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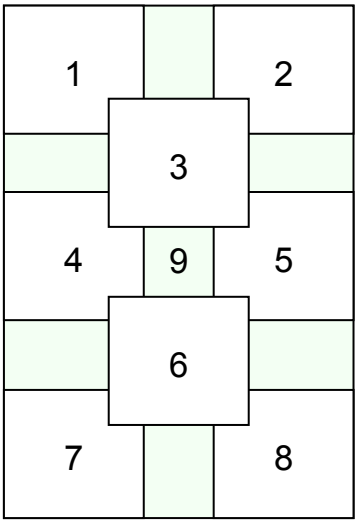
Alaska Legacy Wells Summary Report: National Petroleum Reserve-Alaska

Rob Brumbaugh
Stan Porhola

Cover Photos



1 – J.W. Dalton #1 after considerable beach erosion during the summer of 2004.
2 – Atigaru #1 is a coastal USGS monitor well.
3 – Lisburne #1 is the southernmost of the legacy wells. It currently lies outside the NPR-A boundary due to a lawsuit in the early 1980s that forced the boundary to be moved several miles to the west.
4 – Wolf Creek #1 during the summer of 2004.
5 – A lone drill rig, remnant from the U.S. Navy exploration days, sits abandoned at the once proposed Gubik #3 drilling location.
6 – The drill pad at Awuna #1 has experienced erosion from the reserve pit, exposing pilings and Styrofoam to the elements.
7 – Seabee #1 is a USGS monitor well located at Umiat.
8 – Umiat #10 prior to plugging during May of 2004.
9 – The background image is of the rolling foothills of the Brooks Range near Wolf Creek.

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The Bureau of Land Management sustains the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Alaska Legacy Wells Summary Report: National Petroleum Reserve - Alaska

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Fish Creek Test Well #1 is located within the Northeast Planning Area of the National Petroleum Reserve – Alaska.

ALASKA LEGACY WELLS SUMMARY REPORT: NATIONAL PETROLEUM RESERVE – ALASKA

Executive Summary

The Bureau of Land Management has completed a three-year assessment of all 136 legacy wells (see Map 1) within the National Petroleum Reserve – Alaska (NPR-A). Legacy wells are commonly defined as wells that were drilled during two separate exploration periods under the direction of the United States Government within the NPR-A prior to the 1982 lease sale.

BLM evaluated the wells based on their threat to human health, safety, and the environment if left in their current condition. Of the 136 wells, 99 pose no risks. Thirty-nine of 99 are uncased core holes, which have collapsed and blended into the natural landscape. Another 33 wells have either been conveyed to the North Slope Borough through the Barrow Gas Field Act of 1984 or to Arctic Slope Regional Corporation, and are not within BLM's jurisdiction. Twenty wells are used by the USGS for global climate and permafrost studies, all of which are properly plugged above the hydrocarbon bearing zones up to the surface casing shoe. These wells pose no risks and the USGS plans to continue to use the wells into the foreseeable future. The remaining seven wells have already been plugged.

This leaves 37 wells that were evaluated in greater detail based on their threat to human health, safety, and the environment if left in their current condition (see Appendix A). Of these, only eight wells represent any identified potential threat if left in their current condition.

Umiat was previously identified as an area of particular concern due to surface contaminations and a relatively high level of human activity. Six wells have been plugged at Umiat during the winters of 2002 and 2004. There are three wells left unplugged in Umiat that pose minimal risk to surface resources now, but could leak oil to the surface if development is initiated on the existing leases in this 70 million barrel field. To this date, no development has been proposed.

The J.W. Dalton #1, recently identified as a concern, is located on the coast of the Arctic Ocean. Recent erosion from the ocean has removed over 200 feet of shoreline, threatening the well and the reserve pit. With further weathering, the well could spill several thousand gallons of diesel fuel into the ocean.

There are four wells that were drilled during the first exploration period over fifty years ago in or nearby naturally occurring oil seeps on the Simpson Peninsula that pose a potential risk, too. While none of these four wells are leaking, they have the potential to flow oil to surface if they are not properly plugged and the surface equipment fails due to corrosion or if the surface equipment is damaged.

The cost to plug these eight wells is estimated to be $10,500,000. Funding described below would allow BLM-Alaska to finish plugging the wells at Umiat and take action at the locations of the other five wells representing a potential threat:

FY	Location	Cost, $MM	Description
’05	Umiat	$0.5	Finish plugging last 3 Umiat wells
’05	J.W. Dalton	$5.0	Plug well and remove hazardous material from reserve pit
’06	Simpson Cores	$5.0	7 wells plugged

Since a large portion of plugging costs are associated with mobilizing equipment to remote locations, wells that do not pose any identified threats but are in the general vicinity of the subject wells could also be plugged with minimal additional expenditures. Projected expenditures for 3 of these wells on the Simpson Peninsula are included in the above costs. Additionally, the total cost for J.W. Dalton #1 would be substantially less (closer to 1 million) if testing conducted this fall proves excavation of the reserve pit is unnecessary. The above cost estimates do not include removing old equipment, oilfield debris, and other remnants of historic activity. While some would view these reminders of the early activity as unsightly, they pose no real threat to health, safety, or the environment.

BLM estimates that it would take more than 30 million dollars to plug the remaining 26 wells. Given the low level of threat these wells pose and the significant costs associated with plugging them, consideration should be given to waiting for infrastructure to improve. All of the Simpson Peninsula wells are located on tracts that received bids in the June 2004 lease sale and it is likely that some infrastructure will be established in the next 5 to 10 years. Having some infrastructure and equipment in the area would significantly reduce the costs to plug these wells. It is also possible that the lessees will be able to take advantage of the language in the proposed Energy Bill wherein lessees would be allowed to plug orphan and legacy wells and be eligible for royalty reductions equal to 115% of the plugging costs.

Background and History

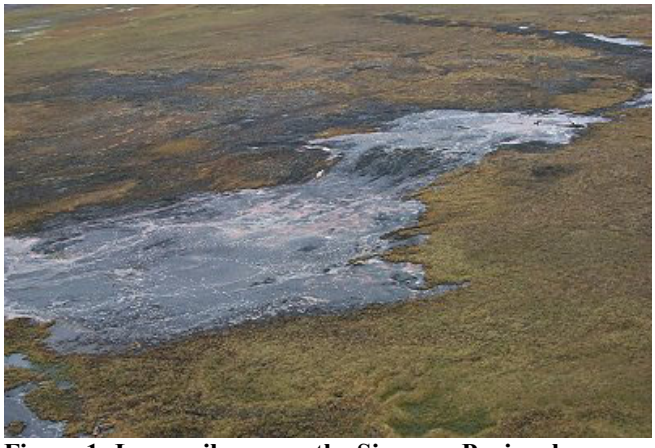

Figure 1: Large oil seep on the Simpson Peninsula.

The NPR-A is a 23 million acre roadless area located 200 miles north of the Arctic Circle. In the early 1900s, field geologists from the United States Geological Survey (USGS) explored the North Slope of the Brooks Range in Alaska to evaluate its mineral potential. The geologists found several oil seeps that prompted President Warren G. Harding to establish the Naval Petroleum Reserve No. 4 (NPR4) in 1923, setting aside approximately 23 million acres of Alaska's North Slope for future energy needs. The area remained largely untouched until the conclusion of World War II. Access is limited to overland travel in winter or by air in the short summer months.

Two U.S. Government exploration programs focused on the petroleum reserve. The U.S. Navy began the first exploration program in 1944 and drilled a total 91 holes in the Reserve. The Navy focused on Cape Simpson (Figure 1) and Umiat (Figure 2), the two most prominent oil seeps. Navy contractors drilled 11 test wells at Umiat and another 34 on Cape Simpson. Overall, the program located eight oil and gas fields (Fish Creek, Gubik, Meade, Simpson Peninsula, South Barrow, Square Lake, Umiat and Wolf Creek). Following the conclusion of the Navy program in the mid-1950s, focus began to shift eastward toward what were to become State lands.

Figure 2: Oil seeping in Umiat Lake.

Exploration activities in the petroleum reserve between 1953 to 1975 were limited to 9 wells in the Barrow area until interest increased following the 1973 Arab oil embargo. The U.S. Navy and the USGS contracted with Husky Oil Corporation to drill 9 and 27 exploratory wells respectively from 1975 to 1981 with one new discovery in the Walakpa Gas Field. The National Petroleum Reserves Production Act of 1976 (NPRPA) changed the name of the Reserve from NPR4 to the NPR-A and transferred administration to the U.S. Department of the Interior (USDOI).

In 1981, Congress authorized the Secretary of the Interior to conduct oil and gas leasing in the reserve (Public Law 96-514 December 12, 1980). Four oil and gas lease sales were held between 1982-1984. There was little interest in the sales and only one well was drilled.

Legacy wells are commonly defined as wells that were drilled within the NPR-A prior to the 1982 lease sale. Exceptions are Grandstand #1, Gubik #1 and Gubik #2 which are legacy wells drilled by the U.S. Navy outside the reserve boundary. Legacy wells are typically grouped into two categories, those drilled by the Department of the Navy and those drilled by the United States Geological Survey.

U.S. Navy Exploration

The U.S. Navy drilled a total of 109 wells and boreholes in the petroleum reserve between 1944 and 1977 ranging in depths from less than 50 feet to almost 12,000 feet. Of those, 32 were uncased core tests drilled primarily to assess the geological characteristics of the permafrost and shallow geologic strata. They tended to be relatively shallow, rarely exceeding depths of 1,000 feet, and are not considered to be oil and gas test wells.

In the early phases of drilling, priorities were based strictly on expediency; therefore, land impacts were less of a concern (Figure 3). Tracked vehicles (Weasels, Bombardiers, Nodwells, and bulldozers) were used to haul drilling equipment and supplies overland during the snow-free months. Drill pads were constructed by scraping away tundra prior to assembling the drill rig. The drill rig was typically placed on large timbers for support. Occasionally, airstrips were created during the winter months to fly in supplies on ski-equipped aircraft.

Figure 3: Ground disturbance at Fish Creek #1, Summer 1949. Photo by George Gryc.

Bulldozers created tracks when they scraped off the top vegetative layer. While the initial result allowed for a smooth driving or skidding surface, the scraping permitted the sun to heat the exposed ground, thawing the underlying permafrost. Low-lying areas of these tracks collected moisture, creating a wet-tundra environment while other sections that remained dry fostered the growth of shrubs and willows. It is still possible to locate many of these old routes that are more than a half-century old.

The Navy sponsored two separate drilling programs. The first program concluded in 1955, and the second program began in 1975. The Navy drilled Cape Halkett in June 1975 then awarded a 5-year contract to Husky Oil NPR Operations, Inc (Gryc, 1988). Six

wells were drilled by the Navy/Husky Oil before the program was discontinued with the reserve's transfer to the USDOI in 1976. An interim period where 9 wells were drilled by the Navy in the Barrow area between 1955 and 1975 is also considered part of the legacy well era in NPR-A. However, the ownership of these 9 wells was transferred in the Barrow Gas Field Transfer Act of 1984.

There are obvious differences between the two Navy programs. Supplies were difficult to receive during the first drilling period and it is apparent that the Navy was forced to use whatever well components and equipment that was available. Early Navy wells can be distinguished by the non-standard and fabricated equipment left in place and by the lack of reserve pits and pads. Casing sizes varied and approximately half the wells had the wellheads removed, leaving behind a cased, open hole. It is possible that this was done so that the wellheads could be used again on future wells.

USGS Exploration

With the passage of the NPRPA, Congress split the management of the NPR-A. The NPRPA transferred legal responsibility for all of the Navy wells to the Department of the Interior. The mineral estate was to be managed by the USGS while the surface responsibilities were transferred to the BLM. The USGS was directed to take over the Navy contract with Husky Oil Company and explore the reserve to determine if economic quantities of hydrocarbons were present.

With Husky Oil under contract, the USGS drilled 27 wells between 1976 and 1982 ranging in depths from 4,000 feet to 20,000 feet.

The wells from the second exploration period used standard oil field equipment and methods. Gravel pads with large reserve pits and modern wellheads typify the wells from this phase (Figure 4). The silts and sands removed from the reserve pits were used to construct the base of the drilling pads.

Typically, a reserve pit was trenched to a depth of 5 feet allowing the excavation of ice-rich soils. Ice wedges were cut perpendicular to the side of the reserve pit, quickly thawing the underlying permafrost. The material used during the excavation process was heaped onto the desired pad area and allowed to settle. Ice was used to thicken the pads to the desired level.

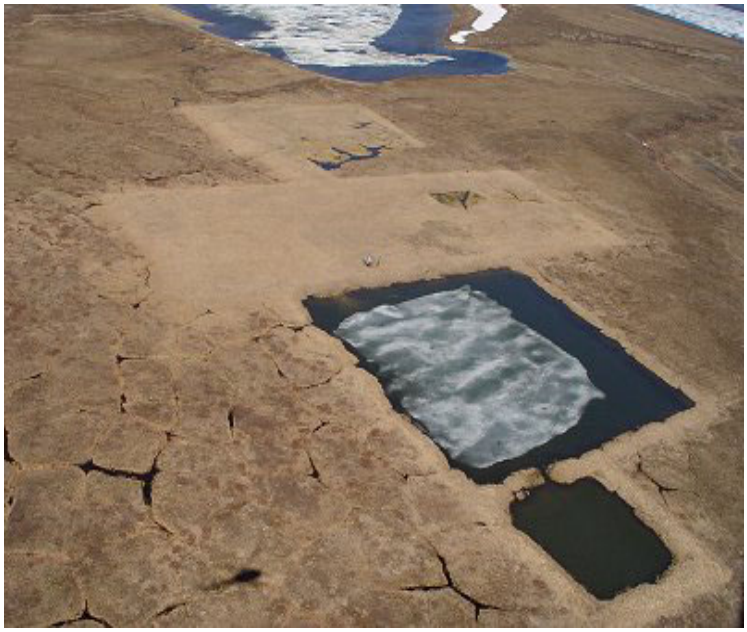

Figure 4: Koluktak #1, a thick pad drill site, typifies one of the designs by Husky under the USGS contract.

NPR-A became a test bed not just for oil and gas exploration practices in the Arctic, but also presented a significant opportunity to test Arctic-engineering practices. Nearly every site has a variation as different technologies were tried. Pads were constructed either as a thick pad (5 feet of material), thin pad (2 feet of material) or a all-season pad (5 feet thick underlain by 2-inch high density Styrofoam). Both types allowed for insulation between the surface of the pad and the permafrost.

With the passage of the Interior Appropriations Act of December 1980 the NPR-A was opened to private exploration. To expedite leasing, Congress made a determination that environmental studies and assessments from previous exploration coupled with the comprehensive land use studies 105(b) and 105(c) of the NPRPA of 1976 satisfied the NEPA requirements to produce an EIS for the first two lease sales. Congress also mandated that leasing in the NPR-A would be exempt from Federal Land Policy Management Act (FLPMA) planning (section 202) and wilderness studies (section 603).

Secretarial Order Nos. 3071 and 3087 were issued in 1982, giving the BLM responsibility for surface and sub-surface resources, including the custody of the wells. Four lease sales were held between 1982-1984, with the first three sales leasing 1.34 million acres for 106.6 million dollars. With the price of oil falling and exploration interest waning, the fourth sale received no bids. A fifth sale was planned, but cancelled due to lack of interest. The sales resulted in the drilling of one well, Brontosaurus, which is not considered a legacy well.

Recent Events

Industry's interest rejuvenated in the mid 1990s with the expansion of North Slope oil and gas infrastructure and the discovery of the Alpine oil field across the Colville River east of NPR-A. This interest prompted the BLM to prepare an Integrated Activity Plan - Environmental Impact Statement (IAP-EIS) for 4.6 million acres in the Northeast NPR-A. The 1998 EIS-IAP Record of Decision (ROD) allowed the BLM to offer 3.9 million acres for lease in a May 1999 lease sale. The sale resulted in leasing 867,721 acres. Another lease sale in the Northeast NPR-A in 2002 resulted in another 579,269 acres being leased. Map 2 displays the NPR-A planning boundaries. Seventeen new exploratory wells have been drilled on the leased tracts and commercial discoveries have been announced.

In June 2004, BLM offered 5.8 million acres in the Northwest NPR-A following the completion of another IAP-EIS. Industry offered bonus bids of $54 million for 1.4 million acres. In October 2004, TOTAL and EnCana relinquished 14 leases totaling 160,000 acres. More than 2.7 million acres are now under lease in the NPR-A.

The Alpine Satellite Development EIS, a joint effort between the federal and state agencies, would authorize ConocoPhillips Alaska, Inc. to develop five oil and gas discoveries on State lands and two fields in NPR-A adjacent to the Alpine Field mentioned earlier. In 2003, BLM let a contract to investigate the possibility of building staging areas with airstrips and storage pads to facilitate the development of infrastructure

in remote areas of the leased acreage. These staging areas have the potential to aid BLM's future remediation work associated with the legacy wells. Map 3 shows the relationship of usable airstrips to legacy wells.

BLM efforts

1976-1982

The USGS initiated cleanup of the early Navy wells in 1976 and contracted Husky Oil NPR Operations, Inc. to manage the project. The NPR-A was divided into four quadrants; Arctic Coastal Plain, Northwest, Southwest and Southeast. The cleanup effort focused on the solid and hazardous materials that were abandoned in place by the Navy and was carried out during two phases. After the spring thaw, crews would travel by helicopter to new sites to break down and transport the wastes to an accumulation site. If a suitable site was located, non-combustible solid wastes were buried. While the ground was still frozen in the spring, a Cat-Train crew retrieved wastes from storage sites established the previous summer. When hazardous materials (explosives and full drums of barite) were found they were transported to the storage site and hauled out the next spring. There is no evidence of anything hazardous remaining on site.

In 1978, an extensive cleanup occurred at East Oumalik, East Topagoruk, Knifeblade, Ikpikpuk (explosives), Skull Cliff, Square Lake, Titaluk, Topagoruk, and Wolf Creek. A total of $1.87 million dollars was spent and 7.2 million pounds of solid wastes were handled, stockpiled or burned. During 1979, cleanup occurred at Fish Creek, Grandstand, Gubik, Oumalik, and several other areas in which a well was planned but not drilled. Approximately $1.85 million dollars were spent and 24.1 million pounds were handled, stockpiled or burned. Field work for 1980 consisted of cleaning up what had been stockpiled and over-wintered from 1979. There is no recorded summary of cost or amount of wastes handled past 1979.

Figure 5: East Oumalik, once the site of major cleanup, is void of surficial debris. The cellar is visible in the mid-right portion of the photo.

In 1981, Husky discharged itself as contract operator and put out an invitation for bids. While waiting for bids, Husky continued its scheduled spring cleanup work at East Oumalik (Figure 5), Wolf Creek, Fish Creek, Kogru River, Meade, Oumalik, Square Lake, and Titaluk. The USGS did not fund additional work at Skull Cliff. The contract received no bids and Husky did not return. The USGS drilling program ceased in 1982.

1988-1995

BLM initiated its first major legacy wells project with the USGS in 1988-90 to study 28 wells. The final report addressed vegetation re-growth and water quality in the reserve pits. As a result, the Alaska Department of Environmental Conservation (ADEC) approved provisionally closing 27 of the 28 reserve pits. East Teshekpuk #1, due to solid wastes buried under the drill pad, is the only pit that did not meet the standards established (BLM, USGS, 1992). Awuna #1 was noted as having surficial concerns with the reserve pit undermining the existing Styrofoam that insulates the pad.

BLM also initiated a program in 1993 to clean up the 28 drill sites from the second exploration period, BLM prioritized the same wells studied for the reserve pit report in three categories for solid waste cleanup based on both the amount of material and potentially hazardous material. This program continued through 1995 and resulted in the removal of 600 pounds of steel from East Teshekpuk, numerous barrels from Ivotuk and light debris from five other wells. However, BLM did not have the funding for cleaning up 21 of the 28 well sites. These cleanup efforts were only focused on. The remaining 108 wells were not yet evaluated for condition, and some wells still had not been located.

1996-1999

In 1996, two BLM employees from the Northern Field Office noticed that Umiat #8 was seeping gas. BLM repaired the well by fitting it with a new valve the following summer. Subsequent to this incident, the Northern Field Office decided to examine the condition of some of the other wells in NPR-A.

During the summer of 1998 and 1999, BLM personnel attempted to locate Navy wells in NPR-A. Locating the wells from the first exploration period was difficult (Figure 6). Limited well information was primarily found in the USGS 305 reports or in non-field tested databases. In the 305 reports, the coordinates were unreliable as they were obtained prior to global positioning system (GPS) technology. Given the age of the wells and the lack of data concerning exact locations, it was not always known ahead of time what to look for. Costs from helicopter use increased because researchers did not know the answers to simple questions such as: Was there a wellhead? Is the well open to the atmosphere? Was casing even set? If casing was set, what height does it extend above the surface? Is it obscured by vegetation? Only a few sites were reached due to weather and extended search times. The BLM also looked for uncased holes and core tests to confirm that casing was not set and collected data on wells outside NPR-A which were drilled on federal lands. When wells were located, the GPS coordinates and the well site conditions were recorded.

Figure 6: Without accurate GPS coordinates, finding a well like Simpson Core #13 is nearly impossible.

Field work was typically conducted in cooperation with the USGS. With the abolishment of the Conservation Division of USGS in 1982, the NPR-A became under the sole jurisdiction of the BLM. The USGS still held funds for the final cleanup and termination of NPR-A operations, however, and the agencies had agreed in a 1988 MOU that BLM would support the USGS ongoing permafrost temperature monitoring studies. The USGS collects data from battery powered data-loggers on the surface and records temperatures at varying depths in the wellbores of 20 wells. A listing of the 20 wells USGS continues to use for collecting temperature data is listed in Appendix B. A geochemist for the USGS also collected oil and gas samples from live wells or natural seeps located on federal lands.

2000-2004

In August 2000, the BLM field crew removed numerous barrels, drill pipe and rubber tracking from a lake 17 miles Northwest of Inigok (Figure 7). The debris was moved by helicopter to Inigok and hauled by large aircraft from there to Fairbanks for disposal. The field crew also noted 6 wells that had pipe open to the surface, potentially allowing rain and snow melt to accumulate in the pipe, causing freezing and corrosion. They installed bull plugs on these wells during the 2001 field season.

Figure 7: Lake site 17 miles Northwest of Inigok prior to cleanup.

From 1999 – 2001 BLM combined existing knowledge from field notes and literature into a central database. This database contains information regarding surface conditions at the wellsites and information on the drilling, casing, and testing of all the legacy wells. It is updated as new data is identified or as conditions change. Wellbore diagrams were also created based on field observations and records in the literature. An example of the data maintained in the database for the wells is shown as Appendix C. Field work continued through the summer of 2003 after which all of the well sites had been either inspected or confirmed that the sites could not be located.

In 2001, a fabricated swedge for Simpson Core #31 was reported as leaking. The swedge and the wellhead above the swedge were removed and a new valve was installed. The leak did little damage as only a small amount of oil was discharged onto the tundra adjacent to a natural oil seep.

In 2002, Umiat #2 and #5 were plugged and abandoned by Corps of Engineers (COE). As the landowner, BLM remained on site throughout the duration of the project. The COE spent approximately $25 million plugging the two wells and remediating the soil which contained PCBs, diesel range organics, and barium (Ecology and Environment, Inc., 1993).

In 2003, the BLM let a contract to investigate potential staging areas as an option to help facilitate the lack of infrastructure in NPR-A. A contractor analyzed possible locations, pad designs, and construction materials to assist in the potential development of a staging area that can be used in plugging and remediation of the legacy wells and by industry for exploration.

After the 2004 field season, it was determined only eight wells pose a potential risk to the environment and building a staging area will be more costly than the benefits it will offer to the BLM legacy well efforts. It may, however be beneficial to continue to investigate the possibilities of a staging area as a tool to manage the NPR-A and to facilitate future exploration.

Figure 8: A temporary enclosure was built around Umiat #8, a live gas well, to circumvent the elements. To minimize surface impacts, plugging occurs during the winter.

In early 2004, the BLM plugged four wells at Umiat (Figure 8). The wells posed a potential threat to the health and safety of both the environment and the local human population. Umiat is regarded as the main hub for activities in southern NPR-A for fuel, recreation, and other activities as it is one of the few areas in this roadless environment that provides fuel, lodging, and meals.

Costs

BLM has estimated the cost of plugging and abandoning 37 legacy wells to exceed $40 million dollars. These costs only represent the cost to place cement plugs in the wellbores. The plugs designed for a well must; 1) eliminate the well's potential to allow oil and gas to flow to the surface and 2) prevent any sub-surface movement of oil and gas that would adversely impact sub-surface resources or interfere with future development operations.

The BLM cost estimates are based on recent experience in Umiat and data gathered regarding mobilizing equipment and camps on Alaska's North Slope but must be

recognized as rough estimates. Costs can increase significantly if the downhole well conditions pose difficulties that are not apparent from the surface (e.g. collapsed casing, junk in hole, lost circulation). The cost estimates also do not represent the costs associated with removing barrels, piping, pilings, and other remnants of the legacy well exploration activity. These "solid wastes" pose no identified risk to surface resources other than being an unsightly reminder of the early exploration and the potential costs to remove these items have not been evaluated in any detail.

Seven legacy wells have been plugged to date. One well is Square Lake #1 where several downhole plugs are documented up to a depth of 700 feet. No surface plug was documented but field investigations by BLM personnel revealed the existence of a cement surface plug. Based on professional judgment, this well is considered plugged. Two were plugged in Umiat by the COE at a cost of $4.1 million in 2002. Umiat #2 and #5 had down-hole problems that could not be predicted or identified until the well plugging work commenced. The COE actually spent closer to $25 million after including the cost of soil remediation. With no down-hole problems and simplified plugging procedures, the BLM plugged the other four at a total cost of $1.4 million in 2004. Umiat has several unique conditions that contributed to keeping the costs to plug the wells relatively low including the maintained airstrip, fuel supply and camp facilities. These facilities greatly facilitated moving equipment to the wellsites and conducting the subsequent work but are not found at the other legacy wellsites. Another factor that makes plugging wells simpler at Umiat is the shallow depth of the wells.

With the remaining legacy wells situated in more remote locations of NPR-A and some of the wells being significantly deeper, the costs to plug them will be much greater than at Umiat. Fuel, camp facilities, and equipment will have to be brought to the sites overland by Cat-Train. The average cost to plug the Umiat wells has thus far been $920,000, although the BLM was able to plug four of them for an average cost of $350,000. The average cost to plug the remaining wells in the more remote locations of NPR-A outside of Umiat is expected to exceed $1,000,000 each. Below is an example of the cost estimate to plug a Simpson Peninsula well. The example also illustrates how wells in the same area can be plugged for a reduced incremental cost;

Cost to plug	Simpson Core #26	Incremental Well	7 Total Wells
Mobilization	$500,000	$40,000	$740,000
Demobilization	$250,000	$25,000	$400,000
Equipment	$750,000	$125,000	$1,500,000
Labor	$150,000	$83,300	$650,000
Lodging	$75,000	$42,500	$330,000
Materials	$750,000	$66,700	$1,150,000
Disposal	$30,700	$30,700	$215,000
Sampling	$3,000	$3,000	$21,000
Total	$2,508,700	$416,200	$5,006,000

Given the expense to plug the legacy wells and the relatively low risk associated with leaving the wells in their current condition, consideration must be given to waiting until infrastructure improves in NPR-A. The highest risk wells are on the Simpson Peninsula on tracts that were leased in the June 2004 lease sale. This area has good potential for infrastructure to be developed in the next five to ten years and improved infrastructure would save the BLM several million dollars.

The first infrastructure in NPR-A is likely to be built during the winter of 2007 with the construction of CD-6, a gravel pad with a road to the current Alpine Facilities. The proposed gravel road is within 8 miles of the Fish Creek #1. Infrastructure in other areas of the Petroleum Reserve, e.g. Simpson Peninsula, is not likely for at least another five to ten years.

Another option is to allow the lessees to plug the wells. Language included in the proposed Energy Bill would allow operators to plug orphan and legacy wells and recover 115% of the costs incurred. Lessees may be able to recover costs through rental/royalty reduction which would not require BLM funding. Current lessees have expressed interest in this. This, too, provides an opportunity to get the wells plugged at a reduced cost since, while drilling exploration wells, the lessees would have the advantage of having the right equipment and personnel in the area. More than two-thirds of the legacy wells and 7 of the 8 higher priority wells, are on or adjacent to leased lands. The lands around J.W. Dalton #1 (Figure 9) are not available for leasing.

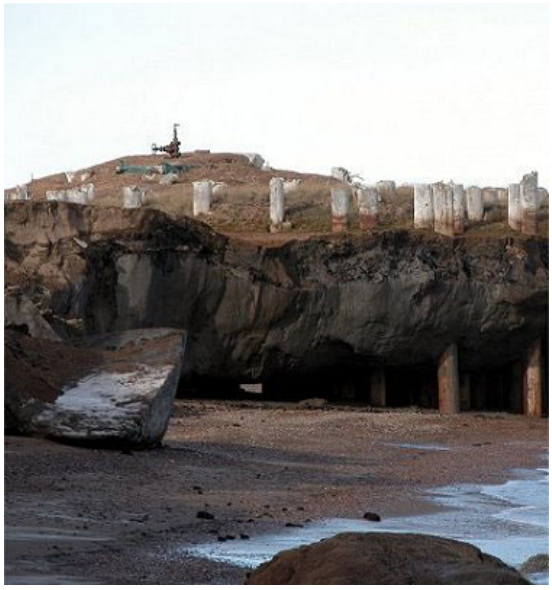

Figure 9: J.W. Dalton #1 wellhead in relation to the advancing beach head. Fall 2004.

As noted above, the cost estimates for plugging the wells do not include removing old equipment or surface restoration. Based on some limited estimates, the additional time, transportation, and equipment needed for removal of solid waste and surface remediation could be in excess of $50 million. These costs would vary depending on the amount of solid waste removed, level of site investigation, and the degree to which the sites are remediated.

Conclusion

The Umiat wells, due to their proximity to the Colville River, the high level of activity in the area, their presence on an active lease and a known oil field, and the identified hazardous materials in the area, have been identified as the highest legacy well priority. At present, Umiat wells #2 and #5 have been successfully plugged and abandoned. Umiat wells #3, #4, #8, and #10 have also been plugged, but all surface objects have been left in place. There are three more Umiat wells that are open to the known oil reservoir that should be plugged next. With plugging equipment already staged at Umiat, it is in the BLM's best interest to plug the remaining of these three wells at the earliest possible time. The cost to finish the Umiat plugging is estimated to be $500,000.

The well that poses the next greatest risk is the J.W. Dalton #1 well on the coast of the Arctic Ocean. The well is properly plugged up to 1,580 feet but is filled with diesel fuel above the plug. Recent erosion has washed away over 200 feet of beach and continued erosion threatens to wash away the drill pad and the reserve pit. There is the possibility that the wave action directly on the well will cause the well casing to fail which would spill hundreds of barrels of diesel fuel into the Arctic Ocean. Limited sampling in 1989 found elevated heavy metal presence in the pit (chromium, zinc, cobalt, and barium). Further sampling is warranted and removal of contaminated soils may be necessary to prevent the soil from washing into the ocean. The cost to plug the well is estimated to be approximately $1,000,000. The cost to remove and dispose of the contaminated dirt in the reserve pit is estimated to be $4,000,000.

The other wells that represent some risk are the four Simpson wells that flow oil. The wells are not currently leaking, but if the surface equipment corrodes or is otherwise damaged, oil would flow onto the tundra. There are also 3 wells in the immediate area that could be plugged for a relatively small additional cost if plugged at the same time. The cost to plug these 7 wells is $5,000,000.

Due to the remoteness of many of the wells, and the high costs associated with plugging, the BLM recommends no action on the remaining low risk wells until better infrastructure is in place. Additionally, any effort to remove the equipment, barrels, and pipe that have been left behind at some of the wellsites is very difficult to justify unless some potential risk of harm is identified. Some would view these locations as unsightly but, given the costs that would be incurred, it makes sense to wait until a better infrastructure is in place before addressing this relatively benign situation. It is also recommended that BLM continue to monitor the coastal wells on an annual basis and the remaining wells on a three-year schedule to identify emerging risks and keep records current.

Bibliography

Burruss, Robert C., Timothy S. Collett, and Paul G. Lillis. *USGS Open-File Report 03-041*. 11 Feb. 2003. United States Geological Survey. 7 Sept. 2004 <http://pubs.usgs.gov/of/2003/of03-041/text.htm>.

Collins, Florence R., Harlan R. Bergquist, Max C. Brewer, and Gates L. George, U.S. Geological Survey. *Test Wells, Umiat Area, Alaska; Geological Survey Professional Paper 305-B.* Washington: United States Government Printing Office, 1958. 135 p.

Collins, Florence R., and Harlan R. Bergquist, U.S. Geological Survey. *Test Wells, Topagoruk Area, Alaska; Geological Survey Professional Paper 305-D.* Washington: United States Government Printing Office, 1958. 49 p.

Collins, Florence R., and Harlan R. Bergquist, U.S. Geological Survey. *Test Wells, Meade and Kaolak Areas, Alaska; Geological Survey Professional Paper 305-F*. Washington: United States Government Printing Office, 1958. 35 p.

Collins, Florence R., and Harlan R. Bergquist, U.S. Geological Survey. *Test Wells, Square Lake and Wolf Creek Areas, Alaska; Geological Survey Professional Paper 305-H*. Washington: United States Government Printing Office, 1959. 61 p.

Collins, Florence R., and Max C. Brewer, U.S. Geological Survey. *Core Tests and Test Wells Barrow Area, Alaska; Geological Survey Professional Paper 305-K.* Washington: United States Government Printing Office, 1961. 75 p.

Ecology and Environment, Inc. for U.S. Army Corps of Engineers, Alaska District. *Draft 1998 Field Investigation Report Former Umiat Air Force Station Umiat, Alaska*. Anchorage, 1999. Ch 3.

Gryc, George, U.S. Geological Survey. *Geology and Exploration of the National Petroleum Reserve in Alaska, 1974 to 1982; Geological Survey Professional Paper 1399.* Washington: United States Government Printing Office, 1988. 940 p.

Houseknecht, David. *Petroleum Source Rocks and Coal, a Core Workshop*. 2001. U. S. Geological Survey,. 7 Sept. 2004 <http://pubs.usgs.gov/of/2004/1283/shortcourseb.pdf>.

Husky Oil NPR Operations for U.S. Geological Survey. *Clean up & Environmental Rehabilitation*. Unpublished report, 1983. 31 p.

Husky Oil NPR Operations for U.S. Geological Survey. *Design and Construction of the Awuna Wellsite*. Unpublished report, 1983. 13 p.

Husky Oil NPR Operations for U.S. Geological Survey. *Design and Construction of the Inigok Wellsite*. Unpublished report, 1983. 18 p.

Husky Oil NPR Operations for U.S. Geological Survey. *Design and Construction of the Lisburne Wellsite*. Unpublished report, 1983. 26 p.

Husky Oil NPR Operations for U.S. Geological Survey. *Design and Construction of the North Inigok Wellsite*. Unpublished report, 1983. 10 p.

Husky Oil NPR Operations for U.S. Geological Survey. *Design and Construction of the Seabee Wellsite*. Unpublished report, 1983. 14 p.

Husky Oil NPR Operations for U.S. Geological Survey. *Design of NPRA Winter Drilling Pads, 1976-1978*. Unpublished report, 1983. 9 p.

Husky Oil NPR Operations for U.S. Geological Survey. *Design of NPRA Winter Drilling Pads, 1979-1981*. Unpublished report, 1983. 9 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Atigaru Point No. 1*. Unpublished report, 1983. 51 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Awuna Test Well No.1.* Unpublished report, 1983. 106 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Drew Point Test Well No. 1*. Unpublished report, 1983. 60 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, East Simpson Test Well No. 1*. Unpublished report, 1983. 56 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, East Simpson Test Well No. 2*. Unpublished report, 1982. 51 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, East Teshekpuk No.1.* Unpublished report, 1982. 56 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Ikpikpuk Test Well No.1.* Unpublished report, 1983. 124 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Inigok Test Well No.1.* Unpublished report, 1982. 170 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, J.W. Dalton*. Unpublished report, 1982. 168 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Koluktak Test Well No.1.* Unpublished report, 1983. 36 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Kugrua Test Well No.1.* Unpublished report, 1982. 76 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Kuyanak Test Well No.1.* Unpublished report, 1982. 50 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Lisburne Test Well No.1.* Unpublished report, 1983. 130 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, North Inigok Test Well No.1.* Unpublished report, 1982. 53 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, North Kalikpik Test Well No.1.* Unpublished report, 1982. 47 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Peard Test Well No.1.* Unpublished report, 1982. 63 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Seabee Test Well No.1.* Unpublished report, 1983. 134 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, South Harrison Bay No.1.* Unpublished report, 1983. 46 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, South Meade Test Well No. 1.* Unpublished report, 1982. 97 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, South Simpson No. 1.* Unpublished report, 1983. 43 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Tulageak Test Well No.1.* Unpublished report, 1982. 36 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Tunalik Test Well No.1.* Unpublished report, 1980. 142 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Walakpa Test Well No.1.* Unpublished report, 1982. 53 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, Walakpa Test Well No.2.* Unpublished report, 1982. 52 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, West Dease Test Well No.1.* Unpublished report, 1982. 43 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, West Fish Creek No.1.* Unpublished report, 1982. 56 p.

Husky Oil NPR Operations for U.S. Geological Survey. *History of Drilling Operations, W.T. Foran No.1.* Unpublished report, 1983. 46 p.

Leach, J. S. and Reser, J. L., Tetra Tech Inc. *Well History U.S.N. Cape Halkett 16N-2W-1 Naval Petroleum Reserve No. 4, Alaska*. Unpublished report, 1975. 109 p.

Reed, John C., U.S. Geological Survey. *Part 1, History of the Exploration; Geological Survey Professional Paper 301*. Washington: United States Government Printing Office, 1958. 192 p.

Robinson, Florence M., and Florence R. Collins, U.S. Geological Survey. *Core Test, Sentinel Hill Area and Test Well Fish Creek Area, Alaska; Geological Survey Professional Paper 305-I.* Washington: United States Government Printing Office, 1959. 36 p.

Robinson, Florence M., and Harlan R. Bergquist, U.S. Geological Survey. *Core Tests and Test Wells Oumalik Area, Alaska; Geological Survey Professional Paper 305-A.* Washington: United States Government Printing Office, 1956. 70 p.

Robinson, Florence M., and Harlan R. Bergquist, U.S. Geological Survey. *Titaluk and Knifeblade Areas, Alaska; Geological Survey Professional Paper 305-G*. Washington: United States Government Printing Office, 1959. 45 p.

Robinson, Florence M., and Max C. Brewer, U.S. Geological Survey. *Core Tests Simpson Area, Alaska; Geological Survey Professional Paper 305-L*. Washington: United States Government Printing Office, 1964. 85 p.

Robinson, Florence M., and S. T. Yuster U.S. Geological Survey. *Test Wells Simpson Area, Alaska; Geological Survey Professional Paper 305-J*. Washington: United States Government Printing Office, 1959. 45 p.

U.S. Army Corps of Engineers, Alaska District, 2003. *Former Umiat Air Station and Umiat Test Wells in National Petroleum Reserve 4*. Elmendorf, AK. 34 p.

U.S. Bureau of Land Management, U.S. Geological Survey. *Environmental Status of 28 Oil and Gas Exploration Areas of Operation in the National Petroleum Reserve-Alaska*. Bureau of Land Management Publication, Anchorage, AK. 1992. 99 p.


Arctic Ocean
Barrow
Barrow Gas Field
Tuläageak
West Dease
East Simpson #1
East Simpson #2
Simpson Cores 13-15, 26-31
North Simpson
Simpson
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Kuyanak
Brontosaurus
Drew Point
J.W. Dalton
W.T. Foran / Livehorse
Peard
Wainwright
South Simpson
Cape Halkett
Kugrua
Topagoruk
Teshekpuk Lake
East Teshekpuk
Atigaru
South Meade
East Topagoruk
North Kalikpik
South Harrison Bay
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Ikpikpuk
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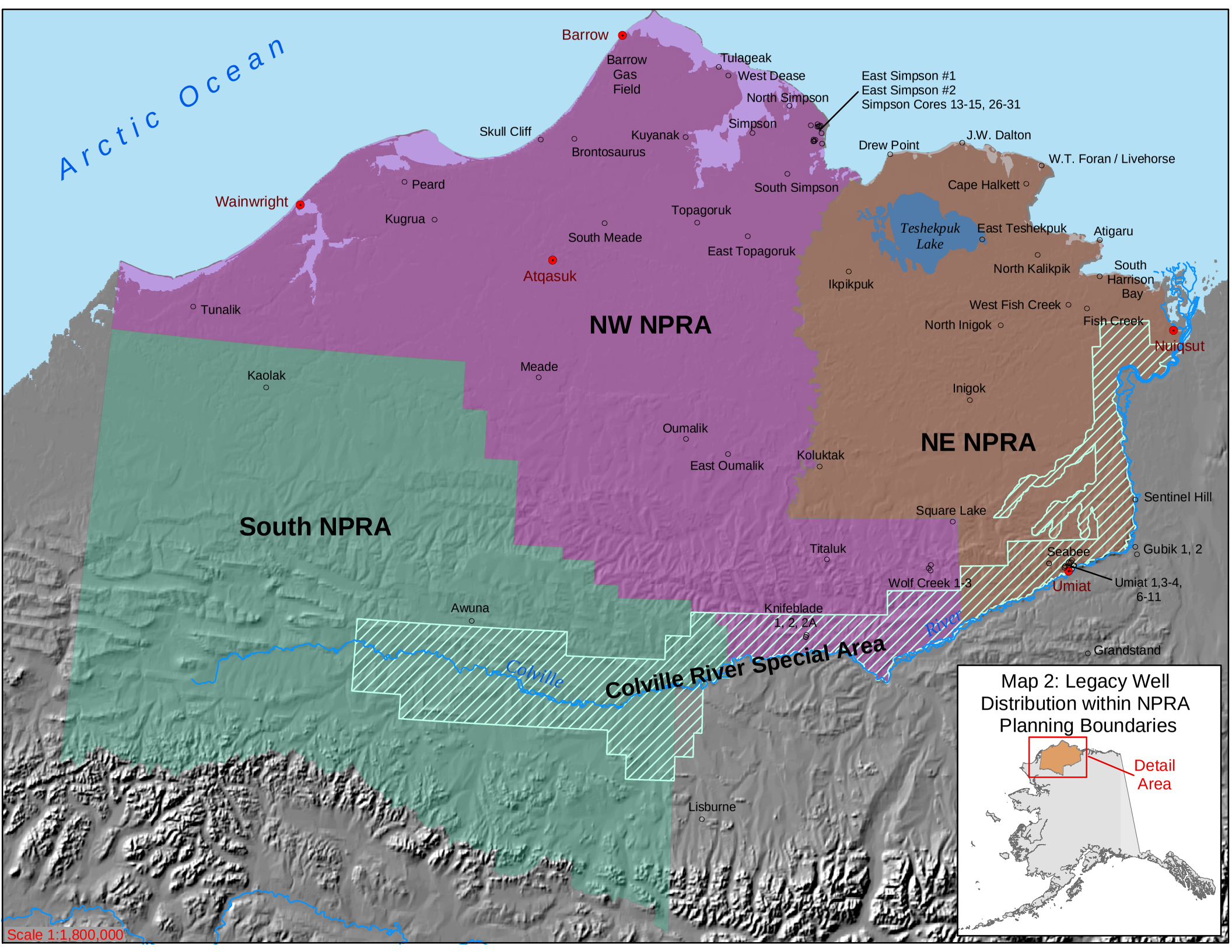
Umiat 1,3-4, 6-11
Awuna
Knifeblade 1, 2, 2A
Colville River
Grandstand
Lisburne
Map 1: NPRA Legacy Well Location Map
Detail Area
Scale 1:1,800,000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Oumalik
NE NPRA
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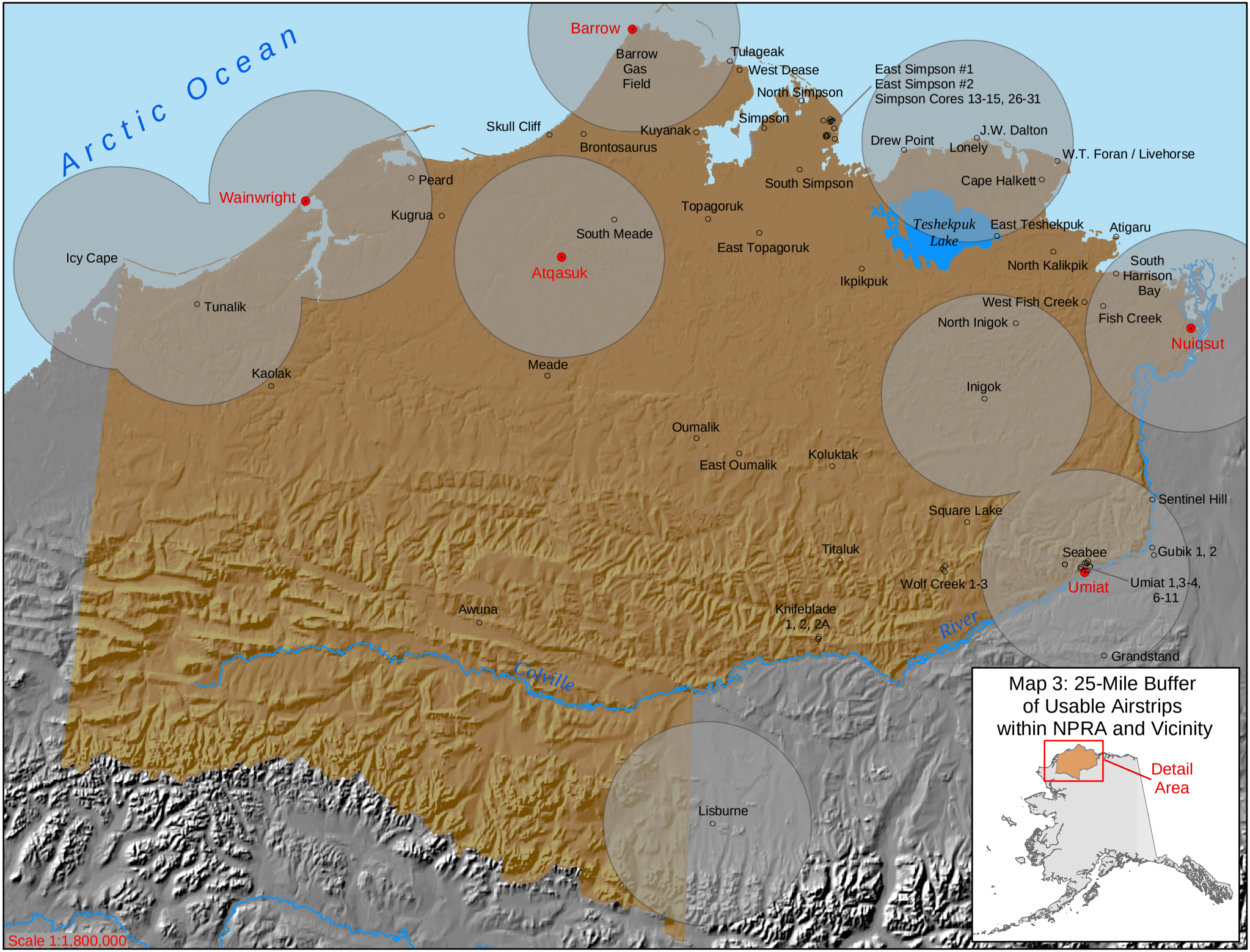
Umiat 1,3-4, 6-11
Awuna
Knifeblade 1, 2, 2A
Colville River
Colville River Special Area
Grandstand
Lisburne
Map 2: Legacy Well Distribution within NPRA Planning Boundaries
Detail Area
Scale 1:1,800,000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Atqasuk
Icy Cape
North Kalikpik
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Umiat 1,3-4, 6-11
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Colville River
Grandstand
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Scale 1:1,800,000
Map 3: 25-Mile Buffer of Usable Airstrips within NPRA and Vicinity
Detail Area

APPENDIX A

Well Ranking

Before identifying the risks associated with the legacy wells, the BLM reviewed the list of wells to determine ownership and well status. A break-down of the 136 is as follows:

- 39 are uncased core holes that did not penetrate oil and gas zone, have naturally collapsed, and have blended harmlessly into the landscape.
- 33 were either transferred to the North Slope Borough through the Barrow Gas Field Act of 1984 or were conveyed to Arctic Slope Regional Corporation.
- 20 wells are being used to by the United States Geological Survey (USGS) for climatic temperature and permafrost studies (see Appendix B).
- 7 wells are plugged (6 at Umiat, Square Lake #1).
- 37 wells that require further evaluation.

Following the 2003 field season, members of the legacy well team met to determine criteria for evaluating the risks associated with the above mentioned 37 wells and ranking each well based on these risks. For consistency purposes, the group devised a series of questions to assist in the process:

- What is the condition of the existing pad and pits? (e.g. any indication of contamination?)
- Is there any solid waste (old equipment, piping, barrels, etc.) or potential hazardous material conditions?
- Did the hole penetrate known oil or gas stratigraphy?
- Did the well have oil or gas shows, and if so, is the well capable of flowing?
- Is the well near human activity, and if so are there conditions present that pose a risk to people?
- What is the condition of the wellhead? Have there been any previous problems or repair work? Does the well (in its current condition) pose a risk?
- What is the surficial condition of the existing pad and pits? Is contamination a possibility?
- Does the presence of unplugged wells have the potential to negatively impact anticipated development?

Each of the 37 wells are described in the following pages. Descriptions are ordered in terms of the ranked priority based on the above stated criteria and the concerns identified.

Umiat Wells

The early Navy wells in Umiat rank at the top of the list. Umiat is located on the north bank of the Colville River 60 miles upstream from the village of Nuiqsut. Natural oil seeps were discovered at Umiat by early explorers. This discovery, along with the detection of seeps at Cape Simpson, motivated the U.S. Navy to conduct a drilling program. Umiat and the Simpson Peninsula were the primary exploration targets in the mid to late 1940s. The Umiat seeps are still visible today. Their locations tend to shift over time. The seeps are currently active in Umiat Lake, just off the northeast portion of the airstrip and in a channel of the Colville River.

The 11 Umiat wells were drilled from 1945 to 1952. These wells are a concern for BLM due to their close proximity to human activity. Umiat is not a village, but serves as a camp for seismic crews: Umiat is also the primary hub for recreational activities in eastern NPR-A and western CAMA (Central Arctic Management Area). It has one of the few airstrips on the North Slope maintained year-round and is a popular location for purchasing aircraft fuel (Figure 10). The Umiat wells all lie within 2 miles of the camp, with the exception of Umiat #1, which is approximately 5 miles to the northwest.

Figure 10: Umiat is a popular stopping point for aircraft.

After the U.S. Navy completed drilling operations in 1952, the U.S. Air Force assumed custodial responsibility at Umiat and established the 8,000-acre Umiat Air Force Station. In June of 1955 the Air Force returned the facility to the U.S. Navy. Since Umiat is a Formerly Used Defense Site (FUDS), the U.S. Army Corp of Engineers (COE) is responsible for the reduction of risk associated with surficial hazardous, toxic, and radioactive waste. The COE has conducted extensive surface investigations in the area and has identified contaminants at several locations. Varying levels of barium, petroleum, pesticides, and polychlorinated biphenyl (PCB) were identified at the wellsites, the landfill, and the nearby slough (U.S. Army COE, 2003). Contamination levels were compared to the Alaska Department of Environmental cleanup standards and were used as a screening level. The COE has conducted site remediation at two well locations, Umiat #2 and #5 (Figure 11), and has plans to continue the surface clean up. To facilitate site remediation, the COE plugged wells #2 and #5 in 2002, but plugging the remainder of the wells is the responsibility of the BLM. Four wells were plugged by the BLM in the Winter/Spring of 2004.

Figure 11: Umiat #2 and #5 prior to removal and remediation. Photo taken August 2001.

After the removal of wellheads #2 and #5, the State of Alaska Historic Preservation Office asked the BLM to leave all existing surface objects (wellheads, tanks, pipes) onsite and intact, because of their potential historic value. The Alaska Heritage Resources Survey (AHRS) included the Umiat wells in an inventory of all reported historic and prehistoric sites within the State of Alaska. This inventory of cultural resources includes objects, structures, buildings, sites, districts, and travel routes generally more than 50 years old. Therefore, the wellheads for the other Umiat wells will be left in place after plugging is completed.

Umiat #9

Umiat #9 was spudded in June 1951 and completed seven months later in January 1952. The well is cased to a depth of 1,257 feet. The purpose of the well was to determine the western extent of the producing field. It was also the first hole in which oil-based muds were used in the Umiat area. Umiat #9 is located about half mile to the north-northwest of the Seabee pad.

Figure 12: Aerial view of Umiat #9.

The drill hole penetrated several known oil and gas formations; Ninuluk, Chandler, Grandstand and Topagoruk. Hydrocarbon shows were prevalent within both the Grandstand and the Topagoruk formations. Multiple sands were perforated and tested. Production exceeded 217 barrels per day, thus seemingly showing the benefit of using an oil-based mud. However, the muds did not allow the different formations to be distinguished. Cement was used in an attempt to "plug back" and isolate individual formations. Samples were taken and sent to a Bureau of Mines lab where the chemical tracer (used during drilling) was measured and the various sandstone samples were examined. This allowed a study of the different lithologies be conducted. The tracer Aroclor used in the well has raised concerns about PCB contamination. However, the well was allowed to flow for seven weeks at 200 barrels per day (Robinson and Bergquist, 1956) prior to shutting it in, possibly purging the potential contaminants. As it stands today, insufficient energy exists in the reservoir for the well to flow to surface and the wellhead has no pressure on it.

The well is located within the Northeast planning boundary (see Map 2) on lease AA-081726. There is some potential for future development to occur in the area within the next 20 years and the well has the potential to leak to surface if development occurs and may adversely affect future development.

Surficial wastes around Umiat #9 could present an issue. As was common with early Navy drilling, a gravel pad was not created. Wooden debris exists around the wellhead and there is a pile of drilling muds directly to the north which is void of vegetation (Figure 12). Samples taken by the COE from around the wellhead detected elevated levels of diesel range organics (DRO), residual range organics (RRO) and PCBs (U.S. Army COE, 2003).

The wellhead is equipped with two bull plugs, a flange and a 2 ¾-inch nipple. There are no fresh water aquifers in the area, but due to potential contaminants downhole and existing contaminants on the surface, the well does pose a risk to human health and the environment in its current condition.

Umiat #6

Umiat #6 was spudded August 1950 to test the southern limits of the Umiat anticline. The hole was drilled to a depth of 825 feet. The well was cased to 35 feet and a 42-foot cement plug was placed on the bottom of the well in order to stop water influx from sands at the base of the permafrost. The well encountered very poor shows in the Killik Tongue (Chandler Formation) and a productive sand in the upper Grandstand Formation. Oil recovered in open-hole pumping tests was produced at rates averaging 53 barrels of oil per day. Insufficient energy exists in the reservoir for the well to flow to surface and there are no fresh water aquifers present. Major caving of the hole occurred and the well was backfilled with mud (Robinson and Bergquist, 1956).

The well is located within the Northeast planning boundary (see Map 2) on lease AA-081726. There is some potential for future development to occur in the area within the next 20 years and the well has the potential to leak to surface if development occurs and may adversely affect future development.

The well lies about 500 feet to the northwest of a gravel spur road which connects the Colville River to the eastern edge of the Umiat airstrip. The well is located in wet tundra adjacent to an empty 55-gallon drum. The well is left open with 8 $^{5}/_{8}$-inch casing to the surface. It has no gauges, valves or a cover plate. Two thermistor protrude to the surface and rests on the lip of the casing. This well poses no threat to human health or the environment unless development occurs.

Umiat #7

Umiat #7 was drilled in 1951 to a depth of 1,384 feet, cased to 1,196 feet and completed as a dry hole. It was the southern most well drilled on the Umiat anticline. The objective was to further delineate the southern extent of the producing field. The well encountered residual hydrocarbons in the Chandler and Grandstand formations. Oil recovered in bailing tests was so minute that it was measured in gallons. The small amount of crude recovered in each test is indicative of residual oil staining. The sands encountered in Grandstand are downdip of the productive reservoir and are water bearing. Minor gas shows were encountered at 260 feet (Robinson and Bergquist, 1956).

Figure 13: Umiat #7 summer and winter photos.

The well is located within the Northeast planning boundary (see Map 2) on lease AA-081726. There is some potential for future development to occur in the area within the

next 20 years but since the well is located below the oil/water contact it has less potential to be adversely affected or affect future development.

The wellhead assembly consists of 7-inch casing (with collar) clamped inside 11 ¾-inch casing at a total height of 30 inches (Figure 13). Surrounding the open hole is wet tundra with no indication of remaining debris or other surficial issues. The hole poses no threat to humans or the environment. The well location is currently situated on Alaska Dept. of Transportation land that was transferred in 1966, but the well remains the property of the BLM.

Additional Umiat Work

Umiat has been a site of recent cleanup projects. The cleanup process began in 1994 with the removal of about 1,000 drums, some containing petroleum and transformer oil with PCBs, from the main gravel pad. Another 200 cubic yards of PCB-contaminated soil was removed in 1998 along with 60 cubic yards of lead-contaminated soils. In 2001, 50 cubic yards of PCB soil was excavated with an additional 10 cubic yards removed the following year by the Corps of Engineers (U.S. COE, 2003).

J.W. Dalton #1

J.W. Dalton #1 was drilled in 1979 to a depth of 9,367 feet. It is cased down to 8,898 feet and plugged back to 1,530 feet. (Husky Oil NPR Operations for U.S. Geological Survey-J.W. Dalton, 1982). The primary objective of the well was to determine if hydrocarbons were present within the Sadlerochit and Lisburne Groups. Gas shows were encountered in trace amounts in the Ivishak Formation, and the Lisburne and Endicott Group. Poor to good oil shows were discovered in the Ivishak Formation and in the Lisburne Group.

Figure 14: Photo of J.W. Dalton taken October 26, 2004. Soil cracking is occurring around the wellhead and the north and east side of the cellar is exposed.

A drillstem test of the Lisburne Group recovered 22 barrels of oily water (Gyrc, 1988). This well has been a USGS monitor well since its completion in 1979. Approximately 230 barrels of diesel fuel were placed downhole to act as a neutral medium for collecting wellbore temperatures.

Figure 15: J.W. Dalton wellhead with pilings. Photo was taken August 2000.

In the summer of 2004, warmer temperatures, wind, and wave action eroded 200 feet of the coastline adjacent to the well (Figures 14, 15). This erosion placed the J.W. Dalton #1 well and reserve pit precariously close

to the edge of the Arctic Ocean. As a result, casing is now exposed to a depth of 15 feet on the present day beach (Figure 16). The top of the diesel is approximately 60 feet below the present beach level. The reserve pit has been breached on the northwest corner from the advancing shoreline (Figure 17). The pit is known to contain chromium, cobalt, zinc, and barium. However, chromium, cobalt and zinc were detected in background levels, due to the east-west water movement into and out of the pit. Barium is a constituent of the drilling muds and is consolidated with other sediments (U.S. Bureau of Land Management, U.S. Geological Survey, 1992).

Figure 16: J.W. Dalton with exposed conductor (left), and rat hole (right). The mouse hole (not pictured) is completely exposed.

The well is located within the Northeast planning area (see Map 2), on a tract currently closed to leasing.

Figure 17: Aerial view of the breached reserve pit.

This well is in danger of becoming engulfed by the ocean. The diesel fuel in the well and reserve pit contaminants raises concerns. The concerns can be eliminated by pumping out the diesel, or displacing the diesel with water and adding a bridge plug and cement to close off the hole. The casing would be cut off below surface. The diesel would be disposed of at the nearest facility. If necessary, the reserve pit could be excavated down to remove contaminated soils, which would be placed into Super-Sacks and hauled out by Cat-Train for grinding and injection into a Class II well or other approved disposal site.

In its current condition, the well does not pose a threat to humans or the environment, but if the casing were to break in its exposed condition, the diesel fuel would, over time, leak into the ocean. The release of heavy metals from the reserve pit may pose an immediate risk to human health and the environment. The pit was sampled October 26, 2004, and results are pending.

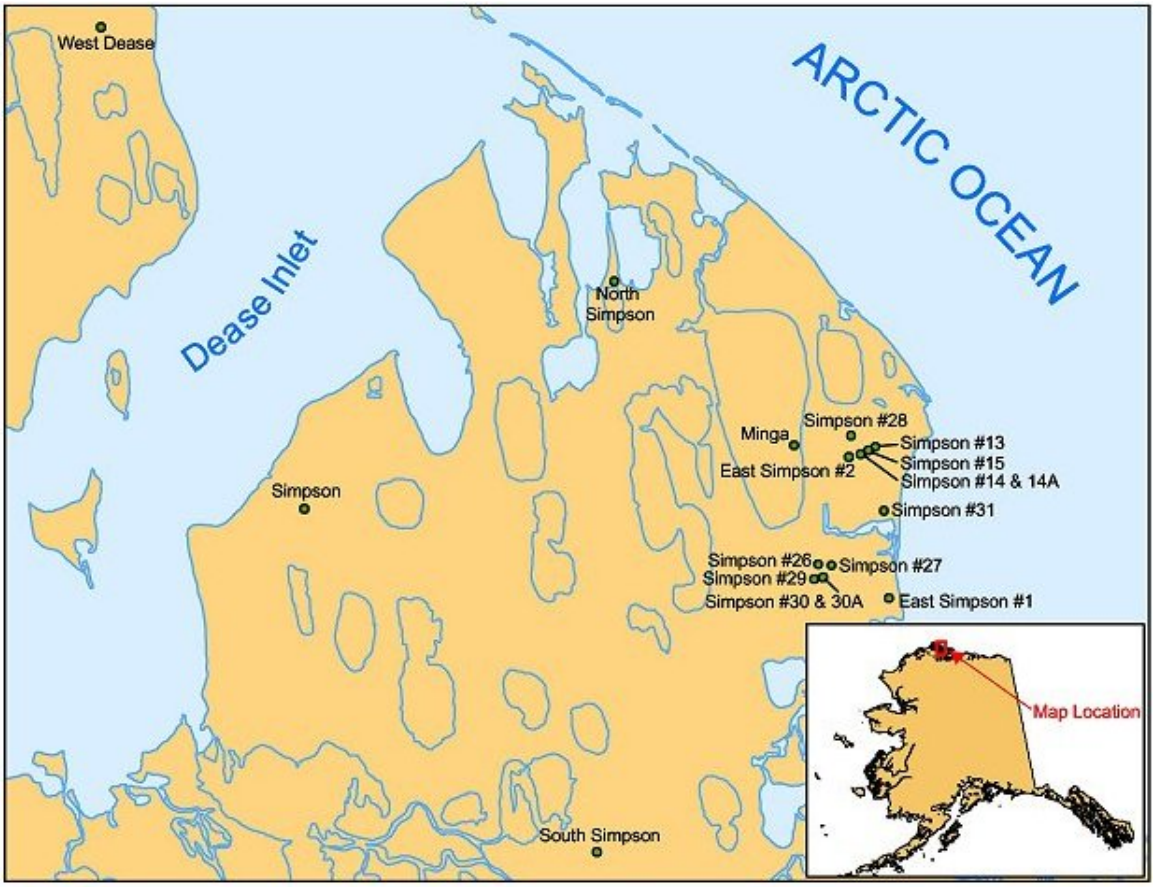


Figure 18: Simpson Peninsula showing well locations.

Simpson Core Test #26

Simpson Core Test #26 was drilled in the middle of one of the larger, active oil seeps in NPR-A (Figure 19). The Navy described this location as Seep 3. The hole reached a total depth of 1,171 feet and was cased to 350 feet. The well encountered one very poor gas show and one productive oil sand in the Ninuluk/Seabee undifferentiated formation. In production tests, the well flowed at rates averaging 110 barrels of oil per day (Robinson and Brewer, 1964). Other formations encountered include the Gubik, Seabee, and Grandstand Formations. Gas bubbles have been observed around the base of the casing since the 2000 field season. Bob Burruss of the USGS, sampled and analyzed gas from Simpson Core #27 which is part of the same oil field, located less than half mile to the east. His findings showed the gas to be biogenic methane indicating that microbial alteration (breakdowns) of the hydrocarbons has generated the gas. Additionally, oil sampled in the well was extremely biodegraded. Simpson Core #26 has a wellhead flanged to the casing, a 2-inch line pipe, and four wing valves and will likely flow oil if

Figure 19: The wellhead is located in the center of the photo. The green color liquid defines the area of active seepage. The orange color is oil-eating bacteria.

the valves are opened. Access to the wellhead is limited by the depth of oily-water surrounding its base (Figure 20). There are no concerns with contaminating fresh water aquifers if the well is left unplugged, but the well could potentially flow oil and cause damage to surface resources if the well equipment corrodes or, through human intervention, the well is opened or damaged.

The well is located within the Northwest planning boundary (see Map 2). The tract was recently leased, receiving a high bid of $7.51 per acre during the NW NPR-A lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since any development will likely target deeper, more productive formations.

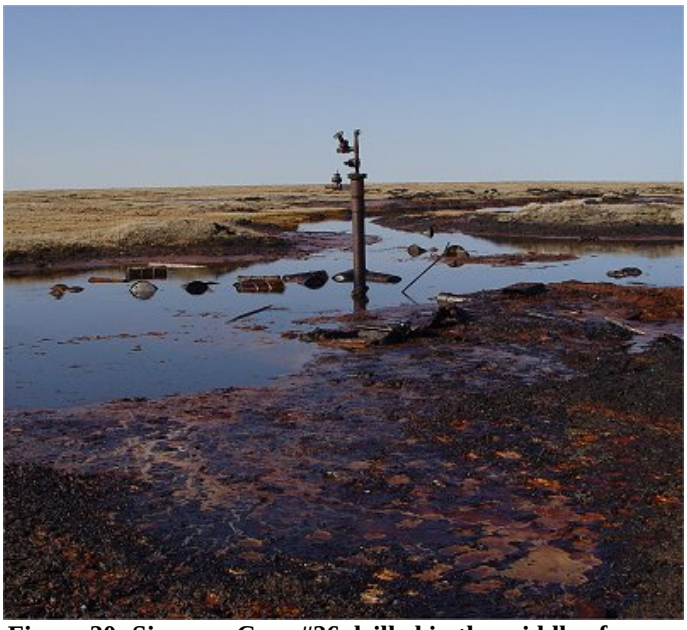


Figure 20: Simpson Core #26 drilled in the middle of an oil seep. Depth of the oily-water prohibits access to the wellhead.

The area around the wellhead looks to have been bulldozed in an attempt to collect the seeping oil. The scraped-up earth was then used to build berms around the depression. Light amounts of trash appear to have been buried in these berms. The Navy cleaned up the site in the late 70s, removing most of the drums and other debris, but solid wastes, including half barrels and other drums can be found in the wet tar that fills the depression.

Simpson Core Test #31

Simpson Core Test #31 is a shallow core test drilled in 1951 to a depth of 355 feet and cased to 101 feet. The objective of drilling was to collect a core to view the material at the bottom of the seep. The well does not meet standard oil and gas exploration well definitions. The casing is not cemented in place and the well is probably not capable of holding substantial pressure. The well encountered a few sands with shows and one productive sand in the Ninuluk/Seabee undifferentiated formation. In 65 hours of testing, this zone flowed oil to the surface at rates averaging 125 barrels and 2,000-4,000 cubic feet of gas per day. Flowing pressure was measured at 60

Figure 21: Simpson Core #31 is located within an active oil seep.

psi. The well also penetrated the Gubik and Seabee Formations, which were unproductive (Robinson and Brewer, 1964).

The well is located within the Northwest planning boundary (see Map 2). The tract was recently leased and received a high bid of $7.51 per acre during the NW NPR-A lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since any development will likely target deeper, more productive formations.

A drilling pad does not exist as the well was drilled in an active oil seep, which remains active today (Figure 21). The Simpson Peninsula contains few permanent settlements, but a multitude of summer camps. The well had been a source of fuel for the inhabitants as evidenced by a 10-foot extension pipe hooked up to the wing valve. The extension allowed for the oil to flow down the pipe and collect in a bucket. In 2000, BLM learned that oil was seeping out of a corroded swedge on the wellhead. The potential harm was mitigated by the fact oil was seeping into a natural oil seep. In June 2001, BLM spent $35,000 to remove the old wellhead and install a new master valve and needle valve. Oil and gas samples were taken by the USGS prior to the replacement.

There are no fresh water aquifers in the well so there are no risks to sub-surface resources but there are risks to surface resources if the well is left unplugged. Oil will flow to surface if the wellhead or casing corrodes or if the well is left open. There are no solid wastes or hazardous materials (besides the natural oil) that would present a concern or pose a risk to the health and safety of the land and people.

Simpson Core Test #30A

Simpson Core Test #30A is an oil well drilled in 1951 to a depth of 693 feet and cased to 152 feet. The well encountered some very poor gas shows and one productive sand in the Ninuluk/Seabee undifferentiated formation. The well was bailed and averaged oil rates of 6 barrels per day during bailing tests (Robinson and Brewer, 1964).

The well is located within the Northwest planning boundary (see Map 2). The tract was recently leased and received a high bid of $7.51 per acre during the NW NPR-A lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since any development will likely target deeper, more productive formations.

The wellhead consists of casing swedge, a nipple, and a brass gate valve and will flow oil to surface if the valve is opened. There are no sub-surface fresh water aquifers at risk. However, if the well is left unplugged it could pose a risk to surface resources. In its current state, oil could flow to surface if the well is damaged, corroded, or the valves are opened. Additionally, concerns have been raised regarding the bubbling around the base of the casing. When the valve is opened, the bubbling subsides. This indicates a small leak around the base of the casing or through a hole in the casing. The gas was sampled by the USGS and has been identified as reservoir-produced biogenic gas. While the well does pose a risk, it is mitigated by the fact that the well is drilled in an active, natural oil seep.

Simpson Core Test #30

Simpson Core Tests #30 and #30A were drilled about 100 feet apart in the same oil seep. The seep is part of the same regime that contains Cores #26 and #27. These wells were drilled to gain an understanding of the producing field limits and to help determine underlying structure. Simpson Core #30 is an oil well drilled in 1951 to a depth of 1,500 feet. No plugs were set and the well was cased to 102 ft. The hole encountered the same formations as Cores #26 and #27; Gubik, Seabee, undifferentiated Ninuluk/Seabee, and the Grandstand with a few poor gas shows and one productive sand in the Ninuluk/Seabee undifferentiated formation. Poor oil shows were also noted in the deeper Grandstand Formation. During production tests of the shallow oil sand the well was bailed at rates averaging 5 barrels of oil per day (Robinson and Brewer, 1964).

Figure 22: Light trash is present in the seep between Cores #30 and #30A.

The well is located within the Northwest planning boundary (see Map 2). The tract was recently leased and received a high bid of $7.51 per acre during the NW NPR-A lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since any development will likely target deeper, more productive formations.

The well was left with sheared, open casing above ground. Even though the well produced oil 50 years ago, it is static today. This suggests the hole has collapsed below the shallow casing. There are no fresh water aquifers in the well, however, since the well was drilled to a reservoir with sufficient energy to flow oil to surface, the well should probably be considered a risk if left unplugged. This well would probably be plugged by placing a 100 foot surface plug downhole to eliminate risks to surface resources. The potential risk is alleviated by the fact that the well is drilled in an active, natural oil seep. There is no drill pad as the Navy drilled within the seep and camped on the tundra. Some light trash is present in the seep between the Core #30 and Core #30A, which may prove difficult to clean (Figure 22). The well lies three tenths of a mile from both Core #26 and #27 (Figure 18).

Simpson Core Test #27

Simpson Core Test #27 is an oil well that was spudded February 1951 and completed one month later. Total depth of the well is 1,500 feet, with casing down to 102 feet. Oil was encountered at a depth of 380 feet and was bailed at a rate of 3 barrels per day. The core test encountered the same formations as Simpson Core Test #26, with a few very poor gas shows and one productive oil bearing sand in the Ninuluk/Seabee undifferentiated formation. Oil-based muds were used from the drilling depth of 325 to 661 feet. At that point the oil was displaced and the drilling crew resumed using water based muds.

Figure 23: There is no surface debris present at Simpson Core #27.

Additional crude was added downhole at a depth of 1,320 feet. The drill pipe was stuck and the two front derrick legs collapsed below the four-foot extension in an effort to free the pipe. The drilling muds in place were re-circulated during the repair process. In an attempt to free the pipe, 73 barrels of crude and 23 barrels of diesel were used to replace the muds and the pipe was worked free. The oil was gradually replaced by mud as the drilling continued, however, some oil remained in the hole after completion. The crude used downhole came from Simpson Core Test #26 (Robinson and Brewer, 1964). There are no fresh water aquifers in the well so there are no risks to sub-surface resources but there are risks to surface resources if the well is left unplugged. Oil could flow to surface if the well equipment corrodes, the well is damaged, or left open. This potential risk is mitigated by the fact that the well is drilled in an inactive, natural oil seep.

The well is located within the Northwest planning boundary (see Map 2). The tract was recently leased and received a high bid of $7.51 per acre during the NW NPR-A lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since any development will likely target deeper, more productive formations.

There is no existing pad. The wellhead consists of 8 $^{5}/_{8}$-inch casing, a flange and a brass gate valve. The casing was set in a small inactive oil seep. It will flow oil to surface if opened. There is no surface debris present at Core #27 (Figure 23). The well poses little threat to human health and the immediate environment around it in its current condition.

Simpson Core Test #29

Simpson Core Test #29 is a dry hole drilled in 1950 to a depth of 700 feet and cased to 152 feet. The purpose of the well was to determine the limits of the producing field encountered at Core #26. A very poor oil show was identified in the Seabee Formation. The productive sand present in the other Simpson Cores does not exist in this well. The test hole also penetrated the Gubik and Grandstand Formations. No oil was recovered from this well (Robinson and Brewer, 1964). The well is grouped higher on the priority list due to its close approximation to Simpson Cores #26, #27, #30 and #30A (Figure 18).

The well is located within the Northwest planning boundary (see Map 2). The tract was recently leased and received a high bid of $7.51 per acre during the NW NPR-A lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development if left unplugged since any development will likely target deeper, more productive formations.

The well was left with 8 ½-inch casing, open to the atmosphere at a height of 6 inches. Thermistor cables protrude from the casing. It is located in a four-by-four foot wooden

cellar filled with water. A drilling pad was never established. There is some light trash around the wellhead including drill pipe, and various sized wooden scraps. A small barrel pump and other small debris can be seen in the casing and within the cellar (Figure 24). This well poses no threat to the human population or the environment.

Figure 24: Simpson Core #29

Umiat #1

Umiat #1 was spud in 1945, and completed in 1946. Total depth reached was 6,005 feet and the well was cased to 685 feet. The well encountered residual hydrocarbons and a few poor gas shows in the Seabee, Ninuluk, Chandler, Grandstand, and Topagoruk Formations. The sands of the Grandstand were outside the productive area encountered by other Umiat wells, which are located five miles to the east. Oil recovered in bailing tests was so minute that it was measured in pints and officially recorded as a trace. Lab tests determined the oil to be of a different type of crude oil than that found in the productive Umiat wells (Robinson and Bergquist, 1956). The small amount of crude recovered in each test is indicative of residual oil staining. No fresh water aquifers exist in the Umiat area, so this well poses no threat to sub-surface water resources.

Figure 25: Umiat #1 is located about 5 miles from the Umiat airstrip.

There is no pressure on the wellhead and it is fitted with a blind plate, a 2-inch nipple and a brass gate valve (Figure 25). The well is located on an unleased tract at the crest of a hill that divides the north and south forks of Seabee Creek. Future development is unlikely because of its location outside the Umiat structure. Left unplugged, the well poses no threat to the environment and has no potential to adversely affect future development.

The surficial landscape is dominated by willows with the exception of three piles of drilling muds that are located to the east and north of the wellhead. Vegetation is absent on the slick, clay-type material. The COE tested the piles and found them to be contaminated with barium, which is not surprising given that barite is a common drilling fluid component. Through sampling, the COE determined the barium has not migrated down the hill and poses no danger to the Seabee Creek drainage (Ecology and Environment, 1999). There is no

indication of stressed vegetation down-gradient from the drill muds. Additionally, solid waste in the form of steel framing and scrap metal are near the wellhead. The solid wastes pose no threat but are unsightly.

Umiat #11

Umiat #11 was spud June 1952 and completed two months later. The well reached a total depth of 3,303 feet with 486 feet cased. One cement plug was placed at 440 feet. The objective was to test production possibilities of the Grandstand Formation on a fault that parallels the Umiat anticline. The well encountered residual hydrocarbons in the Seabee, Ninuluk, and Grandstand Formations but no oil or gas was recovered during production tests. The sands of the Grandstand were outside the productive area encountered by other Umiat wells, which are over one mile to the south.

The well is located within the Northeast planning boundary (see Map 2). The tract is located on lease AA-084141 but there is little possibility of the well interfering with future development due to its location outside the Umiat structure.

The well was drilled in the alluvial plain of Bearpaw Creek, 0.6 miles from Umiat #8. A drilling pad was never created as operations consisted of mounting the drill rig on a sled and then placing it on top of large timbers that were secured to pilings (Robinson and Bergquist, 1956). A pile of unvegetated drilling muds is present 30 feet west of the wellhead in between the wellhead and the creek. The wellhead consists of a 10 ¾-inch open-ended casing with a collar sticking up inside a 30-inch conductor that is filled with water. Minor wood debris can be found around the wellhead. The well poses no risk if left unplugged.

Wolf Creek Area

Three test wells were drilled in the Wolf Creek area. The wells were drilled in the early 1950s with the intent of testing the northwest-trending Wolf Creek anticline structure. Wolf Creek #1 and #3 (Figure 26) are located at the crest of a hill with about 250 feet of relief from the valley. Wolf Creek #2 is located about one and one-third miles north within the Wolf Creek valley. Wolf Creek #2 and #3 are open holes but Wolf Creek #1 is equipped with a wellhead.

Figure 26: Wolf Creek #1 after adding a new ball valve to the wellhead. August 2004.

Wolf Creek #1

Wolf Creek #1 is a gas well drilled in 1951 to 1,500 feet and cased to 48 feet. The well encountered very poor gas shows in the Killik Tongue and productive sands in the Grandstand Formation. The well produced at rates up to 881 MCFPD in open hole tests

of the Grandstand.

The well is equipped with a blind plate, a 2-inch nipple and a brass gate valve (Figure 26). There is a small gas leak in the threaded wellhead flange and, if the valve is opened, the well will flow about 10 MCFPD but the pressure is so low it does not register on a gauge. In its current condition, the well does not appear to pose a risk to surface or sub-surface resources.

The drill pad is shared with Wolf Creek #3. Throughout the pad, there are some wooden pilings, metal anchors and scrap metal. The scraps should not be considered hazardous in this remote region. The leaking gas is of minor concern, however given the weak gas pressure and remote location; the overall risk is very minimal.

Wolf Creek #2

Wolf Creek #2 is a dry hole. The well was drilled in 1951 to 1,618 feet and cased to 53 feet. It is located roughly 1 ¼ miles north of the other Wolf Creek test wells. The purpose of drilling was to determine if the gas-bearing sandstone beds previously encountered in Wolf Creek #1 would contain any oil. The records indicate a very poor gas show was encountered in the Killik Tongue but no oil or gas was recovered in production tests (Collins and Bergquist, 1959). The hole also penetrated the Seabee, Ninuluk, Chandler, and Grandstand Formations.

Figure 27: Wolf Creek #2 had casing cut off at ground level.

The well is located on an unleased tract within the Northwest planning area (see Map 2). No offers were received in the June 2004 lease sale for the tract and near-term development is unlikely.

The wellhead consists of a plate welded onto the 11 ¾-inch casing cut off at ground level (Figure 27). There is no existing drill pad. Solid wastes consist of a few empty 55-gallon drums upstream along the upper floodplain of the creek. The well poses no threat to surface or sub-surface resources and has no potential to adversely affect future development.

Wolf Creek #3

Wolf Creek #3 is a gas well. The well was drilled in 1952 to a depth of 3,760 feet and cased to 625 feet. It is deeper than the other two Wolf Creek wells because its primary purpose was to test the Grandstand Formation (the producing formation around Umiat, 35 miles to the west). The Grandstand Formation produced from four different sands. In

open hole flow tests of the well produced at rates up to 445 MCFPD. The gas appeared to be sufficient to supply a small camp, but not of commercial proportions (Collins and Bergquist, 1959). Two plugs were set in the well above the Grandstand Formation. The top of the shallowest plug is inside the casing at 554 feet. In addition to the Grandstand, the hole penetrated the Ninuluk, Chandler, and Topagoruk Formations. Upon abandonment, the hole was filled with oil-based drilling muds and left open to the environment. A total of 103 barrels of crude were used.

The well is located on an unleased tract within the Northwest planning area (see Map 2). No offers were received in the June 2004 lease sale for the tract and near-term development is unlikely. The well poses no threat to surface or sub-surface resources and has no potential to adversely affect future development.

The drill pad is shared with Wolf Creek #1. There is some minor debris at the site as noted in the Wolf Creek #1 description. The wellhead was cut off six inches from the ground surface. This allows seasonal precipitation to accrue in the hole and spill over the sides, but the well poses no threat to surface or sub-surface resources and has no potential to adversely affect future development.

Fish Creek #1

Fish Creek #1 was drilled by the Navy in 1949 near an oil seep. Total depth of the well was 7,020 feet. The well was plugged back to approximately 2,550 feet, drilled to a new total depth of 3,018 feet and cased to 3,017 feet. The well was drilled to test a large gravity anomaly that suggested the possible presence of petroleum-bearing rocks and some structural anomaly that might be a trap for oil. Very poor oil shows were identified in the Topagoruk Formation at depths from 5,550 - 6,000 feet and a productive sand was reported at 3,000 feet. The well is not a flowing well but was pump-tested at rates averaging 12 barrels of oil per day through a gravel-packed completion. It also produced a small amount of methane gas. The hole encountered the Gubik, Shrader Bluff, Tuluvak, and Seabee Formations.

Figure 28: Fish Creek #1 with concrete cellar.

Current condition of the wellhead is that it has no pressure at surface and consists of two wing valves and a master valve. The well is located within the Northeast planning area (see Map 2) on lease AA-081857 where, in 2004, ConocoPhillips Alaska Inc. drilled an exploratory well within seven miles. The target of the exploration is in the Upper Jurassic at depth of approximately 8,000 feet and it is not likely that this unplugged well will adversely affect development in the area. The recent Alpine Satellites EIS approves oil and gas development in this area. ConocoPhillips has proposed roads and a drilling pad less than eight miles from this well and will likely be

producing by 2008. Given the low level of risk, the plugging of this well should be postponed until infrastructure is established.

Surficially, there are still some solid wastes present. The drilling pad and cellar construction consists of concrete reinforced with steel matting. The concrete, matting, and pilings are still in place today, albeit heaved by permafrost (Figure 28). Several 55-gallon trash drums filled with debris are located off the concrete pad. Other light debris is also present within 500 feet of the pad.

The oil seep is located about 1.5 miles to the southwest of the well site and is inactive. The USGS 305-I reports the dimension of the seep as being 6' x 20' (Florence and Brewer, 1964), however, BLM personnel located the seep in 2001 and noted its dimension to be 3' x 6'.

Simpson Core Test #28

Simpson Core Test #28 was drilled in September 1950 to a total depth of 2,505 feet and cased to 110 feet. Despite the depth, the hole did not encounter any hydrocarbon shows.

The well is located within the Northwest planning area (see Map 2) on a recently leased tract that received a high bid of $21.51 per acre during the lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since the well did not penetrate productive zones and future development will likely target deeper, more productive formations.

A drill pad does not exist, however a large area of disturbance is visible. The wellhead consists of open casing inside a wooden cellar. There is considerable solid waste near the well. These include: numerous metal pilings, drill pipe, large wood fragments (spool, plywood, timbers), and some partially crushed drums. The solid wastes are unsightly, but pose no threat to humans or the environment.

Simpson Core Test #13

Simpson Core Test #13 was drilled in the summer of 1949. It was a relatively shallow test and did not generate any significant oil or gas shows. The well encountered residual hydrocarbons in the Seabee and Grandstand Formations at depths of 1,079 - 1,084 and 1,138 - 1,148 feet (Robinson and Brewer, 1964). No oil or gas was recovered during production tests. The well is over three miles north of the Simpson Core wells that penetrated productive Grandstand sands. Total depth of the well reached 1,438 feet. The top 26 feet are cased and the hole was filled with water-based drilling mud. Fresh water aquifers were not encountered.

The well is located within the Northwest planning area (see Map 2) on a recently leased tract that received a high bid of $21.51 per acre during the lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since the well did not penetrate productive zones and future development will likely target deeper, more productive formations.

A drilling pad does not exist. Seven-inch casing was cut off at ground level and is very difficult to locate. The well is open to the atmosphere. There is no solid waste, nor is there anything hazardous regarding this location. It should not be considered a risk to surface or sub-surface resources.

Simpson Core Test #15

Simpson Core Test #15 was drilled in August 1949 near an active oil seep. The well was drilled to a total depth of 900 feet and cased to 18 feet. The well encountered only residual hydrocarbons in the Ninuluk/Seabee and Grandstand Formations (Robinson and Brewer, 1964). No oil or gas was recovered during well tests. Additionally, fresh water aquifers were not encountered.

Figure 29: Simpson Core #15 is open to the atmosphere.

The well is located within the Northwest planning area (see Map 2) on a recently leased tract that received a high bid of $21.51 per acre during the lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since the well did not penetrate productive zones and future development will likely target deeper, more productive formations.

There is no existing pad. The well was drilled about $^{1}/_{8}$ of a mile north of a natural seep. The well consists of open ended casing with a height of 18 inches (Figure 29). The area is clean with no solid waste. This well poses no risks to the environment or human activities.

Simpson Core Test #14

Simpson Core Test #14 was drilled in 1949 to a depth of 290 feet. The records do not clearly state how much casing was run but the well was left with casing above ground open to the atmosphere. Its present day location lies within 1000 feet to the west of an active oil seep. The well was not drilled deep enough to encounter the hydrocarbon stained sands evident in the Simpson Core #14A well.

The well is located within the Northwest planning area (see Map 2) on a recently leased tract that received a high bid of $21.51 per acre during the lease sale of 2004. Exploration and development in the area is a distinct possibility within the next 20 years. This shallow well did not penetrate any hydrocarbon bearing zones and poses no risk to surface or sub-surface resources, nor does it have the potential to adversely impact future development.

Simpson Core Test #14A

Simpson Core #14A was drilled in 1949 to a depth of 1,270 feet and casing was set to a depth of 32 feet. The well encountered only residual hydrocarbons in the Ninuluk/Seabee and Grandstand Formations. No oil or gas was recovered during tests (Robinson and Brewer, 1964) and fresh water aquifers are not present. Present day location of the well is approximately 1000 feet to the west of an active oil seep.

The well is located within the Northwest planning area (see Map 2) on a recently leased tract that received a high bid of $21.51 per acre during the lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since the well did not penetrate productive zones and future development will likely target deeper, more productive formations.

Figure 30: Simpson Core Tests #14 and #14A.

Surficially, it is best to consider both Core #14 and #14A together. A drilling pad does not exist, the wellheads are non-threatening, and there are no solid wastes. There is some discrepancy between the USGS 305-L report and the BLM field findings in terms of the wellheads. According to the report, Core #14A was uncased and the casing for Core #14 was cut off at ground level. In 2002, BLM discovered both holes side-by-side with open casing extending upwards 24 inches from the ground surface (Figure 30). The site was last visited in August 2002. This well does not pose any concern and should not be considered a risk to surface or sub-surface resources.

East Simpson #2

East Simpson #2 was drilled in 1977 to 7,505 feet and cased to 6,427 feet. Five cement plugs were set, with the top of the shallowest plug set at 1,997 feet. The primary objective of the well was to test the Ivishak Sandstone where it onlaps the Pre-Devonian age basement rock (Husky Oil NPR Operations for U.S. Geological Survey, 1982). Small scale faulting was found between the wells in the area, possibly accounting for the thin section representing the Sadlerochit Formation. The well encountered very poor oil shows at 6,000 feet in the Torok Formation and Endicott age sandstones were cored with poor porosity and dead oil shows. The well is officially listed as a dry hole. Upon completion of the production tests, the well was plugged back to 1,997 feet and filled with approximately 280 barrels of diesel to facilitate permafrost temperature measurements. However with East Simpson #1 less than five miles away, the USGS has no plans to use this well for temperature monitoring.

The well is located within the Northwest planning area (see Map 2) on a recently leased tract that received a high bid of $21.51 per acre during the lease sale of 2004. Exploration and development is a distinct possibility within the next 20 years but it is unlikely this

well will have an adverse impact on development. If this exploration and development establishes infrastructure nearby, it would greatly facilitate plugging this well and significantly reduce costs.

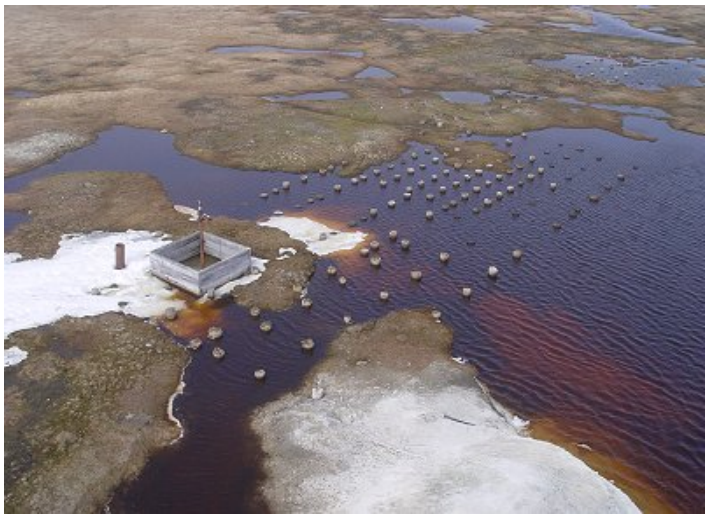


Figure 31: East Simpson #2 is partially submerged during the spring thaw. Photo taken June 2003.

The wellhead consists of a casing head, side gate valve, a master gate valve, and a needle valve. The drilling pad is of the thin pad variety and is slowly being reclaimed by natural processes. Exposed pilings stick up a height of two feet from the surface, but no other objects needing removal are present (Figure 31). The cellar is a wooden 12' x 12' with standing water. With the existing plugs and the static condition of the well, there is no risk to surface or sub-surface resources.

Kaolak #1

Kaolak #1 lies in the northwest portion of NPR-A and is considered one of the more remote well sites within the reserve. Kaolak #1 was drilled in 1951 to a depth of 6,952 feet and casing was set to 1,000 feet. Drilling served two purposes, to determine the presence of any reservoir characteristics, and to determine if oil or gas shows were present in this remote portion of the reserve. The site was chosen based on a seismograph survey in 1950 that identified an anticline at this location. The intent was to drill to a depth of 8,000 feet, but a windstorm destroyed the derrick. After the storm, the hole was abandoned due to unsatisfactory oil and gas shows. Findings indicated some very poor oil and gas shows in the Chandler Formation and very poor shows in the Topagoruk Formation. Gas shows were attributed to association with the coal beds (Collins and Bergquist, 1958). Upon abandonment, no plugs were set and the hole was filled with heavy muds.

Figure 32: Kaolak #1 with cabin on the drill pad.

The well is located on an unleased tract, in Southern NPR-A (see Map 2) where a lease sale is scheduled for 2008. Exploration and development in the area is a possibility within

the next 20 years, but since this well did not penetrate productive oil and gas zones it will not have an adverse impact.

There are no major surface issues. The working area is still visible due to a multitude of wooden pilings around the wellhead and a cabin on the north end of the pad (Figure 32). Off the pad, the area is clean. The wellhead is missing its upper components. All that remains is the top flange above the base plate and the casing spool, leaving 11 ¾-inch casing open to the environment. The well is left with a casing head and is open to atmosphere. The wellsite is 45 miles southwest Wainwright, which is the nearest community. There are no hazardous materials or anything that would pose a risk to the general health and safety of the land. The cabin may be a concern, but dealing with the situation is outside the scope of this report.

Meade #1

Meade #1 is a gas well drilled to a depth of 5,305 feet in 1950. The well was cased to 2,785 feet and two cement plugs were set, with the top of the shallowest plug tagged at 2,783 feet inside the casing. The well encountered some gas shows in one productive sand within the Grandstand Formation. The gas tested at rates up to 1.1 MMCFPD during openhole flow tests of the sand at 2,949 - 2,969 feet. The well is estimated to have gas reserves of 10 BCF. Gas pockets are relatively common in this portion of NPR-A due in large part to the underlying coal.

At one point while conducting tests, some problems were encountered while attempting to pull a testing tool out of the hole; a ball-peen hammer was inadvertently dropped downhole, causing the tubing to stick. The tubing could not be freed and as a result, it twisted off leaving tubing in the hole. When the lost tubing could not be pulled out, heavy muds were pumped downhole and the well was abandoned (Collins and Bergquist, 1958).

The well is located within the Northwest planning area (see Map 2). The well is adjacent to a recently leased tract that received a high bid of $10.26 per acre during the 2004 lease sale. Exploration and development is a distinct possibility within the next 20 years and has the potential to target the Grandstand Formation. If left unplugged the well has no potential to adversely affect future development.

There is no pad present at Meade #1. Several pilings and light trash are present, but overall is pretty clean. The wellhead is at ground level and consists of an open flange bolted to the top of the casing (Figure 33). This differs from the Navy reports that indicate the wellhead was abandoned in place. There is no record as to why it was removed. A BLM field crew bailed the hole and discovered a swedge and 2-inch needle valve junked downhole. This site is very remote (30 miles south of Atqasuk) and since the gas zones are currently isolated below the cement plugs there is a limited risk of adverse impacts to surface or sub-surface resources.

Figure 33: Meade #1 wellhead.

Titaluk #1

Titaluk #1 was drilled in 1951 to a depth of 4,020 feet and is a dry hole. The well was drilled on the end of an anticline to test the oil and gas potential of formations within the Nanushuk Group. A few very poor oil and gas shows were encountered in the Grandstand and Topagoruk Formations, but no oil or gas was recovered during multiple production tests. The Ninuluk and Chandler Formations were also encountered, but with no shows. One cement plug was set at 3,471 feet. The placement of this plug is curious since the shows (albeit poor) were reportedly discovered above this level (Robinson and Bergquist, 1959). The well remains in a static condition.

Figure 34: Titaluk #1 wellhead with wooden cellar.

Titaluk #1 is located within the Northwest planning area (see Map 2) on an unleased tract. No offers were received in the June 2004 lease sale. Near-term development is unlikely.

Surficially, there are no concerns with this well. The well is open, 10 ¾-inch casing above ground to a height of 3 feet. It is open to the atmosphere. The area of disturbance is completely revegetated with no solid waste concerns. The wooden cellar is in a state of disrepair and filled with water (Figure 34). The site is clean with very little debris. There are no hazardous conditions associated with the surface. The nearest settlement is Umiat, 60 miles to the east. The well poses no risks to human safety or the environment.

Skull Cliff Core Test #1

Skull Cliff Core Test #1 was drilled in 1947 to a depth of 779 feet and is a dry hole. No shows of oil or gas were reported while drilling through the Gubik, Grandstand, and Topagoruk Formations. While drilling to the target depth of 1,500 feet, the drillstring was lost in the hole and fishing attempts were unsuccessful in recovering the lost drillstring. The drilling mud was bailed down to the top of the fish and the remainder of the well was filled with diesel to 54 feet to prevent the wellbore from freezing and facilitate downhole temperature measurements. It is plausible that the casing could corrode and the diesel fuel could seep into the sub-surface strata, but since there are no fresh water zones in the well it is not considered a risk that would adversely impact sub-surface resources (Collins and Brewer, 1961).

The well is located within the Northeast planning area (see Map 2). The well lies adjacent to a recently leased tract that received a high bid of $10.77 per acre during the 2004 lease sale. Exploration and development is a distinct possibility within the next 20 years but it

is unlikely this well will have an adverse impact on development since industry will likely target deeper, productive formations.

An oil seep located at the base of Skull Cliff (land/ocean contact) was observed and documented in the 1940s, which influenced the Navy's decision to drill. BLM and USGS crews searched for the seep when they were in the area but nothing was found at the cliff/beach contact. However, another seep was reported in 1996 by a group from the Academy of Natural Sciences in a small gully about a mile to the east near the old radio tower site. This seep was never confirmed by BLM.

Surficially, a drill pad was never established, but a large area of activity is defined by roughly 200 drums, metal tracks, wood debris and various other scraps that litter the site (Figure 35). Presently, the well consists of open casing with a wooden plug shoved into it. There does not appear to be any stressed vegetation that might indicate a hazardous situation. Since the well did not encounter oil and gas formations and has no pressure at the surface, it is not considered a risk to surface resources. The only potential risk is that this site lies near a popular winter route between Barrow and Wainwright and it is possible for a snowmachine to impact the solid waste. Barrow is approximately 30 miles to the northeast and Wainwright is about 60 miles to the west.

Figure 35: Solid waste primarily in the form of empty drums litter the area around Skull Cliff Core Test. The wellhead is in the upper left portion of the photo.

Oumalik #1

Oumalik #1 was drilled in 1950 and is a dry hole. The well was drilled to a total depth of 11,872 feet and cased to 2,762 feet. It is the deepest well drilled by the early U.S. Navy program. The well location was positioned on the apex of the Oumalik Anticline and drilled with the intent of revealing the oil, gas, and water content of the penetrated stratigraphy. Two cement plugs were set, the shallowest of which is inside the casing at 2,543 feet. Very poor oil and gas shows were reported in the Grandstand Formation, and poor gas shows were noted in both the Topagoruk and Oumalik Formations. Small undetermined volumes of gas were recovered during multiple production tests. It is believed that the gas encountered was large enough to furnish fuel to a camp but not large enough to become a commercial producer. The gas encountered during drilling showed high gas pressure, but the sandstones in which they were observed are thin with low porosity (Robinson and Bergquist, 1956). The gas zones are currently isolated by the cement plugs and pose no risk to sub-surface resources.

The wellhead and a fabricated plate are below ground level. Two 2 ½-inch nipples open to the atmosphere are above ground to allow thermistor cables to be run into the well. The well is located within the Northwest planning area (see Map 2) on unleased tract that received no bids during the lease sale of 2004. Near-term development is unlikely. If left

unplugged, the well has no potential to adversely affect future development.

The existing pad contains piping from a ground refrigeration system similar to Topagoruk #1. The ground in this area is somewhat swampy with high susceptibility to permafrost melt. Circulating cooled diesel fuel in the pipes enabled drilling to occur without thawing the ground. The steel pilings were pulled from the ground to be reused at another site (Robinson and Bergquist, 1956). However, steel pipe filled with diesel fuel remains. A 6-inch circumference of stressed vegetation was noted around several of the low-cut pipes. Despite the diesel, the well does not pose a risk to any existing communities or habitation. It is in a remote location approximately 55 miles southeast of Atqasuk. Overall, the well poses no risk to people or the environment.

East Oumalik #1

East Oumalik #1 was drilled on a ridge that overlooks an unnamed tributary of the Oumalik River. Topographic relief is approximately 100 feet. The drill site is highly remote as the nearest village (Atqasuk) is 65 miles away. The well was drilled in 1951 and reached a total depth of 6,035 feet and is cased to 1,100 feet. It is a dry hole. Very poor oil and gas shows were reported in the Grandstand Formation and very poor gas shows were reported in Topagoruk Formation.

The well is located within the Northwest planning area (see Map 2) on an unleased tract that received no bids during the lease sale of 2004. It is unlikely that exploration and development will occur in the vicinity of this well in the near future. If left unplugged, the well has no potential to adversely affect future development.

The well was left with open casing below ground level and has thermistor cables protruding from inside the casing. The casing is marked by a 7-foot, ¾-inch pipe. The open pipe lies within a water-filled cellar. The standing water has produced numerous algae and other aquatic vegetation obscuring the wellbore. Surficial hazards consist of several 10-foot timbers and a few 4-foot pipes (probably rig anchors) sticking up out of the ground. The site is mostly overgrown with shrubs and appears to be relatively clean. The airstrip, incoming, and outgoing trail scars are obvious and can be used to navigate to the wellsite. There are no risks associated with the well in its current condition and was given this ranking due to its close proximity to Oumalik #1.

Topagoruk #1

Topagoruk #1 was drilled in 1951 to a depth of 7,154 feet and is a dry hole. The intent was to test a small, buried anticline and the various formations associated with it. The well was cased to 6,073 feet, plugged back to 6,175 feet and then drilled to a new total depth of 10,503 feet. Prior to re-drilling to total depth, approximately 250 barrels of crude oil from Cape Simpson were added downhole to help offset lost circulation and caving. Additionally, 20 barrels of diesel were added downhole during the drilling phase. No plugs exist in this well. The well is left with open casing to the surface and thermistor cables protruding from the casing (Figure 36). The well encountered the following stratigraphic units while drilling; Gubik, Grandstand, Topagoruk, and Oumalik Formations, Middle and Upper Jurassic rocks, Shublik Formation (Triassic age), Permian rocks, and Lower-Middle Devonian rocks. Hydrocarbon shows were limited to a few very poor gas shows in the Oumalik Formation. No oil or gas was recovered during

multiple production tests (Collins and Bergquist, 1958). The well penetrated no fresh water aquifers and does not represent a threat to surface or sub-surface resources.

Figure 36: Topagoruk #1 casing on its side. When the casing was pulled out of the ground, thermistor cables were discovered.

The well is located within the Northwest planning area (see Map 2). It is adjacent to a recently leased tract, receiving a high bid of $50.00 per acre during the NW NPR-A lease sale of 2004. Exploration and development in the area is a distinct possibility within the next 20 years but since this well did not penetrate productive oil and gas zones it will not have an adverse impact.

There is not a visible pad, but rather an area of disturbance. Disturbance stretches $^1/_4$ mile in an east-west direction and $^1/_8$ of a mile in a north-south direction. Solid wastes exist in the form of piping remaining from a refrigeration system that circulated diesel to keep the permafrost frozen. A potential hazard exists because diesel still occupies the ground circulation lines. These lines stretch approximately 750 feet to the east, 250 feet to the north, and 100 feet to the south from the wellhead. Other debris on site include some large, partially-burned timbers, a water-filled wooden box (Figure 37) that resembles a cellar ($^1/_4$ mile east of the wellhead), and drilling muds. Atqasuk is the closest village approximately 30 miles to the southwest. The well is remote with the exception of a subsistence camp approximately one mile southwest of the wellhead along the Topagoruk River.

Figure 37: Drilling muds and a wooden box that resembles a cellar are located about ¼ mile east of the wellhead.

Topagoruk's wellhead consists of an open hole cut off at the ground surface with several thermistor cables. A thin piece of weathered metal fits around the cut-off casing to resemble a marker. The weathered metal has been smashed at the base and now lies bent in half on its side. Overall this site poses little hazard to the environment or human population.

East Topagoruk #1

East Topagoruk #1 was drilled on top of a small ridge in the Chipp River delta in 1951. It reached a total depth of 3,589 feet and is cased to 1,100 feet. The purpose of the well was to test an anticline with closure as well as test the fluid content of the permeable Cretaceous sandstone (Collins and Bergquist, 1958). A very poor gas show in the Topagoruk Formation is the only reported hydrocarbons encountered in the well and no oil or gas was recovered during multiple production tests. One cement plug was set in the

well at 1,049 feet.

The well is located within the Northwest planning area (see Map 2) on a recently leased tract. The tract receiving a high bid of $84.99 per acre during the NW NPR-A lease sale of 2004. Exploration and development in the vicinity of this well is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since the well did not penetrate productive zones and future development will likely target deeper formations.

A drill pad does not exist. There are a few rig anchors near the wellhead, but no other surficial debris. The current state of the wellhead is open-ended 10 ¾-inch casing. Casing height is three feet above the ground surface. It is housed in a small 9' x 9' water-filled cellar. The area is remote and poses no health and safety risks to humans or the environment.

Knifeblade Wells

There were three shallow test wells drilled in the Knifeblade Ridge area. Knifeblade #1 was drilled on the ridge at the head of a small stream, with wells 2 and 2A drilled about a mile downstream. The wells are in a highly remote location with Umiat being the nearest settlement, 65 miles to the east.

Knifeblade #1

Knifeblade #1 is a dry hole drilled in 1951. The well was drilled to a depth of 1,805 feet and cased to 1,211 feet. The purpose of the well was to test the oil and gas properties of the Grandstand and Tuktu Formations (Robinson and Bergquist, 1959). The well encountered very poor gas shows in the Killik Tongue of the Chandler Formation and very poor oil and gas shows in the Grandstand Formation.

The well is located on an unleased tract, in Southern NPR-A (see Map 2) where a lease sale is scheduled for 2008. It is unlikely that exploration and development will occur in the vicinity of this well in the near future. If left unplugged, the well has no potential to adversely affect future development.

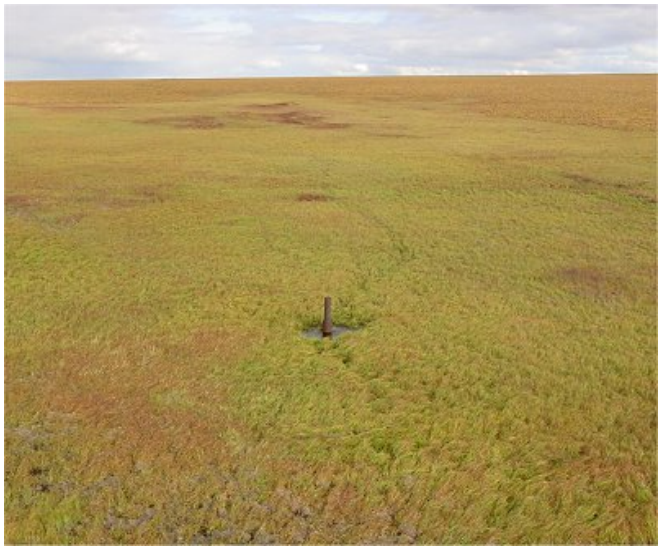


Figure 38: Knifeblade #1 is located in a marshy area at the headwaters of a small creek.

Surficially, there are no concerns associated with this well. A drill pad does not exist and the wellhead consists of open-ended casing (Figure 38). The wellhead is 8 $^{5}/_{8}$-inch pinup inside 11 by 12 ¼-inch collar. The plumb-bob hit solid at 12 feet. Total height for the well is about three feet. If this well is left in its current condition, it poses no risk to adversely impacting the surface or sub-surface resources.

Knifeblade #2

Knifeblade #2 is another dry hole drilled in 1951. It was the first of the three Knifeblade wells drilled and reached a total depth of 373 feet, cased to 45 feet, before being junked and abandoned. The purpose of the well was to test the oil and gas properties of the Grandstand and Tuktu Formations (Robinson and Bergquist, 1959). The well did not encounter any hydrocarbon shows.

The well is located on an unleased tract, in Southern NPR-A (see Map 2) where a lease sale is scheduled for 2008. It is unlikely that exploration and development will occur in the vicinity of this well in the near future. If left unplugged, the well has no potential to adversely affect future development.

Surficial issues are negligible. A drill pad does not exist and the wellhead consists of open-ended casing. There are approximately eight empty drums near Knifeblade #2 and #2A. The wells are highly remote and should not be considered a threat to the environment or human activity.

Knifeblade #2A

Knifeblade #2A, also drilled in 1951, reached a total depth of 1,805 feet and was cased to 38 feet. The well lies 28 feet to the north of Knifeblade #2A. The purpose of the well was to test the oil and gas properties of the Grandstand and Tuktu Formations (Robinson and Bergquist, 1959). Only very poor oil and gas shows were reported in the Grandstand Formation. The well was left with casing open to the atmosphere and poses no threat to surface or sub-surface resources in its current condition.

The well is located on an unleased tract, in Southern NPR-A (see Map 2) where a lease sale is scheduled for 2008. It is unlikely that exploration and development will occur in the vicinity of this well in the near future. If left unplugged, the well has no potential to adversely affect future development.

Simpson #1

Simpson #1 test well was drilled with a rotary rig in 1948 by the U.S. Navy. The well was drilled to a total depth of 7,002 feet and cased to 5,954 feet. The purpose of the well was to test the various formations of the Lower Cretaceous and Upper Jurassic rocks. The well encountered several very poor oil and gas shows and one productive gas sand in the Lower Jurassic at a depth of 6,183 - 6,193 feet. The well produced gas at rates up to 3.0 MMCFPD during open hole flow tests of this Lower Jurassic sand. The gas zones are currently isolated from other formations and the surface by two cement plugs set above the productive sand. The top of the shallowest plug is at 5,520 feet (Robinson and Yuster, 1959).

The well is located within the Northwest planning area (see Map 2) adjacent to recently leased tract that received a high bid of $7.51 per acre during the lease sale of 2004. Exploration and development in the vicinity of this well is a distinct possibility within the next 20 years and this exploration has the potential to target the Lower Jurassic. Since the well is partially plugged, however, it poses little risk to surface or sub-surface resources and will not likely adversely affect any future development.

The pad is highly visible and was constructed in the same fashion as Fish Creek #1 in which concrete was used as a working pad. Concrete was poured over a landing mat which was placed on pilings. As a result of ground movement from permafrost freeze/thaw cycles, the concrete has buckled in numerous places creating a partially-collapsed surface. This feature provides excellent shelter to small animals and rodents. Additionally, there is a small pile of drilling muds near the wellhead. The well was left equipped with a casing flange, spool w/ side bull plug, and another flange and nipple and is shut-in with no pressure at surface. The components past the flange have since been removed. Overall, the current condition of the site is non-threatening to the sparse human population and the surrounding environment.

North Simpson #1

North Simpson #1 was drilled in 1950 to a depth of 3,774 feet and cased to 109 feet. No hydrocarbon shows were reported during the drilling of this well as no sandstone was encountered (Robinson and Yuster, 1959). Upon completion, no plugs were set and the hole was filled back with muds.

The well is located within the Northwest planning area (see Map 2) adjacent to a recently leased tract that received a high bid of $12.76 per acre during the NW NPR-A lease sale of 2004. Exploration and development in the vicinity of this well is a distinct possibility within the next 20 years but it is unlikely this well will have an adverse impact on development since the well did not penetrate productive zones and future development will likely target deeper formations.

Figure 39: North Simpson #1 is partially submerged in the summer.

Surficially, the area is wet with the wellhead partially submerged intermittently throughout the summer (Figure 39). The drill site lies only a few miles from the Arctic Ocean. The work area is visible with metal pilings around the wellhead. It is unknown if additional solid wastes exist under water. The well was left with a bull plug installed on top of a swedge. The well is not near human activity, and does not pose a threat to surface or sub-surface resources.

South Simpson #1

South Simpson #1 was drilled in 1977. The purpose of the hole was to test the Sadlerochit Formation where it laps onto the south flank of the Barrow Arch. The well was drilled to 8,795 feet and cased to 7,206 feet. Reports show that poor gas shows were identified in the Nanushuk Group, Kingak Shale and Shublik Formation. Gas flowed at a rate of 75 MCFPD between 6,522 - 6,568 feet within the Kingak Shale (Gyrc, 1988). The gas contained more than 70% nitrogen. The origin of the high nitrogen content is unknown, but appears to be a localized phenomenon (Burruss, 2003). Sandstone tongues

(Simpson sand) within the Kingak Shale in the Simpson and Barrow localities are known to display good gas reservoir quality (Houseknecht 2001). Poor oil shows were discovered in the Nanushuk Group and Shublik and Torok Formations. Drill stem tests did not recover any oil.

Figure 40: South Simpson #1 had its cellar backfilled with silt, consequently burying the casing head.

The well is located within the Northwest planning area (see Map 2) on a recently leased tract that received a high bid of $5.01 per acre during the lease sale of 2004. Exploration and development is a distinct possibility in the near future since the well is properly plugged it will have no adverse impacts on development.

Surficially, the pad and pits are in good shape. The cellar has been backfilled with silt which resulted in the burial of the casing head (Figure 40). Above the surface, the wellhead consists of a 4-inch line pipe and a master valve. The master valve is frozen in the open position. The needle valve previously located above the master valve no longer exists. Beneath the casing head the well is plugged to surface and has no potential to adversely effect surface or sub-surface resources. The wellhead stands about eight feet high. A plumb-bob was dropped and hit solid at 8 feet and stuck. It was subsequently lost. An old, stripped snowmachine sitting next to the wellhead is the only sizable object that would be considered solid waste. Overall, there is no risk associated with this well.

Inigok #1

Inigok #1 was drilled in 1979 to a depth of 20,102 feet and cased to 17,432 feet. The well objective was to test a structural/stratigraphic trap within the Sadlerochit and Lisburne Groups (Husky Oil NPR Operations for U.S. Geological Survey-Inigok, 1983). Some very poor gas shows were recorded in the Sag River, Nanushuk, and Endicott Group. Poor oil shows were reported for the Kingak Shale and Lisburne Group. The best shows were found in the base of the Torok Formation at 8,852 feet. No oil or gas was recovered during multiple production tests. The wellhead consists of three spools, each with a gate valve, a master valve, and a needle valve. Ten cement plugs were set in the well and it is plugged to surface.

The well is located within the Northeast planning area (see Map 2) on a recently leased tract that received a high bid of $20.34 per acre during the lease sale of 2002. Total E&P Incorporated drilled an exploratory well 15 miles north of Inigok #1 and used the gravel

pad and airstrip near the well for staging areas and a camp. It would be fairly simple to remove the wellhead but the well has no potential to adversely affect surface or sub-surface resources. Additionally, the well poses no threat to adversely affect future development.

Figure 41: Aerial view of Inigok #1. The drill pad and reserve pit are visible in the top of photograph. A road leads from the apron of the airstrip to the drilling pad.

Inigok #1 is one of the few logistical centers within NPR-A (Figure 41). The airstrip and pad are maintained with no solid wastes present. The wellhead poses no risk, and with the plugs already in place, could be removed. Additionally, this well has a year-round airstrip and serves as a logistical base to various NPR-A activities.

USGS Monitored Wells

The USGS has used wells drilled in the NPR-A for collecting temperature data to better understand both the global temperature pattern and its effects on the permafrost. The wells that are currently used are properly plugged above the hydrocarbon bearing zones and into the well casing. The wells are filled with diesel fuel down to the shallowest plug at depths ranging from 1,500 - 3,000 feet. For a list of wells see Appendix B. The program began in 1958 and will continue for the foreseeable future. After this project ends, the wells will have the diesel extracted and the well will be properly plugged to surface. Diesel is a non-corrosive agent, and even if the casing should corrode there would be no impact to the surface resources and minimal impact on the sub-surface resources as there are no known fresh water aquifers in NPR-A.

The following wells are monitor wells with surficial issues. It is difficult to establish a rank since the wells are sufficiently plugged. The cleanup priority is difficult to determine as the primary threat lies with wells having downhole issues. However, political concerns could influence the timing in which the surface issues are dealt.

East Teshekpuk #1

East Teshekpuk #1 was spudded in March 1976. The well was drilled to a depth of 10,664 feet. It is an active USGS monitor well that was properly plugged. The top of the shallowest plug is located at 2,400 feet. From that point to the surface, the hole is filled with diesel fuel. With the well properly plugged and diesel fuel being a non-corrosive agent, there is no downhole issue with the well at this time but there are solid wastes buried on site that may warrant removal.

East Teshekpuk #1 was drilled on a small peninsula on the southeast side of Teshekpuk Lake. The southern shore of the peninsula is protected from the prevailing northerly winds, however the north shore doesn't have the luxury of a barrier and is subject to erosion. Unfortunately, solid wastes from the camp and drilling operation were buried on the northern portion of the pad, possibly in the old reserve pit. The northern shore has been battered by numerous storms which have eroded the shoreline and exposed the solid wastes. The wastes are unsightly and potentially hazardous. While the nearest village of Nuiqsut is 52 miles to the southeast, Teshekpuk Lake is rich in subsistence resources and numerous summer cabins dot the lake's shoreline. It is possible that at the time of surficial restoration, the downhole could be pumped free of diesel and plugged to the surface.

Awuna #1

Awuna #1 was spudded February 1980 and completed April 1981. It is the only well drilled in the southwest portion of NPR-A and is 90 miles south-southwest of Atqasuk. Awuna is the most remote well in the entire petroleum reserve. The well was drilled to a total depth of 11,200 feet. Drilling was conducted over two consecutive winters. Ice roads and an ice airstrip were constructed for logistical support. The project cost approximately $6 million (Husky Oil NPR Operations-Awuna, pg 5).

Due to the orientation of the pad, the prevailing winds force wave action into the drilling pad, undermining the sands and silts which make up the pad. Below the sands and silts, Styrofoam was used to insulate the underlying permafrost. Wave action has eroded tens of feet into the drilling pad, exposing the Styrofoam, which consequently breaks loose and blows away. Wooden pilings exposed from erosion show how much attrition has taken place. Styrofoam can be seen all around the pad with pieces blown up to 5 miles away.

Figure 42: Awuna wellhead with exposed wooden pilings and Styrofoam.

Downhole, the well is in good shape with sufficient plugs. Diesel fuel fills the top 4,000 feet. The well is an USGS monitor well. Wellhead components are in working condition with no problems.

The immediate concern with this site is the blowing Styrofoam, but as the years progress erosion could become a major issue (Figure 42). The loose Styrofoam should be cleaned up and erosion progress should be monitored on an annual basis. It is also worth mentioning that the same type of scenario is unfolding at Tunalik #1 (another USGS well). Wave action from the reserve pit is beginning to

undermine Styrofoam from the drilling pad. Tunalik #1 differs from Awuna #1 in that prevailing wind direction does not force erosion in the direction of the wellhead.

Uncased Core Tests

There are thirty-nine uncased core test holes. These holes were typically left filled with drilling mud and abandoned without being plugged. Drilling depths ranged between 500 and 1,500 feet depending on the purpose of the test. By nature, core tests were drilled to test soils, permafrost, or lithologic units. They were not drilled for oil or gas exploration purposes and did not encounter hydrocarbons. Many of the cores are stored in the Alaska Geologic Materials Center (Figure 43). The BLM has examined the cores and they are extremely friable. It is likely that these uncased core holes have naturally collapsed and harmlessly blended into the environment. There is no surface indication of their location and BLM has been unsuccessful in locating them during several visits to their reported location. They do not pose any potential risks.

Figure 43: Core samples from Simpson Core Test #25, an uncased core test, are stored in the Alaska Geologic Materials Center.

Barrow Gas Wells

The Barrow Gas Field Act of 1984 (P.L. 98-366, 98 Stat. 468, July 17, 1984) allowed the U.S. Navy to transfer several wells to the North Slope Borough. The Navy drilled six shallow wells between 1953 and 1974 to test the natural gas potential. Between 1974 and 1982, 10 additional wells were drilled to help supplement the local gas supply. The wells were developed for use by the local government agencies and Barrow residents. The act conveyed the sub-surface estate, held by the federal government and any other interest therein, to the Arctic Slope Regional Corporation (ASRC). The BLM acknowledges the surface and sub-surface lands as conveyed and the Office of the Regional Solicitor has confirmed that the Transfer Act included the wells and well locations, and any liabilities associated with these wells are the responsibility of ASRC.

Plugged Wells

Square Lake #1

Square Lake #1 is a Navy well that was drilled to a depth of 3,984 feet. Its primary intent was to test the Cretaceous rocks in east-west trending anticline structure (305H pg 424). No significant shows of oil were found. Gas shows were encountered in various sandstone beds between 1,600 and 1,900 feet, but otherwise the hole was dry. Upon completion, four plugs were reported to be set with the upper plug at 728 feet, well above the gas shows. Two other plugs were reported to be set in the gas zone, spanning depths of 1,640 - 1,840 and 1865 - 1934 feet. In addition to the six plugs, water and mud fill the remaining distance to the surface (Collins and Berquist, 1959). Upon successive visits to the site, BLM field crews dropped a plumb-bob down the hole and hit a solid obstruction between 8 and 10 feet. Don Meares, Northern Field Office, visited the site in August 2003 with an underwater camera and determined the solid surface to be cement.

The Square Lake area is clean of debris with a few deadmen pilings (anchors) near the wellhead that could pose a ground hazard. The wellhead is open casing cut off at ground level.

Umiat #2 and #5

The Umiat #2 and #5 wells were plugged and abandoned in 2002 by the COE (Figure 44). The wells were drilled on a common four-acre pad in 1947 and 1951. The purpose of the wells was to test for producing lithologies and determine petroleum quantities. Umiat #2 penetrated the Gubik Formation, Nanushuk Group (Chandler and Grandstand Formations), Topagoruk Formation and Oumalik Formation. Problems with the drilling muds were encountered while drilling Umiat #2. Analysts determined that the fresh water drilling fluid caused formation damage and the Umiat #5 well was drilled adjacent to the #2 with a cable-tool rig. The well produced 400 barrels per day with the most productive sandstones in the lower Chandler and upper Grandstand. Below a depth of 1075 feet, 107 barrels of crude oil from both Umiat and Simpson were used as a drilling fluid, as well as 11 barrels of diesel fuel (Robinson and Bergquist, 1956).

Figure 44: Plugging operations at Umiat #5. March 2002.

In 2000, the Colville River threatened to erode both wellsites away. The COE took action under the FUDS program in the winter of 2001-2002 to plug, abandon and remove any surface features.

The concrete lined cellar of Umiat #2 and wooden platform from Umiat #5 were removed. Costs were approximately $25 million dollars due in part, to soil remediation. Approximately 30,000 tons of petroleum-contaminated soil was excavated. The soil was

transported on an ice road to the Umiat camp where it was thermally treated in a rotary kiln to remove petroleum residues. Small quantities of PCB contaminants were unexpectedly encountered after the excavation was completed. The source of the PCBs has been linked back to the #5 well and the fluids used downhole. The ever-shifting Colville River continues to erode the north bank and is approximately 50 feet from the old wellbores. With the removal of hazardous soils, this site should not be considered a threat to humans or the environment.

Umiat #3

Umiat #3, also known as Umiat Core Test #1, was spudded in December 1946 and drilled to test some of the oil bearing zones encountered while drilling Umiat #1. The well was drilled on the northeast corner of Umiat Lake just below the hill from Umiat #4 (Figure 45). Umiat #3 penetrated the Gubik Formation and the Nanushuk Group. The Grandstand Formation within the Nanushuk Group is considered to be the primary source of oil between the depths of 258 and 514 feet. The hole produced 50 barrels per day prior to shutdown. The well was re-tested nine months later with production dropping to 24 barrels per day (Robinson and Bergquist, 1956). The wellhead consists of homemade components with a single water service type valve and is capped with a needle valve. There is no seeping present at this site, however seeps are common in the area, including an active seep in Umiat Lake.

Figure 45: The view from Umiat #4 looking southwest toward Umiat Lake and Umiat. Umiat #3 is located on the near shore of Umiat Lake.

An extensive piping system is still visible. The pipes probably supplied water during the drilling phase. They connect Umiat #3 to #4 which then follow the hill from Umiat #4 to a side channel of the Colville River. Their function was to either carry water to the drilling sites or assist during the well's production phase. The overall surficial conditions including the wellhead and piping, do not pose a threat to human health nor the environment. BLM plugged the well in May 2004.

Umiat #4

After encountering relatively poor oil shows on the first three wells, operations were suspended until 1950. Cable tool drilling rigs were introduced to determine if the fresh water muds had hindered the oil production in the previous wells (Robinson and Bergquist, 1956). Cable tool wells did not require the excavation of a cellar; therefore Umiat wells #4-#7 did not have cellars.

Umiat #4 is located on top of the hill to the northeast of Umiat #3 (Figures 45, 46). The well was drilled May 1950 to a maximum depth of 840 feet. The hole bored through the Ninuluk, Chandler and Grandstand Formations. Oil was found in the upper and lower

sandstone of the Grandstand Formation. Drilling encountered good oil shows around 300 feet with a total 500 barrels produced (Robinson and Bergquist, 1956). The wellhead consists of 11 ¾-inch casing protruding 36 inches above the ground surface. The casing is capped with a steel plate. Upon removal of the cover, the hole was open to the environment. No valves or gauges are present. The well was plugged by the BLM on May 9, 2004. The well poses no risk to humans or the environment.

Figure 46: Umiat #4 prior to plugging. The wellhead is located in the center of the photograph.

Umiat #8

Like the other wells drilled in the 1950s, Umiat #8 was drilled using cable tools. The well was spudded May 1951 and completed August 1951. It is located on top of a ridge that separates Umiat from the Bear Paw Creek valley. Drilling intention was to determine the quality and quantity of hydrocarbons in the Grandstand formation near the crest of the anticline structure. The hole encountered the Seabee, Ninuluk, Chandler, and Grandstand Formations. The Grandstand Formation produced approximately 60-100 barrels per day of oil and more than 6 million cubic feet per day of gas. The well was shut in with a gas pressure of 275 pounds per square inch. The gas was analyzed by the Bureau of Mines and determined to be 97.3 per cent methane. Brine was mixed (35 lbs of salt per barrel of water) and used in the drilling fluid to prevent freeze up. Brine solution of approximately the same ratio of salt per barrel of water was used to kill the well and set the plug while cementing casing. A total of 21,695 pounds of salt were used in the well (Robinson and Bergquist, 1956).

The well was plugged May 2, 2004. Prior to plugging, the well was nicknamed the "Whistling Well" due to the gas of which was escaping through fittings and valves in the wellhead. The wellhead is easily the most complex of the 11 Umiat test wells. It consists of five valves and multiple gauges. It has several homemade components and reaches a total height of ten feet. After reporting the seeping gas in 1996, two new valves and gauges were installed in 1997. The new gauges have been checked regularly since 1998 and have consistently read 250 psi. Despite replacing the two valves and gauges, gas continued to leak from the wellhead. The largest of the leaks occurred just above the top flange where a 4-inch nipple and collar are welded together. Other leaking occurred at the fittings of some of the gauges.

The wellhead is sited on a gravel pad. A series of piping extends from the wellhead to a small stock tank about 100 feet to the south. The tank probably was used as a holding tank for the oil while testing the production potential of the hole. The same style of stock tank is present in various old photographs found in the Umiat area and may be the same

tank. Oil from inside the tank was sampled in 2004 with test results positively identifying PCB contamination which is slightly below the level of concern.

Umiat #10

Umiat #10 was spudded September 1951 and completed January 1952. This well was drilled to test the Umiat anticline and is located about a half mile northwest of Umiat #8. Total depth of the well is about 1,573 feet. When the well was bailed, it produced 222 barrels of oil in a 24-hour time span. The most productive layers occurred at 980 feet and 1,095 feet, penetrating both the Ninuluk and Grandstand Formation (Robinson and Bergquist, 1956). Also encountered were the Seabee and Chandler Formations. The hole was somewhat problematic as it caved considerably during drilling. Operations consisted of a drill rig set on a foundation of 12" x 12" timbers with a thin layer of gravel in between.

Twenty-five pounds of salt mixed with Aquagel and water (per barrel) were used downhole to help lubricate the drill bit above the 650-foot marker (from the surface). More Aquagel-brine mud was used down to about 1,000 feet to keep the hole from caving. The wellhead contains two valves; a master and a gate, both are closed. The total height of Umiat #10 is approximately 10 feet. The 8 $^{5}/_{8}$-inch casing is flared and open at the top. This well was plugged May 6, 2004 (Figure 47).

Figure 47: Plugging operations at Umiat #10. May 2004.

The surface near Umiat #10 is in good shape. There is no existing pad and no solid wastes. With the recent plugging of the well, it is not a risk to human health and safety or the environment.

APPENDIX B

20 Wells Currently Monitored by the United States Geological Survey:

NAME	HOLE DEPTH(meters)
Atigaru	648
Awuna*	884
Drew Point	640
East Simpson #1	600
East Teshekpuk	727
West Fish Creek #1*	735
Ikpikpuk	615
Kugura	582
Koluktak*	227
Kuyanak	856
Lisburne	532
North Inigok	625
North Kalikpik	660
Peard Bay	591
Seabee*	393
South Meade	549
South Harrison Bay	399
Tunalik*	556
Tulageak	756
West Dease	823

*Are also part of the CALM network (Circumpolar Active-Layer Monitoring).

APPENDIX C

This is an example from the database maintained by BLM-Alaska. Umiat #9 was chosen due to it's high ranking and completeness of data. The following pages are ordered by surface report, surface diagram, subsurface report, and wellbore schematic. This format was followed on all cased wells and that data is being compiled.

Umiat #9 Example

Well Specifics:
Well Head Description (from base to top):
3' of 8 1/2" casing
5 1/2" casing with collar sticking 2 1/2' out of 8 1/2'
2 side outlets (both plugged)
top of blind flange (8 x 5/8" studs)
2 3/4" welded collar and nipple, cemented?
TOTAL STICK UP: 5 1/2'

Casing extends about 3 feet from the ground surface with two plugged side outlets. No valves or gauges are present. There is no oil or gas seeping on site.

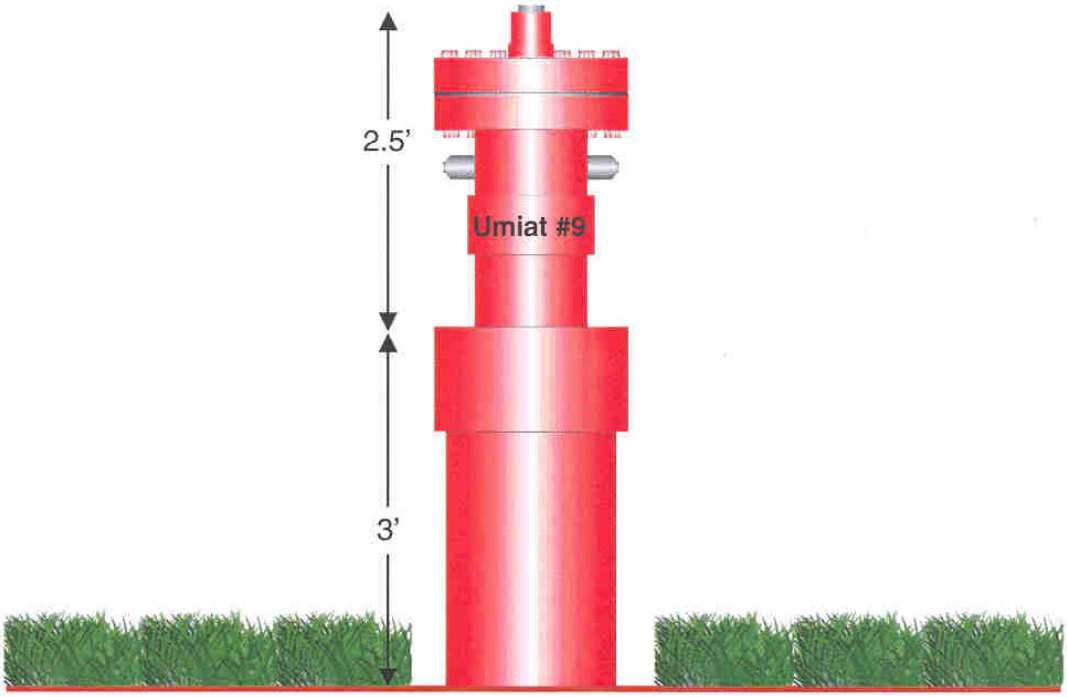
Summer photo - June 18, 2003

Winter photo showing snow depth - April 26, 2004

BLM ALASKA

Umiat #9

Surface Diagram



Well Head Description (stick up 5 1/2'):
3' of 8 1/2" casing
2 1/2' of 5 1/2" casing with collar sticking out of 8 1/2" casing
2 side outlets (both plugged)
top blind flange (8 x 5/8" studs)
2 3/4" welded collar and nipple with cement

U.S. Department of the Interior
Bureau of Land Management
Well Plugging and Abandonment Summary For
Umiat Test Well #9

Operator: US Navy

Well Name and Well#: Umiat Test Well #9

Spud Date: 6/25/1951

Completion Date: 1/15/1952

Total Depth: 1257' **Hole Size:** 7 7/8 **T.D.M.W.:** 11.4 ppg
Effective Depth: 1255'

Special Mud Additives/Concerns: Oil base mud w/ Aroclor (PCB) added as a chemical tracer for core analysis

Status: Shut-in - Last Reported fluid level was crude oil @ 270' in August 1954.

Plug and Abandonment Date: Scheduled for March 2005.

Surface Equipment/Status: 5 1/2" Wellhead w/ No valves and 2 side bull plugs

Casing	Hole Size	Casing Size	Weight	Grade	Depth	Cement
Conductor	12 1/4"	8 5/8"	24 #/ft	N/A	61'	40 Sacks of Cal-Seal
Surface	7 7/8"	5 1/2"	22.5 #/ft	N/A	1257'	140 Sacks of Construction
Intermediate						
Intermediate						
Production						
Tubing						

Well Remarks:
Produced through openhole pumping tests averaging 217 BOPD
5 ½" Casing Perforated at various intervals from 866' to 1255'

Plug Remarks:
Bottom hole cement is remnants of clean-out following surface casing cement job. Well will be plugged in March 2005.

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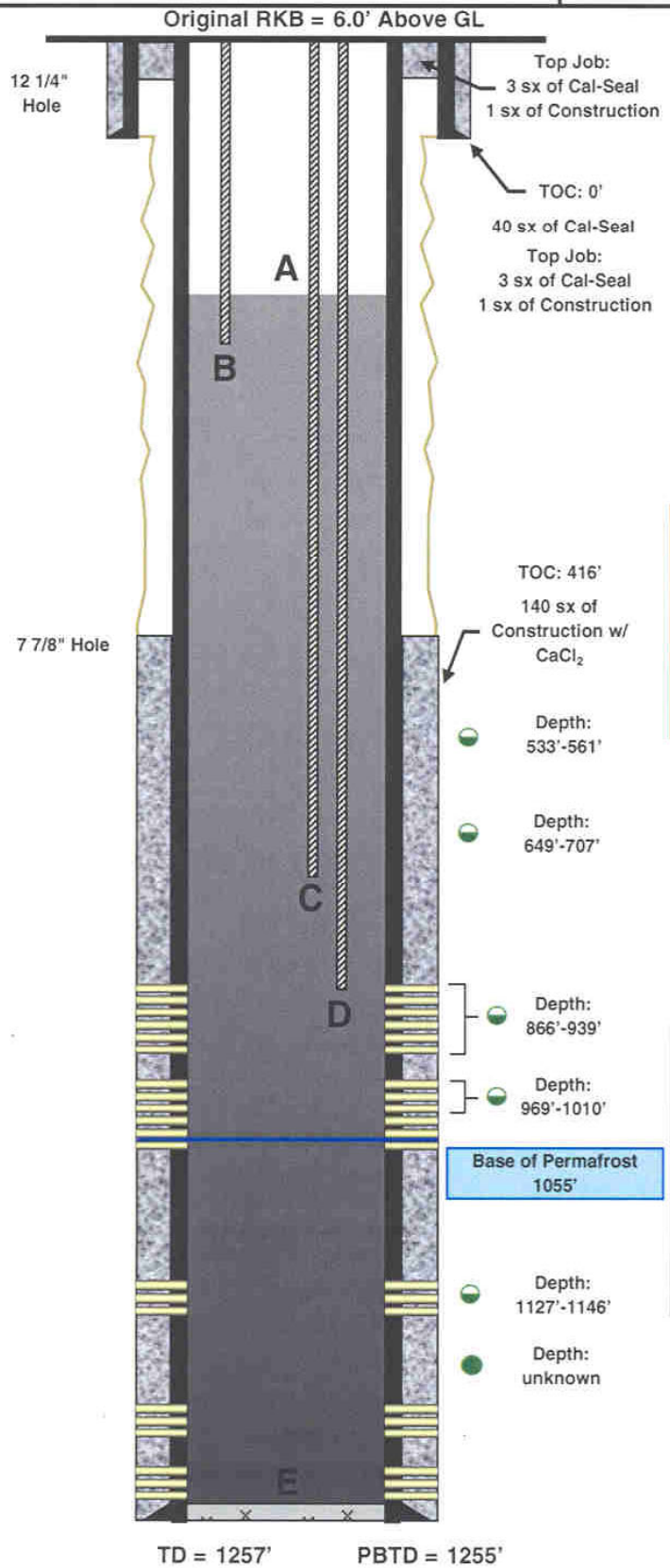
Umiat #9	Rig:	Failing 1500 Rotary Rig			
	Spud:	June 25, 1951			
Umiat Test Well	Meridian	Township	Range	Section	Umiat
	Umiat	1S	1W	5	1.5 mi
Current Wellbore Schematic	GL: 418.0' AMSL	KB: 424.0' AMSL			Inigok
	69° 23.149' N - 152° 10.280' W				49 mi



Average production = 217 bbl/d

Test time = 6 1/2 weeks

Test method = Open hole Pump Test

Casing and Tubing Detail

Size	Weight	Type	Grade	ID	Top	Btm
8 5/8"	24	Conductor	---	8.097	0	61
5 1/2"	22.54	Surface	---	4.500 ?	0	1257

Drilling Fluids

Base	Depths	Weight	Additives
Water	0-209	---	Jelflake
Oil	209-375	8.7-11.6	Diesel, Fish Creek Oil, Ken-Oil, Unslaked Lime
Oil	375	---	**500 lbs of Aroclor**
Oil	375-868	10.8-11.2	Aquagel, Micatex
Oil	868	---	**500 lbs of Aroclor**
Oil	868-1257	10.8-11.4	Aquagel, Micatex

Geology

Formation	Age	Depths	Shows
Ninuluk	Upper Cretaceous	6-155	---
Chandler (Killik Tongue)	Upper/Lower Cretaceous	155-425	
Grandstand	Upper/Lower Cretaceous	425-1090	Oil
Topagoruk	Lower Cretaceous	1090-1275	Oil
Base of Permafrost	---	1055	---

Fish/Fill Information

Item	Date	Depth	Comment
A	8/1/54	270	Crude Oil in hole (reported August 1954)
B	11/23/52	?	Thermistor Cable
C	" "	665	Thermistor Cable
D	10/12/53	870	Thermistor Cable
E	1/15/52	1255	Cement plug

Perforations

Depth	Spf	Oil	Zone
866-900	4	Dry	Grandstand
900-938	4	Dry	Grandstand
960-1017	3.7	Dry	Grandstand
1017-1073	3.75	Dry	Grandstand
1135-1145	4	Dry	Topagoruk
1218-1234	3.75	Dry	Topagoruk
1245-1255	4	1 1/2 bbl	Topagoruk

Crude Oil

Cement Plug

Oil produced

Gas produced

Oil show

Gas show

Fluoresence-Cut

NaCl	*Sodium Chloride*
$CaCl_2$	*Calcium Chloride*
Cal-Seal	*Gypsum cement*
Construction	*Unknown cement type*
Fish Creek Oil	*Fish Creek Crude Oil*

APPENDIX D

	Name	Total Depth	Spud Date	Subsurface Info	Surface Info
#1	Umiat #9	1257	06/25/51	Shut-in - Pumped oil - 217 bbl/day / 0 plugs	Wellhead w/ 0 valves - PCB contaminated soil
#2	Umiat #6	825	08/14/50	Shut-in - Pumped oil - 100 bbl/day / 0 plugs	Open casing
#3	Umiat #7	1384	12/14/50	Dry hole - Outside Umiat reservoir / 0 plugs	Open casing - AKDOT surface near Umiat runway and Umiat #6
#4	J.W. Dalton #1	9367	05/01/79	Dry Hole - Diesel in hole (230 bbls) / 5 plugs to 1580 ft	Wellhead & Reserve Pit threatened by coastal erosion
#5	Simpson Core Test #26	1171	08/13/50	Shut-in - Naturally flows oil - 176 bbl/day / 0 plugs	In oil seep - Wellhead w/ 4 valves - Solid waste
#6	Simpson Core Test #31	355	03/20/51	Shut-in - Naturally flows oil - 125 bbl/day / 0 plugs	In oil seep - Wellhead w/ 2 valves
#7	Simpson Core Test #27	1500	02/08/51	Shut-in - Natually flows oil - 6 bbl/day / 0 plugs	In oil seep - Wellhead w/ 1 valve
#8	Simpson Core Test #30a	701	01/23/51	Shut-in - Bailed oil - 5 bbl/day / 0 plugs	In oil seep - Wellhead w/ 1 valve - Casing leaking gas below seep
#9	Simpson Core Test #30	693	11/30/50	Shut-in - Bailed oil - 6 bbl/day / 0 plugs	In oil seep - Open casing
#10	Simpson Core Test #29	700	10/31/50	Dry hole - Outside Simpson Reservoir / 0 plugs	Wooden Cellar - Open casing - Proximity to Simpson Core Test #26 and #30a
#11	Simpson #1	7002	06/14/47	Plugged Gas well - 3 MCF/day / 2 plugs to 5520 ft	Wooden cellar - Wellhead w/ 1 valve - Timber pilings - Proximity to Simpson Core Test #26
#12	Fish Creek #1	7020	05/17/49	Shut-in - Pumped oil - 18 bbl/day / 0 plugs	Concrete cellar - Wellhead w/ 1 valve - Solid waste
#13	Wolf Creek #1	1500	04/29/51	Shut-in - Gas well - 881 MCF/day / 0 plugs	Wellhead w/ 2 valves - Minor leak in wellhead repaired
#14	Wolf Creek #3	3760	08/20/52	Plugged Gas well - 445 MCF/day / 2 plugs to 554 ft	Open casing - Timber and metal pilings - Discarded drilling mud
#15	Wolf Creek #2	1618	06/06/51	Dry hole / 0 plugs	Open casing capped at ground level / Proximity to Wolfcreek #1 & #3
#16	Skull Cliff Core Test #1	779	02/02/47	Diesel in hole (16 bbls) / 0 plugs	Wooden cellar - Open casing (wood plug) - Solid waste near winter trail
#17	East Simpson #2	7504	01/29/80	Diesel in hole (280 bbls) / 5 plugs to 1977 ft	Wooden cellar - Wellhead w/ 1 valve - Timber pilings
#18	Simpson Core Test #28	2505	09/05/50	Dry hole / 0 plugs	Wooden cellar - Open casing - Metal pilings - Solid waste
#19	Simpson Core Test #13	1438	06/09/45	Dry hole / 0 plugs	Open casing
#20	Simpson Core Test #14	1270	07/21/49	Dry hole / 0 plugs	Open casing
#21	Simpson Core Test #15	900	08/16/49	Dry hole / 0 plugs	Open casing
#22	Simpson Core Test #14A	290	08/13/49	Dry hole / 0 plugs	Open casing
#23	Kaolak #1	6952	07/21/51	Dry hole / 0 plugs	BOP left on top of well following rig damage (wind storm) - Wood building near well
#24	Meade #1	5305	05/02/50	Plugged Gas well - 1132 MCF/day / 2 plugs to 2783 ft	Wellhead w/ 0 valves consists of flange at ground level - Metal junked at top of well
#25	Titaluk #1	4020	04/22/51	Dry hole / 1 plug to 3471 ft	Wooden cellar - Open casing
#26	Oumalik #1	11872	06/11/49	Dry hole / 2 plugs to 2543 ft	Wellhead below ground level (revegetated) - Metal pilings - Diesel refrigeration system
#27	East Oumalik #1	6035	10/23/50	Dry hole / 0 plugs	Wooden cellar - Wellhead below ground level - Timber pilings
#28	Topagoruk #1	10503	06/15/50	Dry hole / 0 plugs	Wooden cellar - Open casing - Metal pilings - Solid waste - Diesel refrigeration system
#29	East Topagoruk #1	3589	02/18/51	Dry hole / 1 plug to 1049 ft	Wooden cellar - Open casing
#30	Knifeblade #1	1805	10/13/51	Dry hole / 0 plugs	Open casing
#31	Knifeblade #2A	1805	08/06/51	Dry hole / 0 plugs	Open casing - Solid Waste
#32	Knifeblade #2	373	07/26/51	Dry hole / 0 plugs	Open casing
#33	North Simpson #1	3774	05/06/50	Dry hole / 0 plugs	Wellhead w/ 0 valves - Metal pilings - Solid waste
#34	Umiat #1	6005	06/22/45	Dry hole / 0 plugs - Outside Umiat reservoir	Wooden cellar - Wellhead w/ 1 valve - Discarded drilling mud - Solid waste
#35	Umiat #11	3303	06/03/52	Dry hole / 1 plug - Outside Umiat reservoir	Open casing - Timber pilings
#36	South Simpson #1	8795	03/09/77	Dry hole / 5 plugs to surface	Wellhead in need of removal / located on revegetated gravel pad
#37	Inigok #1	20102	06/07/78	Dry hole / 10 plugs to surface	Wellhead in need of removal / located on usable gravel pad
#38	Atigaru Point #1	11535	01/12/77	Dry hole / 5 plugs to 2255 ft	Used by USGS for Permafrost Temperature Measurements
#39	Awuna #1	11200	03/01/80	Dry hole / 1 plug to 7868 ft	Used by USGS for Permafrost Temperature Measurements
#40	Drew Point #1	7946	01/13/78	Dry hole / 4 plugs to 2153 ft	Used by USGS for Permafrost Temperature Measurements
#41	East Simpson #1	7739	02/19/79	Dry hole / 4 plugs to 2039 ft	Used by USGS for Permafrost Temperature Measurements
#42	East Teshekpuk #1	10664	03/12/76	Dry hole / 5 plugs to 2520 ft	Used by USGS for Permafrost Temperature Measurements
#43	Ikpikpuk #1	15481	11/28/79	Dry hole / 5 plugs to 2047 ft	Used by USGS for Permafrost Temperature Measurements
#44	Koluktak #1	5882	03/24/81	Dry hole / 4 plugs to 1400 ft	Used by USGS for Permafrost Temperature Measurements

#45	Kugrua #1	12588	02/12/78	Dry hole / 6 plugs to 1894 ft	Used by USGS for Permafrost Temperature Measurements
#46	Kuyanak #1	6690	02/13/81	Dry hole / 3 plugs to 4464 ft	Used by USGS for Permafrost Temperature Measurements
#47	Lisburne #1	17000	06/11/79	Dry hole / 8 plugs to 1840 ft	Used by USGS for Permafrost Temperature Measurements
#48	North Inigok #1	10170	02/13/81	Dry hole / 3 plugs to 8192 ft	Used by USGS for Permafrost Temperature Measurements
#49	North Kalikpik #1	7395	02/27/78	Dry hole / 5 plugs to 2293 ft	Used by USGS for Permafrost Temperature Measurements
#50	Peard #1	10225	01/26/79	Dry hole / 4 plugs to 2026 ft	Used by USGS for Permafrost Temperature Measurements
#51	South Meade #1	9945	02/07/78	Dry hole / 5 plugs to 1875 ft	Used by USGS for Permafrost Temperature Measurements
#52	Seabee #1	15611	07/01/79	Dry hole / 8 plugs to 1478 ft	Used by USGS for Permafrost Temperature Measurements
#53	Tulageak #1	4015	02/26/81	Dry hole / 2 plugs to 2600 ft	Used by USGS for Permafrost Temperature Measurements
#54	Tunalik #1	20335	11/10/78	Dry hole / 5 plugs to 1825 ft	Used by USGS for Permafrost Temperature Measurements
#55	West Dease #1	4173	02/19/80	Dry hole / 4 plugs to 2700 ft	Used by USGS for Permafrost Temperature Measurements
#56	South Harrison Bay #1	11290	11/21/76	Dry hole / 5 plugs to 2289 ft	Used by USGS for Permafrost Temperature Measurements
#57	West Fish Creek #1	11427	02/14/77	Dry hole / 5 plugs to 2443 ft	Used by USGS for Permafrost Temperature Measurements
#58	Ikpikpuk Core #1	178	07/09/47	Dry hole / 0 plugs	Located 6 miles east of Oumalik #1
#59	Minga Velocity #1	1233	04/29/50	Dry hole / 0 plugs	Located in Minga Lake (5' below water) in Cape Simpson Area
#60	Oumalik Core #1	392	07/21/47	Dry hole / 0 plugs	Located within 100 ft of Ikpikpuk Core Test #1
#61	Oumalik Core #2	190	09/08/47	Dry hole / 0 plugs	Located 25 ft northwest of Oumalik #1
#62	Oumalik Core #11	303	03/09/49	Dry hole / 0 plugs	Located 25 ft south of Oumalik #1
#63	Oumalik Core #12	300	04/11/49	Dry hole / 0 plugs	Located 75 ft south of Oumalik #1
#64	Sentinel Hill #1	1180	01/26/47	Dry hole / 0 plugs	Well covered in landslide a few years following drilling
#65	Oumalik Foundation Test #1	50	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#66	Oumalik Foundation Test #2	50	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#67	Oumalik Foundation Test #3	50	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#68	Oumalik Foundation Test #4	50	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#69	Oumalik Foundation Test #5	49	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#70	Oumalik Foundation Test #6	48	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#71	Oumalik Foundation Test #7	47	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#72	Oumalik Foundation Test #8	50	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#73	Oumalik Foundation Test #9	50	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#74	Oumalik Foundation Test #10	50	10/01/48	Dry hole (shallow well) / 0 plugs	Wellhead indistinguishable from metal pilings used for rig foundation
#75	Simpson Core Test #1	116	06/25/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#76	Simpson Core Test #2	226	06/30/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#77	Simpson Core Test #3	368	07/03/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#78	Simpson Core Test #4	151	07/08/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#79	Simpson Core Test #5	130	07/11/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#80	Simpson Core Test #6	149	07/12/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#81	Simpson Core Test #7	532	07/15/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#82	Simpson Core Test #8	580	07/27/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#83	Simpson Core Test #9	320	08/05/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#84	Simpson Core Test #10	500	08/08/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#85	Simpson Core Test #11	580	08/17/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#86	Simpson Core Test #12	460	08/27/45	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#87	Simpson Core Test #16	800	08/24/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#88	Simpson Core Test #17	1100	08/31/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#89	Simpson Core Test #18	1460	09/10/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#90	Simpson Core Test #19	1061	09/23/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#91	Simpson Core Test #20	1001	10/05/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated

#92	Simpson Core Test #21	1502	10/13/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#93	Simpson Core Test #22	903	10/29/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#94	Simpson Core Test #23	1035	11/08/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#95	Simpson Core Test #24	901	11/22/49	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#96	Simpson Core Test #25	1510	07/03/50	Dry hole / 0 plugs	Uncased (openhole) / Surface revegetated
#97	Arcon Barrow Core #1	1442	03/29/47	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#98	Avak #1	4020	10/21/51	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#99	Barrow Big Rig #1	685	10/13/44	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#100	Barrow Core Rig Test #1	344	09/17/44	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#101	Barrow Core Rig Test #2	236	10/09/44	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#102	Gubik #1	6000	05/20/51	Plugged Gas well - 2561 MCF/day / 5 plugs to 800 ft	Transferred to ASRC as part of land conveyances
#103	Gubik #2	4620	09/10/51	Plugged Gas well - 8000 MCF/day / 2 plugs to 2200 ft	Transferred to ASRC as part of land conveyances
#104	Grandstand #1	3939	05/01/52	Dry hole / 2 plugs to 688 ft	Native selected land not yet conveyed
#105	Iko Bay #1	2731	02/01/75	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#106	South Barrow #1	3553	08/15/48	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#107	South Barrow #2	2505	12/18/48	Abandoned Gas well - 6000 MCF/day	Transferred to NSB in Barrow Gas Field Transfer Act
#108	South Barrow #3	2900	06/23/49	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#109	South Barrow #4	2538	03/09/50	Abandoned Gas well - 1800 MCF/day	Transferred to NSB in Barrow Gas Field Transfer Act
#110	South Barrow #5	2456	05/17/55	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#111	South Barrow #6	2363	02/28/64	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#112	South Barrow #7	2351	03/04/68	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#113	South Barrow #8	2359	04/04/69	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#114	South Barrow #9	2450	03/19/70	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#115	South Barrow #10	2349	03/07/73	Producing Gas Well / South Barrow Field	Transferred to NSB in Barrow Gas Field Transfer Act
#116	South Barrow #11	2350	02/10/74	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#117	South Barrow #12	2285	03/10/74	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#118	South Barrow #13	2535	12/17/76	Producing Gas Well / South Barrow Field	Transferred to NSB in Barrow Gas Field Transfer Act
#119	South Barrow #14	2257	01/28/77	Producing Gas Well / East Barrow Field	Transferred to NSB in Barrow Gas Field Transfer Act
#120	South Barrow #15	2278	08/23/80	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#121	South Barrow #16	2400	01/28/78	Dry hole / 2 plugs to 1414 ft	Transferred to NSB in Barrow Gas Field Transfer Act
#122	South Barrow #17	2382	03/02/78	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#123	South Barrow #18	2125	09/22/80	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#124	South Barrow #19	2300	04/18/78	Shut-in Gas Well	Transferred to NSB in Barrow Gas Field Transfer Act
#125	South Barrow #20	2356	04/07/80	Dry hole / 0 plugs	Transferred to NSB in Barrow Gas Field Transfer Act
#126	Cape Halkett #1	9900	03/24/75	Plugged Dry Hole / 4 plugs to surface	Transferred Land to ASRC in Cape Halkett Land Exchange - Timber pilings
#127	Walakpa #1	3666	12/25/79	Plugged Dry Hole / 4 plugs to 1440 ft	Transferred to NSB in Barrow Gas Field Transfer Act
#128	Walakpa #2	4360	01/03/81	Producing Gas Well / Walakpa Field	Transferred to NSB in Barrow Gas Field Transfer Act
#129	W.T. Foran #1	8864	03/07/77	Plugged Dry Hole / 5 plugs to surface	Transferred Land to ASRC in Cape Halkett Land Exchange
#130	Sqaure Lake #1	3987	01/26/52	Plugged Gas Well / plugged to surface	Wooden cellar - Open casing
#131	Umiat #2	6212	06/25/47	Plugged Dry Hole / plugged to surface	Gravel pad and surface reclaimed / Orignally threated by river erosion
#132	Umiat #3	572	11/15/46	Plugged Oil Well / plugged to surface	Wellhead left intact by State Historic Preservation Office request
#133	Umiat #4	840	05/26/50	Plugged Oil Well / plugged to surface	Wellhead left intact by State Historic Preservation Office request
#134	Umiat #5	1077	07/05/50	Plugged Oil Well / plugged to surface	Gravel pad and surface reclaimed / Orignally threated by river erosion
#135	Umiat #8	1327	05/02/51	Plugged Gas Well / plugged to surface	Wellhead left intact by State Historic Preservation Office request
#136	Umiat #10	1573	09/09/51	Plugged Oil Well / plugged to surface	Wellhead left intact by State Historic Preservation Office request