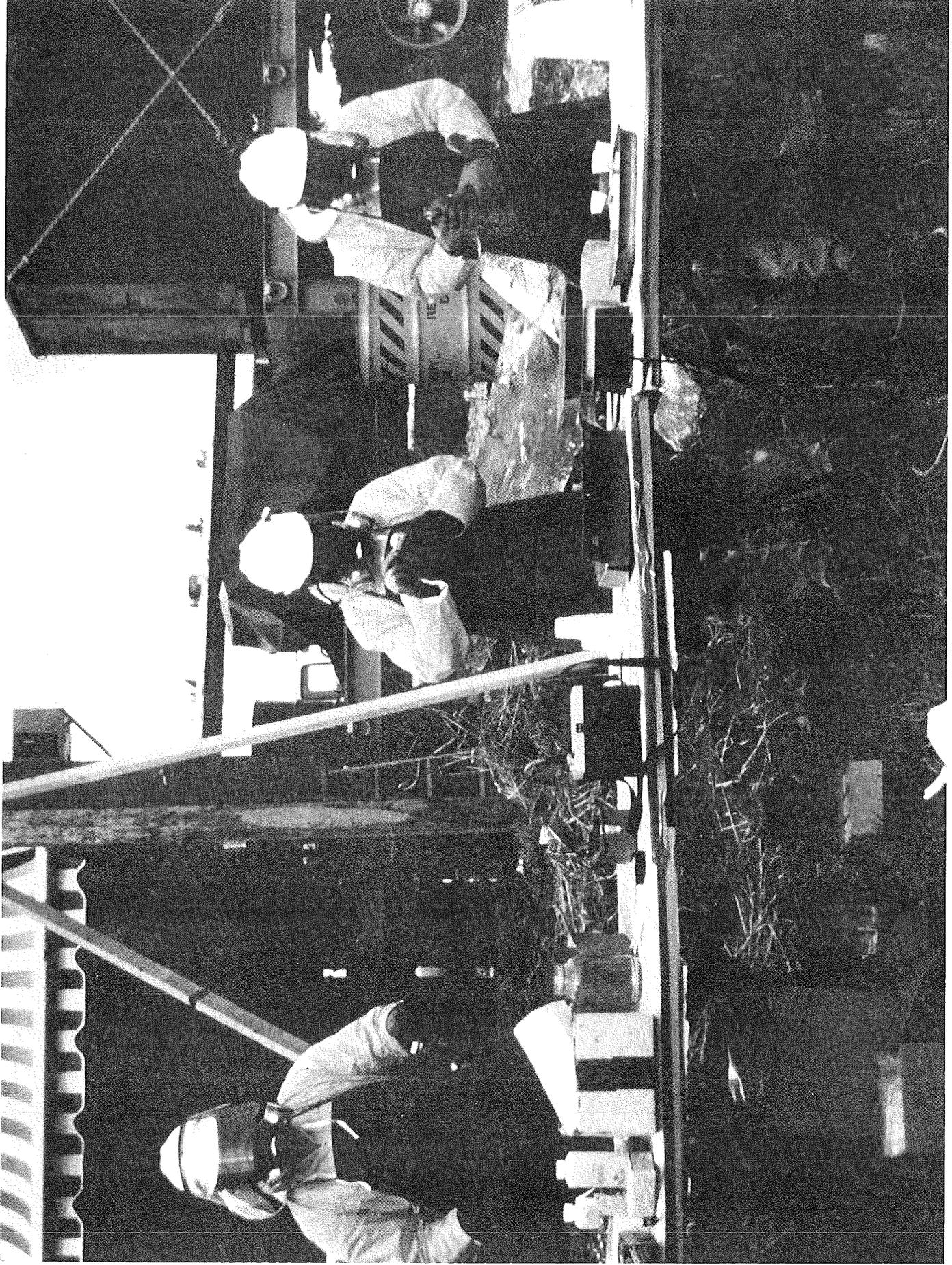
Program Administration		
Salaries, Benefits, Equipment, Travel		1,815,000
Agency Overhead		303,000
Remedial Action at Sites		1,602,000
State Match for "3012" Program		56,000
Agency Lab Support Services		360,000
City of Seattle Metro Lab Contract		20,000
Regional Office Support		26,000
Water Quality Investigation Support		28,000
Hazardous Waste Site Discovery		30,000
Contract Management Assistance		10,000
Health & Safety Program		25,000
Public Information		25,000
Total Allocated 4,300,000	Total State Funded Program	<u>4,300,000</u>
	Federal Share	<u>6,100,000</u>
	Total Program	10,400,000

The Remedial Action Section has the resources of the state's attorney general and his assistants to sue for cost recovery under the state's hazardous waste laws. The money recovered in this way is then added to Ecology's cleanup funds to be used at other sites.

F. Medical Monitoring

The Remedial Action Program has established a voluntary, agency-wide medical monitoring program for employees. This program is specifically designed to follow the health of employees who may be exposed to hazardous substances during the course of their work.

Although private contractors are hired to do the actual cleanup work at hazardous wastes sites in Washington, Department of Ecology employees are usually the first to discover and investigate these sites. They are also responsible for supervising contractors during cleanup work and for making sure that laboratory analyses are made of hazardous waste samples taken from these sites.



**WESTERN PROCESSING** Compatibility analyses involved testing for pH, radiation, water reactivity, flammability, halogen presence, oxidative potential and organic vapors. Level C protection was used. Careful records and chain of custody procedures were used at all times on the site.



The medical monitoring program provides basic health examination information that can be used for periodic comparisons in the future. By identifying job-related problems, the effectiveness of protective equipment and personnel safety measures can be judged, resulting in improved safety programs for employees.

Services for this program are being provided by the Occupational Medicine Program of Harborview Hospital in Seattle. Ecology's contract with the hospital includes provisions for 24-hour consultation and treatment capabilities in the event of toxic chemical exposures or any type of emergency. Harborview's staff includes industrial hygienists, toxicologists, epidemiologists and many other medical specialists.

V. HIGHLIGHTS OF SELECTED CLEANUP ACTIONS

A. Western Processing

Western Processing Company operated a chemical reprocessing, recycling and storage facility in Kent, a city southeast of Seattle in King County, from about 1960 until 1983. Many hazardous substances stored on the 13-acre site have contaminated the soil and groundwater. Some of the contaminants are in extremely high concentrations, including 87 of the Environmental Protection Agency's 129 "priority pollutants."

The site was first identified as a hazardous waste disposal site in 1982. In the spring of 1983, the Environmental Protection Agency ordered the facility to shut down. A removal of the most hazardous substances began shortly thereafter. In the fall of 1983, the Ecology Department conducted, at its own expense, an emergency storm water control project that cost \$450,000. In the winter of 1983-84, the state and federal agencies proposed to expand the storm water control system, but costs were prohibitive. The Environmental Protection Agency then assumed the lead role in an investigation and feasibility study to find long-term solutions to the problem, with the immediate aim being a surface removal of all remaining material.

About 400 individuals or firms are being held responsible for producing or hauling the hazardous waste materials that were disposed of at Western Processing. A group of these producers, or "generators," began negotiations with the Environmental Protection Agency and Ecology in the winter of 1983-84 with the purpose of getting the proposed surface cleanup done privately, rather than turning it over to the government. The negotiation was successful, and the generators, now being referred to as trustees, contracted with a private firm to do the surface work. It began in late July of 1984 and was completed in November of that year at a cost of more than \$9 million. State and federal conferees are currently

preparing a feasibility study for the final cleanup of contaminated ground and surface waters and soils on and off the site.

B. Well 12A

Well 12A is one of 13 wells used by the City of Tacoma to meet peak summer and emergency water demands. The well was voluntarily removed from service in 1981 when tests identified the presence of chlorinated organic solvents in the well water. Subsequent tests during 1982 determined that the contaminants were migrating towards the other wells. To prevent this continued migration and to enable use of Well 12A, a water treatment system was installed at Well 12A during 1983. This system has proven successful in removing contaminants and blocking their further migration towards the other city wells, but the continued presence of this contamination has jeopardized using these wells to their fullest potential.

The contractor for the Environmental Protection Agency conducted a remedial investigation and feasibility study from 1982 to 1984 to identify the source of the contamination and evaluate cleanup options. This study concluded that industrial wastes and contaminated soil, found mostly on nearby properties belonging to Time Oil and Burlington Northern, were a major source of the contamination in Well 12A. Many cleanup plans were examined, with cost estimates of the cleanup ranging from \$1.4 million to \$24 million depending on the plan chosen. A public meeting to discuss the study was held in July 1984.

In October 1984, the Environmental Protection Agency notified four companies (B&W Investments, Burlington Northern, Fleetline Automotive and Time Oil) that they were the responsible parties as defined under Superfund rules and they would be held accountable for cleaning up the soil and groundwater contamination at the site.

Negotiations then began with two of the companies -- Burlington Northern and Time Oil -- that had already indicated an interest in taking part in the cleanup. The negotiations came to an end in early December 1984, however, when it became clear that the two firms were unwilling to provide for an acceptable level of site cleanup. The Environmental Protection Agency is now readying a document, which was negotiated with Ecology to meet state requirements, that will specify the cleanup plan chosen. It will be used as a basis for a federal administrative order directing the responsible parties to clean up the site. It's expected that they will not comply with the order, but the cleanup will proceed using state and federal Superfund money. The present schedule calls for final design work to be completed in mid-1985, with construction to begin shortly afterward.

C. Lakewood/Ponders Corner

In 1981, two major drinking water wells of the Lakewood Water District, located south of Tacoma, were found to be contaminated by synthetic organic compounds. The prime source of the contamination appeared to be a nearby dry cleaning firm. After the contamination was discovered, the wells were shut down and the district relied on other wells unaffected by the contamination to satisfy water supply needs.

In the summer of 1984, the Environmental Protection Agency decided to install a water treatment system to bring the water from the affected wells up to drinking water standards. This system is very similar to the system used on Well 12A. The system was completed and the wells returned to normal service in October 1984. The total cost was \$690,000, of which the Ecology Department paid \$69,000.

When the system was completed, Ecology assumed responsibility for operation and maintenance of the treatment plant. Actual operation and maintenance is being performed by the Lakewood Water District, at a cost for the first year of about \$64,500, of which the federal authorities will pick up \$44,000, the state \$5,000, and the water district \$15,500. Long-term operation and maintenance will be performed by the water district.

A remedial investigation was started by the Environmental Protection Agency in October 1984, in cooperation with the Ecology Department. The investigation was to uncover the nature and extent of the contamination in the groundwater and to find any other sources of contamination. The investigation is due to be completed by mid-1985.

D. Frontier Hard Chrome

Frontier Hard Chrome is an abandoned chrome plating facility in the southeastern part of Vancouver, Washington. The property is now leased to an engine repair firm. From 1970 to 1976, the company discharged wastewater contaminated with hexavalent chromium (chromium is a cancer-causing agent, while hexavalent chromium is a toxic agent) into the Vancouver city sewage system. In 1976, wastewater was redirected to a "dry well" behind the plating shop because of concern over problems the chromium was causing for the sewage treatment process.

Chromium has been found in an industrial well at the old FMC Corporation facility about a quarter-mile southwest of Frontier Hard Chrome. Because the Frontier site is close to the city drinking water wells and chromium has been found in the groundwater, the site was nominated to the Superfund list in the fall of

1983, making cleanup activities at the site eligible for federal money.

In early 1984, Ecology began preparing a cooperative agreement application that would allocate funds to the state to do an investigation and feasibility study for this site. The investigation would determine the nature and extent of chromium contamination in the groundwater, while the feasibility study would outline methods of cleaning up contaminated soils and groundwater.

Due to federal funding delays and adjustments, the agreement wasn't signed by the Environmental Protection Agency until June 1984. It authorized Ecology to spend \$333,000 on the investigation and feasibility study. The initial stages of the investigation began in late October 1984 and it should be complete by mid-1985. The study will get under way when the investigation ends and be finished by late summer of 1985. A community relations plan has also been incorporated into this effort.

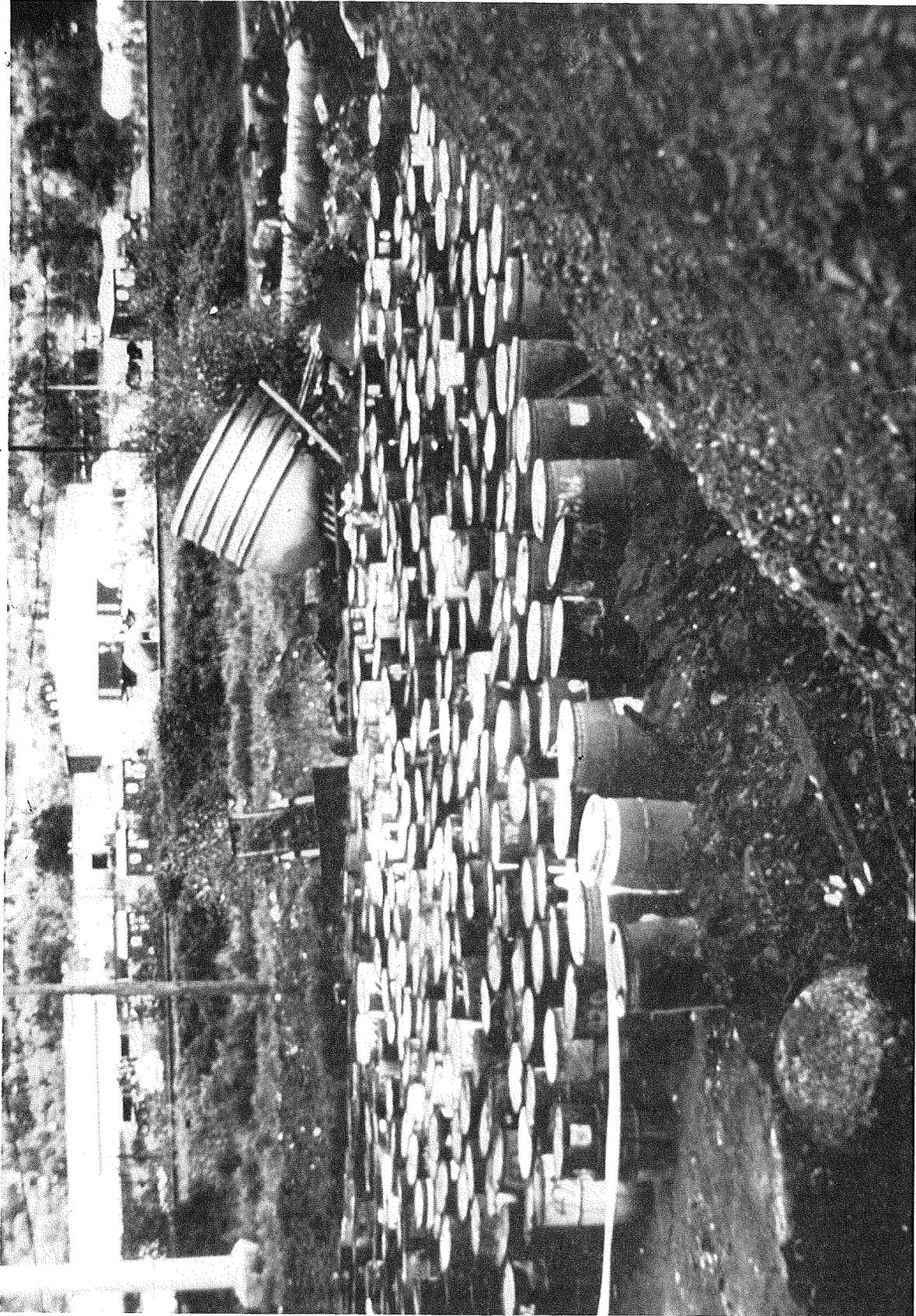
E. Colbert Landfill

The 40-acre Colbert Landfill in Spokane County is a source of contaminants in a regional aquifer supplying numerous private wells. Wells nearly one mile away have been contaminated. The Key Tronic Corporation disposed of industrial solvents over a five-year period by pouring as much as 400 gallons per month into different cuts filled with municipal refuse. The landfill has from one to three years of use remaining.

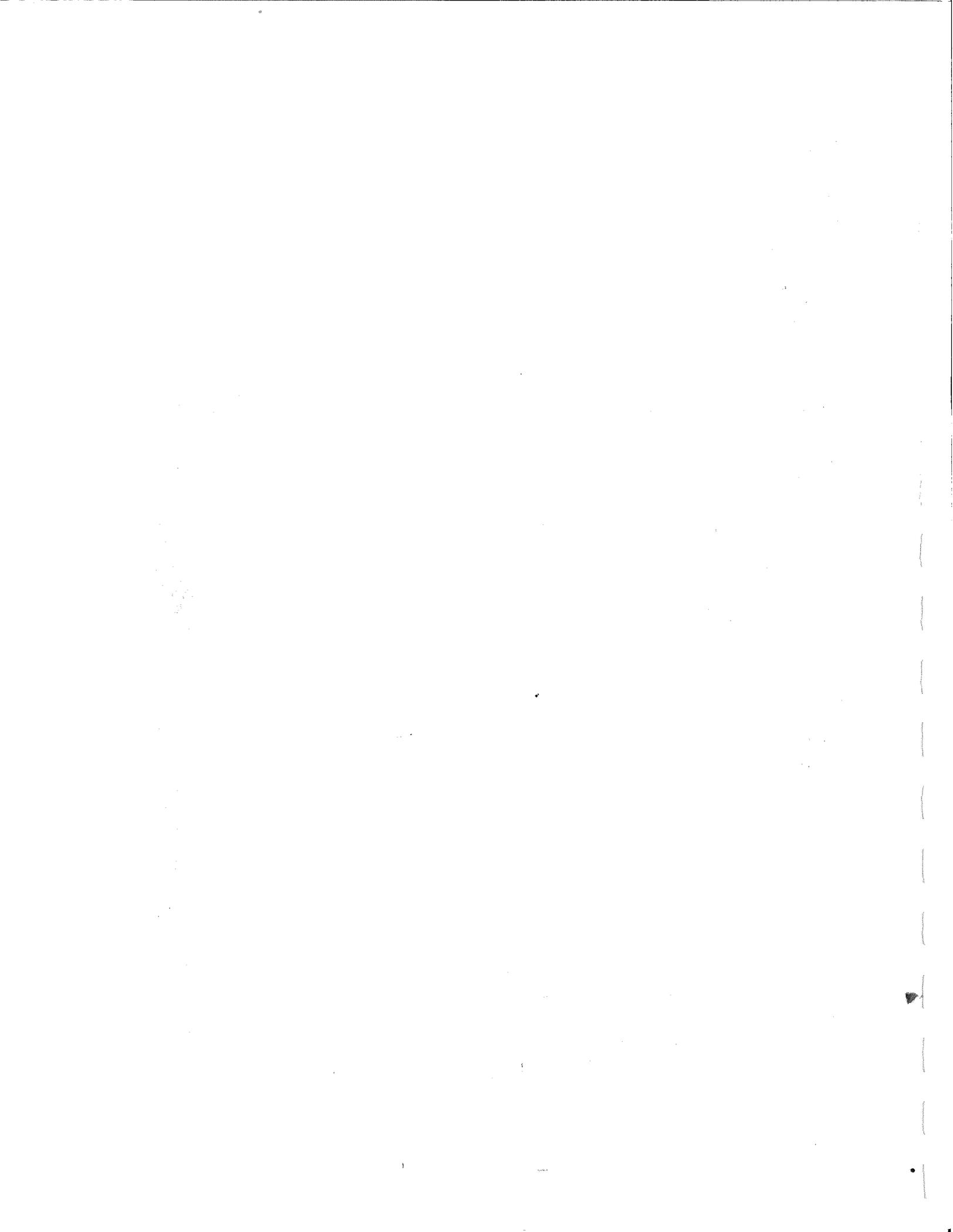
The Ecology Department has hired a private firm to conduct a remedial investigation and feasibility study on this site. The major points covered in this investigation are to re-evaluate existing hydrogeologic data, identify existing land use patterns, determine the risk to public health, identify corrective measures and decide what other information is needed. The feasibility study will lay out the technical solutions feasible, their cost, and recommend a course of action. A community relations plan has also been outlined for this project and reviewed by the public.

In late August 1983, the Spokane County commissioners approved a new water service area near the landfill to be supplied jointly by the Colbert and Whitworth water districts as an interim solution. A community relations plan and feasibility study were prepared by the state for submission to the Environmental Protection Agency and review by the public.

The newest area of groundwater contamination has been found in wells south and southwest of the landfill. Public meetings were held by the Ecology Department in September 1984 and February 1985 to discuss citizen concerns and the investigation and feasibility study that began in November 1984. Actual field work began in April 1985.



WESTERN PROCESSING Drum staging area near a large pile of battery chips.



F. Tacoma Landfill

The present City of Tacoma solid waste site began receiving wastes in 1960. It is situated on about 200 acres of land bounded by Orchard Street on the west, Center Street to the north, South 48th Street on the south and Manitou-Tyler Street to the east. The site is northeast of an area called the South Tacoma Swamp, which was used as an unauthorized dump site from about 1920 to 1960. The landfill serves a population of about 200,000.

The geologic nature of the landfill site is important because it appears contamination could spread out from the location. It is between glacial ridges and has a very hard "till" bottom. Such a base usually has low permeability, but in the Chambers Creek-Clover Creek drainage, there are till layers that allow water to pass through and are therefore not a barrier to pollution. Many buried stream beds and other possible means for the pollution to spread exist once it escapes the till layer.

Concern over potential pollution coming from the landfill has been limited to toxic materials being dissolved and washed off, or "leached" off the site. Leach Creek, which runs parallel to the landfill on the west side, has received some leached material, or leachate, by way of storm water runoff. Part of the landfill has an internal leachate collection system that collects leachate and transmits it to the Tacoma sewer system.

In the late 1970s, several poorly-located wells in the adjacent community of University Place were found to be contaminated. The data suggests that one source may be the surface storm water from the landfill, which enters the Leach Creek holding basin. A complicating factor in interpreting the data, however, is the fact that storm water from a large area outside the landfill also collects in the basin, including sewage overflows during storms.

Samples taken from domestic water supply wells outside the landfill haven't been shown to be contaminated. A monitoring well on the western boundary of the site had measurable levels of some pollutants, but it wasn't considered necessarily representative of groundwater at the site.

Due to the possible presence of hazardous materials, groundwater movement in the area, and the poor containment record of landfills, the Tacoma Landfill is a prime candidate for investigation, even before problems become evident. A preliminary federal geologic study has been completed to provide more information about the groundwater and to interpret data from work already done. The first step of the remedial investigation will be to evaluate this study, and decide what other studies or well-sampling may be needed. The second phase would be to put into action the strategies decided on in phase one.

If contamination is present, it will have to be confirmed and the rate and direction determined. The feasibility study will evaluate the various options for containment -- cleaning up the aquifers, providing protection to affected water supplies, or a combination of the two -- if hazardous materials are present.

G. Toftdahl Drums

During or about 1970, up to 200 drums of paint, glue and related chemicals were drained onto or buried on the Toftdahl property, near the town of Brush Prairie in rural Clark County. The Ecology Department became aware of the problem in March 1982. Most of the drums were supposedly removed by the property owner and taken to a landfill later that year. In March 1983 however, a field investigator for the Environmental Protection Agency made a preliminary field and sampling investigation. A survey found a potential burial area of 1,600 square feet, and in June of 1983, the federal agency received consent to conduct any necessary sub-surface investigations to find buried drums. In mid-July, digging uncovered several partly-filled drums.

Tests on water, soil and drum samples indicated the presence of heavy metals, PCBs and other toxic substances (polynuclear aromatic hydrocarbons and phthalates). At least one privately-owned drinking water well near the site appeared to be slightly contaminated.

In December 1983, the Department of Social and Health Services found that there was no immediate health hazard in drinking water from private wells near the site. Additional samples from several wells taken in February and March 1984 by Ecology found no significant degradation of the water quality. A periodic sampling program is being conducted to monitor the drinking water near the site.

In May 1984, the Ecology Department took soil samples from the site where dumping of drum contents was alleged to have occurred. No organic contaminants were found and no gross quantities of heavy metals. More drinking water well samples were taken at five homes in July but sample results didn't show any significant changes in water quality.

Ecology plans an investigation and cleanup of the site to begin with removing the remaining drums and contaminated soil. A formal agreement between federal and state officials is expected to result in a joint study of the problem, beginning in the summer of 1985.

H. Tacoma Spur

Test borings taken by the Washington Department of Transportation between December 1983 and February 1984, during roadway engineering work for the Tacoma Spur (I-705) project, revealed tar-like deposits in the ground. Samples were sent to a federal laboratory

for testing and were found to contain high levels of many very toxic chemicals, including 13 polynuclear aromatic hydrocarbons, several which are known carcinogens (including benzo(a)pyrene and benzo(b)anthracene). Several suspected carcinogens were also detected (including pyrene, fluorene, anthracene and chrysene). The "tar" appears to be similar to coal sludge and may be a by-product of the coal gasification process that took place at a plant that operated on the site between 1884 and 1924.

A two-month investigation conducted for the Transportation Department found randomly-scattered tar deposits that were two- to four-foot thick. The investigation centered on an area bounded by South 21st Street, Puyallup Avenue, "A" Street and the City Waterway. The 26 completed soil borings became water-monitoring wells and eight of them were sampled for priority pollutants. A minimal amount of contamination was found in the groundwater and an extended monitoring plan began in January to further determine the effect of the contamination on the groundwater and on the City Waterway.

#### I. Argonne Road

Three private wells in the 5900 and 6000 blocks of North Argonne Road, about six miles from Spokane, are contaminated with chlorinated organic solvents. No source of the contamination has been identified, but a probable source is the nearby Bonenko septage disposal site. The problem was uncovered in 1983 and levels of contamination in the wells have continued to rise. The wells are the sole sources of water for several residences.

Initially, the Ecology Department considered the purchase of filtration units to decontaminate the well water, but units that would do the job right proved to be very expensive and would still not have provided a long-term solution. Ecology then negotiated with the local irrigation district, Spokane City Health, the state Department of Social and Health Services and other concerned parties about extending the public water supply into and beyond the affected area. Those talks resulted in an agreement to provide a 10-inch main line from Bigelow Gulch to the most distant residence at a cost of about \$100,000 to Social and Health Services and Ecology.

The irrigation district has completed the annexation procedures to extend the water supply and installed the main line crossings beneath Argonne Road. The main line installation began in April and the whole project, including residential hookups, is expected to be done in May 1985.

The Ecology Department is developing plans to investigate the "plume", or extent of spread of the contamination through the

ground. The Bonenko disposal site was legally closed in April 1984.

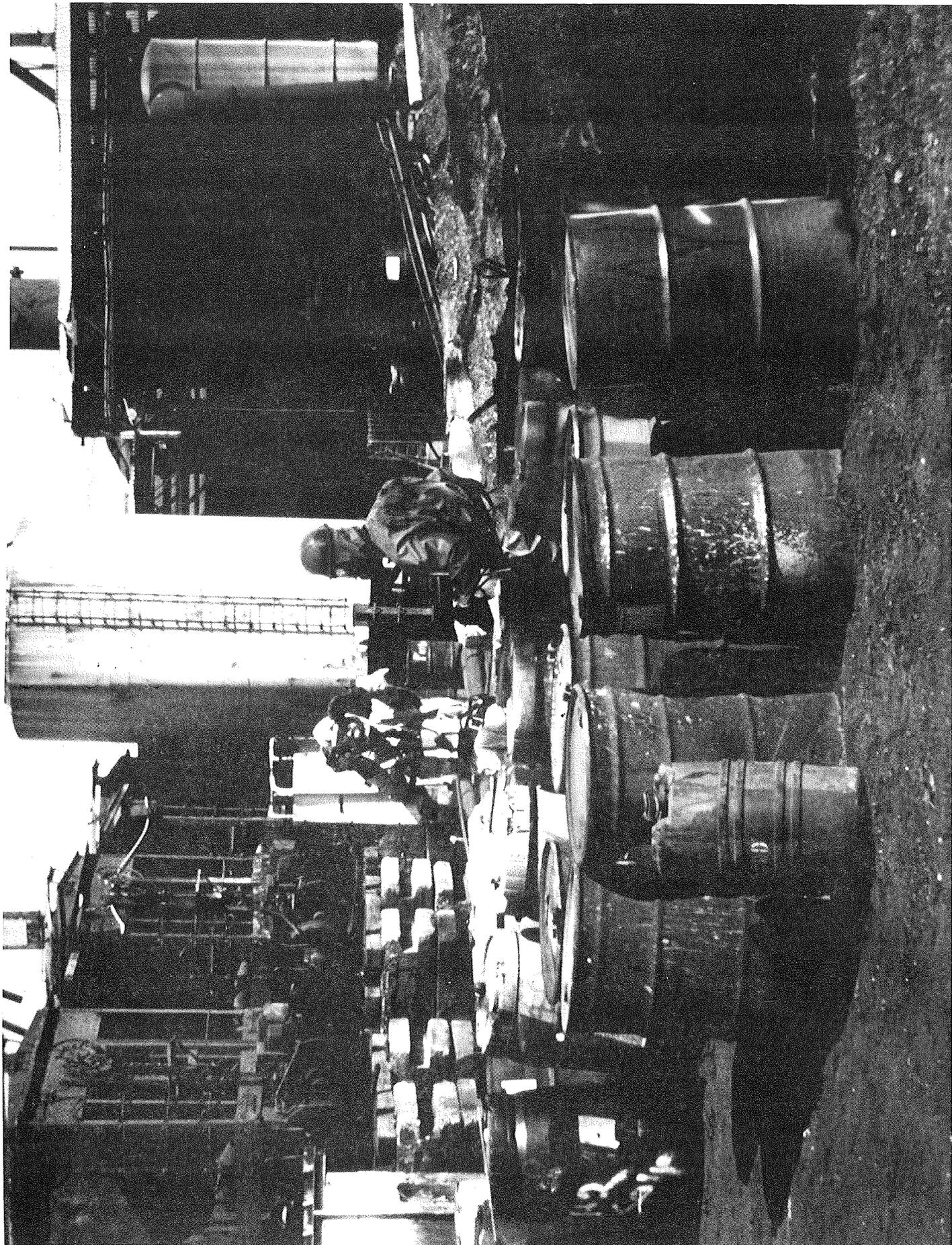
J. Parkland Gasoline Spill

Early in November 1984, residents and businesses around Pacific Avenue and South 131st Street in the Parkland suburb of Tacoma began reporting noxious fumes in their basements. When a natural gas leak was ruled out, the Brookdale Mobil Service Station at 13106 Pacific Avenue was viewed as the most likely source. After questioning, the independent owner and operator of the station found that one of his underground storage tanks had been losing leaded gasoline. About 2,000 gallons of gas had leaked into the soil in a couple of days and was definitely the source of the fumes. When the faulty tank was removed, it was shown to have developed a hole in the bottom, directly beneath the filler cap, where it was routinely poked with a rod to check the level in the tank.

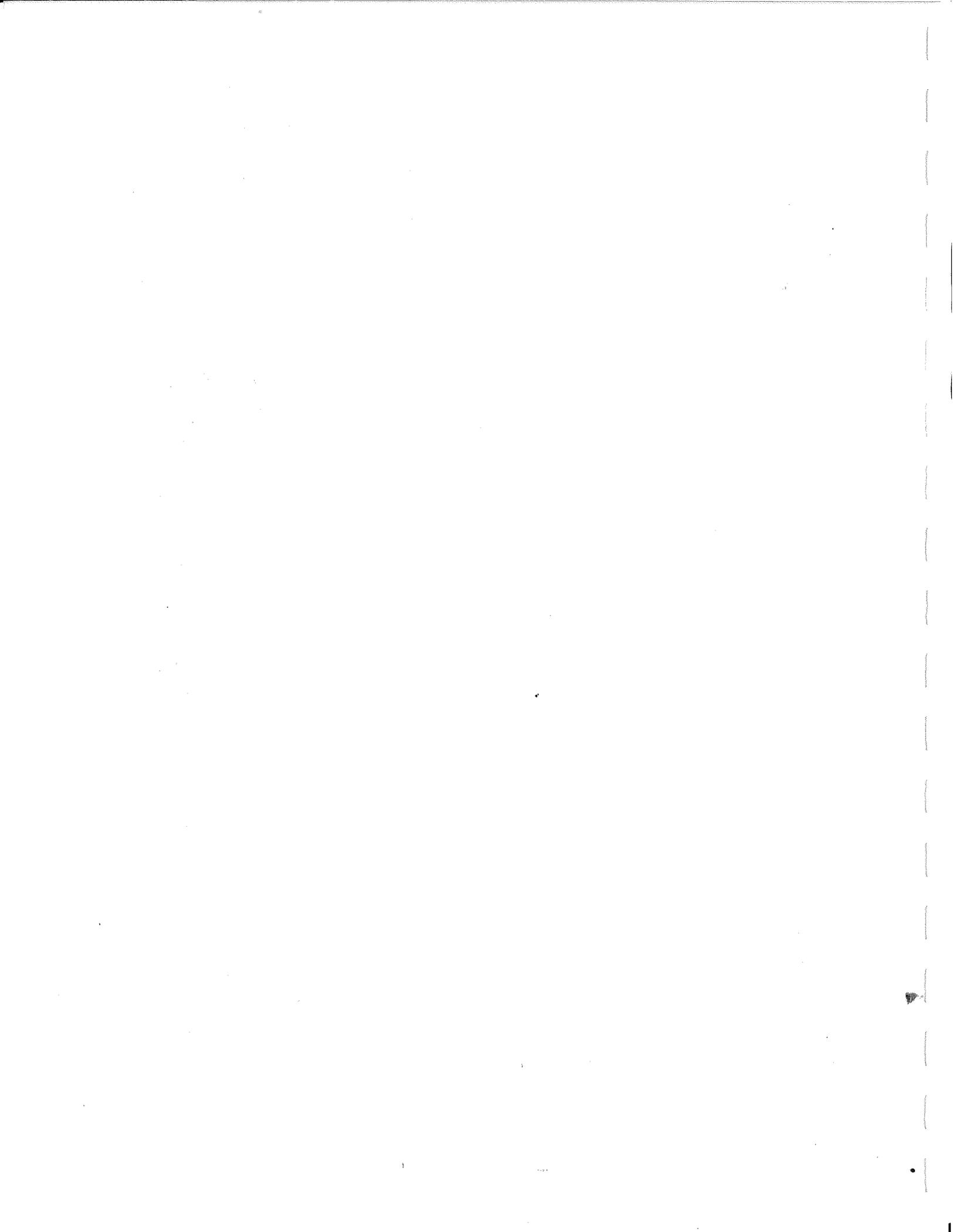
The spill response unit from Ecology's southwest regional office coordinated the initial department work on the spill. After determining that the station owner wasn't able to respond adequately to the problem, the decision was made to use the department's capabilities to investigate and take corrective action. The hydrocarbon vapors were a risk to public health and safety from inhalation and their explosive potential. Several residences and businesses were evacuated due to the danger. Contamination of the shallow (12 feet) aquifer threatened private and public wells in the area. Parkland's municipal wells, downgradient -- on a lower level -- than the spill, provide water for more than a thousand homes.

During the succeeding two months, two consulting contractors installed 19 vapor probe wells (slotted plastic pipes eight feet deep), eight groundwater monitoring wells and two sub-surface vapor extraction systems within four blocks of the site to help find the extent of the contamination. Vapor probe wells provided access ports for monitoring the concentration and movement of vapors in the ground. Groundwater monitoring wells determined the depth to groundwater, flow direction and velocity and allowed sampling of groundwater for general quality and gasoline contaminants (benzene, toluene and xylene).

Contaminants were found in several monitoring wells and a couple of private wells that were abandoned. Sub-surface vapor extraction systems greatly accelerated the removal and dissipation of the hydrocarbon vapors. They will operate for at least six months more. Recovery of the gasoline from the groundwater wasn't feasible due to the hydrogeology of the area.



WESTERN PROCESSING Sampling drums to determine compatibility and type of material.



The department will continue to monitor the situation in Parkland. The major problem with gas fumes has been corrected and additional sampling of groundwater will continue to track the plume of gasoline contaminants and monitor the remaining vapors. During the first two months, Ecology has spent in excess of \$60,000 for contracted services, staff time and expenses. Other agencies have spent more than \$35,000 on the spill (Parkland Fire Department, Tacoma-Pierce County Health Department, Pierce County Fire Marshal's Office, Parkland Light and Water Utility, and Pierce County Public Works). All agencies will try to recover their costs from the station owner's insurance company, and homeowners and businesses affected will also be filing insurance claims.

K. Commencement Bay

As a result of the many commercial and industrial activities in the Commencement Bay area, many organic and inorganic chemicals such as PCBs and other chlorinated organics, polynuclear aromatic hydrocarbons and metals have been released into the environment. The presence of toxic chemicals in the sediments of the waterways has caused much concern about degradation of the marine habitat, diseases in organisms living in the bay, and public health effects from eating fish and shellfish from the area. Increased levels of arsenic in the urine of residents and higher levels of metals in the environment (soil, dust, vegetation, etc.) in the Ruston and Vashon Island area have raised concerns over exposure of residents to toxic metals.

In April 1983, state and federal authorities agreed the state would spearhead the investigation and Ecology received approximately \$1.4 million in federal Superfund money to do the job. An expansion of the study's scope and design has resulted in a current investigative budget equivalent to about \$3.5 million.

The Commencement Bay Superfund site has two distinct areas of concern. The waterways and shoreline part deals with chemical contamination in the inner waterways and along the southwest shoreline of the bay. The Ruston and Vashon portion deals with high arsenic levels in the urine of people living in these areas and high metal concentrations in the soil and vegetation.

1. Waterways/Shoreline

The primary goals of the waterways and shoreline part of the site study are to: 1) determine the extent of contamination; 2) determine if the contamination results in adverse effects to the public health or the environment; 3) identify problem contaminants; 4) identify sources of problem contaminants, and 5) identify the choices available to solve the contamination problems.

Much of the actual work on this part of the project will be done through contracts with consultants or through inter-agency agreements. Such agreements exist with the Tacoma-Pierce County Health Department, the Corps of Engineers and the Port of Tacoma. A multi-agency committee to supervise the project has also been set up.

Some of the most important accomplishments to date are:

- o A computerized data management system has been developed and put in place.
- o A decision-making process has been agreed upon. Historical facts have been reviewed and areas where more information was needed were identified.
- o A drainage map of the project area has been finished.
- o An assessment of the potential public health effects from eating fish from the affected area is complete.
- o An assessment of ways of dredging, handling and disposing of contaminated sediments and development of disposal criteria is nearly done.
- o Problem areas, contaminants and sources are being identified and listed according to their importance.

The waterways and shoreline investigation is scheduled for completion in August 1985.

## 2. Ruston/Vashon Island

The primary goals of the Ruston and Vashon Island part of the site study are to: 1) determine the environmental pathways by which people get arsenic into their systems; 2) evaluate lead and cadmium contamination of the environment; 3) determine the geographical extent of the contamination; 4) identify potential ways to reduce exposure of people and reduce environmental contamination.

Much of the work so far has been accomplished through inter-agency agreements with the University of Washington, the Tacoma-Pierce County Health Department and the Department of Social and Health Services. A multi-agency work group has been set up to give advice and guidance on the project.

Some of the most important accomplishments to date are:

- o Historical information on arsenic, lead and cadmium has been reviewed.

- o An exposure pathways study has been designed and is now being put to use.
- o An analysis of historical urinary arsenic levels is being completed.
- o A brief investigation of the leaching of metals from area soils has been completed.

The exposure pathways study is schedule to be finished in October 1986 and the Ruston and Vashon Island area investigation by the end of 1986.

## VI. DISCUSSION

Past mismanagement of hazardous wastes in Washington may result in one of the state's most challenging and persistent problems during the 1980s and 1990s. Experiences in this state and others indicate the problem is not easily solved.

Many of the serious problem sites have been identified and are being investigated or cleaned up. More than 500 sites in Washington that may require some level of cleanup have already been identified. Recently the Ecology Department completed preliminary assessments on 162 of the sites, providing information that will direct further site activities.

Technical procedures involved in conducting investigations and cleanups are complex and costly. Since many sites are inherently dangerous, they must be investigated cautiously by qualified and highly trained people. The material must be carefully analyzed so it can be properly handled and treated. Cleanup techniques differ for each class of hazardous waste and disposal may be expensive, with the options of recycling or completely destroying it usually even more so.

Although citizen concern and the demand for immediate or quick solutions are often present, the process of cleanup from initial discovery to final disposition is likely to be long and involved.

It is virtually certain that there will be more discoveries of high priority hazardous waste sites made in Washington. Many lower-priority sites or new classes of sites -- such as pesticide-contaminated areas -- will also be identified. Because there are so many of these smaller sites, their collective effect on the total workload can be great.

Additional funding and personnel will undoubtedly be needed to carry out the process of site identification, sampling and cleanup. Additional legislative powers may also be necessary to compel responsible parties to clean up these sites. Other program areas that may need additional legislation or funding are cost recovery and enforcement.

For the 1985-87 biennium, the department plans to work on 30 to 35 sites per year. A range of funding levels are possible, depending on the amount of federal funds expected, the number of independent state sites -- those not receiving any federal funding -- that are worked on, how quickly cleanup is accomplished and what level of cleanup is acceptable.

To adequately fund all the projects during the next decade, regular, continuous funding processes need to be established. The current state fees imposed on waste generators and treatment, storage and disposal facility operators are not sufficient to pay for even the hazardous waste regulatory program for which they are primarily intended. The current level of general fund support (\$4.3 million this biennium) will be exhausted in June 1985. If that level of funding were continued, it would only take care of one-half of one site per biennium, on the average.

Hazardous waste cleanups usually take place over several budget cycles and often can't be halted or interrupted without increasing risks and costs as well as heightening public concern. In addition, most groundwater problems need continued maintenance and monitoring of cleanup activities for many years. For these reasons, hazardous waste cleanup must have reliable, continuous funding year after year.

Failure to provide a stable and long-term funding solution will increase the cleanup costs substantially, allow contamination to spread, increase the eventual scope of the cleanup, cause several communities with threatened water supplies to construct alternative supply systems and jeopardize the state's full share of federal cleanup money.

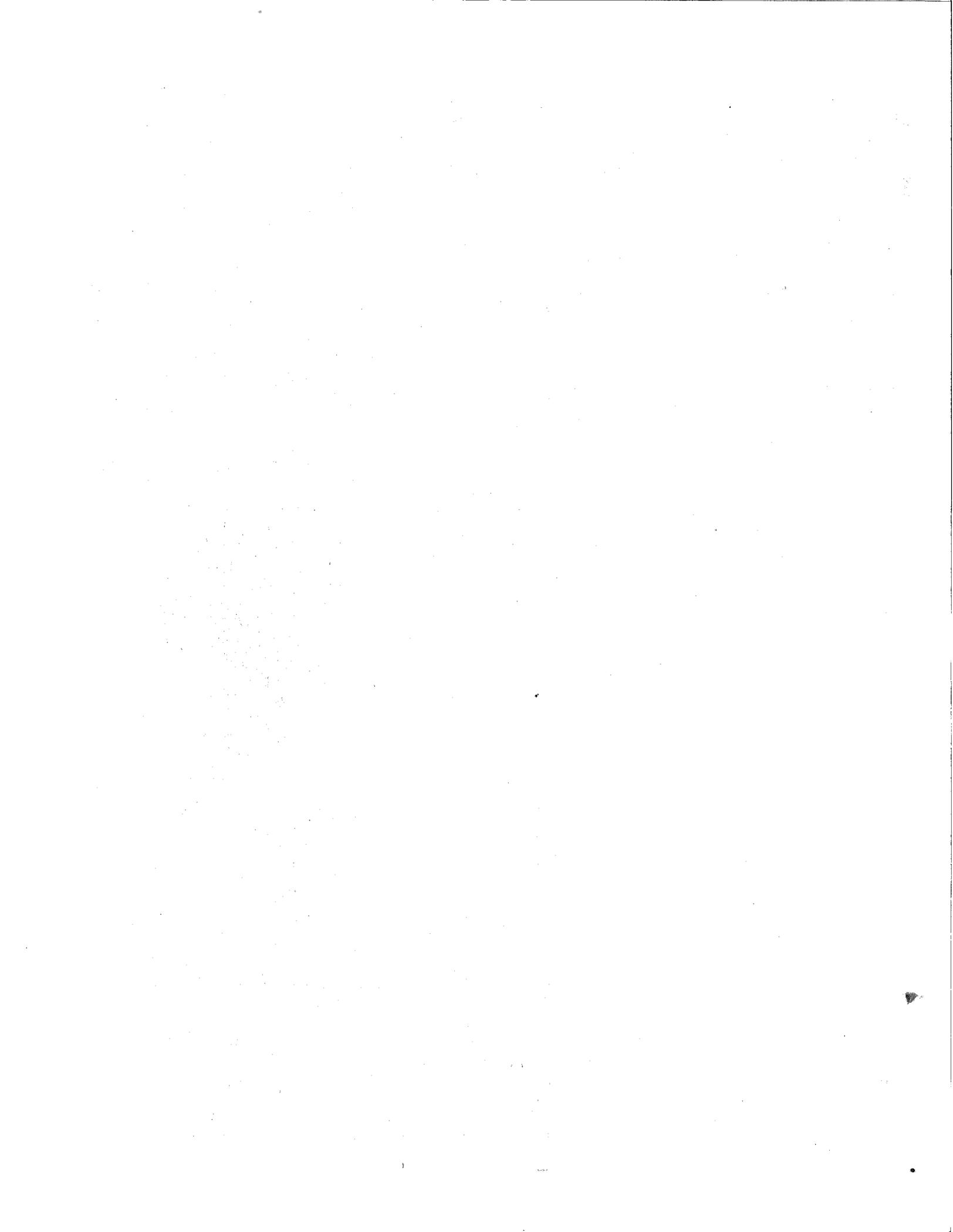
It may not be possible to clean up all sites to pre-existing levels of environmental quality. Those which can't be restored, however, can be kept from contaminating the surrounding soil or water. It may also be necessary to treat drinking water in some localities to make it safe or to provide alternative water supplies to affected residents for up to 50 years.

The protection of groundwater supplies, particularly those aquifers that are the sole source of drinking water for an area's residents, will be a high priority concern during the next decade. Once polluted, groundwater may not be usable again for a long period of time, and possibly never.

Although the job of cleaning up our environment is a long and difficult one, the rewards make it well worth the effort.



**WESTERN PROCESSING** Tank sampling crew using Level B protection. Self-contained breathing apparatus (SCBA), 2 layers of clothes and gloves.



VII. GLOSSARY

Hazardous Waste Site

A site where hazardous wastes are found that endanger, or have the potential to endanger, people or the environment.

Remedial Action

Work done at a hazardous waste site to clean up the contamination found there or to control the spread of contamination.

Remedial Action Program

A state-funded cleanup program by which the Department of Ecology, acting alone or with the Environmental Protection Agency, cleans up abandoned hazardous waste sites or sites the owners are unable or unwilling to clean up.

Remedial Investigation

Studies designed to find the source and extent of pollution at a site. They may be limited to researching files and reports or include work such as drilling sample wells.

Preliminary Assessment

A limited study made of a potential hazardous waste site to determine if a problem exists. An assessment primarily involves researching files. Sites with problems may become eligible for federal cleanup funding.

Feasibility Study

An examination of the most efficient and effective ways to accomplish a cleanup of a site. Usually, several options are studied and presented to local residents for review and comment before the cleanup is conducted.

Biennium

A two-year period used by government agencies as a basis for budgeting and spending plans. Each year of the biennium is called a fiscal year. Different levels of government differ on when these periods begin and end, but the state's fiscal year is from July 1 to June 30 of the following year.

Matching Funds

Money that must be put up by one partner (such as the state) in an agreement, in order to obligate the other partner (such as the federal government) to provide an agreed-upon share of funds for a project.

### Superfund

The federally-funded program to clean up hazardous waste sites nationwide, established under the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

### National Priority List

The federal list of major hazardous waste sites eligible for Superfund money.

### Hazard Ranking

A system of points assigned hazardous waste sites, based on the kind of waste found there and its nearness to people. The closer a site is to people and the more hazardous it is, the higher its ranking.

### Ecosystem

The complex interrelationship of land, air, water, sunlight and living organisms.

### Geohydrology

The study of underground water sources and movement, and factors affecting them.

### Plume

The extent or boundary of the spread of underground soil or water contamination.

### Aquifer

An underground porous layer of rock, gravel or sand that holds or carries water. The depth of this porous layer can vary from a few feet to several hundred feet under the surface. Aquifers, which are very vulnerable to contamination from chemical spills, provide a source of drinking water for approximately 2.5 million Washington residents.

### Groundwater

Water found in underground aquifers, in layers of gravel, sand, sandstone or limestone. It is usually like a slow-moving underground "river" fed by rain water or snow melt.

### Permeability

The ability of a substance to be penetrated or soaked through by water, other liquids or gases. Water passes quickly through sand or gravel, but slowly or not at all through clay or solid rock.

### Leachate

Material, commonly containing metals or organic pollutants, that seeps or leaks out of deposits such as garbage dumps or contaminated soil. The leaching, or washing out, of the material is usually caused by rain.

### Pathways

Means by which a poison or pollutant gets into a human, an animal or the environment. Common pathways for pollutants getting into humans include direct contact (spills), ingestion (direct or through contaminated food) and inhalation (breathing toxic fumes).

### Toxic

Capable of causing illness or death. Poisonous.

### Toxicology

The study of poisons and pathways.

### Responsible Parties

Those who are responsible for causing hazardous substances to contaminate the environment. Responsible parties include the persons or companies that generate, transport or improperly manage the hazardous waste.

### Priority Pollutants

A list of 129 chemicals or substances the Environmental Protection Agency considers most hazardous to health or that readily pollute the environment.

### Arsenic

A poisonous element, which can be fatal in small amounts, that is used in pesticides. Arsenic is suspected of causing cancer.

### Heavy Metals

Forms of a number of metallic elements, such as lead, zinc, cadmium, silver, barium, mercury and others that may be poisonous if accumulated in a living organism beyond normal levels.

### Synthetic Organic Compounds

Chemical compounds, created for industry or agriculture, that did not exist 100 years ago but are now widespread in the environment. They are entering water supplies and some are very toxic. The following is a partial list of common synthetic organic compounds found at hazardous waste sites.

- o Chlorinated Organic Solvents are compounds on the federal priority pollutants list that are considered dangerous because their chemical make-up can turn relatively safe compounds into strong cancer-causing or poisonous substances.
- o Polynuclear Aromatic Hydrocarbons, or PAHs, are compounds found in petroleum or that may be formed by incomplete burning and industrial activities. PAHs include several cancer-causing chemicals -- Benzo(a)pyrene, Benzo(b)anthracene -- and several suspected cancer-causing chemicals - Pyrene, Fluorene, Anthracene, Chrysene.
- o Phthalates are a group of chemical compounds often used in plastics, paper, cosmetics, lubricating oil and some industrial processes.
- o Benzene is used in industrial detergents and solvents, pesticides, degreasers and motor fuel. It can accumulate in the body and is extremely dangerous.
- o Toluene is used to make benzene and many other chemicals, so many industrial workers come into contact with it. In large amounts, it can kill.
- o PCBs, or polychlorinated biphenyls, were used as coolants for electrical transformers, in making plastics and hydraulic fluid, and in compressors. No longer produced in the United States, PCBs are still found in old transformers and in the environment, since they are very slow to break down chemically. They are poisonous and suspected of causing cancer.

