STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL AND GEOPHYSICAL SURVEYS

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Report of Investigations 87-16

EXTENT OF GROUND-WATER CONTAMINATION IN ALASKA

in cooperation with Alaska Department of Environmental Conservation

By
J.A. Munter and D.L. Maynard

STATE OF ALASKA
Department of Natural Resources
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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EXTENT OF GROUND-WATER CONTAMINATION IN ALASKA

by
J.A. Munter[1] and D.L. Maynard[1]

ABSTRACT

From a literature review and a survey of environmental agencies, 72 sites of documented, man-caused ground-water contamination have been identified in Alaska as of June 30, 1987. The sites range from small areas near single wells to a 2.5 mi^2 fuel-contaminated area at Eielson Air Force Base near Fairbanks. Within these areas, 40 regulated public water-supply systems were contaminated, mainly since 1983. Petroleum products account for the most prevalent type of documented contamination (68 percent), followed by bacteriological (15 percent), dump or landfill (7 percent), and salt-water intrusion (7 percent) contamination. In addition to these sites, an estimated 300 to 400 septic systems in Alaska discharged incompletely decomposed effluent to the surface of nearby lands or water during 1986. Numerous potential sites of ground-water contamination exist in areas of oil spills, landfills, and waste-water or other discharges.

INTRODUCTION

In recent years, ground-water contamination has become widely recognized as a threat to drinking-water supplies. As a result, the U.S. Environmental Protection Agency (EPA) has encouraged all states and territories to formulate ground-water protection strategies; each strategy is to address issues unique to each state or territory. The Governor of Alaska has designated the Department of Environmental Conservation (DEC) as the lead agency in formulating Alaska's ground-water protection strategy. Part of the strategy involves assessing the ground-water contamination problems in Alaska by inventorying known ground-water contamination sites, considering potential sources of contamination, and evaluating the impact on public health and the environment. This report is a summary of ground-water contamination problems in Alaska.

METHODS

The Alaska Inventory of Contaminated Aquifers (AICA) was established during this investigation, which was conducted from October 1986 through June 1987. The system consists of manual files maintained at the Eagle River office of the Division of Geological and Geophysical Surveys (DGGS) and a computer data storage and retrieval system maintained on the Department of Natural Resources (DNR) Geoprocessor system. The term 'aquifer' as used during this inventory refers to any geologic unit capable of yielding water to a well, spring, or excavation. Aquifers inventoried during this investigation include both shallow or remote aquifers not currently used as sources of drinking water and water-supply aquifers.

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For a site to be included in AICA, a well or spring must be known, by means of a water-quality test, to have been contaminated as a direct result of man's activities. Such contamination may not have exceeded water-quality standards established by regulatory agencies. If the determination of contamination depended solely on laboratory tests (as opposed to a visual determination, for example), a replicate set of analyses was used as a minimum criteria to verify site contamination. If a parameter occurred naturally in background water-quality samples, then the concentration of the parameter had to be at least an order of magnitude above background concentrations to establish a positive determination of contamination. Some contamination sites were identified through a review of reports available to the general public. In these instances, it was assumed that the reports were prepared using accepted professional practices similar to those described above.

During this investigation, numerous sites were identified where ground-water contamination was a possibility but was not clearly established. These sites are categorized according to type of potential contamination, and each category is described in general terms. Information about known and potential ground-water contamination is related to water use and hydrogeological conditions in Alaska to provide perspective on ground-water contamination problems.

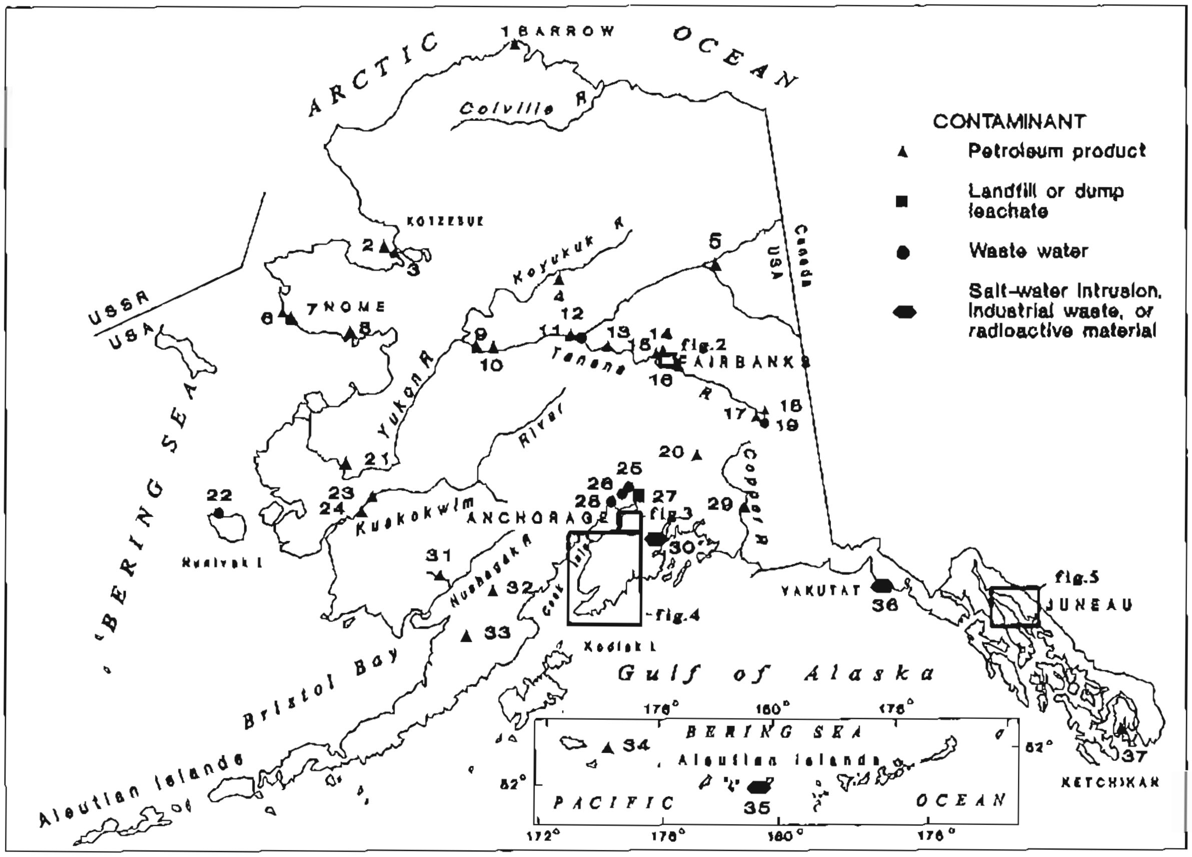
RESULTS

Known Sites of Ground-water Contamination

Figures 1 through 5 show the 72 sites of known ground-water contamination contained in AICA as of June 30, 1987. Data sheets that list location, type of contamination, hydrogeologic parameters, and sources of information (if known) for each site are available in Munter and Maynard (1987). Table 1 summarizes the data listed in Munter and Maynard (1987). Numerous blank data fields in table 1 illustrate that for most sites of contamination only cursory information is available.

Petroleum products cause the majority of known contamination cases (68 percent) through accidental spills or leakage from dumps, pipelines, or storage tanks (table 1). In the northern region alone, an estimated 20,000 oil spills that total about 5 million gallons have reportedly occurred from 1974 to 1985 (J.H. Janssen, DEC, written commun., 1985). Within the group of known ground-water contamination sites, 29 public water-supply systems have been contaminated by petroleum products, mostly since 1983.

Ground water in Alaska has also been contaminated by dump or landfill operations, industrial-waste disposal, septic-system discharge, extraction of water from coastal aquifers (resulting in salt-water intrusion), and underground detonation of nuclear explosives (Cannikin and Milrow testing sites, Amchitka Island; fig. 1). Ground-water contamination occurs in diverse geologic environments and in all regions of the state; however, 49 percent of the contamination sites are near the well-developed areas of Fairbanks (fig. 2), Anchorage (fig. 3), the Kenai Peninsula (fig. 4), and Juneau (fig. 5). At many sites in Alaska, the depth to ground water is



GROUND-WATER CONTAMINATION SITE

1. Ukpeagvik Inupiat Corporation-Naval Arctic Research Laboratory, Point Barrow
2. Kotzebue
3. Kotzebue Air Force Station, Kotzebue
4. Indian Mountain Air Force Station, Hughes
5. Fort Yukon School District, Fort Yukon
6. Q Trucking, Nome
7. Chevron Tank Farm, Nome
8. White Mountain Washeteria, White Mountain
9. Galena airfield, Galena
10. Campion Air Force Station, Galena
11. Tanana Public Health Service Hospital, Tanana
12. Tanana Well #2, Tanana
13. Manley Hot Springs, Manley
14. Check valve 6BA, milepost 430, Trans-Alaska Pipeline System
15. Minto School, Minto
16. Eielson ski lodge, Eielson Air Force Base
17. Tok River campground, Tok
18. U.S. Coast Guard Loran Station, Tok
19. State Trooper housing, Tok
20. Sourdough Roadhouse, Gakona
21. Marshall
22. Mekoryuk, Nunivak Island
23. Chuathbaluk
24. Akiak
25. Fishhook West Subdivision, Wasilla
26. Ship Ahoy Bar, Wasilla
27. Butte landfill, Matanuska-Susitna Borough
28. Knik Bar, Wasilla
29. Chitina Cafe, Chitina
30. Whittier Creosote, Whittier
31. Koliganek
32. Sparrevohn Air Force Station, southwest Alaska
33. King Salmon Air Force Station, King Salmon
34. Shemya Air Force Base, Shemya
35. Amchitka Island
36. Ocean Cape, Phipps Peninsula
37. Ketchikan Union 76, Ketchikan

Figure 1. Location of ground-water contamination sites in Alaska. For sites in the Fairbanks, Anchorage, Kenai Peninsula, and Juneau areas, see figures 2 through 5, respectively. For description of sites, see table 1 and Munter and Maynard (1987).

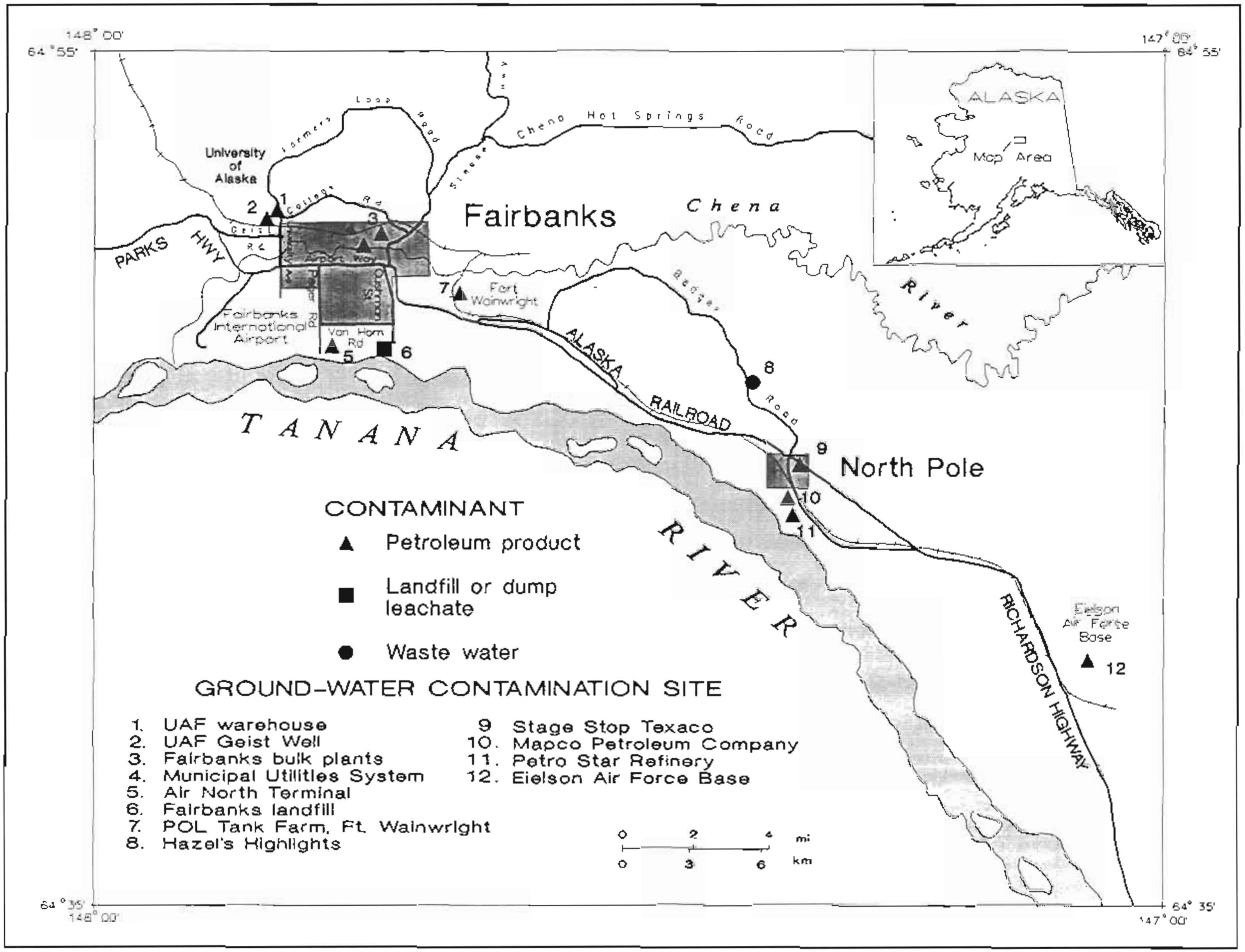


Figure 2. Location of ground-water contamination sites in the Fairbanks vicinity. For description of sites, see table 1 and Munter and Maynard (1987).

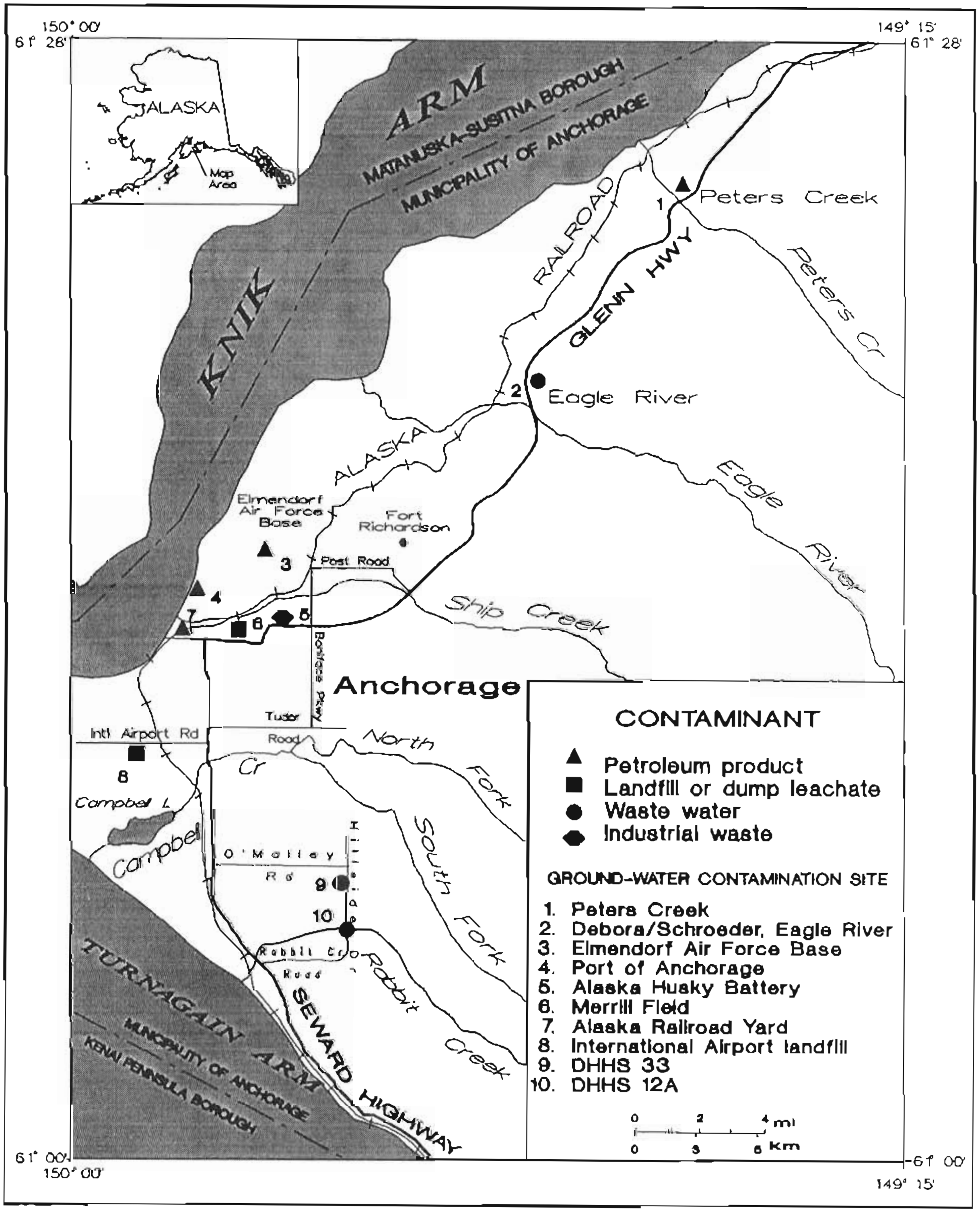


Figure 3. Location of ground-water contamination sites in the Anchorage vicinity. For description of sites, see table 1 and Munter and Maynard (1987).

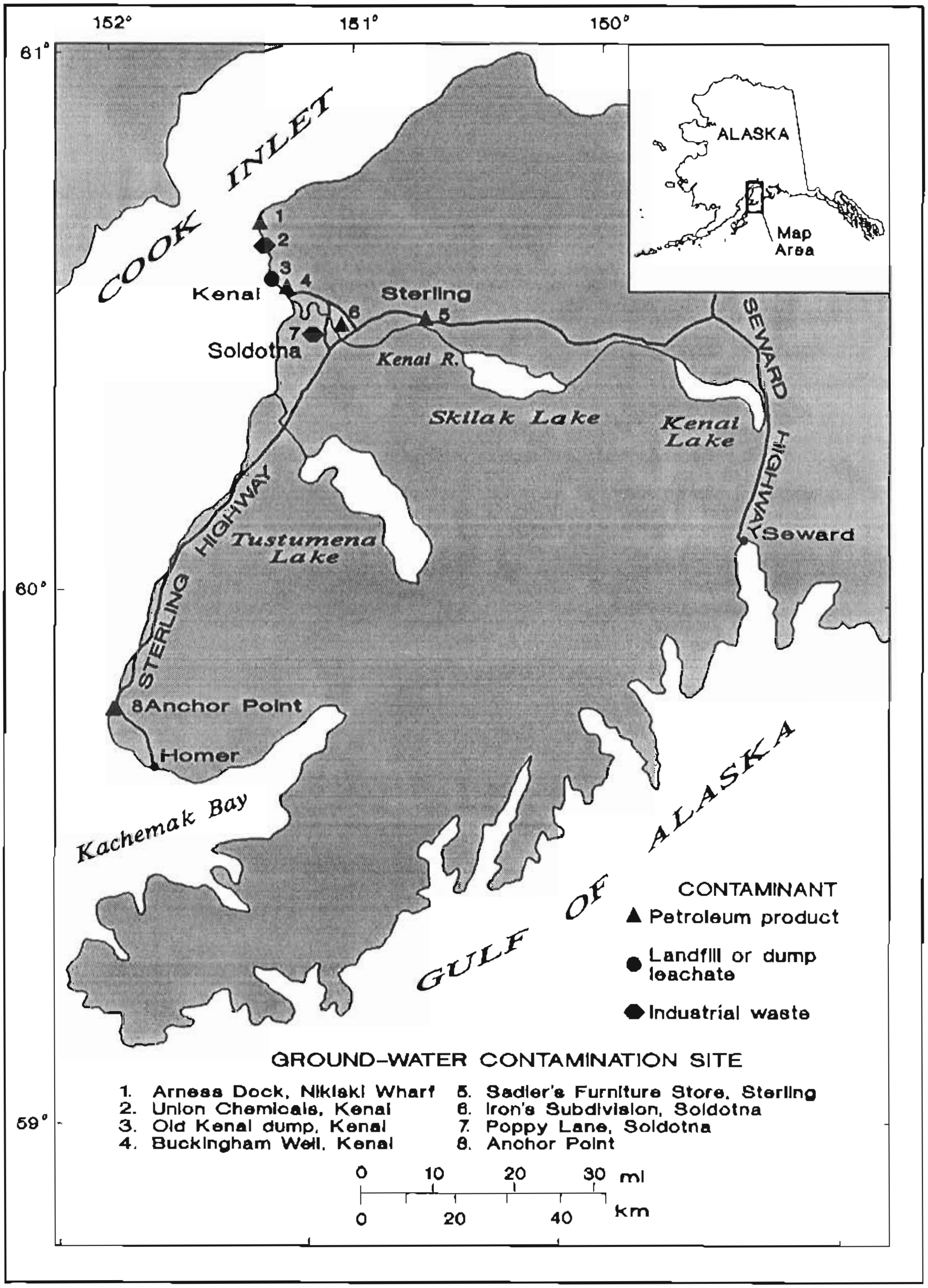


Figure 4. Location of ground-water contamination sites in the Kenai Peninsula vicinity. For description of sites, see table 1 and Munter and Maynard (1987).

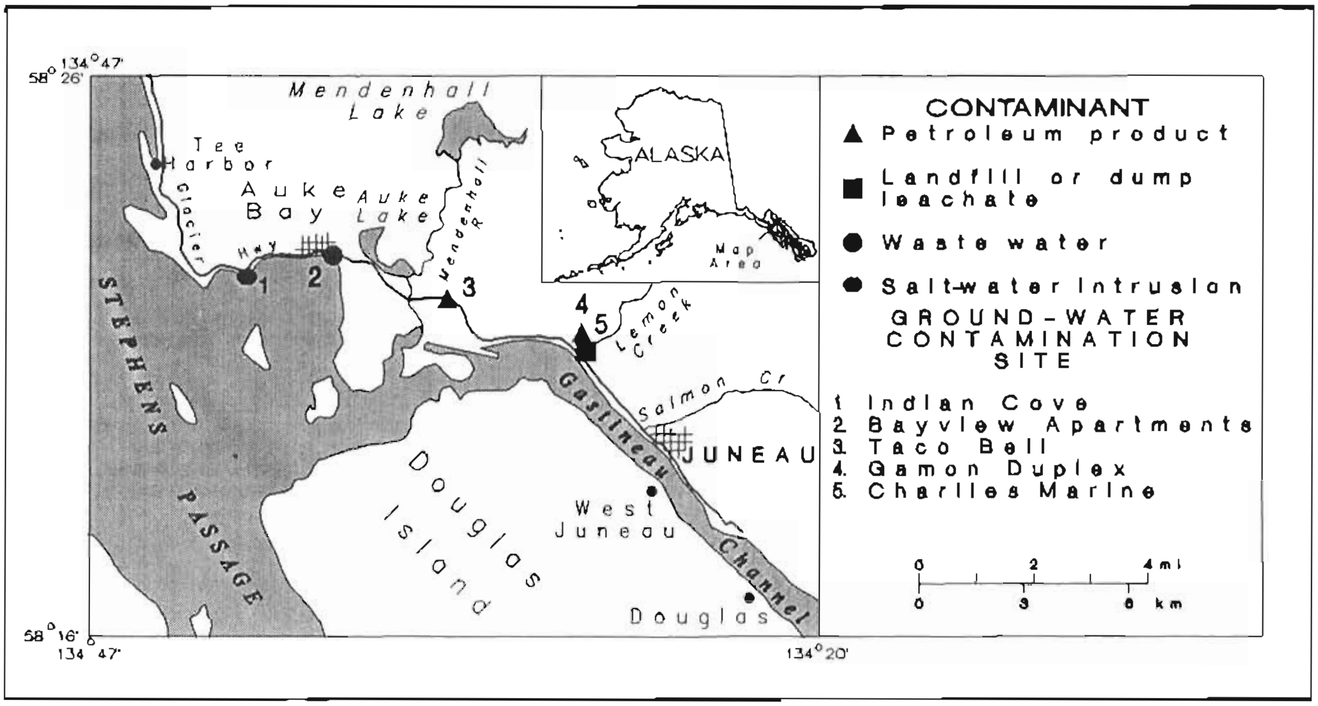


Figure 5. Location of ground-water contamination sites in the Juneau vicinity. For description of sites see table 1 and Munter and Maynard (1987).

relatively shallow, usually <20 ft below land surface. The size of known contaminated areas varies from localized problems near individual wells to the 2.5 mi^2 'fuel-saturated area' at Eielson Air Force Base (Dames and Moore, 1986a).

The contamination of drinking-water-supply wells usually results in the acquistion of an alternate source of water supply, such as at Marshall, Minto School, Peters Creek, Indian Cove, Stage Stop Texaco, and Debora/Schroeder (table 1). Occasionally, low levels of contamination are treatable, such as at Municipal Utilities System (MUS) in Fairbanks, or decrease to levels below detection limits, allowing normal use of the well, such as at the State Trooper housing in Tok. Most public drinking-water supplies affected by contamination are effectively remedied by one of these approaches. Contaminated aquifers not currently used as sources of drinking water may pose significant environmental concern as a source of contaminants (most notably fuel or septic-system effluent) to current or future water-supply aquifers or surface water bodies.

Potential Sites of Ground-water Contamination

Ground-water contamination can result from a wide variety of human activities. The major sites of potential contamination in Alaska are petroleum-product storage and transportation facilities, historic oil spills,

Table 1. Summary of Alaska Inventory of Contaminated Aquifers (AICA), October 1986 to June 1987.

Site no.[a]	Site name	Site location	Contaminated public water supplies	Type of contamination	Volume of spill or leak (gal)	Contaminant found	Aquifer	Depth to water table (ft)
NORTHERN REGION								
2-5	Air North Terminal	Fairbanks	1	Fuel	40	Benzene, ethylbenzene, xylenes	-	-
1-10	Campion AFS[b]	Galena	0	Fuel	-	-	Sand and gravel	-
1-7	Chevron Tank Farm	Nome	0	Fuel	-	Fuel	-	-
2-12	Eielson AFB[c]	Eielson	1	Fuel	-	Lead, oil, and grease, TOH[d]	Sand and gravel	5-10
1-16	Eielson ski lodge	Eielson	1	Fuel	-	Benzene	-	-
2-4	Fairbanks MUS[e]	Fairbanks	1	Fuel	-	Benzene	Sand and gravel	10-20
2-3	Fairbanks bulk plants	Fairbanks	0	Fuel	-	Fuel	Sand and gravel	14
2-6	Fairbanks landfill	Fairbanks	0	Leachate	-	Sodium chloride, iron, manganese	Sand and gravel	6-19
1-5	Ft. Yukon School District	Ft. Yukon	1	Fuel	-	Diesel oil	-	-
1-9	Galena airfield	Galena	1	Fuel	-	Benzene	Gravel and sand	14-21
2-8	Hazels Highlights	North Pole	1	Bacteriological	-	Coliform	-	-
1-4	Indian Mtn. AFS[b]	Hughes	0	Fuel	140,000	Fuel	-	-
1-2	Kotzebue	Kotzebue	0	Fuel	200,000	#2 diesel	-	6
1-3	Kotzebue AFS[b]	Kotzebue	0	Fuel	-	Fuel	-	-

[a] Figure number - Location number on figure
[b] Air Force Station
[c] Air Force Base
[d] Total Organic Halogens
[e] Municipal Utilities System
[f] Petroleum Oil and Lubricants
[g] Public Health Service
[h] Trans-Alaska Pipeline System
[i] University of Alaska
[j] Ukpeagvik Inupiat Corporation/Naval Arctic Research Laboratory
[k] U.S. Coast Guard
[l] Department of Health and Human Services
- Unknown or not applicable

Table 1. (con.)

Site no.[a]	Site name	Site location	Contaminated public water supplies	Type of contamination	Volume of spill or leak (gal)	Contaminant found	Aquifer	Depth to water table (ft)
1-13	Manley Hot Springs	Manley	0	Fuel	-	Fuel	-	-
2-10	Mapco Petroleum Company	North Pole	1	Fuel	100,000	Petroleum products	-	-
1-15	Minto School	Minto	1	Fuel	6,000	#1 diesel	Bedrock	40
2-11	Petro Star Refinery	North Pole	1	Fuel	-	Benzene	Sand and gravel	-
2-7	POL[f] Tank Farm	Ft. Wainwright	1	Fuel	-	Fuel oil	-	-
1-6	Q Trucking	Nome	0	Fuel	30,000	Unleaded gas	-	-
1-20	Sourdough Roadhouse	Gakona	1	Fuel	-	Benzene	-	-
1-19	State Trooper housing	Tok	1	Solvents/ detergents	-	Paradichloro-benzene, LES (detergents)	-	-
2-9	Stage Stop Texaco	North Pole	1	Fuel	-	Benzene, ethyl-benzene, toluene, xylene	-	-
1-11	Tanana PHS[g] Hospital	Tanana	1	Fuel	-	Fuel	-	-
1-12	Tanana Well #2	Tanana	1	Bacteriological	-	Coliform	-	-
1-14	TAPS[h] check valve 68A	Milepost 430, TAPS[h]	0	Fuel	3,780	Crude oil	-	4-18
1-17	Tok River campground	Tok	1	Fuel	-	Oil and grease	-	-
2-2	UAF[i] Geist Well	Fairbanks	1	Fuel	-	Benzene	-	-
2-1	UAF[i] warehouse	Fairbanks	1	Fuel	-	Benzene	-	-
1-1	UIC/NARL[j] facility	Point Barrow	0	Fuel	830,000	Fuel	Gravel and sand	3
1-18	USCG[k] Loran Station	Tok	1	Fuel	-	Fuel	-	-
1-8	White Mtn. Washeteria	White Mountain	1	Fuel	2,500	Fuel oil	-	-

Table 1. (con.)

Site no.[a]	Site name	Site location	Contaminated public water supplies	Type of contamination	Volume of spill or leak (gal)	Contaminant found	Aquifer	Depth to water table (ft)
SOUTHCENTRAL REGION								
1-24	Akiak	Akiak	1	Fuel	-	Oil and grease	-	-
3-5	Alaska Husky Battery	Anchorage	0	Chemical	-	Sulfates	Sand and gravel	8-11
3-7	Alaska Railroad Yard	Anchorage	0	Fuel, chemical	-	Benzene, xylenes, arsenic, chromium	Sand and gravel	9-10
1-35	Amchitka Island	Amchitka Island	0	Radioactivity	-	Gross alpha, gross beta, tritium	Rock	-
4-8	Anchor Point	Anchor Point	1	Fuel	100	Aromatic hydro-carbons, benzene	Gravel and sand	24-52
4-1	Arness Dock	Nikiski Wharf, Kenai Peninsula	0	Fuel	3,000	Fuel	-	-
4-4	Buckingham Well	Kenai	0	Fuel	50	#2 fuel oil, benzene	Sand and gravel	-
1-27	Butte landfill	Matanuska-Susitna Borough	0	Leachate	-	Iron, manganese	-	-
1-29	Chitina Cafe	Chitina	1	Fuel	-	Oil and grease, other hydro-carbons	-	-
1-23	Chuathbaluk	Chuathbaluk	1	Fuel	-	Oil and grease	-	-
3-2	Debora/Schroeder	Municipality of Anchorage	1	Bacteriological	-	Coliform, nitrate, chloride, fluore-scein	Sand and gravel	28-30
3-10	DHHS[1] 12A	Anchorage	0	Bacteriological	-	Coliform	Sand and gravel	5-12
3-9	DHHS[1] 33	Anchorage	0	Bacteriological	-	Coliform	Sand and gravel	7-8
3-3	Elmendorf AFB[c]	Anchorage	0	Fuel	148,000	Fuel	-	-

Table 1. (con.)

Site no.[a]	Site name	Site location	Contaminated public water supplies	Type of contamination	Volume of spill or leak (gal)	Contaminant found	Aquifer	Depth to water table (ft)
1-25	Fishhook West Subdivision	Wasilla	1	Bacteriological	-	Coliform	-	-
3-8	International Airport landfill	Anchorage	0	Leachate	-	Iron, manganese, DOC	-	-
4-6	Iron's Subdivision	Soldotna	0	Fuel spill	-	Benzene	Sandy gravel	-
1-33	King Salmon AFS[b]	King Salmon	0	Fuel	-	Fuel	-	spring
1-28	Knik Bar	Wasilla	1	Bacteriological	-	Coliform	-	-
1-31	Koliganek	Koliganek	1	Fuel	-	Ethylbenzene, xylenes	-	-
1-21	Marshall	Marshall	1	Fuel	-	oil	-	-
1-22	Mekoryuk	Nunivak Island	1	Bacteriological, salt-water intrusion	-	-	-	-
3-6	Merrill Field	Anchorage	0	Leachate	-	-	-	-
4-3	Old Kenai dump	Kenai	0	Leachate	-	Oil and grease, iron, manganese, chromium	Sand	20-30
3-1	Peters Creek	Municipality of Anchorage	2	Fuel	-	Benzene, toluene, xylene	Sand and gravel	80-110
4-7	Poppy Lane	Soldotna	0	Drilling fluids	2,500	Drilling mud, glycol, gas-field condensate	Sand and gravel	8-12
3-4	Port of Anchorage	Anchorage	0	Fuel	-	Fuel oil, oil and grease	Sand and gravel	9-32
4-5	Sadler's Furniture Store	Sterling	1	Fuel	-	Benzene	-	-
1-34	Shemya AFB[c]	Shemya	0	Fuel, saltwater intrusion	-	Fuel, saltwater	-	-

Table 1. (con.)

Site no.[a]	Site name	Site location	Contaminated public water supplies	Type of contamination	Volume of spill or leak (gal)	Contaminant found	Aquifer	Depth to water table (ft)
1-26	Ship Ahoy Bar	Wasilla	1	Bacteriological	-	Coliform	-	-
1-32	Sparrevohn AFS[b]	SW Alaska	0	Fuel	-	Diesel fuel	-	-
4-2	Union Chemicals	Kenai	0	Processing waste	-	Aresenic, ammonia, nitrate, nitrite, urea	-	-
1-30	Whittier Creosote	Whittier	0	Creosote	-	Creosote	-	-
SOUTHEASTERN REGION								
5-2	Bayview Apartments	Auke Bay	1	Bacteriological, saltwater intrusion	-	Coliform, saltwater	-	-
5-5	Charlies Marine	Juneau	0	Fuel	-	Benzene, chloro-benzene, ethyl-benzene	-	-
5-4	Gamon Duplex	Juneau	1	Fuel	20	Benzene, ethyl-benzene	Sand and gravel	20-30
5-1	Indian Cove	Juneau	2	Saltwater intrusion	-	Sodium chloride, dissolved solids	Bedrock	20-110
1-36	Ocean Cape	Phipps Peninsula	0	Saltwater intrusion	-	Chloride	Gravel and sand	24
5-3	Taco Bell	Juneau	1	Fuel	20	Benzene, toluene	-	-
1-37	Ketchikan Union 76	Ketchikan	0	Fuel	-	Fuel	-	-

hazardous-waste disposal areas, waste-water discharge lands, landfills and dumps, and coastal areas with relatively large rates of ground-water extraction.

Petroleum-product storage and transportation facilities occur in all developed areas of Alaska and constitute the most significant potential sources of contamination. The facilities include pipelines, refineries, airports, docks, service stations, railyards, military installations, power-generating stations, and numerous small businesses and residences. Contamination can result from leaking pipes, tanks, or barrels or from accidental spillage during fuel handling or transportation. Once in the ground, components of most petroleum products are relatively mobile.

Historic oil spills constitute another major category of potential ground-water contamination. If a large spill penetrates the subsurface, recovery of the oil is typically incomplete and the extent of migration is not completely known. Although many reported spills are minor, 12 sites that require additional investigative or cleanup work have been identified by DEC (table 2).

Table 2. Sites of petroleum-product contamination where response activities have been projected to occur, 1987-88. Data from Alaska Department of Environmental Conservation (1987).

Site name	Location
Peters Creek	Municipality of Anchorage
Anchor Point	Anchor Point
Iron's Subdivision	Soldotna
Industrial site-Kenai (includes Arness Dock)	North Kenai
Kotzebue	Kotzebue
Lucky Sourdough	Fairbanks
Stage Stop	North Pole
Air North	Metro Field, Fairbanks
Minto School	Minto
Harold's Air Service	Galena
Wale's city building	Wales
Manley Hot Springs	Manley

Hazardous substances generated and used in Alaska have the potential to contaminate ground water. Horton (1986) observed that estimates of the quantity of hazardous waste generated in Alaska are about twice as large as estimates of quantities disposed of annually. Although about 50 potential hazardous-waste sites are under investigation in Alaska (Alaska Department of Environmental Conservation, 1987), only a small amount of ground-water-quality data have been generated (Munter, 1987a). Investigations at potential hazardous-waste sites are prioritized on the basis of anticipated impacts on human health or the environment; potential ground-water contamination constitutes only one of several criteria.

Waste-water discharge through injection wells or soil-absorption fields can result in ground-water contamination. Septic systems have caused ground-water contamination in numerous places in the United States (Canter and Knox, 1985) and in a few places in Alaska (table 1), although several studies of areas in Alaska suspected of being contaminated by septic systems have not exhibited area-wide ground-water contamination (Krumhardt, 1982; URS Engineers, 1983; Hart Crowser, 1987; Munter, 1987b). DEC personnel and Municipality of Anchorage staff indicated that an estimated 300 to 400 septic systems failed in Alaska during 1986. A failed system is defined as one discharging incompletely treated septic-system effluent to lands or waters; thus a significant potential exists in Alaska for contamination of ground water from failing septic systems.

In Alaska, waste water is also discharged from dairy farms into unlined ponds and from car washes, cooling systems, seafood-processing plants, oil and gas facilities, and photographic-processing establishments directly into the ground (Julie Howe, DEC, written commun., 1987). These types of facilities, coupled with septic systems that are malfunctioning, located in inappropriate soil or water-table conditions, or situated near water-supply wells or surface water bodies, are potential sources of ground-water contamination problems. Monitoring associated with subsurface disposal activities currently occurs at about 32 sites in Alaska (Julie Howe, DEC, written commun., 1987).

Solid-waste disposal sites are located throughout the populated areas of Alaska. In interior northern Alaska, where some solid waste is perennially frozen, potential for ground-water contamination may be very low. Where waste is deposited in or near shallow water tables, ground-water contamination is likely. Presently, about 40 solid-waste facilities in Alaska are being monitored for ground-water contamination (Henry Friedman, DEC, written commun., 1987; Steve Haavig, DEC, oral commun., 1987; Munter, 1987a).

Potable-water extraction facilities occur within a few hundred feet of the coast at many locations in Alaska. These facilities commonly tap aquifers that may be susceptible to salt-water intrusion depending on local hydrogeologic conditions and on rates of ground-water extraction. The number of water supplies potentially susceptible to salt-water intrusion is unknown.

Hydrogeologic Conditions and Water-use Patterns

Ground-water contamination in Alaska is related in large measure to hydrogeologic conditions and water-use patterns. Four hydrogeologic environments---alluvial aquifers, glacial-drift aquifers, coastal-lowland aquifers, and bedrock aquifers---have been recognized in Alaska (Williams, 1970) and are described in detail by Zenone and Anderson (1978). Different hydrogeologic environments are associated with specific types of contamination problems. Ground-water contamination sites are concentrated near population centers, where development activity is greatest and aquifers are used most heavily.

Alluvial aquifers are associated with major valleys and small drainages and are typically composed of sand and gravel with varying amounts of silt. Saturated aquifer materials typically occur within a few feet of the land surface, which creates a high susceptibility to contamination from petroleum-product spills or leaks and waste-disposal activities. Alluvial aquifers associated with major interior drainages, such as the Yukon or Tanana Rivers, are typically thick enough to yield uncontaminated water from deep wells. The relatively high permeability of alluvial aquifers allows contaminant plumes to migrate, which causes concern that down-gradient or deep wells may also become contaminated.

Glacial-drift aquifers are abundant and widely used in southcentral Alaska but are absent in the interior of the state and are uncommon in southeast Alaska. Glacial-drift aquifers are composed principally of sand and gravel, are usually confined by silty glacial deposits, and may be as small as a few tens of cubic feet or as large as 1 mi^3 (Barnwell and others, 1972). Contaminant transport through glacial deposits can be highly variable; therefore, it is difficult to determine in detail. Localized, coarse-grained material may allow relatively rapid contaminant movement, whereas fine-grained, confining units can retard or divert contaminants. Although glacial deposits can be suitable receptors for waste material, permanent or seasonal water tables at shallow (<5 ft) depths can create failure conditions for solid or liquid waste-disposal operations.

Coastal-lowland aquifers consist mostly of sand or sand-and-gravel deposits formed by alluvial or near-shore marine activity. These aquifers are commonly thin and shallow and are particularly vulnerable to salt-water intrusion or other types of contamination caused by human activity. These aquifers can also be affected by natural processes such as storm-wave inundation or seasonal variations in recharge rate (Zenone and Anderson, 1978).

Bedrock aquifers in Alaska usually consist of fractured igneous, metamorphic, or sedimentary rocks that have relatively low yields (<10 gal/min). They are used primarily in areas of residential rather than commercial or industrial development (Dearborn and Barnwell, 1975; Nelson, 1978; Dearborn, 1985); thus would be affected mainly by waste-water and salt-water-intrusion contamination. In areas where bedrock is well fractured, contaminants may migrate rapidly with little attenuation. In many areas, the low permeability of bedrock aquifers may result in limited contaminant transport.

Sources of Drinking-water Supplies

Ground water is used by 85 percent (2,045) of the 2,400 public water-supply systems regulated by DEC (Richard Farnell, DEC, written commun., 1987). These systems provide the normal residential water supply for 295,000 people and provide the incidental water supply at public or commercial facilities for an additional 125,000 people. A review of about 20,000 water-well logs stored at the offices of DGGS and the U.S. Geological Survey shows that public water-supply systems constitute a small percentage of ground-water-supply systems in Alaska. Ground water is used most heavily in the southcentral and interior regions of the state; rainwater and surface water are used more frequently in the arctic and southeast regions. Ground water is used in large areas of Alaska because it is readily obtainable, typically potable, and available in sufficient quantities.

Although ground water is widely used throughout Alaska for both public-water-supply systems and single-family water-supply systems, no systematic method exists for monitoring contamination of single-family systems. In areas where certificates from local environmental authorities are required to finance properties, individual water and waste-water systems are evaluated. These procedures help identify sites of septic-system contamination, but areas of salt-water intrusion or of other types of contamination may go unreported.

SUMMARY AND CONCLUSIONS

Ground-water contamination has been documented at 72 locations in Alaska; 68 percent of the contamination is related to petroleum products. All major hydrogeologic environments exhibit contamination, and in recent years, at least 40 public water-supply systems have been affected (table 1); contamination of nonpublic water-supply systems is poorly documented. The contamination of drinking-water-supply wells typically results in the development of an alternative water supply, usually from a nearby aquifer.

Known and potential ground-water-contamination sources are petroleum-product storage and transportation facilities, historic oil-spill areas, hazardous-waste sites, waste-water-discharge grounds, landfills and dumps, and coastal areas with relatively large rates of ground-water extraction. In the future, more extensive ground-water contamination is likely to be recognized because sites of contamination currently unknown to regulatory agencies may be discovered, currently known sites of potential contamination are under investigation, documented bodies of contaminated ground-water are likely to migrate, and new incidences of contamination are likely to occur.

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