Synopsis of Six Mile Area Groundwater Investigation
Prepared for January 17, 2002 meeting
Badger-Richardson Safe Water Association

This synopsis presents a chronological summary of the major milestones of the Six-Mile Area groundwater investigation, a summary of the major cleanup activities, and the current status of the regional groundwater contamination.

Chronological History:

1987 - ADEC investigated the open burning of possible hazardous waste on the McCall property. Water samples were taken from two businesses and four residential wells near the McCall property. The wells at the two businesses contained low levels of trichloroethylene (TCE) while the four residential wells had no contamination above the detection limit. ADEC notified the well owners of the results.

1989 - The National Bank of Alaska (NBA), who controlled the McCall property as the result of a loan default, hired Shannon & Wilson, Inc. (S&W) to conduct a limited site investigation. S&W found no evidence of a TCE source area on the property, however TCE was detected in three nearby residential wells to the west. NBA notified the well owners of the results. NBA sent the results of their investigation to ADEC in Feb. 1990.

1994 - ADEC began a response-fund investigation of the McCall property. Results published in spring 1995 indicated possible TCE source areas on the Holder property, possible TCE and 1,1,1- trichloroethane (TCA) source areas on the Walsky property, and a possible TCE source area on the Six Mile Truck Shop property. Sampling results from monitoring wells on the Walsky property and the water supply well at Six-Mile Truck Shop indicated that the groundwater contamination extended further towards the northeast and the Six-Mile Village Subdivision.

1995 - In early summer, ADEC sampled 41 residential wells northwest of Six-Mile Truck Shop and within the Six Mile Village Subdivision. Results indicated groundwater contamination of unknown extent consisting of TCE, TCA, petroleum products (in particular benzene), and their degradation products. ADEC issued a health alert for the area bound by Badger Road, the Old Richardson Highway, Davison Avenue, and the New Richardson Highway because of the uncertainty of the extent of the groundwater contamination. In late summer, an additional 54 residential wells were sampled within the alert area. A total of 95 wells were sampled. Major conclusions from both sampling events were:

1) Where TCA was detected, the levels were significantly below the safe drinking water standard of 200 ppb. TCA was detected in 40 of the 95 wells. The groundwater exceeding the 200-ppb level was confined to the Walsky property.
2) Benzene, a soluble component of gasoline and diesel fuel, was detected in four residential wells (4.2 % of total wells sampled) above the safe drinking water standard of 5 ppb. Benzene was detected in a total of 19 wells (20%). The source of the benzene was unknown.
3) TCE was detected in 16 wells (16.8% of total wells sampled) above the safe drinking water standard of 5 ppb. Twelve of these wells (12.6%)were residential wells; the other four water supply wells were associated with

suspected source area properties. TCE was detected in a total of 51 wells (53.7%).

4) All degradation products of TCE, TCA, and petroleum products were below their respective safe drinking water standards.
5) The extent of the TCE plume was estimated using the 1-ppb level. The plume is slightly longer than a mile in length, up to 1200 feet wide and at least 100 feet deep.

1995 - During fall and early winter, ADEC conducted of series of public meetings. Additional sampling was conducted around McPeak's Store as a result of concerns expressed at one of the public meetings. Some residences along Faultline Drive as well as others nearby the store were sampled. No TCE or other significant contamination was detected.

The office of the State Epidemiologist and the federal Agency for Toxic Substances and Disease Registry (ATSDR) reviewed the groundwater results. ATSDR published a Health Consultation report. Both the state and federal agencies concluded that the reported TCE concentrations did not pose a short-term acute risk. Comparing TCE and benzene's toxicity at the detected concentrations, the benzene posed a greater risk.

1996 - In early winter ADEC provided grant monies for the installation of activated carbon filter systems for all residences that were close to the safe drinking water standards (5-ppb for both TCE & benzene). The grant monies were not available to suspected source area properties or four wells. Any home that had either TCE or benzene at or above 3.5 ppb in their well water qualified for the grant. The lower level (3.5 ppb versus the standard of 5 ppb) was chosen to account for the uncertainty of a single sampling event and other possible contaminants in the well water. One residence that had 3.1 ppb TCE also received grant monies.

Seventeen residences qualified for grant monies, however only 14 residences chose to participate. A total of 21 wells had TCE at or above 3.5 ppb. Two of these wells were associated with uninhabitable structures. Four of these wells were located on suspected source area properties thus leaving 15 grant qualified wells. Four wells had benzene at or above 3.5 ppb, however two of these wells also had TCE above the standard leaving two wells qualifying because of benzene alone. Adding the 15 TCE grant qualified wells and two benzene grant qualified wells produced a total of 17 grant qualified loans. The qualified homeowners at 1319 Smithson, 1333 Sloan and 1357 Sloan chose not to receive the grant monies. (Note: 1357 Sloan requested and received a filter system in 2000). Grant recipients were responsible for the annual filter changes and maintenance costs.

During the winter, ADEC installed a series of permanent monitoring wells along the length of the TCE plume and established an annual long-term monitoring program using the monitoring wells and selected residential wells.

Also during the winter, ADEC requested the landowners of record for the McCall, Holder, Walsky, and Six-Mile Truck Shop properties to perform a site characterization to identify the nature and extent of any soil and groundwater contamination on their properties. The McCall and Six-Mile Truck Shop owners were not responsive – the properties were essentially abandoned by the owners; the Walsky and Holder property owners were unable financially to conduct the site characterization.

During the summer, EPA conducted a removal action on the McCall property. The remnants of about 1000 barrels were removed from the north pond on the property and the pond filled. Some of the drums contained hazardous waste. EPA also performed exploratory trenching and sampling on other portions of the property. There were no indications that the property was a TCE source area. Cost of removal action was about $950,000.

During the summer, ADEC inspected the Six-Mile Truck Shop property and located the general area of the benzene release. Using an inspection warrant, ADEC identified and characterized some of the waste (partially filled drums and transformer casings). Using temporary groundwater probes, ADEC identified Tract 1 & 2, Groff Subdivision (Denny property) as the likely source of a gasoline release that was causing the benzene contamination.

Also during the summer, ADEC used temporary groundwater probes on the Walsky & Holder properties to further identify possible TCE & TCA source areas. Limited diesel contamination of the groundwater was discovered on the Walsky property.

1997 - The Denny property was identified as the source of a gasoline release. The source area and onsite groundwater contamination was fully characterized. Alternative cleanup options were evaluated. After consultation with the public, excavation of the source area and natural attenuation of the benzene-contaminated groundwater were selected.

Limited soil sampling and groundwater investigation continued on the suspect TCE source area properties due to the focus on Denny property.

1998 - ADEC fully characterized the abandoned waste on the Six-Mile Truck Shop property and conducted a removal action. The contents of about 300 partially filled drums and transformer casing along with other waste material were consolidated, identified according to hazardous nature, and disposed at appropriate facilities. Cost of removal action was about $350,000.

ADEC conducted cleanup of the Denny property. Cost of cleanup was about $300,000.

ADEC continued identification of suspected TCE source areas using temporary groundwater probes. Probes were installed in a transect traversing the width of the regional plume and groundwater samples were collected at multiple depths. This provided a three dimensional view of the contamination at a specific location and time.

1999 – ADEC continued groundwater investigation using temporary groundwater probes. As a result, two TCE source areas were identified on the Holder property (one source extended over onto the Davison Street right-of-way), and three source areas were identified on the Walsky property. Two of the source areas on the Walsky property were relatively minor, however the third source area was significant and also was co-located with the TCA source.

ADEC evaluated potential cleanup alternatives and estimated costs. ADEC consulted with the public. Estimated cleanup costs based on state-of-the-practice technology varied between about $1.2 to $7.5 million dollars over a twenty year period.

2000 – ADEC investigated the cause of the identified source areas. Ground Penetrating Radar was used to identify buried material in suspect source areas prior to sampling. Soil sampling documented low levels of TCE contamination in the vadose zone, the area between the ground surface and the water table.

ADEC allowed Dr. Sharon Richards, a Ph.D. candidate at the University of Alaska Fairbanks, access to groundwater samples during the annual long-term monitoring sampling. Dr. Richards performed state-of-the-art hydrogen measurements to determine the extent that the TCE is biologically degrading.

ADEC conducted a "five-year" checkup of the residential filter systems that were installed under the 1995 grant program. Of the 15 original grant recipients, 12 allowed inspection and testing of their systems. Inspection and water testing revealed that the homeowners have not been properly maintaining the systems. As a result, the filter systems were not performing correctly.

ADEC assumed responsibility for filter system maintenance. ADEC had filters replaced and re-tested the water. The retest showed that the treated water met drinking water standards.

2001- ADEC continued the residential filter system maintenance and testing program and conducted it concurrently with annual long-term groundwater sampling.

Additional permanent monitoring wells were installed on the Walsky and Six-Mile Truck Shop properties to provide a better definition of the plume boundaries and to assess the long-term concentration trends of the major TCE/TCA source areas.

Dr. Sharon Richards, et. al., published an article titled "Assessment of Natural Attenuation of Chlorinated Aliphatics and BTEX in Subarctic Groundwater" in *Environmental Science and Technology* , volume 35, in pages 4038 – 4045. The article described the natural attention processes that are likely occurring in the Six-Mile area.

Current Status of Regional Groundwater Contamination:

An annual long-term groundwater-monitoring program has been in existence since1996. The purpose of the program is to monitor the relative size of the TCE groundwater plume and to determine concentration changes at specific wells over time. A mixture of permanent monitoring wells and residential wells have been sampled over the years. A review of the accumulated data reveals some general conclusions and tentative results for the 2001-sampling event:

1) The size of the plume is stable overall: some portions of the plume are decreasing in size whereas other portions of the plume have remained the same size.
2) Where there is sufficient data to perform a statistical analysis, about 50% of the wells show a "statistically significant" decrease in concentrations while the other 50% of the wells show no trend (neither increasing or decreasing).
3) One well (MW-13) shows a "statistically significant" increase – it has increased from 1.7 ppb in 1995 to 5.6 ppb in 2001.
4) The four homes in 1995 that had benzene levels above the safe drinking water standard now are significantly below the standard.
5) Six of 12 homes that in 1995 had TCE above 5 ppb allowed sampling in 2001: 4 of the homes now have TCE below 5 ppb. Two homes remain above the standard and

have decreased from 10.1 ppb in 1995 to 5.47 ppb in 2001 and from 12.0 ppb in 1995 to 5.13 ppb in 2001.

6) Dilution appears to be the main natural attenuation mechanism, however biological degradation has occurred in the past and may still occur albeit at very low rates.
7) In some wells, the decrease in concentrations can be reliably modeled.
8) All homes that currently allow testing, have water that is below the state drinking water standards either naturally, or after treatment by a ADEC supplied and maintained filter system.