VOLUME 1
SUMMARY REPORT ON SITE INVESTIGATION AND REMOVAL ACTIVITIES
CSMRI CREEKSIDE SITE
GOLDEN, JEFFERSON COUNTY, COLORADO
TDDs T08-9202-017, T08-9205-018
T08-9210-011, T08-9210-012

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1.0 INTRODUCTION

This report summarizes the 1992-1993 site investigation and removal activities at the Colorado School of Mines Research Institute (CSMRI) creekside site in Golden, Colorado.

Under Technical Direction Document (TDD) numbers T08-9202-017 and T08-9210-011 the U. S. Environmental Protection Agency - Emergency Response Branch (EPA) tasked the Ecology & Environment, Inc., Technical Assistance Team (TAT) to: 1) Provide a site map detailing the subsurface drain systems, 2) provide an estimate of volume of waste on site, 3) prepare a sitewide health & safety plan, 4) prepare a sampling plan for QA level one, 5) conduct sampling with the Geoprobe, 6) arrange for lab analysis of the samples, 7) prepare a sampling activities report, and 8) QA data as required for the CSMRI Creekside site located in Golden, Colorado (Figure 1).

In May 1992 the EPA mobilized the Emergency Response Cleanup Service (ERCS) contractor to begin cleaning buildings and excavating the estimated 22,000 cubic yards of contaminated materials on the site. Under TDD numbers T08-9205-018 and T08-9210-012 TAT was tasked to 1) provide daily oversite during the removal, 2) provide photodocumentation, and 3) perform confirmation sampling during the removal operations on the site. The Response, Engineering, and Analytical Contractor (REAC) was also mobilized to provide radiation screening on site.

Cleaning of the buildings and construction of a clay lined stockpile area for contaminated soils were completed in July of 1992. Removal of contaminated soils was completed in October, 1993. Site regrading was completed in November, 1992. Replacement water and sewer lines were installed in January, 1993.

2.0 BACKGROUND

CSMRI was established in approximately 1912. Historical data indicates that extensive underground coal mining was performed on and under the site until 1889[1]. The clay pits to the south of the facility were extensively mined beginning in the early 1900's. It is possible that spoils from the original mining activities were used to build up the embankment areas and the playing fields

adjacent to the CSMRI site. Mr. Al Benjamin (INTERPRO) indicated that a brick kiln may have been located on the site in the late 1890's. During investigation and excavation, brick debris was noted in most excavations on the west and south half of the property.

CSMRI was a research facility established in the early 1900's, to develop mining and extraction processes for metals. Research on the beneficiation of radioactive materials was also conducted on the site. Some of the earliest data indicate that research on radium extraction was performed on the site[2]. Later processes included the milling of uranium ores and the concentration of some naturally radioactive rare earth elements[3]. Some of the processes involved organic additives with the subsequent generation of possible mixed wastes. Tailings and waste material containing metals and radioactives from some of the processes were disposed of onsite. Over the years some of the tailings piles were paved over or buildings were constructed over the piles (Figure 2). Waste streams from the laboratories and pilot scale processes were dumped into the drainage system which eventually emptied into the tailings pond. Another source of contamination was the laboratory fume hoods where samples were digested and/or assayed. There also existed the possibility that deposits of shock sensitive compounds such as perchloric acid and metals such as mercury may have been precipitated within the hoods and vent systems. Also stored on site were approximately 700 drums of waste material and approximately 15 pressurized gas cylinders of unknown contents.

In the 1980s, INTERPRO, the operators of the CSMRI Creekside site, moved operations to the Table Mountain Research Center (TMRC) east of Golden, Colorado. Most laboratory equipment and chemicals were removed for use at TMRC. The Colorado School of Mines Research Institute (CSMRI), which owned the Creekside facility, took over maintenance of the facility. Left on site were drums of process materials, ores, tailings, some containers of laboratory chemicals, and old compressed gas cylinders.

In 1985, the Colorado School of Mines Plant Facilities Department conducted a survey of the site and recommended against use of the site due to the projected costs of bringing the facility buildings in line with building codes[4].

In 1987, CSMRI contracted with Jacobs Engineering, Inc. (Jacobs) to provide a site assessment and inventory hazardous materials on site. The Jacobs report[5] investigated chemicals on site, radiation and radon hazards on site and in the tailings pond, and the threat posed due to asbestos on site.

In 1989-90, CSMRI contracted with Industrial Compliance, Inc. (IC) to sample the tailings pond[6], remove laboratory chemicals/hazardous materials from the site and to secure the

estimated 700 drums of materials on site. IC sampled the pond, arranged for disposal of chemicals, and secured the drums in covered storage on site.

In March 1991, under TDD# T08-9103-010[7] TAT performed a gamma survey of the tailings pond and took samples from the tailings pond. This survey documented levels of gamma radiation in the tailings pond and demonstrated the presence of Uranium and Thorium isotopes in the tailings pond.

In January, 1992 a watermain break under building 109 on the site filled the tailings pond which eventually overflowed releasing radioactive and heavy metals to Clear Creek. Clear Creek is a major drinking water supply for the northern Denver suburbs. CSMRI contracted with IC[8] to perform stream sampling during and after the event. TAT, under TDD# T08-9201-027, performed stream and sediment sampling immediately after the event. The East face of the tailings dam was severely eroded and the integrity of the structure was in question. TAT and the Colorado State Engineers office inspected the dam and recommended the repairs be initiated immediately to prevent a catastrophic release of sediments into Clear Creek. Damage to the tailings dam was temporarily repaired by the Emergency Response Cleanup Service (ERCS) contractor with technical supervision by the Bureau of Reclamation (BOR). The BOR also performed a rainfall/runoff analysis for the tailings pond watershed. The analysis indicated that a substantial flood event would affect the tailings pond.

In February, 1992 TAT was tasked to gather data on the site and to supplement the existing data through sampling.

3.0 SITE ASSESSMENT ACTIVITIES

TAT initially assembled all existing sampling data on the site. This data included the gamma surveys conducted by J.L. Grant and Associates (Grant)[9] and Jacobs, and the analytical data provided by Jacobs and IC. The On Scene Coordinator (OSC) determined that sufficient data on the radiation contamination had been developed by previous site activities. TAT then developed a site sampling plan to augment the existing data. TAT was directed to sample for metals contamination in soils and water on site. TAT also had analysis for gross alpha and beta performed to supplement the gamma activity data and to determine the hazard to workers on site. To augment and confirm the existing radiation data TAT used Ludlum micro R (μR) and milli R (mR) survey meters on site to map gamma radiation. TAT also used a Victoreen Geiger-Mueller type meter with a pancake probe on site to estimate the hazards due to alpha and beta radiation. The site investigation was divided into the following tasks: investigation of contamination in buildings,

investigation of contamination in soils, investigation of contamination in water on site, investigation for location of a temporary stockpile area, investigation and mapping of the utility and drainage systems, development of a health & safety plan for removal workers on site, and development of a work plan for removal of contamination from the site.

3.1 Buildings

The 17 buildings on site had been used for metals and radioactive research. TAT investigated the interiors of the buildings for radiation and chemical hazards. Each building entry was made with radiation monitoring equipment, a PhotoIonization Detector (PID), cyanide and hydrogen sulfide monitox monitors, and an explosimeter. No elevated levels of organic vapors, explosive atmospheres, or toxic vapors were detected in any of the buildings. Some areas with relatively low levels of radioactive hazards were located and marked. While investigating the interiors, TAT located numerous small containers of laboratory chemicals in the buildings. Where radioactivity was noted in the buildings, the areas were flagged with orange paint for later swipe sampling and possible removal. TAT also mapped the interior drainage systems to determine whether the drains lead to the tailings pond or into the municipal sanitary sewer system on site. Maps of each building are included in Appendix A. The following information was determined with respect to each building:

BUILDING 101: This steel frame and stucco structure constructed in the early 1900's was the main plant building. Originally a mill, the interior was repartitioned over the years to accommodate 22 laboratories, and numerous offices, storage rooms, and process areas. Five levels and one subbasement/sump were investigated. Small containers of chemicals and compressed gas cylinders were located and noted for future removal. Asbestos insulation on heating system ducts was noted. Rainwater/runoff was noted to enter the main floor through a garage door. The water then flowed across the floor and into the drain/launder system. All drains, except sanitary sewer, were routed to the main and basement levels where a grated launder system was in place. The launders varied from 6" deep to 3' deep. Up to 2 feet of material was located in parts of the launder system. Material in the launder system exhibited elevated levels of gamma radiation. All launders lead to the subbasement/sump area. This sump was accessible only through a floor grate. Jacobs personnel had sampled the sediments in the sump. Analysis of the sediments indicated elevated levels of radiation (5). TAT sampled the sediment and water using a dip sample apparatus. The samples indicated elevated levels of metals. TAT also sampled the water exiting the subbasement through the main tunnel. These samples exhibited elevated levels of metals, notably lead,

which exceeded the Maximum Contaminant Level (MCL) for drinking water. At the time of sampling a sheen was noted on the water surface in the subbasement indicating that some organic contaminants may be present in the area. Three capacitors containing PCBs were located and slated for future removal and disposal. Radiation up to 200 counts per minute (cpm) alpha was noted in the structural beams at the top of the building and in some of the walls. Apparently the National Radium Institute did research in this building. Residual radium from this research may have been the source for the elevated alpha readings. Elevated levels of gamma radiation were noted in the main floor. These areas were flagged with paint. The pattern of the areas suggests that one area may be a concrete patch where radioactive material may have been used as matrix. Three other areas suggest that material may have been spilled on the concrete. The basement (north wall) has elevated gamma readings. At a breach in the wall readings of up to 1 mR/hr were recorded. The areas of elevated radiation were mapped and the resulting pattern indicate that material may have been used as fill material under the concrete floor and wall.

BUILDING 102: This building was the Fabrication and Experimental Laboratory where pilot scale testing of processes and materials grinding was performed. Building 102 was a single story of steel frame construction. Contained in the building were a SemiAutogenous Grinding (SAG) mill, a rod mill, a ball mill, a cyclone separator, electrical panels, a tar sands extraction apparatus, and a cyanide leach pilot plant. The mills did not contain any materials of a hazardous nature. The electrical panels were all of a 'dry' construction containing no PCBs. The tar sands extraction apparatus had several tanks containing a residual, semisolidified, oily material. The tanks were coated with asbestos insulation (5) and the area was coated with a tar residue. Analysis of the residue indicated heavy oil constituents. The cyanide leach pilot plant was partially dismantled. Some white crystalline material was noted on the top of the apparatus near where the cyanide would be added to the circulating liquids. This material was not sampled due to the limited extent of the material and the hazard in reaching the top of the apparatus.

A laboratory had been constructed in the southwest corner of the building. A fume hood located in the lab had a cyanide warning placard. Testing with a cyanide monitox indicated no breathing hazards in the lab. Small containers of chemicals were noted in the lab and slated for future removal. The top of the lab was used for storage of materials. On top were found 5 gallon containers containing suspected cyanide, potassium permanganate, and several small acid containers. The roof of building 102, over this area, had been breached. Other containers on top of the lab were filled with rainwater.

The building was drained by a system of 12" deep floor launders which carried material out the north side of the building into the trench drain along the south and west sides of building 101. This drain then flowed into the tailings pond at drain 'O' at the west end of the pond. The material in the floor launders in the southeast end of building 102 exhibited elevated levels of gamma radiation. All floor launders contained from 3" to 8" of material.

BUILDING 103: Building 103, two stories of brick/masonry construction was the Analytical Chemistry Building. Nine laboratories were located in this structure. The building had a flat tarred roof. The roofing material was failing and rainwater was leaking into the building. The drop ceiling (acoustic tile) on the second floor was collapsing when TAT investigated the building. The building contained laboratories on both floors. Approximately 15 fume hoods were located in this building. Historical reports indicated that digestion of samples in the hoods may have resulted in the deposition of perchloric acid crystals in the hood systems. The hoods on the second floor were wash-back type hoods with filter apparatus located on the roof. Due to the shock sensitive nature of perchloric acid TAT did not attempt to sample any hoods on the site. Visual inspection of the hoods indicated unknown materials had deposited in the vent systems. Visual inspection of the filter system on the roof indicated that sediments of unknown composition had been deposited in the filter system. TAT traced all laboratory sink drains to the outside drain system and eventually to the tailings pond through drain 'F'. Several small containers with laboratory chemical were located in this building. The hood wash system had a 50 gallon fiberglass tank located in the southeast corner of the second floor. This tank contained approximately 10 gallons of a high pH liquid and was labeled NaOH.

BUILDING 103A: Attached to building 103, yet having no internal connection, building 103A was a cinder block construction. The building was used for sample preparation. Generally this included drying, sieving, and sorting ore samples. Located within this building were several 5 gallon pails containing radioactive ores. Under the drying floor approximately 5 inches of fine ore material of mixed composition was noted. Several drums of ore material and trash were also noted in the building. Building drains all lead to drain 'F'.

BUILDING 104: This building, one of the original buildings on site, was the Chemical Engineering Laboratory. A single story masonry/brick building it contained six laboratories with five fume hoods and four offices. Several small containers of chemicals were located in the inspection of this building and noted for future removal. Radiation scanning with the GM

meter located several countertops with elevated radiation readings. These areas were flagged with paint for future swipe sampling and possible removal. All laboratory and floor drains lead to drain 'F'.

BUILDING 105: This building, also one of the older buildings on the site, was the Analytical Laboratory Building. A single story of wood frame construction, this building contained six laboratories with associated fume hoods. No containers of laboratory chemicals were located in the building. Several fire extinguishers (pressurized containers with various chemical compounds) were noted for future removal. All laboratory drains lead to drain 'S'.

BUILDING 106: A machine shop, building 106 was one of the newer buildings located on the site. A two story steel frame and metal walled structure, this building was apparently used for vehicle and equipment maintenance. This building was securely locked and placarded for radiation hazards. According to the Jacobs report, the building had high levels of organic vapors based on PID measurements. Between 1987 and 1992 most chemicals/lubricants were removed from the building. CSMRI began storing 55 gallon drums and 5 gallon containers of radioactive materials in this building. Also contained in the building were radioactive mineral specimens. A medium volume (80 liter/min.) air sampling pump was placed inside this building to determine the health & safety threat to workers entering the building. Analysis indicated elevated Radon levels in the building. Prior to entering the building all doors were opened and the building allowed to ventilate for several hours. TAT and REAC personnel entered the building in level 'C' protection and conducted continuous monitoring with radiation survey instruments and the PID. No elevated levels of organic vapors were noted with the PID. The drums in the building contained material apparently removed from the ground on the CSMRI site by CSMRI. Several drums with external readings of up to 1 mR/hr were noted. These drums were labeled as drill cuttings from the TMRC site. Five gallon pails (sealed) with readings of up to 30 mR/hr were also located on the building. Small containers of chemical oxidants were located in this building and noted for future removal. The single floor drain lead to drain 'S'.

BUILDING 107: Building 107 was the Chemical Laboratory and Processing Plant. This building was a two story structural steel frame building with a central core rising five levels. Within the central core was a Reichert Cone concentration apparatus. Adjacent to the Reichert Cone was a mill for separation of fine materials. The south end of the building was two stories. The first floor was one laboratory. The second floor contained four laboratories. All labs had associated fume hoods. Numerous small containers of

laboratory chemicals were located in this building. According to CSMRI (2) the last operation run in this building was concentration of high thorium tin ore in 1987. The mill and floor had elevated radiation levels noted in the material spilled on the floor. The floor drain system was a launder system which was one-half to three-quarters full. Some of the material exhibited elevated radiation readings. Also noted in the northeast room were elevated alpha and gamma readings.

BUILDING 108: This was a one story wood frame and asphalt shingle construction building. The building contained two laboratories each with one fume hood. No small containers of hazardous materials were located in this building.

BUILDING 109: Building 109 was a combination of laboratories, storage, and a fabrication shop. This was a one story structure constructed variously of steel framing, wood framing, and sheet metal. The east side of the building contained four laboratory areas. Radioactive contamination was noted in one of the vent hoods in the east lab. Drains in the labs emptied directly on the ground behind the building. Elevated levels of radiation and numerous laboratory containers were noted behind this lab. The west three-quarters of the building was an open area. Contained inside was one kiln and approximately 500 drums. The drums had been consolidated from all over the site by CSMRI. The drums, which had generally been exposed to the elements, were in varying stages of decomposition. During consolidation the worst drums were overpacked. All drums contained waste from the operations on site. As CSMRI had catalogued and sampled the drums in the past TAT did not attempt to sample the drums. The water main break had occurred under the northeast quadrant of the building. Sediments flushed up into the building exhibited elevated levels of radioactivity. Material behind the building exhibited elevated levels of gamma radiation and sample containers were noted buried in the fill material at the base of the building. Also noted in the embankment on the north side of the building were numerous laboratory containers, sample vials, drums, and other debris.

BUILDING 110: Building 110 was the pumphouse for an experimental slurry pumping system established adjacent to the building. The structure was a two story steel framed metal walled building. Located in the building were several containers of laboratory acids, as well as other small containers of laboratory chemicals. Also noted were seven compressed gas cylinders without labels or markings. Several launders were located on the bottom floor of this building. The launders lead to drain 'P' at the west side of the tailings pond. Two launders in the building had been covered with steel plate. Under the plate the launders were filled with a multicolored sludge. XRF analysis indicated the sludge

to be high in metals. At the base of the south concrete wall weep holes were partially plugged with a green/yellow/white precipitate. XRF analysis indicated that the material had high copper and iron contents. Screening with the GM meter indicated elevated levels of radiation in the concrete along the south wall on the floor.

BUILDING 111: Known as 'Pyromet' this building was a steel frame metal walled structure. Records indicate that the building was used as an equipment and maintenance shop. Records also indicate that the building may have been used for some processing. It is possible that mercury containing wastes were deposited in a small settling pond directly behind the building. When TAT inspected the building, approximately 200 drums, similar to the drums in building 109, were in storage in the building. After the drums were removed, radiation screening indicated minor alpha radiation in the launder system.

BUILDING 112: Building 112 was the original garage/maintenance shed. The building was one story of steel/wood frame and masonry construction. When TAT inspected the building, minor amounts of debris and small containers of lubricants and cleaners were found in the building. These materials were noted for later removal.

BUILDING 114: This building was a small metal shed used for solvent storage. No small containers were located within this building. Attached to the structure was an open faced shed with a chain link gate for entry. Under the shed were 15 large compressed gas cylinders with inadequate labeling as well as eight lecture-size cylinders with labels indicating specialty gasses, several 'bomb' type fire extinguishers, and 20 standard fire extinguishers containing various chemicals. Dry weed and grass growth had encroached upon the cylinders posing a threat of fire and explosion. Building 114 was later used as a temporary disposal/staging area for chemicals found on site.

BUILDING 115: Located at the main facility power substation this was a small shed (8' x 12') for transformers. When TAT inspected the area all transformers had been removed from the shed and the substation.

BUILDING 116: Constructed of steel frame and metal siding, this building was used as a welding and preparation shop. The building contained several welders and a small oxygen furnace for smelting/melting materials. Several small fiberpack drums containing unknown materials were located in this building.

BUILDING 117: This building, constructed in the late 1970s,

is a two story building of masonry/brick construction. Attached to building 101, this building apparently served as an administrative center on the site. No hazardous materials were located in this building.

3.2 Site Utilities

The site utilities were mapped through a combination of the data contained in the Jacobs and in the CSM facilities reports, a meeting with the former maintenance supervisor for the site, and TAT field investigation on site. All utilities on site were privately owned by CSMRI and no known maps of the systems existed. TAT contacted the phone, gas, electric, and water companies to confirm service to the facility was disconnected prior to subsurface soil sampling. All utilities to the site were disconnected with the exception of the water main and sewer line traversing the site. The water main was field staked to prevent damaging the line during sampling. A map of the site utility lines was constructed and provided to the EPA for use during the removal activities (Figure 3).

3.3 Drain System

TAT developed a map of the drainage system on the CSMRI site using available utility information and by performing surveys with magnetic pipe locators. TAT also traced the connections between various parts of the system by using water to trace pathways. The drain map connected the 20 separate drains located on the south embankment of the tailings pond to building and street drains on the site (Figure 3). None of the drains were connected to the sanitary or storm sewer systems. It was determined that cleaning of the buildings could be accomplished by allowing all decontamination waters to flow through the drainage system into the tailings pond for containment. The drains from each building could then be flushed, completing decontamination of the system.

3.4 Water Sampling

Samples of water flowing through the site drain system were taken during the spring runoff. Samples were taken from the five drains flowing during and after a storm event. Samples were taken from drains 'A', 'F', 'L', 'M', and 'OP' (Figure 3). Samples were also taken from the water contained in the tailings pond. The samples were analyzed for metals contamination and for gross alpha and beta determinations. Analysis of the samples indicated that metals were being transported through the site drainage system and into the tailings pond (Table 1).

3.5 Soil Sampling

CSMRI performed laboratory, bench scale, and pilot scale processing on ores from all over the world. Excess process feedstock and waste remaining after processing were either flushed into the tailings pond or were dumped in various piles on the perimeter of the site. The facility operators also had disposed of laboratory equipment, glassware, sample containers, etc. on the embankment at the tailings pond. Over the years the north embankment and areas west of building 101 were filled. Eventually buildings and roads were constructed over some of the filled areas. Aerial photographs were obtained for selected years from 1951 through 1990. The aerials were used to assist in the determination of which areas on the site may have been filled.

The filled areas required surface and subsurface sampling to determine the presence and extent of contamination. Selective soil sampling was conducted to augment the data developed in the Jacobs and IC reports and to determine whether metals contamination conformed to the areas of radioactive contamination (Figure 4). Composite samples were taken from selected waste piles on site. Small waste piles were located on site which were not radiation contaminated but did have high levels of metals contamination. Gamma survey instruments were used to confirm the reported radioactive areas on the site.

Subsurface sampling was conducted with the Geoprobe and with a backhoe (Figure 5). Sampling along the embankment was limited because of the 'live' sewer line. Subsurface contamination data was used to generate an estimate of the volume of contaminated material contained on the site. Cores extracted with the Geoprobe were screened with the gamma survey instrument and with the geiger mueller instrument. Samples were examined for visual evidence of contamination. Samples were taken, where possible, from the visually contaminated zones and below the visually contaminated zones. A small backhoe was used in April, 1992, to sample subsurface soils ('digs' on Figure 5). Because all data on the location of utilities on site was not complete, this sampling was limited in area and depth. In June, 1992, a trackhoe was used to dig deeper trenches in an expanded area on the facility ('Trenches' on Figure 5).

Data from the Geoprobe sampling, the trenching, and the existing reports were plotted on an aerial topographic map of the area. The map was used to calculate volumes of contaminated soils on site. The map of potential removal areas is contained in Figure 6. TAT estimated that approximately 22,000 cubic yards of material were on site. This estimation was based on soil sampling conducted on the facility. The volume given was approximate due to the limitations on sampling along the embankment and because the total depth of contaminants in the tailings pond was unknown.

3.6 Drum Sampling

Approximately 700 drums of ore and process material remained on site. Most of the drums were in storage in buildings 109 and 111. Data on the contents of the drums had been developed by CSMRI through its contractors. The EPA determined that resampling of these drums would not be conducted.

There were numerous drums contained in the retaining wall along the south embankment to the tailings pond. These drums constituted part of the retaining system. TAT sampled several of these drums to confirm that the material contained within the drums was hazardous material. Gamma surveys of the drums indicated that low levels of radioactive materials was contained in some of the drums.

4.0 ANALYTICAL

All soil and water samples for metals analysis were submitted to EPA ESD for analysis at the EPA laboratory. The sample results are contained in Appendix B. Results are summarized in Table 1. Samples for radiochemistry analytical services were submitted to commercial laboratories for analysis. Sample results are also contained in Appendix B and are summarized in Table 1.

5.0 QA/QC

All analytical services were performed at QA-1. TAT performed QA/QC on the samples sent to the commercial laboratories.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The watermain break had washed radioactive and metals contaminated materials into Clear Creek, a major source of drinking water in the Denver area. Studies performed by the BOR on the flood potential for the drainage area above the tailings pond indicated that the pond would be adversely affected by a substantial runoff event. Studies of the flood potential for Clear Creek indicated that a substantial portion of the tailings pond embankment would be eroded into Clear Creek. Also radiation surveys indicated that radioactive materials were located outside of the tailings berm and adjacent to Clear Creek. Samples of drainage water from the site indicate that metals contaminated waters were draining from the facility and into the tailings pond.

From the analytical data, the previous surveys performed on site, and the TAT investigation, TAT recommended that the contamination

on the site be removed to a licensed disposal facility to prevent further releases of contaminated material into Clear Creek. If offsite disposal was not feasible TAT recommended that construction of an on-site repository be investigated. TAT also recommended that the buildings and drains leading to the tailings pond be cleaned first to prevent the recontamination of the area after removal of the tailings pond.

7.0 HEALTH & SAFETY PLAN

Using all available data regarding the site, TAT developed a site specific Health and Safety plan for possible removal action on the site. The plan is included in Appendix C. The Health & Safety plan directed that all removal operations be conducted in level 'C' personal protection unless monitoring indicated that other levels of personnel protection were applicable.

8.0 WORK PLAN

At the request of the OSC, TAT developed a work plan for removal at the site. The plan discussed cleaning the buildings, decontamination of the drainage system, removal and stockpiling of the contaminated material on site, construction of a temporary waste materials stockpile pad, possible construction of a repository on site for the contaminated materials, the disposal of compressed gas cylinders found on site, and the collection and disposal of containers of laboratory chemicals found on site. The plan also addressed site security and response actions for possible releases of contaminants from the site. Comments on the draft work plan were solicited from interested parties. Generally these parties included the local residents, CSMRI, the City of Golden, local industrial concerns, and downstream water users. The final work plan is included in Appendix D.

9.0 REMOVAL OPERATIONS

Under TDD numbers T08-9205-018 and T08-9210-012, TAT was tasked to provide daily oversite during the removal, provide photodocumentation, and to perform confirmation sampling during the removal.

9.01 General Site Activities

On May 20, 1992, the ERCS contractor began mobilization on site. Office and decontamination trailers were set up at the east entrance to the site. The general sequence of removal activities

was: collect chemical and compressed gas cylinders from each building, remove any physical safety threat inside of each building, clean each building, flush the drainage system, dewater the tailings pond, construct a temporary stockpile clay liner, excavate and stockpile contaminated soils, regrade and topsoil all disturbed areas, reinstall the water and sewer lines, sample and dispose of the compressed gas cylinders, and dispose of the frac tank waters. TAT and the Response, Engineering, and Analytical Contractor (REAC) were on site to provide air monitoring and screening of workers on site. TAT also performed photodocumentation and confirmation sampling on site.

9.02 Health & Safety

All removal operations were conducted in level 'C' personal protection. REAC provided air monitoring to monitor for possible releases of radioactive contaminants off site. Air monitoring was also performed to confirm levels of respiratory protection. All workers were screened with radiation survey equipment before leaving the exclusion zone.

9.03 Chemical Container Collection

Prior to initiating building cleanup, TAT and the ERCS contractor inspected each building and collected all containers of laboratory chemicals. All compressed gas cylinders were collected and stored in building 114. Most of the cylinders collected from the buildings were fire extinguishers, however, several compressed gas cylinders with unknown contents were also collected. All chemicals found on site were collected and stored in building 114. Among the materials located were PCBs, cyanide, acids, bases, and various reagents. TAT chemists performed hazard categorization on the materials and incompatible materials were separated. The ERCS contractor lab packed the materials and arranged for disposal with a licensed disposal facility.

9.04 Building Decontamination

All cleaning activities were conducted in level 'C' personal protection. Air monitoring for radioactive materials releases was conducted by REAC personnel on site. Prior to decontamination each building was inspected for physical hazards. As many of the buildings were used for storage of desks, chairs, and similar equipment these items were moved to a central area, steam cleaned, surveyed for contamination, and removed to a 'clean' building for storage. Any removable contamination was removed from floors and launders with shovels. Steam cleaning began at the highest level of each building. All mobile contamination was removed from the rafters and walls washed. Decontamination water was flushed into

the drainage system for each building. After each building was completed, the drains were flushed with high pressure water to move any mobile contamination down to the tailings pond. All decon waters were allowed to wash through existing drains and into the tailings pond. While the buildings were being cleaned, TAT monitored the drainage waters for pH and conductivity. Samples of the drain water were analyzed for metals contamination by ESD (Table 1). High conductivity and low pH were noted in the drain waters from the building cleaning operations. Samples analyzed for metals indicated that contaminants were being washed from the buildings and drains on the site. The sequence of building decontamination was: 103, 102, 104, 105, 108, 107, 109, 114, 110, 111, 112, 116, 115, 117, and 101.

Building 103 was the Analytical Chemistry Building. The failing acoustical tile ceiling was removed and stored in two cleaned rooms on the upper floor. The wash back vent hood system on the roof was cut open and cleaned. Vent piping inside the building was washed. Laboratory benches and drains were washed with steam cleaners. An electron microscope located in the basement of the building was covered with visqueen to prevent water damage during cleaning operations. Survey of the building after cleaning indicated that no radioactive materials remained in building 103. The roof of this building is in extremely poor condition and future entries should be made with caution.

Building 102 was the Fabrication and Experimental Laboratory. The equipment in the building was cleaned and, if possible, moved to a central area for storage. The tar sands extraction apparatus, in the east side of the building, was opened up and the residual materials were removed into drums. The asbestos insulation on the tanks for the tar sands extraction unit was wrapped in plastic to prevent migration. Floor launders, which were full of sediments, were shoveled out and the material placed in a small storage area to the west of building 101. A high lift platform was brought in and washing began at the rafters and moved down to the floors. Surveys, after cleaning, indicated that an area in the south east quadrant of the building has non-removable radioactive contamination in the cement floor. After cleaning the three mills in the building were surveyed for residual contamination. The mills were later removed from the site by INTERPRO.

Building 104 was the Chemical Engineering Building. A failing acoustical ceiling was removed and placed in a cleaned room. Washing of the building began from the ceiling to the floor. Floor drains and sinks were flushed with water. Subsequent screening of previously detected radioactive areas indicated that washing had not removed the materials. Swipe samples indicated that some of the material was still removable. The ERCS contractor cut out the countertops and the hood which still had radioactive contamination. These materials were placed in a radioactive debris storage area for future disposal.

Building 105 contained several chemical laboratories and offices. The building was steam cleaned in the same manner as other buildings. A survey of the building after cleaning indicated that no radioactive contamination remained.

Building 108 contained two chemistry labs. This building was cleaned in the same manner as other buildings. A survey of the building after cleaning indicated that no radioactive contamination remained.

Building 107 was the Processing Plant with an attached two story laboratory on the south side. All movable equipment was moved to a central area, cleaned and stored. Contaminates in the processing plant and in the launders were shoveled out and taken to the radioactive materials storage area. Cleaning began at the top of the processing plant and proceeded down the structure. A survey of the building after cleaning indicated that elevated levels of radiation, primarily alpha, remained in the concrete floor in the northeast end of the building. Further cleaning and swipe sampling confirmed that the material was not mobile.

Building 109 was an open structure with four laboratory areas located on the east side. CSMRI had moved most of the drums on the site into this building. ERCS removed the drums to building 102 for storage. The building was cleaned in the same manner as other buildings on the site. Contamination was suspected under the foundation of the building. After cleaning, the building was taken down with a backhoe. All debris was surveyed and swipe sampled for residual radiation. No elevated levels of radioactive materials were noted in the debris. The debris was moved off site to the local landfill for disposal.

Building 114 was a small metal shed which was used to store chemicals and compressed gas cylinders found on site. The building was cleaned in the same manner as the other buildings on site. Contamination was suspected under this building also. The building was razed with a backhoe. The debris was surveyed, and swipe samples taken, for residual radioactive contamination. No contamination was noted on the debris and it was shipped off site to the local landfill for disposal.

Building 110 was the pumphouse. All removable equipment in the building was cleaned and moved to a storage area. The floor launders were cleaned with shovels and the material was placed in the stockpile area to the west of building 101. The interior of the building was steam cleaned in the manner described above. Survey of the building after cleaning indicated that residual alpha contamination remained in the concrete floor of the building. Subsequent cleaning and swipe sampling indicated that the material was not removable. After cleaning, much of the process equipment and pumps in the building were removed from the site by INTERPRO.

Building 111 was referred to as 'Pyromet' in the CSM Building survey. The building contained drums stored on the site. The drums were removed to building 102 for storage. The launders in the building were cleaned with shovels and the material was transported to the storage area to the west of building 101. The building was steam cleaned. Slight residual alpha contamination was noted in the launders of the building. Swipe sampling and survey instruments indicated that the material was not removable. Previous reports and sampling indicated that a tailings pond had been built on the north side of building 111 and that mercury contaminated wastes had been flushed into the pond. Contamination was suspected underneath the foundation of the building. The building was razed with a backhoe. The debris was surveyed and swipe sampled for removable radioactive contamination. No contamination was noted and the debris was removed off site for disposal at the local landfill.

Building 112 was the old maintenance shop. Cracking in the walls of the single story brick building indicated that the building was in poor condition. The building was cleaned as other buildings on the site. Contamination was suspected under this building. The building was razed with a backhoe. The debris were surveyed and swipe sampled for radioactive contamination. No contamination was noted and the debris were removed to the local landfill for disposal.

Building 116 was the welding and preparation shop. Several welders and a furnace were located in the building. The building was cleaned and surveyed for residual radioactive materials. No residual radioactive materials were noted. The building was then used to store equipment and materials found on other locations on the site. The welders were removed from site by INTERRO.

Investigation of building 106 indicated no contamination of concern in the structure. As 106 was licensed and used for storage of radioactive materials by CSMRI it was determined that the building would be left undisturbed.

Building 115 was a small building located at the main electrical substation for the site. The transformers from the site had been removed and the building was empty. The building was cleaned and surveyed as other buildings on the site.

Building 117 was an administrative add-on to building 101. Surveys of the building indicated that no contamination existed in this building. This building was not cleaned.

Building 101 was the largest, most contaminated building on the site. The building contained numerous laboratories and offices as well as process areas, floor launders, and the sump area. The building had originally been an open spaced mill building. Over the years floors and many rooms had been constructed inside the

building. The earliest uses of the building included the research of radium extraction processes. Surveys indicated that alpha contaminated material pervaded the structure of the building. Alpha counts of over 200 counts per minute (cpm) were noted on the roof beams. Site background for alpha was determined to be approximately one count per minute. Swipe sampling indicated that almost all of the contamination was removable. EPA determined to remove all mobile contaminants in the building. Mobile contaminants did not include contaminants contained behind walls and under floors in the building. EPA determined not to raze the building as it has been designated an historical building.

To prevent major structural damage due to cleaning the building with water, the ERCS contractor used a vacuum truck to remove solids and wash water during the cleaning process. Cleaning proceeded from the top of the building down. Asbestos covered ducts were wrapped in plastic to immobilize the material. As a floor was cleaned the drains were flushed to the next level. REAC performed air monitoring during the cleanup. Surveys and swipe sampling of the cleaned areas indicated that non-removable radioactive contamination remained in the structure frame. As cleaning progressed to the bottom floor the launders were shoveled clean and the material stored in the storage area to the west side of building 101.

The final cleaning step for building 101 was the removal of part of the north addition of the building. This structure was removed to facilitate access to the sump area. The concrete pad covering the four sumps was removed with a backhoe. The sumps contained from 1 to 4 feet of contaminated materials. The material was mucked out with the backhoe and stored on the concrete pad for building 109. Any material the backhoe could not remove was shoveled out by laborers. This material was later moved to the stockpile. The sumps were then washed to remove any remaining contamination.

A six foot diameter reinforced concrete pipe (RCP) lead from the east sump to the tailings pond. TAT performed a level 'B' investigation of the tunnel. Gamma survey instruments indicated no levels above 50 μR/hr in the main length of the tunnel. The tunnel had been extended at the north end by the addition of 4 timber sets. The timber sets were buried under waste material, drums, and laboratory debris. Survey instruments in this area of the tunnel indicated levels of 800 μR/hr.

9.05 Stockpile Construction.

A construction fill area located to the west of the baseball field was selected for a possible temporary stockpile area for contaminated soils. The Bureau of Reclamation (BOR) developed estimates of the maximum volume of storage area available on the site west of the baseball field. The BOR also provided

specifications for a clay pad to be constructed under the stockpile. TAT and REAC performed a gamma survey of the stockpile area prior to construction. The survey indicated no elevated levels of gamma radiation at the site. TAT also collected composite soil samples from the surface of the stockpile area. The samples indicated no elevated levels of metals on the site. The northern most face of the construction fill area did contain tailings material. This material was approximately 75 feet from the perimeter of the proposed stockpile area. North face material did have elevated levels of metals and radiation. No other viable stockpile areas existed close to the site. The EPA selected the west side location to construct the temporary stockpile. Most of the contaminants located at the north face of the area were moved into the stockpile during filling. Any remaining material would be excavated when the stockpiled material was transported to the final disposal site.

Clay for the stockpile pad was transported from a clay mine approximately six miles east of the site. The clay was truck transported. After dumping, the clay was wet to increase moisture content and improve compaction. The clay was spread in 6 inch lifts and compacted with bulldozers. A one foot thick layer of clay was laid over the stockpile area in this manner. A two foot tall berm was constructed around the perimeter of the stockpile to contain any runoff water from the stockpile. A six foot cyclone fence topped with barbed wire was constructed around the perimeter of the stockpile.

Excavated material from the tailings pond was trucked to the stockpile area and placed in lifts with a bulldozer. To prevent possible airborne migration of contaminants, the material was kept damp with water during all phases of filling. Each evening the ERCS contractor sprayed a poly acrylic resin (Marlock) surfactant on the pile to prevent migration of the material. Prior to demobilization from the site, the stockpile was recoated with the surfactant. Periodic inspections and recoatings of the stockpile are conducted regularly. A survey performed by a TAT subcontractor, in January, 1993, estimated that approximately 15,000 cubic yards of material were contained in the stockpile.

9.06 Dewatering of the Tailings Pond.

After completion of building decontamination, the water in the tailings pond was transferred to four frac tanks brought onto the site. A skimmer pump was used to prevent pumping contaminated sludge into the tanks. After two and one half tanks were filled the pond water level was low enough to merit pumping the final liquids into the fourth tank. It was anticipated that some sludge would be pumped with the final liquids. After filling the tanks, TAT sampled the liquids for metals analysis and gross alpha counts. EPA ESD conducted the analysis for metals. REAC dried samples and

performed alpha counts on site. Analysis indicated that the first two tanks had little contamination. Tank three had some contamination. Tank four had the highest contamination. Tank four only had approximately 2000 gallons of liquid. The liquid was used to wet down the stockpile and the remaining sludge in the tank was also moved onto the stockpile. Tanks one through three were slated for filtering for possible disposal in the POTW. In March, 1993, permission was given for the EPA to discharge filtered water from tanks one and two into the POTW. Tank three, containing liquids with elevated alpha and a high potassium-40 level was not suitable for discharge to the POTW. Final disposal from the 10,000 gallons of liquid in tank three is still being investigated.

9.07 Excavation of Contaminated Soils

In July 1991,the ERCS contractor began excavation of the tailings pond. All excavation was conducted in level 'C' personal protection. Water sprays were used to wet down the excavation area and to suppress dust on site. REAC performed air monitoring for releases of radioactive materials from the site. TAT and REAC used radiation survey instruments to screen workers exiting the site.

The EPA determined that the removal action would address the threat posed by mobile contamination on the site. Mobile contamination was determined to be material exposed to migration by the elements. Immobile contaminated material was located in isolated areas of the site. Immobile contaminants were generally under an asphalt or concrete floor, isolated under floors or between walls of a building, or contained in a cement matrix. These materials were not removed as a part of this removal action. This designation includes materials located between floors and in walls within building 101. Figure 7 indicates areas where contaminants were determined to be immobile and were left in place.

Excavation began at the west end of the pond and embankment. The pond area was too soft and access too limited to allow direct loading of trucks in the lower area. A dozer was used to push materials up to where the backhoe could reach. The backhoe was used to load trucks. Excavation progressed to the east. As the embankment was removed a road was left above the pond for truck access. Material within the pond itself was too wet for the dozer at the stockpile to handle. The wet pond material was mixed with the dry embankment material to allow for better handling at the stockpile. After the material in the pond was removed, the tailings dam was removed, starting from the northwest and working around to the southeast. Up to four dump trucks continuously hauled material to the stockpile.

TAT performed radiation surveys as excavation progressed to determine excavation areas. TAT also used a field portable X-Ray florescence unit (XRF) to determine excavation areas for metals.

After radioactive contaminated areas were excavated to a level of 70 μR/hr TAT used the XRF to determine whether further excavation was needed to remove metals contamination. Visual examination of the areas was also used to direct excavation. Contaminants characterized by specific colors and textures were used as indicators of contaminated areas. Also, where laboratory trash was encountered, it was removed.

The metals and radioactive contaminated wastes were intermingled to the extent that it was not possible to segregate the materials into distinct waste stockpiles. All materials were eventually stockpiled into one stockpile located at the western perimeter of the site.

9.08 Removal Confirmation Sampling

Removal confirmation sampling was performed in the tailings pond and embankment after removal operations were completed. Confirmation included constructing a 10m x 10m grid and taking composite samples from each grid. Each soil sample was sent to REAC for analysis by gamma spectral analysis. Results indicated that all samples had concentrations of less than 15 pCi/gm, the limit prescribed by the Nuclear Regulatory Commission (NRC) for soils below six inches of cover. Selected samples were also collected for metals analysis. The sampled area is depicted in Figure 8. The results of analysis are presented in Table 3.

After placement of fill and topsoil in the removal area, the Colorado Department of Health requested that the area be sampled to assure conformance with the NRC limits on soil contamination. The area was again gridded in a 10 meter grid and composite soil samples taken from each grid (Figure 9). Soil samples were again sent to REAC for analysis. All samples passed the 5 pCi/gm limit for surface soils as prescribed by NRC. The analytical data for the surface soil samples is presented in Table 4. A survey with the Ludlum Micro R survey meter was also performed. A reading was taken at each node point of the grid. The survey indicated that no areas above the 70 μR/hr limit remained in the tailings pond area. Data for the survey are included in Figure 9.

9.09 Final Grading, Filling, and Seeding

After confirmation of removal of contaminated soils in the area of the tailings pond the ERCS contractor brought in approximately 6000 cubic yards of clean fill material and topsoil. The slopes were graded to the best achievable grade. Where needed fill material was used to soften the grade. Fill material was placed in the bottom of the pond and topsoil placed above the fill. The final contoured area was seeded with a native seed mix to promote grass growth on the embankment slope and prevent erosion problems on the

site.

9.10 Water and Sewer Line Replacement

A twelve inch water main and an eight inch sewer line were removed from the embankment as part of the excavation on site. During the removal the water was rerouted around the site on a temporary basis. The waterline removed was an integral part of the City of Golden water distribution system and replacement was required to assure proper operation of the system. The sewer line serviced a small community to the west of the site. Due to elevation constraints no other sewer routing was possible. TAT recommended and ERCS constructed a temporary tank and pump system to route sewage around the excavation area. This system was used throughout the excavation period. After final contours for the site were achieved, TAT contracted for a survey of the embankment area. The survey was used to determine alignment and grades for the replacement water and sewer lines. TAT designed replacement water and sewer lines and the City of Golden approved the final alignment and design. ERCS contracted with a construction firm to install the new lines in the cleaned areas. TAT provided occasional review of the construction of the pipelines and also performed radiation monitoring along the alignment to assure no threats to the health of workers would be encountered during the installation phase. The replacement lines were completed and placed in service in January, 1993.

9.11 Compressed Gas Cylinder Disposal

During building decontamination, many fire extinguishers were located on site. All compressed gas cylinders were stored in building 114 until demolition of the building was imminent. The cylinders were then removed to building 104. The fire extinguishers were removed from the site by a local fire extinguisher supply company. The remaining compressed gas cylinders were tested for valve packing integrity in January by a subcontractor to the ERCS contractor. Thirteen of the cylinders were found to have impaired valve packing integrity. Two of the cylinders still had good valve packings and these were sampled for analysis of contents. The thirteen with impaired valve packings had sample sleeves fabricated and were sampled for characterization in March of 1993. Final disposal options on the compressed gas cylinders await sample results.

10.0 SUMMARY

During the removal sixteen buildings were cleaned of mobile contamination. Four of these buildings were razed and removed from the site. All remaining laboratory chemicals were labpacked and

disposed of at a licensed disposal facility. Fifteen thousand cubic yards of contaminated soil was excavated and stockpiled in a secure location west of the site. During building cleaning and excavation REAC performed air monitoring for possible off site releases of contaminated materials. TAT and REAC performed radiation screening of personnel on site. TAT directed excavation on a continuous basis through use of an XRF and radiation survey instruments. After excavation TAT designed, and ERCS installed, water and sewer mains which had been dismantled during the excavation process.

The next phase of site operations includes: 1) Sampling of the compressed gas cylinders in March, 2) disposal in March, to the POTW, of the liquids in the two frac tanks, 3) Disposal of the liquid in the third frac tank, 4) sampling of the waste stockpile for disposal characterization and, 5) development of a site specific disposal and transportation plan for the waste stockpile.

REFERENCES
CSMRI Creekside Summary Report

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2. Colorado School of Mines Research Institute Historical Records Search: R. A. MacPherson, CSMRI Radiation Protection Officer, January 15, 1991.

3. Personal Communication with Mr. Michael Zimmerman, On-Scene Coordinator, U.S. EPA Region VIII.

4. CSMRI Facilities Condition Report: CSM Plant Facilities Department, August 1, 1985.

5. CSMRI Environmental Assessment: Jacobs Engineering, Inc. 1987.

6. Colorado School of Mines Research Institute Tailings Pond Sampling Report: Industrial Compliance Incorporated, Golden, Colorado.

7. Sampling Activities and Analytical Results for the Colorado School of Mines Research Institute, Golden, Colorado; TDD #T08-9103-010: Ecology & Environment, Inc., May 2, 1991.

8. Memorandum; Distribution of Analytical Data: Ronald W. Geason, Colorado School of Mines, February 14, 1992.

9. Map; Soil Gamma Survey - CSMRI Creekside, Golden, Colorado: J.L. Grant & Associates.

TABLES

TABLE 1
CSMRI SAMPLE RESULTS
T08-9210-011, T08-9210-012, T08-9205-018, T08-9202-017

MtxSample #	TAG	Location	Sample Date	mg/kg As	Cd	Cr	Cu	Pb	Zn	pCi/gm Alpha	Beta	Hg
W CSDW03	8-28543/8-28542	DRAIN I	3/11/92	<0.005	0.0003			0.007	0.04	ND	0.7	<.0003
W CSDW01	8-28548/8-28547	DRAIN A	3/11/92	<0.005	0.0004			0.019	0.08	ND	3.8	<.0003
W CSDW04	8-28541/8-28538	DRAIN L	3/11/92	0.05	0.0032			0.13	0.82	8.5	5	0.026
W CSDW02	8-28546/8-28544	DRAIN F	3/11/92	<0.005	0.0018			0.003	0.16	1.1	1.4	<.0003
W CSDW05	8-28540/8-28539	DRAIN O	3/11/92	0.009	0.0016			0.04	0.31	3.8	5.1	<.0003
W CSSW101	8-63620	TP WATER	5/21/92	0.0064	0.003	0.006	0.287	0.061	0.364			
W FSW01	8-63572	DECON LAB 103	5/30/92	0.0111	0.027	0.207	0.307	0.187	2.795			
W DRAIN P	8-63583	DECON BLDG 110	6/10/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W 107NE DRA	8-63590	DECON NE LAB 107	6/11/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W DRAIN B	8-63589	DECON 107 MAIN	6/12/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W CSGW04	8-63301	WELL #4	6/15/92	0.003	<.008	<.015	<.022	<.08	0.068			
W CSSW102	8-63303	TAILINGS POND WATER	6/15/92	0.017	<.008	<.015	198	<.08	0.17			
W CSGW02	8-63302	WELL #2	6/15/92	0.0031	<.008	<.015	0.026	<.08	0.471			
W CSGW01	8-63304	WELL # 1	6/15/92	0.0025	<.008	<.015	<.01	<.08	0.022			
W DRAIN B	8-63305	DECON 107 PROCESS EQPT	6/16/92	0.3	0.031	0.11	2.743	1.29	64.94			
W DRAIN F	8-63306	DECON LABS 107	6/17/92	0.0377	0.023	<.015	2.027	0.18	2.787			
W DRAIN L	8-63307	DECON 101	6/17/92	0.007	<.008	<.015	0.703	<.08	0.696			
W CSSW103	8-63322	TAILINGS POND	6/23/92	18.2	<8	<15	310	<80	278			
W DRAIN 'OP	8-63323	DECON OF BLDG 101	6/23/92	3.3	<8	<15	63	<80	220			
W CSSW104	8-63324	TAILINGS POND	6/25/92	12.5	<8	<15	190	<80	166			
W CSSW105	8-63325	TAILINGS POND	6/26/92	12.4	<8	<15	175	<80	185			
W CSSW106	8-63341	TAILINGS POND	6/27/92	13.6	<8	<15	217	<80	167			
W DRAIN 'O'	8-63340	DECON 1/DEMO 11	6/27/92	428	34	305	4532	2644	14150			
W DRAIN 'L'	8-63339	DEMO 12/DECON 1	6/27/92	38.8	<8	44	1200	315	822			
W CSSW107	8-63342	TAILINGS POND	6/29/92	13.4	<8	<15	195	<80	160			
W DRAIN O	8-63575	BLDG 102 DECON	6/2/92	0.029	0.067	<.015	3.214	<.080	11.32			
W CSGW04	8-63344	WELL 4 (EAST)	6/30/92	2.1	<8	<15	28	<80	110			
W CSGW02	8-63345	WELL 2 (@ DAM)	6/30/92	<2	<8	<15	36	<80	517			
W CSGW01	8-63346	WELL 1 (BKGD)	6/30/92	<2	<8	31	48	<80	88			
W CSSW108	8-63343	TAILINGS POND	6/30/92	12.6	<8	<15	192	<80	151			
W 102 DRAIN	8-63574	@ TRENCH DECON 102 WALLS	6/4/92	1.78	0.324	0.765	34.96	4.098	41.63			
W 102 DRAIN	8-63576	@ TRENCH DECON 102 WALLS	6/5/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W DRAIN F	8-63577	DECON 104	6/5/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W DRAIN A	8-63578	FIRE HOSE FLUSH	6/6/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W DRAIN F	8-63579	DECON 103A @ 104	6/6/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W DRAIN F	8-63581	DECON 107 LAB	6/9/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W DRAIN S	8-63582	DECON 105 LAB	6/9/92	EXPIRED HOLDING TIME - NOT ANALYSED								
W CSSW109	8-63349	TAILINGS POND	7/01/92	14.6	<8	<15	220	<80	163			
W DRAIN O	8-63348	DEWATERING SUMP	7/01/92	2140	<8	<15	25605	<80	220			
W DRAIN L	8-63347	OPENING SUMPS	7/01/92	30.5	<8	47	1664	220	1263			
W DRAIN O	8-63350	DEWATERING SUMP	7/02/92	4760	<8	2500	466000	45200	172300			
W CSSW110	8-24348	TAILINGS POND	7/02/92	36.5	<8	<15	264	<80	190			
W CSSW111	8-63402	TAILINGS POND	7/07/92	23.6	<8	<15	367	<80	168			
W CSSW112	8-63403	TAILINGS POND	7/08/92	22.4	<8	<15	396	<80	174			
W CSSW113	8-63404	TAILINGS POND	7/09/92	23.9	<8	<15	493	<80	195			
W CSSW114	8-63405	TAILINGS POND	7/10/92	22.5	<8	<15	388	<80	160			
W CSSW115	8-63406	TAILINGS POND	7/11/92	21.5	<8	<15	402	<80	158			
W CSSW116	8-63407	TAILINGS POND	7/13/92	20.7	<8	<15	726	<80	231			
W CSSW117	8-63408	TAILINGS POND	7/15/92	18.7	<8	<15	507	<80	178			
W CSSW118	8-63412	TAILINGS POND	7/16/92	18.5	<8	<15	465	<80	164			

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TABLE 1 (continued)
CSMRI SAMPLE RESULTS
T08-9210-011, T08-9210-012, T08-9205-018, T08-9202-017

Mtx	Sample #	TAG	Location	Sample Date	As	Cd	Cr	Cu	Pb	Zn	pCi/gm Alpha	pCi/gm Beta	Hg
					mg/kg								
W	CSGW04	8-63410	MONITORING WELL #4	7/16/92	11.2	<8	<15	77	<80	220			
W	CSGW01	8-63409	MONITORING WELL #1	7/16/92	2.8	<8	<15	63	<80	137			
W	CSGW02	8-63411	TAILINGS POND	7/17/92	2.9	<8	<15	42	<80	554			
W	CSSW119	8-63413	TAILINGS POND	7/17/92	17.4	<8	<15	490	<80	176			
W	CSGW04	8-63426	WELL #4	7/27/92	5.1	<8	<15	55	<80	165			
W	CSGW02	8-63427	WELL #2	7/27/92	<2	<8	<15	31	<80	444			
W	CSGW01	8-63425	WELL #1	7/27/92	2.3	<8	<15	79	<80	126			
S	CSSO107	8-28536/8-63558	DIG 1 @ 18" BWN CLAY	4/27/92	8.4	2.4	31.3	58.2	<50	144	10.8	30.4	
S	CSSO104	8-30399/8-63552	DIG 7 @ BLDG9 (YELLOW)	4/27/92	<2	1.2	<6	25.7	<50	131	63.2	111	
S	CSSO109	8-28534/8-63560	DIG 4	4/27/92	330	35	108	1078	5162	3222	65.2	58.8	
S	CSSO101	8-30396/8-63554	COMP. CREEK TO TP	4/27/92	165	10.5	15.7	4128	460	1216	82.6	89.4	
S	CSSO108	8-28535/8-63559	DIG 3 @ 2' BWN CLAY	4/27/92	10.7	<.5	<6	3	<50	<6	14	35.5	
S	CSSO106	8-28537/8-63557	Hg POND	4/27/92	19.4	18.8	55.6	1925	789	2299	20.7	38.4	1.66
S	CSSO111	8-28532/8-63562	DRUM @ TP	4/27/92	244	17.4	59.6	4565	237	1518	5120	3320	
S	CSSO103	8-30398/8-63551	DIG 7 @ BLDG9 (PURPLE)	4/27/92	10.4	2.9	11.4	147	182	363	4380	1540	
S	CSSO102	8-30397/8-63555	COMP. FROM TP	4/27/92	135	3.1	78	1135	1157	313	138	119	
S	CSDR01	8-60299/8-63556	TAILINGS @ TUNNEL	4/27/92	70.5	2.3	14.9	2497	357	401	304	256	
S	CSSO105	8-30400/8-63553	DIG 7 @ BLDG9 (BROWN)	4/27/92	<2	0.8	31.5	31.4		81.6	57.3	111	
S	CSSO112	8-60298/8-63563	DIG 3 RUBBLE @ 24"	4/27/92	10.6	1.7	13.9	62.8	120	150	34.2	47.4	
S	CSDR02	8-60300	ASBESTOS AT TUNNEL	4/27/92	1-3% CHRY								
S	CSSO110	8-28533/8-63561	DIG 5	4/27/92	4.9	1.8	15.8	28.4	<50	85.4	14.8	36.6	
S	GPS004	8-60272	18"-28"	4/6/92	17.4	1.59	24.7	47.9	49.9	100			
S	GPS002	8-60268	3'-6'	4/6/92	6.13	2.68	24	94.4	80.4	230			
S	GPS003	8-60269	0'-3'	4/6/92	111	22.5	77	756	1624	1312			
S	GPS001	8-60266	9'-12'	4/6/92	5.46	1.6	24.4	17.8	17.3	87.5			
S	GPS006	8-60274	1'-3'	4/6/92	16.5	12.4	78.8	227	511	1147			
S	GPS007	8-60276	3'-6'	4/6/92	175	10.8	47.6	304	618	1442	590	274	
S	GPS004	8-60271	10"	4/6/92	198	7.01	22.6	1023	427	1134	2280	1070	
S	GPS002	8-60267	0'-3'	4/6/92	10.8	5.27	48.2	299	397	725			
S	GPS003	8-60270	3'-6'	4/6/92	32.3	7.46	29	663	212	467			
S	GPS001	8-60265	6'-9'	4/6/92	2.78	1.21	14.5	23.5	38.1	90.1			
S	GPS001	8-60264	3'-6'	4/6/92	8.32	2.22	26.3	107	91.1	127			
S	GPS009	8-60279	3'-6'	4/6/92	10.1	3.44	43	151	102	268			
S	GPS001	8-60263	1'-3'	4/6/92	1.42	2.36	31.1	57.1	15.3	81.7			
S	GPS009	8-60278	1'-3'	4/6/92	20.6	6.17	30.9	1333	214	467			
S	GPS008	8-60277	0-'3'	4/6/92	6.11	1.46	18	43.5	68.2	118	46	41.6	
S	GPS010	8-60280	1'-3'	4/6/92	37.4	7.47	31.6	830	559	699	148	78.7	
S	GPS007	8-60275	1'-3'	4/6/92	37.3	14.4	45.9	459	2958	1147	146	81.4	
S	GPS022	8-60292	Road 101 west	4/7/92	75.4	25.5	105	641	768	1748			
S	GPS016	8-60286	Yellow pile W of W gate	4/7/92	48.5	6.72	23.8	4847	134	225			
S	GPS015	8-60285	Red mtl N side of W road	4/7/92	130	17.2	244	519	1419	632			
S	GPS025	8-60295	102 Launders	4/7/92	163	15	19.8	7381	1394	2492			
S	GPS021	8-60291	yellow piles W Of 101	4/7/92	138	39.5	67.3	804	1415	4051			
S	GPS020	8-60290	Black piles W of 101	4/7/92	135	16.6	256	482	2306	9330			
S	GPS023	8-60293	Road 116 west	4/7/92	131	7.78	197	1263	321	619	27.8	27.4	
S	GPS024	8-60294	Sump 101	4/7/92	169	8.76	49.9	3693	607	912	608	120	
S	GPS026	8-60296	Surf on bank 9 to road	4/7/92	329	6.31	50.5	959	233	472	125	77.8	
S	GPS011	8-60281	SE pile at arti tail pond	4/7/92	57	31.7	4539	571	472	1115			
S	GPS012	8-60282	NW pile at Arti Tail pond	4/7/92	125	26.6	1012	1512	3749	5027			
S	GPS018	8-60288	Niobium	4/7/92	4.23	3.55	11.7	137	58.4	174	229	161	

TABLE 1 (continued)
CSMRI SAMPLE RESULTS
T08-9210-011, T08-9210-012, T08-9205-018, T08-9202-017

MtxSample #	TAG	Location	Sample Date	mg/kg As	Cd	Cr	Cu	Pb	Zn	pCi/gm Alpha	Beta	Hg
S GPS005	8-60273	0'-3'	4/7/92	1530	10	18.6	529	131	1062	49.6	35.8	
S GPS017	8-60287	Red pile above #16	4/7/92	187	13.5	34.3	6016	71.7	79.6			
S GPS027	8-60297	107 Launders	4/7/92	174	16	24.5	2181	1502	33436			
S GPS013	8-60283	W side of bld 101	4/7/92	26.1	9.9	18.5	173	51	114			
S GPS014	8-60284	Red mtl E of 15	4/7/92	86.7	3.77	19.3	370	254	214	270	148	
S GPS019	8-60289	red piles W of 101	4/7/92	17.7	27.2	4408	149	127	510	43.7	29.2	
S CSGP01	8-20306	BKGD @ 6TH AVE	5/1/92							16.5	43.2	
S CSS0113	8-63622	ABOVE POND N OF 107	5/21/92	7.7	13.5	35.6	247	1350	1020			
S CSSD101	8-63621	TP SED @DW1	5/21/92	69.3	15.3	24.3	2850	1100	42600			
S CSSE102	8-63617	SUMP	5/22/92	71.5	8	53	1650	665	1170			
S CSS0114	8-63618	SOIL AT BROKEN SEWER	5/22/92	9.57	3.8	43.5	288	183	260			
S 103 DRAIN	8-63571	SLUDGE @ INVERT BET 104 &	5/28/92	80.6	13.7	109	1300	570	2530			0.1045
S TRENCH 1	8-63564	W OF W GATE	5/29/92	<20	<2	<30	467	459	401			
S TRENCH 3	8-63566	SE OF 116	5/29/92	<20	<2	<30	743	24.1	178			
S TRENCH 4	8-63567	@ GPS001	5/29/92	<20	<2	106	55.5	82.5	69.4			
S TRENCH 6	8-63569	E OF 101	5/29/92	<20	7.5	<30	242	512	976			
S TRENCH 5	8-63568	W OF 112	5/29/92	<20	<2	<30	27.6	41	76.5			
S TRENCH 7	8-63570	ROAD @ CP	5/29/92	<20	<2	<30	28.3	41.1	78.2			
S TRENCH 2	8-63565	SW OF 116	5/29/92	<20	<2	<30	24.5	36.6	86.7			
S 102 PROCE	8-63573	UNDER PROCESS EQUIP 102	5/30/92	<20	2.8	<30	26.4	31.6	38.4			
S CSS0201	8-63593	YELLOW SOIL IN CP ROAD	6/10/92	<20	<2	102	534	53.9	51.7			
S DRAIN 8	8-63591	DECON 107 PROCESS EQPT	6/13/92	EXPIRED HOLDING TIME - NOT ANALYSED								
S DRAIN 8	8-63592	DECON 107 PROCESS EQPT	6/15/92	EXPIRED HOLDING TIME - NOT ANALYSED								
S CSS0210	8-63308	COMP HILL @ DRAIN 7	6/16/92	<25	<3	49.9	1113	340	891			
S CSS0211	8-63309	COMP LEVY BEHIND BLDG 9	6/16/92	216	<3	<30	3743	117	399			
S CSS0213	8-63311	R,Y,G MTL AT NOBIUM	6/16/92	237	<3	78.9	6190	325	181			
S CSS0212	8-63310	COMP HILL CENT OF BLDG 9	6/16/92	78.1	4.1	<30	342	383	658			
S CSS0216	8-63313	COMP ARTI TAIL POND	6/18/92	162	24.1	<30	678	892	4878			
S CSS0217	8-63312	COMP PAILS W OF 101	6/18/92	<25	<3	203	41	<10	53.8			
S CSS0214	8-63315	COMP BEHIND 112	6/18/92	<25	<3	96.5	418	551	854			
S CSS0215	8-63314	COMP WHERE TANKERS SAT	6/18/92	49.9	5.5	128	592	330	838			
S CSS0225	8-63327	TCH N OF 7 PINK CLAY	6/27/92	41.6	<2	<50	766	58.2	111			
S CSS0228	8-63330	TCH N OF 7, PINK WHITE YEL	6/27/92	75.9	<2	145	1200	134	163			
S CSS0235	8-63337	LOWER STOCKPILE AREA	6/27/92	<20	<2	<50	34.6	53.7	125			
S CSS0229	8-63331	NTV SAND, PIT BELOW 9	6/27/92	20.4	3.8	<50	276	298	727			
S CSS0226	8-63328	TCH N OF 7 ORNG/GREEEN	6/27/92	63	<2	502	2084	273	339			
S CSS0230	8-63332	BLK/RED SAND, PIT BELOW 9	6/27/92	36.1	2	<50	2475	507	1327			
S CSS0231	8-63333	NTV CLAY TCH W OF 10	6/27/92	<20	4.5	<50	427	288	421			
S CSS0227	8-63329	TCH N OF 7 BLACK	6/27/92	1430	<2	178	33640	<10	20.8			
S CSS0233	8-63335	COMP TCH S OF 110 IN CONCR	6/27/92	<20	<2	<50	80.3	173	149			
S CSS 232	8-63334	MULTI COLOR TCH W OF 10	6/27/92	172	5	<50	2307	1863	1431			
S CSSU224	8-63326	NAT CLAY TNCH W OF 112	6/27/92	<20	<2	<50	39.4	22.5	91			
S CSS0234	8-63336	TOP 18" BTW 1 & 2	6/27/92	<20	3.6	<50	140	168	486			
S CSS0236	8-63338	UPPER STOCKPILE AREA	6/27/92	<20	<2	<50	39.4	175	156			
S CSS0209	8-63600	WEEP HOLES 110	6/8/92	<20	3.5	87.2	9106	689	571			
S CSS0207	8-63598	110 LAUNDERS AFTER CLEAN	6/8/92	410	12.7	286	2846	1240	2910			
S CSS0237	8-63401	EXCV MTL @ WATERBREAK	7/02/92	<20	<2	<50	27.9	58.5	53			
S CSM0015	8-63416	Pb SOIL SW OF 101	7/14/92	60	10.2	637	1065	1085	2226			
S CSM0014	8-63415	Cu SOIL NW OF 101	7/14/92	78.6	2.9	33"	38300	482	1046			
S CSM0013	8-63414	Pb SOIL BEHIND 109	7/14/92	288	2.6	<50	283	2213	590			
S CSM0016	8-63417	R SOIL FROM DIG 1.8mR/HR	7/15/92	223	<2	<50	2870	901	9885			

TABLE 1 (continued)
CSMRI SAMPLE RESULTS
T08-9210-011, T08-9210-012, T08-9205-018, T08-9202-017

MtxSample #	TAG	Location	Sample Date	mg/kg As	Cd	Cr	Cu	Pb	Zn	pCi/gm Alpha	Beta	Hg
S CSM0026	B-63418	Hi R @ HWY 6	7/17/92	104	<2	<50	<10	333	<10			
S CSM0025	B-63421	COMP ASHY N OF 7	7/17/92	<20	<2	<50	59.7	108	134			
S CSM0027	B-63419	TP @ BLDG 111	7/17/92	<20	148	1230	4900	43620	56200			1260
S CSM0037	B-63424	ORANGE SAND @ BURN PIT 5	7/20/92									
S CSM0034	B-63423	ORANGE N OF 6	7/20/92	<20	<2	102	59	103	123			
S CSM0033	B-63422	YELLOW N OF 6	7/20/92	28	5.2	740	681	38	182			
S D-13	B-62552	SUBSURFACE GRID	9/22/92	<20	3.8	<60	169	243	532			
S A-10	B-62553	SUBSURFACE GRID	9/22/92	27.8	3.8	125	209	238	477			
S C-2	B-62554	SUBSURFACE GRID	9/22/92	<20	<2	<60	179	334	486			
S D-5	B-62555	SUBSURFACE GRID	9/22/92	<20	<2	<60	164	81	199			
S D-1	B-62551	SUBSURFACE GRID	9/22/92	<20	<2	<60	165	270	423			
S D-11	B-62557	SUBSURFACE GRID	9/22/92	73.2	6.5	<60	695	511	798			
S C-13	B-62558	SUBSURFACE GRID	9/22/92	<20	<2	<60	222	196	467			
S BLANK-1	B-62556	SUBSURFACE GRID	9/22/92	<20	2.2	<60	413	82.8	2.17			
S BLANK-1	B-62573	SURFACE GRID	10/13/92	<20	<2	<60	31.1	46.2	121			
S B-3	B-62567	SURFACE GRID	10/13/92	<20	<2	<60	52.7	76.7	161			
S D-15	B-62571	SURFACE GRID	10/13/92	<20	<2	<60	47.7	59.4	123			
S E-1	B-62572	SURFACE GRID	10/13/92	<20	<2	<60	44.6	70.9	183			
S C-8	B-62569	SURFACE GRID	10/13/92	<20	2.2	<60	40.5	52	125			
S C-1	B-62568	SURFACE GRID	10/13/92	<20	<2	<60	72.4	102	177			
S D-3	B-62570	SURFACE GRID	10/13/92	<20	3.7	<60	64.4	69.4	177			
S A-9	B-62566	SURFACE GRID	10/13/92	<20	3.1	<60	39.4	66.8	119			

TCLP ANALYSIS
SOILS

MtxSample #	TAG	Location	Sample Date	mg/kg As	Cd	Cr	Pb	Hg	Ba	Se	Ag
S CSS0202	B-63584	R' PILE COMP	6/12/92	ND	0.27	ND	19J	ND	0.48	ND	ND
S CSS0203	B-63585	METALS PILE COMP	6/12/92	ND	0.063	ND	0.95J	ND	0.55	ND	ND
S CSS0204	B-63586	COMP @ NW PILE OF GPS011	6/12/92	ND	0.21	ND	52J	ND	0.61	ND	ND
S CSS0205	B-63587	DIG # 4 COMP.	6/12/92	ND	0.13	ND	5.5J	ND	0.39	ND	ND
S CSS0206	B-63588	R, B,& Y PILES W OF 101	6/12/92	ND	0.22	ND	2.7J	ND	0.29	ND	ND

TABLE 1 (continued)
RADIOCHEM IN SOILS
pCi/gm

				Ra226	Ra228	Th228	Th230	Th232	U234	U235	U238	K40	Pb210
S CSS0223	8-63322	HOT SPOT E OF 116	6/23/92	ND	2.2	2.4	168	3.4	22	1.2	50		
S CSS0222	8-63321	HILLSIDE W OF W GATE	6/23/92	268	ND	6	34	4.8	5.3	ND	3		
S CSS0221	8-63320	COMP BEHIND BLDG 109	6/23/92	515	7.5	5.2	190	3.2	64	2.9	64		
S CSS0220	8-63319	DELTA BELOW DRAIN B	6/23/92	ND	197	168	46.3	189	23	ND	23		
S CSS0219	8-63318	W RD HOT SPOT @ 116	6/23/92	79000	ND	29.1	12200	83	1970	88	1970		
S CSS0218	8-63317	HOLE IN BSMT 101	6/23/92	1060	ND	6.5	698	10.9	223	8.8	223		
S D-9	K.R.I.	SUBSURFACE SOILS	9/22/92	6.5	1.8	1.7					6.2	19.8	<8
S C-15	K.R.I.	SUBSURFACE SOILS	9/22/92	5.3	2.2	1.6					10	18.6	<6
S C-10	K.R.I.	SUBSURFACE SOILS	9/22/92	6.8	1.9	1.7					6.5	18.6	<6
S D-7	K.R.I.	SUBSURFACE SOILS	9/22/92	5.7	2.6	2.4					6.5	18.8	<3
S D-14	K.R.I.	SUBSURFACE SOILS	9/22/92	9.3	2.5	2					9.5	23.3	<6
S D-11	K.R.I.	SUBSURFACE SOILS	9/22/92	12.8	1.6	1.6					10.5	18.8	<6
S C-13	K.R.I.	SUBSURFACE SOILS	9/22/92	8.4	2.6	2.2					6.5	18.9	<6
S BANK-1	K.R.I.	SUBSURFACE SOILS	9/22/92	19	1.7	2.2					<6	14.9	13.5

TABLE 2
CSMRI FRAC TANK SAMPLE RESULTS
T08-9210-011, T08-9210-012, T08-9205-018, T08-9202-017

FRAC TANKS
Metals Analysis
ug/l

MtxSample #	TAG	Location	Sample Date	As	Cd	Cr	Cu	Pb	Zn	Ni	Va	Hg	Ba	Se	Ag
W FRAC 1 T	8-63449	FRAC 1 TOP	7/28/92	<3	<0.5	<15	306	<80	170	<20		2.1	57	<5	<1
W FRAC 1 B	8-63443	FRAC 1 BOTTOM	7/28/92	<3	1	<15	1033	<80	615	25		9.3	216	<5	2.3
W FRAC 2 T	8-63437	FRAC 2 TOP	7/28/92	9.1	0.8	<15	238	<80	119	<20		1.9	66	<5	<1
W FRAC 2 B	8-63431	FRAC 2 BOTTOM	7/28/92	77.9	7	26	3133	459	1620	34		23.2	1447	15.1	10.7
W FRAC 3 T	8-62248	FRAC 3 TOP	7/28/92	13.1	<0.5	<15	469	100	400	<20		4.4	104	<5	1.9
W FRAC 4	8-62236	FRAC 4	7/28/92	23.6	2.2	<15	674	187	786	120		12.8	976	<5	2.8
W FRAC 1	8-62559	FRAC 1	9/29/92	<3	<0.5	<8	<8	<50	<8	<30	<6	<0.05	54	9.1	<0.5
W FRAC 2	8-62560	FRAC 2	9/29/92	<3	<0.5	<8	<8	<50	<8	<30	<6	<0.07	124	6.2	<0.5
W FRAC 3	8-62561	FRAC 3	9/29/92	<3	<0.5	<8	<8	<50	<8	<30	<6	0.12	378	<5	<0.5

FRAC TANKS
Total Suspended Solids (TSS)
mg/l

W FRAC 1 T	8-63448	FRAC 1 TOP	7/28/92	TSS	70
W FRAC 1 B	8-63442	FRAC 1 BOTTOM	7/28/92	TSS	565
W FRAC 2 T	8-63436	FRAC 2 TOP	7/28/92	TSS	68
W FRAC 2 B	8-63430	FRAC 2 BOTTOM	7/28/92	TSS	655
W FRAC 3 T	8-62247	FRAC 3 TOP	7/28/92	TSS	110
W FRAC 4	8-62235	FRAC 4	7/28/92	TSS	305

FRAC TANKS
Radiochem Analysis
pCi/gm

				K40	Sr(t)	U(t)	Yt	Ra226	Ra228	Th228	Th230	Th232
W FRAC 1 T	8-63450	FRAC 1 TOP	7/28/92	<282	0.52	46.4	ND	<2	1.8	1.1	2.9	<0.4
W FRAC 1 B	8-63444	FRAC 1 BOTTOM	7/28/92	<457	0.53	30	ND	<2	<2	<0.5	2.6	<0.5
W FRAC 2 T	8-63438	FRAC 2 TOP	7/28/92	<458	0.55	44.2	ND	7.4	2.3	1.1	4.9	<0.4
W FRAC 2 B	8-63432	FRAC 2 BOTTOM	7/28/92	<281	0.58	45.6	ND	8.1	<2	<0.7	3.6	<0.7
W FRAC 3 T	8-62249	FRAC 3 TOP	7/28/92	638	0.57	51.5	ND	26.8	2.1	<0.6	4.2	<0.6
W FRAC 4	8-62237	FRAC 4	7/28/92	162	0.71	105	ND	66.4	3.5	8.2	27.1	<0.4

				K40	Pb214	Bi214	Alpha	Beta
W FRAC 3A	8-62209	FLOCK & FILT.	1/22/93	478	ND	ND	2.66	437.9
W FRAC 3B	8-62208	FILTERED	1/22/93	469	32.6	12.5	31.14	460.3

TABLE 2 (cont)
CSMRI FRAC TANK SAMPLE RESULTS
T08-9210-011, T08-9210-012, T08-9205-018, T08-9202-017

FRAC TANKS
PCB ANALYSIS
ug/ml

					AROCHLOR 1254	AROCHLOR 1260	AROCHLOR 1242	
W	FRAC 1 T	8-63446	FRAC 1 TOP	7/28/92	<0.1	<0.1	<0.1	
W	FRAC 1 B	8-63440	FRAC 1 BOTTOM	7/28/92	<0.1	<0.1	<0.1	
W	FRAC 2 T	8-63434	FRAC 2 TOP	7/28/92	<0.1	<0.1	<0.1	
W	FRAC 2 B	8-63428	FRAC 2 BOTTOM	7/28/92	<0.1	<0.1	<0.1	
W	FRAC 3 T	8-62245	FRAC 3 TOP	7/28/92	<0.1	<0.1	<0.1	
W	FRAC 4	8-62233	FRAC 4	7/28/92	<0.1	<0.1	<0.1	
O	CSWP04	8-63597	BLANK	6/10/92			<0.1	ug/sheet
O	CSWP03	8-63596	VAC SYSTEM 101	6/10/92			<0.1	ug/sheet
O	CSWP02	8-63595	COMPRESSOR 101	6/10/92			1.21	ug/sheet
O	CSWP01	8-63594	VAC SYSTEM 103	6/10/92			7.19	ug/sheet

FRAC TANKS
BNA AND VOC ANALYSIS

W	FRAC 1 T	8-63447	FRAC 1 TOP	7/28/92	BNA SEE ANALYTICAL APPENDIX
W	FRAC 1 B	8-63441	FRAC 1 BOTTOM	7/28/92	BNA SEE ANALYTICAL APPENDIX
W	FRAC 2 T	8-63435	FRAC 2 TOP	7/28/92	BNA SEE ANALYTICAL APPENDIX
W	FRAC 2 B	8-63429	FRAC 2 BOTTOM	7/28/92	BNA SEE ANALYTICAL APPENDIX
W	FRAC 3 T	8-62246	FRAC 3 TOP	7/28/92	BNA SEE ANALYTICAL APPENDIX
W	FRAC 4	8-62234	FRAC 4	7/28/92	BNA SEE ANALYTICAL APPENDIX
W	FRAC 4	8-62232	FRAC 4	7/28/92	VOC SEE ANALYTICAL APPENDIX
W	TB	8-62231	TRIP BLANK	7/28/92	VOC SEE ANALYTICAL APPENDIX
W	TB	8-62230	TRIP BLANK	7/28/92	VOC SEE ANALYTICAL APPENDIX

TABLE 3
Subsurface Soils Analytical Data
T08-9210-011, T08-9210-012

CSNRI Soil Analysis
15 cm (6") depth
01/07/93

Sample Number	Weight	Analysis Date	Counting Time	Net Area 50 pCi/g Std (5000 sec)	Net Net Area 50 pCi/g Std (5000 sec)	Net Area Sample	Net Net Area Sample (After Bk Strip)	X Non-Equilibrium Factor (1.3)	Ratio: Sample/ 50 pCi/g Std	Mass Correction Factor	Sample (pCi/g)
A5	601.8	10/14/92	1000	57326	52487	2073	1099	1428.7	0.136	1.112	6.12
A6	571.7	10/14/92	1000	57326	52487	2220	1248	1622.4	0.155	1.057	7.31
A7	646.7	10/14/92	1000	57326	52487	1896	918	1193.4	0.114	1.195	6.76
A8	702.6	10/14/92	1000	57326	52487	2185	1212	1575.6	0.150	1.298	5.78
A9	653.2	10/14/92	1000	57326	52487	1732	760	988	0.094	1.287	3.90
A10	689.5	10/14/92	1000	57326	52487	1523	534	694.2	0.066	1.274	2.59
A11	613	10/14/92	1000	57326	52487	3101	2128	2766.4	0.264	1.133	11.65
A12	636.3	10/14/92	1000	57326	52487	1901	919	1194.7	0.114	1.176	6.84
A13	656.1	10/13/92	1000	55267	50524	2451	1503	1953.9	0.193	1.213	7.97
B2	550.8	10/14/92	1000	57326	52487	1902	905	1176.5	0.112	1.018	5.51
B3	461.8	10/14/92	1000	57326	52487	2869	1894	2462.2	0.235	0.853	13.74
B4	711.1	10/14/92	1000	57326	52487	1907	932	1211.6	0.115	1.314	4.39
B5	650.7	10/20/92	1000	54391	49825	1406	496	644.8	0.065	1.203	2.69
B6	511.1	10/14/92	1000	57326	52487	1553	584	759.2	0.072	0.945	3.83
B6(2)	658.8	10/23/92	1300	51197	45999	1432	397	516.1	0.056	1.218	2.30
B7	631.8	10/15/92	1000	57857	53290	1339	412	535.6	0.050	1.168	2.15
B8	655.8	10/15/92	1000	57857	53290	1438	497	646.1	0.061	1.212	2.50
B9	743.9	10/15/92	1000	57857	53290	1495	569	739.7	0.069	1.375	2.52
B10	590.9	10/13/92	1000	55267	50524	1375	404	525.2	0.052	1.092	2.38
B11	664.3	10/13/92	1000	55267	50524	1487	533	692.9	0.069	1.228	2.79
B12	505.2	10/13/92	1000	55267	50524	2167	1219	1584.7	0.157	0.934	8.48
B13	588.9	10/14/92	1000	57326	52487	3296	2322	3018.6	0.288	1.088	13.21
B14	526	10/14/92	1000	57326	52487	3267	2294	2982.2	0.284	0.972	14.61
B15	476.8	10/15/92	1000	57857	53290	2094	1162	1510.6	0.142	0.881	8.84
C1	572.2	10/13/92	1000	55267	50524	1212	265	344.5	0.034	1.057	1.61
C2	435	10/13/92	5000	55267	50524	7032	2288	2974.4	0.059	0.804	3.66
C3	497.1	10/13/92	5000	55267	50524	10500	5756	7482.8	0.148	0.919	8.06
C4	642.9	10/14/92	1000	57326	52487	1781	752	977.6	0.093	1.188	3.92
C5	614.7	10/15/92	1000	57857	53290	1679	754	980.2	0.092	1.136	4.05
C6	686.4	10/15/92	1000	57857	53290	1606	680	884	0.083	1.269	3.27
C7	697.1	10/15/92	1000	57857	53290	1904	980	1274	0.120	1.288	4.64
C8	693.7	10/19/92	1000	48838	44135	2280	1355	1761.5	0.200	1.282	7.78
C9	678.3	10/19/92	1000	48838	44135	1766	825	1072.5	0.122	1.254	4.85
C10	552.7	10/19/92	1000	48838	44135	2259	1319	1714.7	0.194	1.021	9.51

TABLE 3
Subsurface Soils Analytical Data
T08-9210-011, T00-9210-012

CSNRI Soil Analysis
15 cm (6") depth
01/07/93

Sample Number	Weight	Analysis Date	Counting Time	Net Area 50 pCi/g Std (5000 sec)	Net Area 50 pCi/g Std (5000 sec)	Net Area Sample	Net Area Sample (After Bk Strip)	% Non-Equilibrium Factor (t.3)	Ratio: Sample/ 50 pCi/g Std	Mass Correction Factor	Sample (pCi/g)
C11	588.5	10/19/92	1000	48838	44135	2567	1627	2115.1	0.260	1.088	11.02
C12	538.2	10/16/92	1000	55067	50178	2412	1429	1857.7	0.185	0.995	9.31
C13	535.7	10/19/92	1000	48838	44135	1992	1051	1366.3	0.155	0.990	7.82
C14	580	10/19/92	1000	48838	44135	4386	3445	4478.5	0.587	1.072	23.67
C14-R	653.7	12/10/92	1000	68799	62319	1650	305	396.5	0.032	1.208	1.32
C15	551.4	10/19/92	1000	48838	44135	1544	602	782.6	0.089	1.019	4.35
D1	609.7	10/19/92	1000	48838	44135	1753	813	1056.9	0.120	1.127	5.31
D1-R	576.8	12/09/92	1000	66971	61710	1392	349	453.7	0.037	1.062	1.73
D3	572.4	10/19/92	1000	48838	44135	1463	538	699.4	0.079	1.058	3.75
D4	612	10/15/92	1000	57857	53290	1996	1070	1391	0.133	1.151	5.77
D5	617.2	10/19/92	1000	48838	44135	1257	316	410.8	0.047	1.141	2.04
D6	548.3	10/15/92	1000	57857	53290	1582	576	748.8	0.070	1.013	3.47
D7	599.8	10/19/92	1000	48838	44135	1652	713	926.9	0.105	0.924	5.68
D8	647.2	10/19/92	1000	48838	44135	2454	1510	1963	0.222	1.196	9.30
D9	609.9	10/19/92	1000	48838	44135	2250	1311	1704.3	0.193	1.127	8.56
D10	552.6	10/19/92	1000	48838	44135	1807	946	1229.8	0.139	1.021	6.02
D11	553.1	10/19/92	1000	48838	44135	2925	1985	2580.5	0.292	1.022	14.30
D12	522.5	10/19/92	1000	48838	44135	1778	839	1090.7	0.126	0.966	6.40
D13	560.5	10/16/92	1000	55067	50178	1695	713	926.9	0.092	1.036	4.46
D14	602.8	10/19/92	1000	48838	44135	2518	1576	2048.8	0.232	1.114	10.42
D15	615.9	10/16/92	1000	55067	50178	2154	1172	1523.6	0.152	1.138	6.67
E1	482.5	10/16/92	1000	55067	50178	3369	2387	3103.1	0.309	0.892	17.34
E1-R	592.4	12/10/92	1000	68799	62319	1639	366	475.8	0.038	1.095	1.74
E4	698.8	10/15/92	1000	57857	53290	2634	1707	2219.1	0.208	1.291	8.06
E5	549.5	10/15/92	1000	57857	53290	2613	1685	2190.5	0.206	1.016	10.12
E6	593.2	10/15/92	1000	57857	53290	1553	605	786.5	0.074	1.096	3.57
E7	543	10/15/92	1000	57857	53290	2082	1060	1388.4	0.130	1.004	6.49
E8	547.7	10/15/92	1000	57857	53290	3089	2161	2809.3	0.264	1.012	13.02
E9	553.2	10/15/92	1000	57857	53290	2762	1237	1608.1	0.151	1.022	7.38
E10	521.8	10/15/92	1000	57857	53290	2642	1716	2230.8	0.209	0.964	10.85
E11	571.1	10/19/92	1000	48838	44135	7060	6120	7956	0.901	1.055	42.70
E11-R	672.2	12/11/92	1000	66843	60851	1406	291	378.3	0.031	1.252	1.24
E12	532.7	10/15/92	1000	57857	53290	2042	1116	1450.8	0.136	0.984	6.91
E13	550.7	10/15/92	1000	57857	53290	1836	911	1184.3	0.111	1.018	5.46

TABLE 3
Subsurface Soils Analytical Data
T08-9210-011, T08-9210-012

CSMRI Soil Analysis
15 cm (6") depth
01/07/93

Sample Number	Weight	Analysis Date	Counting Time	Net Area 50 pCi/g Std (5000 sec)	Net Area 50 pCi/g Std (5000 sec)	Net Area Sample	Net Area Sample (After Bk Strip)	X Non-Equilibrium Factor (1.3)	Ratio: Sample/ 50 pCi/g Std	Mass Correction Factor	Sample (pCi/g)
E14	601.2	10/15/92	1000	57857	53290	7520	6594	8572.2	0.804	1.111	36.19
E14-R	580.3	12/10/92	1000	68799	62319	1426	104	135.2	0.011	1.072	0.51
E15	484.1	10/16/92	1000	55067	50178	5027	4044	5257.2	0.524	0.895	29.28
E15-R	570.4	12/10/92	1000	68799	62319	2598	1305	1696.5	0.136	1.054	6.46
BackA1	549.4	10/16/92	1000	55067	50178	3626	2644	3437.2	0.343	1.015	16.87
F2-R	607	12/10/92	1000	68799	62319	1641	271	352.3	0.028	1.122	1.26
F3-R	522.3	12/09/92	1000	66971	61710	1748	652	847.6	0.069	0.965	3.56
F4-R	600.5	12/09/92	1000	66971	61710	1081	775	1007.5	0.082	1.110	3.68
F5-R	662.1	12/09/92	1000	66971	61710	1239	213	276.9	0.022	1.224	0.92

AVG: 7.54
After Resample: 5.85

TABLE 4
Surface Soils Analytical Data
T08-9210-011, T08-9210 012

CSMRI Soil Analysis - After application of 6" clean soil

Sample Number	Weight	Analysis Date	Counting Time	Net Area 50 pCi/g Std (5000 sec)	Net Area 50 pCi/g Std (5000 sec)	Net Area Sample	Net Net Area Sample (After 8k Strip)	X Non-Equilibrium Factor (1.3)	Ratio: Sample/ 50 pCi/g Std	Mass Correction Factor	Sample (pCi/g)
A5	263.1	11/03/92	1000	51059	46178	1245	216	280.8	0.030	0.486	3.13
A6	646.2	11/03/92	1000	51059	46178	1252	269	349.7	0.038	1.194	1.59
A7	315.4	11/03/92	1000	51059	46178	1579	528	686.4	0.074	0.583	6.38
A7-R	596.7	12/09/92	1000	69381	63938	1579	584	759.2	0.059	1.103	2.69
A8	595.3	11/03/92	1000	51059	46178	1246	271	352.3	0.038	1.100	1.73
A9	576.3	11/03/92	1000	51059	46178	1301	319	414.7	0.045	1.065	2.11
A10	695.9	11/03/92	1000	51059	46178	1644	666	865.8	0.094	1.286	3.64
B2	539.2	11/02/92	1000	53698	48680	1999	993	1293.5	0.133	0.996	6.67
B2-R	479.5	12/09/92	1000	69381	63938	1846	789	1025.7	0.080	0.886	4.53
B3	671.4	11/02/92	1000	53698	48680	1790	797	1036.1	0.106	1.241	4.29
B4	484	11/02/92	1000	53698	48680	1298	291	378.3	0.039	0.894	2.17
B5	523	11/02/92	1000	53698	48680	1582	578	751.4	0.077	0.967	3.99
B6	442.9	11/02/92	1000	53698	48680	1143	160	192.4	0.020	0.819	1.21
B7	436.4	11/02/92	1000	53698	48680	1245	234	304.2	0.031	0.807	1.94
B8	436.6	11/02/92	1000	53698	48680	1193	195	253.5	0.026	0.807	1.61
B9	586.5	11/02/92	1000	53698	48680	1352	357	464.1	0.048	1.084	2.20
B10	594.5	11/03/92	1000	51059	46178	1770	709	921.7	0.100	1.099	4.54
B11	504.6	11/03/92	1000	51059	46178	1651	471	612.3	0.066	0.933	3.55
B12	488.2	11/03/92	1000	51059	46178	1559	583	757.9	0.082	0.902	4.55
B13	641.4	11/03/92	1000	51059	46178	1242	264	343.2	0.037	1.185	1.57
C1	588.1	10/30/92	1000	52076	47042	2019	1018	1323.4	0.141	1.087	6.47
C1-R	578.9	12/09/92	1000	69381	63938	1361	321	417.3	0.033	1.070	1.55
C2	635	10/30/92	1000	52076	47042	1903	905	1176.5	0.025	1.174	1.07
C3	580.6	10/30/92	1000	52076	47042	1966	946	1229.8	0.026	1.073	1.22
C4	623.5	10/30/92	1000	52076	47042	1452	452	587.6	0.062	1.152	2.71
C5	545.3	10/30/92	1000	52076	47042	1475	476	618.8	0.066	1.008	3.26
C6	308.3	10/30/92	1000	52076	47042	1560	489	635.7	0.068	0.570	5.93
C7	488.7	10/30/92	1000	52076	47042	1285	286	371.8	0.040	0.903	2.19
C7-R	574.6	12/08/92	1000	69381	63938	1314	228	296.4	0.023	1.062	1.09
C8	590.4	10/30/92	1000	52076	47042	1540	528	686.4	0.073	1.091	3.34
C9	571.4	10/30/92	1000	52076	47042	1293	301	391.3	0.042	1.056	1.97
C10	439.6	10/30/92	1000	52076	47042	1715	524	681.2	0.072	0.812	4.46
C11	578	10/30/92	1000	52076	47042	1453	383	497.9	0.053	1.068	2.48
C12	531.8	10/30/92	1000	52076	47042	1566	501	651.3	0.069	0.983	3.52

TABLE 4
Surface Soils Analytical Data
T08-9210-011, T08-9210-012

CSERI Soil Analysis - After application of 6" clean soil

Sample Number	Weight	Analysis Date	Counting Time	Net Area 50 pCi/g Std (5000 sec)	Net Area 50 pCi/g Std (5000 sec)	Net Area Sample	Net Area Sample (After Bk Strip)	X Non-Equilibrium Factor (1.3)	Ratio: Sample/ 50 pCi/g Std	Mass Correction Factor	Sample (pCi/g)
E13	429	11/02/92	1000	53698	48680	1596	568	738.4	0.076	0.793	4.78
E14	467.7	11/02/92	1000	53698	48680	1377	287	373.1	0.038	0.864	2.22
E15	483.7	11/02/92	1000	53698	48680	1355	356	460.2	0.047	0.896	2.64
D1	310.8	10/28/92	1000	51110	46231	1291	331	430.3	0.047	0.574	4.05
D2	303.2	10/28/92	1000	51110	46231	1331	363	471.9	0.051	0.560	4.55
D3	618.1	10/28/92	1000	51110	46231	1211	239	310.7	0.034	1.142	1.47
D4	617.9	10/28/92	1000	51110	46231	1301	251	326.3	0.035	1.142	1.59
D5	348.8	10/28/92	1000	51110	46231	1257	284	369.2	0.040	0.645	3.10
D6	562.1	10/28/92	1000	51110	46231	1377	406	527.8	0.057	1.039	2.75
D7	354	10/29/92	1000	56205	51226	1528	526	683.8	0.067	0.654	5.10
D7-R	547.7	12/08/92	1000	69381	63938	1663	555	721.5	0.056	1.012	2.79
D8	352.8	10/29/92	1000	56205	51226	1132	146	189.8	0.019	0.652	1.42
D9	385.2	10/29/92	1000	56205	51226	1404	421	547.3	0.053	0.712	3.75
D10	348.9	10/29/92	1000	56205	51226	1217	227	295.1	0.029	0.645	2.23
D11	285.9	10/29/92	1000	56205	51226	1154	119	154.7	0.015	0.528	1.43
D12	273.1	10/29/92	1000	56205	51226	1705	683	887.9	0.087	0.505	8.59
D12-R	514.1	12/08/92	1000	69301	63938	1812	729	947.7	0.074	0.950	3.90
D13	344.9	10/28/92	1000	51110	46231	1355	261	339.3	0.037	0.637	2.88
D14	518.9	10/29/92	1000	56205	51226	1419	383	497.9	0.049	0.959	2.53
D15	575	10/29/92	1000	56205	51226	1734	748	972.4	0.095	1.063	4.47
E1	606.3	10/27/92	1000	52528	47692	1377	417	542.1	0.057	1.119	2.54
E2	614.7	10/27/92	1000	52528	47692	1458	493	640.9	0.067	1.136	2.96
E3	669.5	10/27/92	1000	52528	47692	1526	573	744.9	0.078	1.237	3.16
E4	637.7	10/27/92	1000	52528	47692	1431	475	617.5	0.065	1.179	2.75
E5	645	10/27/92	1000	52528	47692	1527	562	730.6	0.077	1.192	3.21
E6	561.4	10/28/92	1000	51110	46231	1110	87	113.1	0.012	1.038	0.59
E7	556.4	10/28/92	1000	51110	46231	1476	475	617.5	0.067	1.028	3.25
E8	623.8	10/27/92	1000	52528	47692	1341	374	486.2	0.051	1.153	2.21
E9	576	10/28/92	1000	51110	46231	1148	174	226.2	0.024	1.064	1.15
E10	602.7	10/27/92	1000	52528	47692	1546	562	730.6	0.077	1.114	3.44
E11	537.3	10/29/92	1000	56205	51226	1049	103	133.9	0.013	0.993	0.66
E12	657.1	10/29/92	1000	56205	51226	1329	344	447.2	0.044	1.214	1.80
E13	615.9	10/27/92	1000	52528	47692	1667	704	915.2	0.096	1.137	4.22
E14	637.8	10/27/92	1000	52528	47692	1237	218	283.4	0.030	1.179	1.26

TABLE 4
Surface Soils Analytical Data
T08-9210-011, T08-9210-012

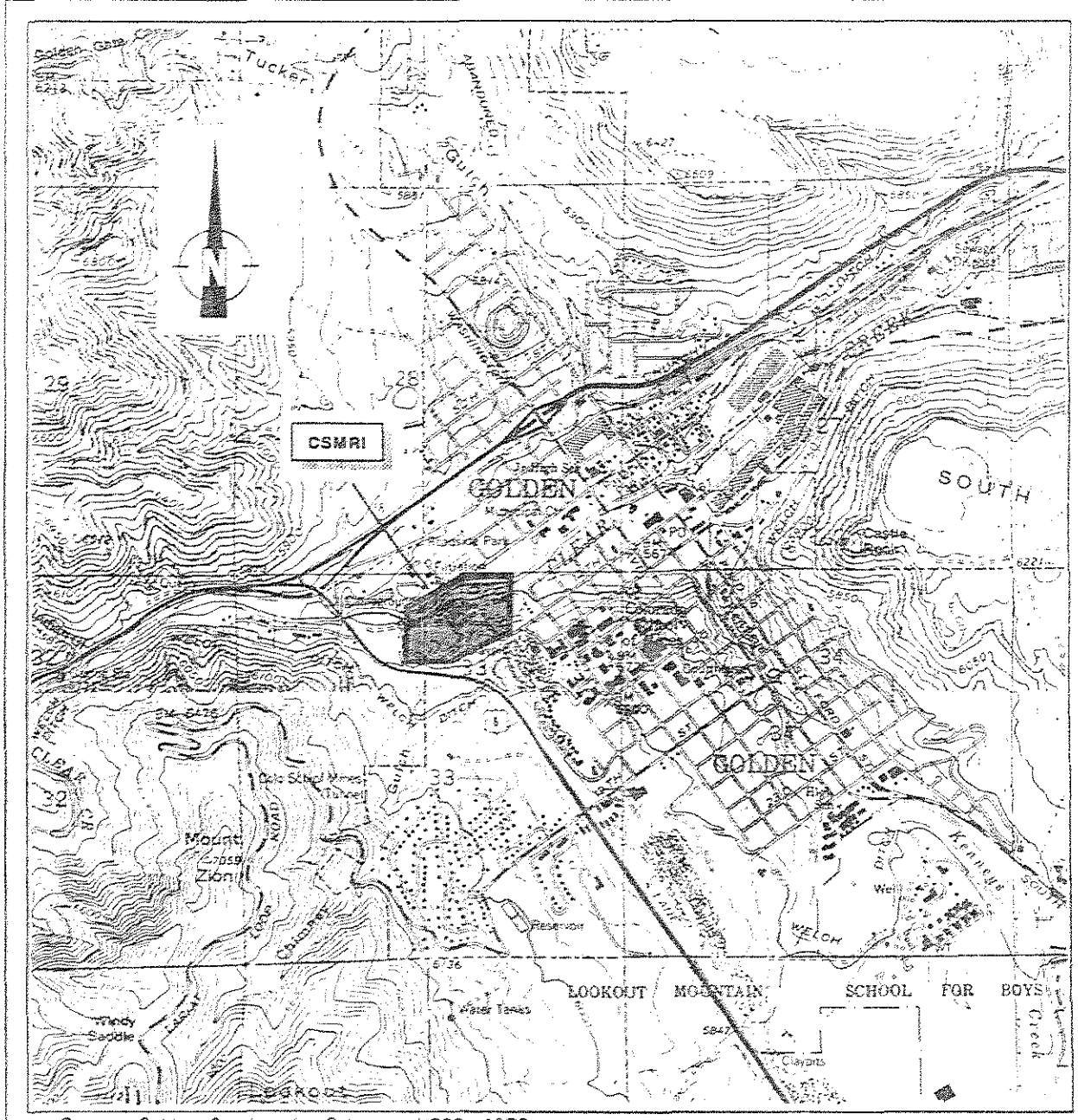
CSMRI Soil Analysis - After application of 6" clean soil

Sample Number	Weight	Analysis Date	Counting Time	Net Area 50 pCi/g Std (5000 sec)	Net Area 50 pCi/g Std (5000 sec)	Net Area Sample	Net Area Sample (After Bk Strip)	K Non-Equilibrium Factor (1.3)	Ratio: Sample/ 50 pCi/g Std	Mass Correction Factor	Sample (pCi/g)
E15	659.1	10/26/92	1000	49557	44722	953	-28	-26	-0.003	1.218	-0.12
E21	450.7	11/03/92	1000	51059	46178	2786	1804	2345.2	0.254	0.833	15.24
E22	513.5	11/03/92	1000	51059	46178	2613	1631	2120.3	0.230	0.949	12.10
E23	466.5	11/02/92	1000	53698	48680	2450	1446	1879.8	0.193	0.862	11.20
E24	583.6	11/03/92	1000	51059	46178	1802	821	1067.3	0.116	1.079	5.36
F1	664.1	10/27/92	1000	52528	47692	1322	381	495.3	0.052	1.227	2.12
F2	640	10/27/92	1000	52528	47692	1534	558	725.4	0.076	1.183	3.21
F3	647.9	10/27/92	1000	52528	47692	1488	469	609.7	0.064	1.197	2.67
F4	610.4	10/26/92	1000	49557	44722	1564	589	765.7	0.086	1.128	3.79
F5	595.3	10/26/92	1000	49557	44722	1343	356	462.8	0.052	1.100	2.35
Bank1	647.7	11/02/92	1000	53698	48680	1114	120	156	0.016	1.197	0.67

AVG: 3.33

After Resample: 3.12

FIGURES



Source: Golden Quadrangle, Colorado, USGS, 1980

0 1/2 1 MILE

LOCATION MAP
COLORADO

Golden

LEGEND

Site location

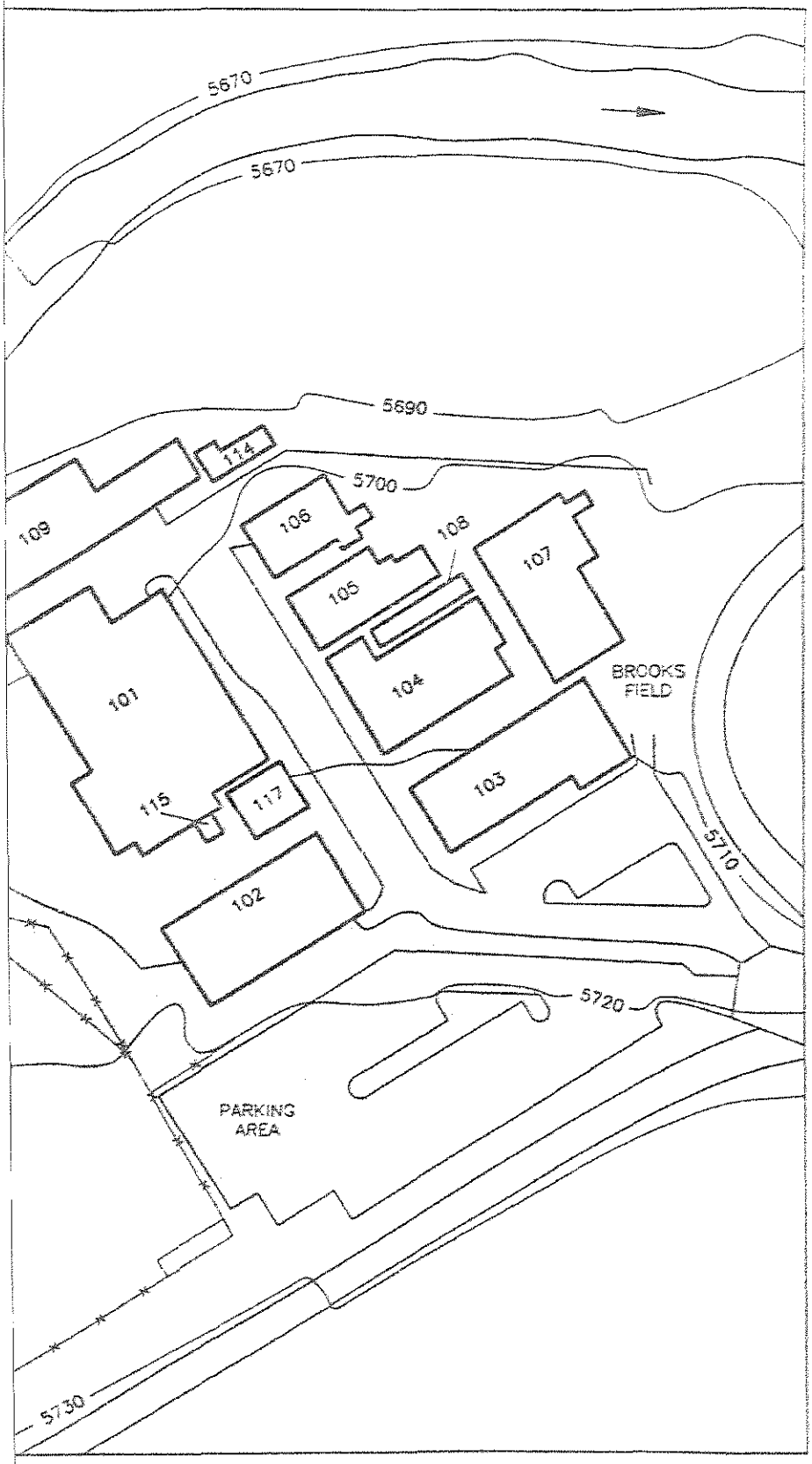
TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037

TITLE:
CSMRI
Golden, Colorado
SITE LOCATION MAP
TO8-9202-017, TO8-9205-018
T.D.L. TO8-9210-01.1, TO8-9210-012

ecology & environment, inc.
DENVER, COLORADO

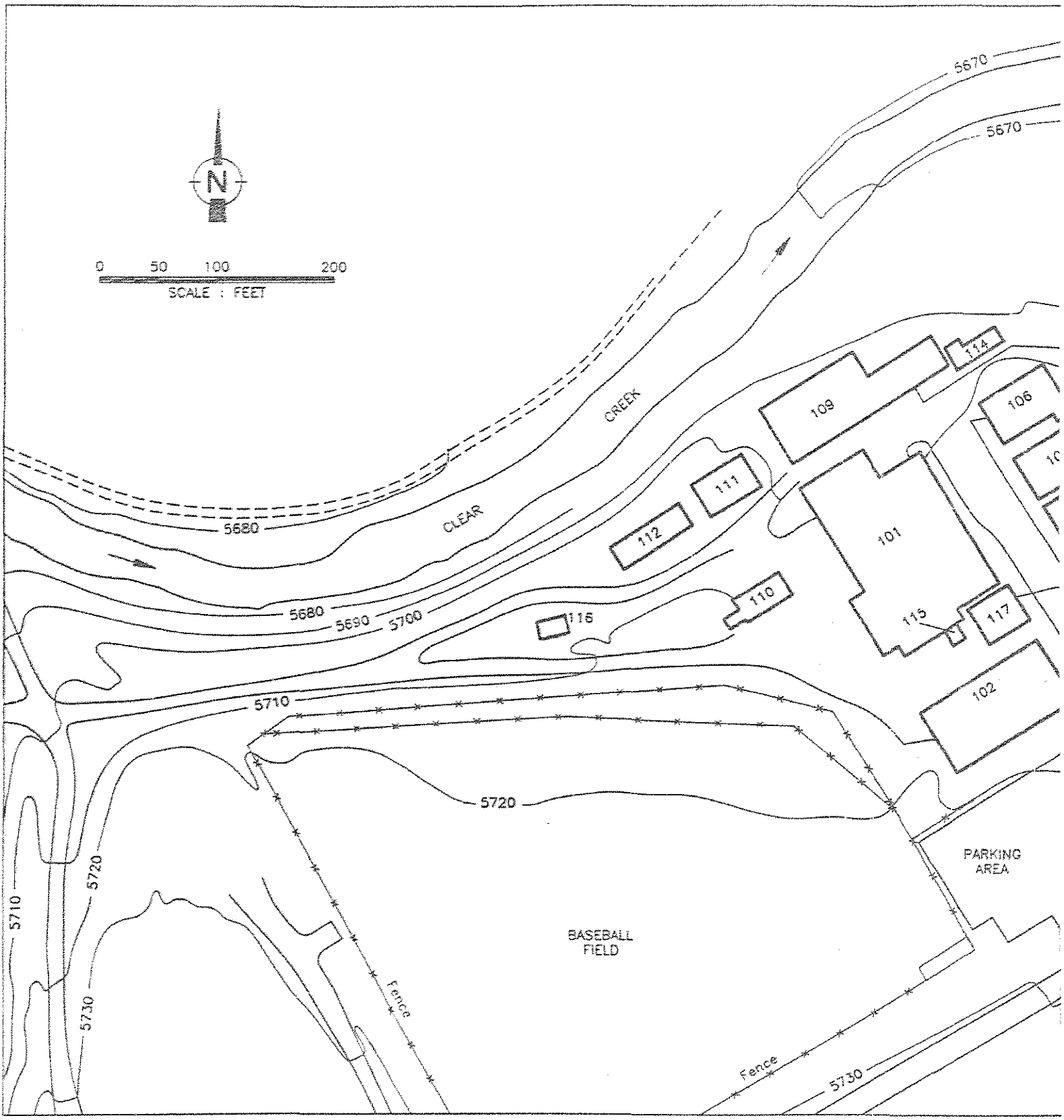
FIG. 1

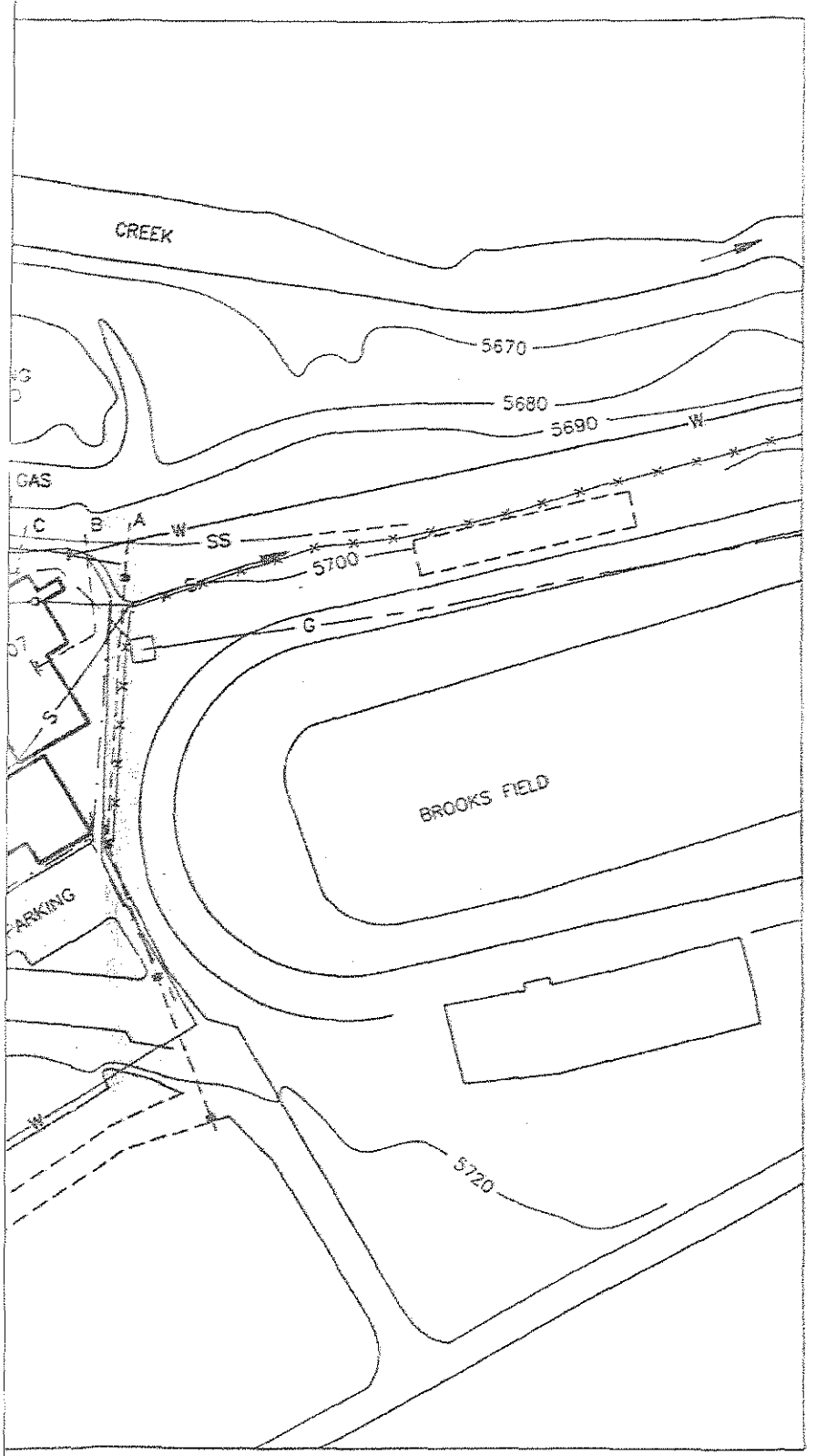
Date: 03/93 Drawn by: RSM Scale:



Remaining building concrete foundations

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-W0-0037	
TITLE: CSMRI Golden, Colorado SITE MAP T08-9202-017, T08-9205-018 T.O.D. T08-9210-011, T08-9210-012	
ecology & environment, inc. DENVER, COLORADO	FIG. 2
Date: 03/93 Drawn by: PSM Scale:	


N
0 50 100 200
SCALE : FEET
5670
5670
CREEK
CLEAR
5680
5680
5690
5700
5710
5720
5720
5710
5720
5730
5730
109
114
106
111
112
101
110
116
115
117
102
PARKING AREA
BASEBALL FIELD
Fence
Fence



LEGEND

——W——	Water line
—I— · ——	Irrigation line
—— —G— ——	Gas line
— — · — —	Suspected gas line
- - - - - - - -	Drain lines
——S——	Sanitary sewer
//////	Tunnel 6' Dia. R.C.P.

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037

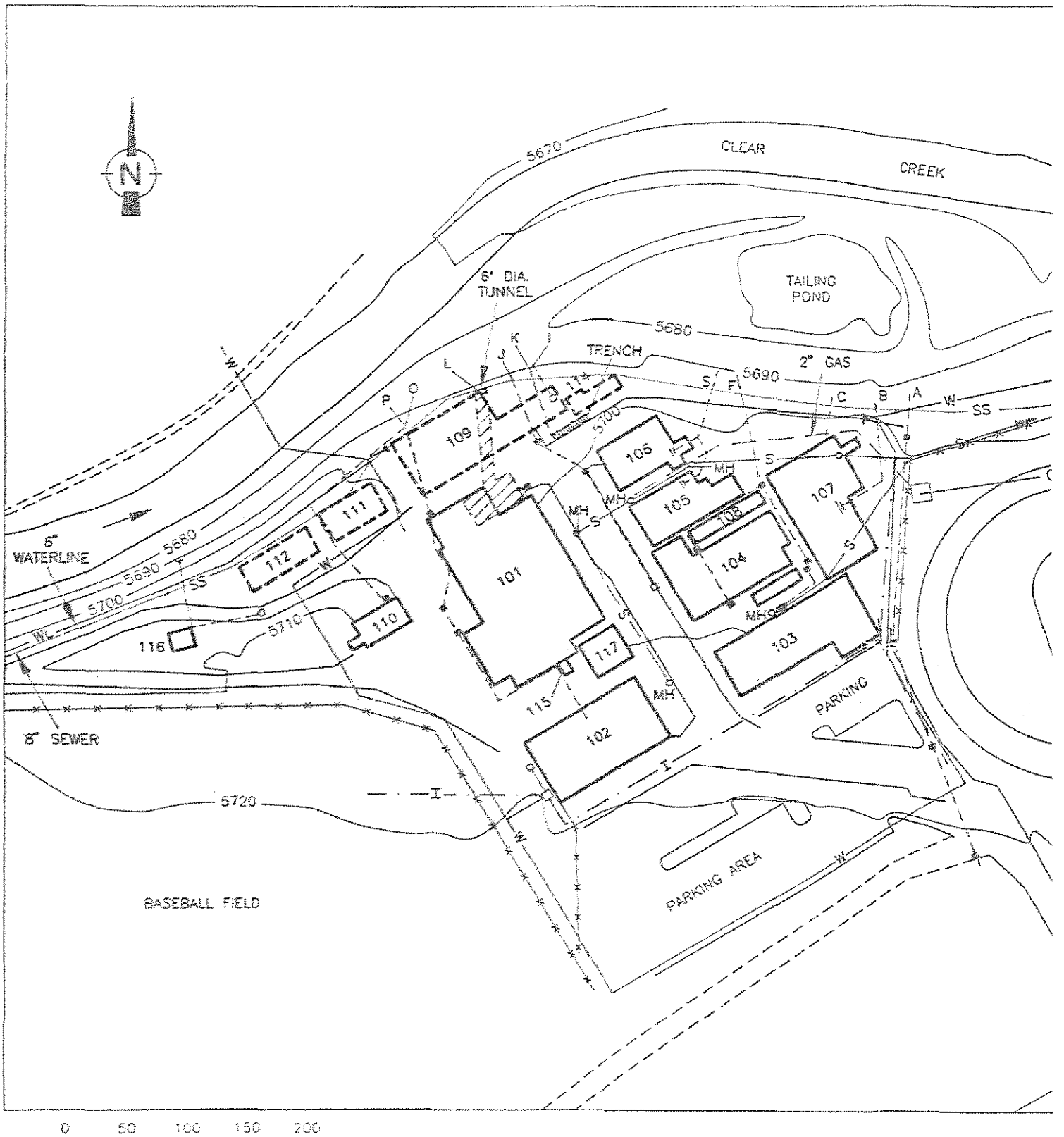
TITLE: CSMRI
Golden, Colorado
UTILITIES LOCATION MAP

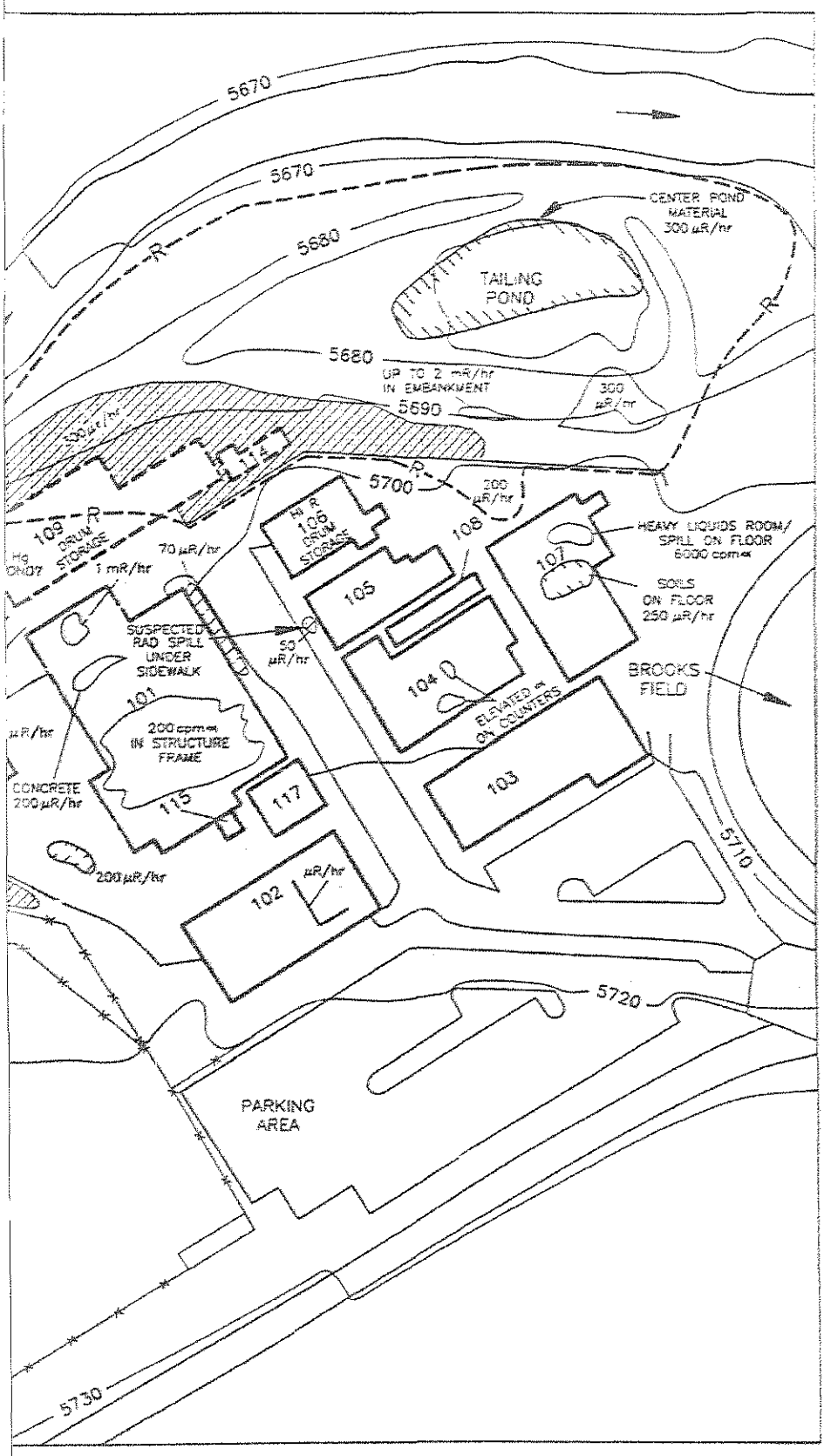
T.O.D. T08-9202-017, T08-9205-018
T08-9202-017, T08-9210-012

ecology & environment, inc.
DENVER, COLORADO

FIG. 3

Date: 02/93 Drawn by: RSM Scale:


N
CLEAR
CREEK
5670
TAILING
POND
6' DIA.
TUNNEL
TRENCH
5680
2" GAS
5690
5700
5710
5720
6"
WATERLINE
8" SEWER
SS
W
S
MH
109
111
112
110
116
101
106
105
104
107
103
117
115
102
PARKING
PARKING AREA
BASEBALL FIELD
0 50 100 150 200
SCALE : FEET

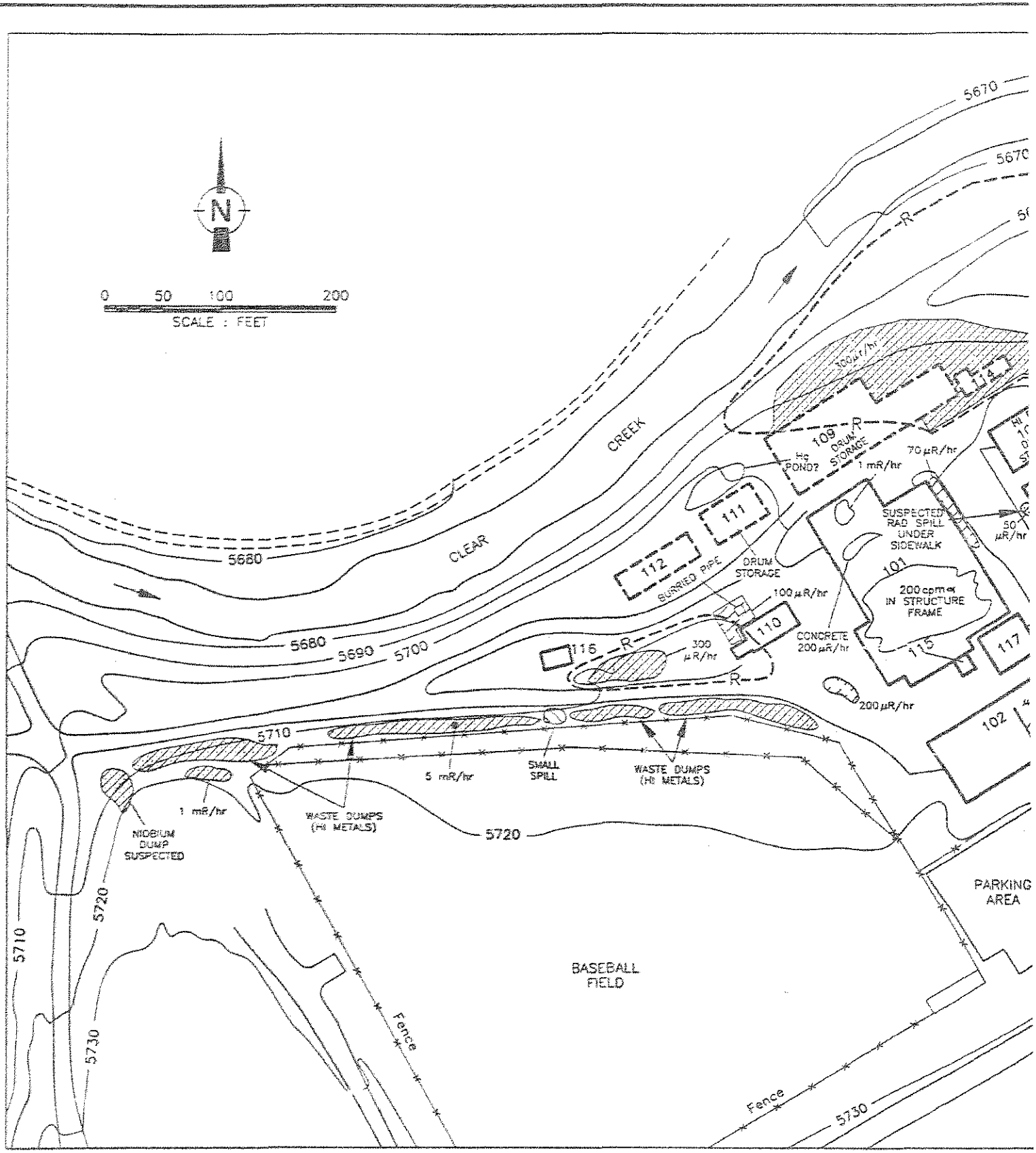


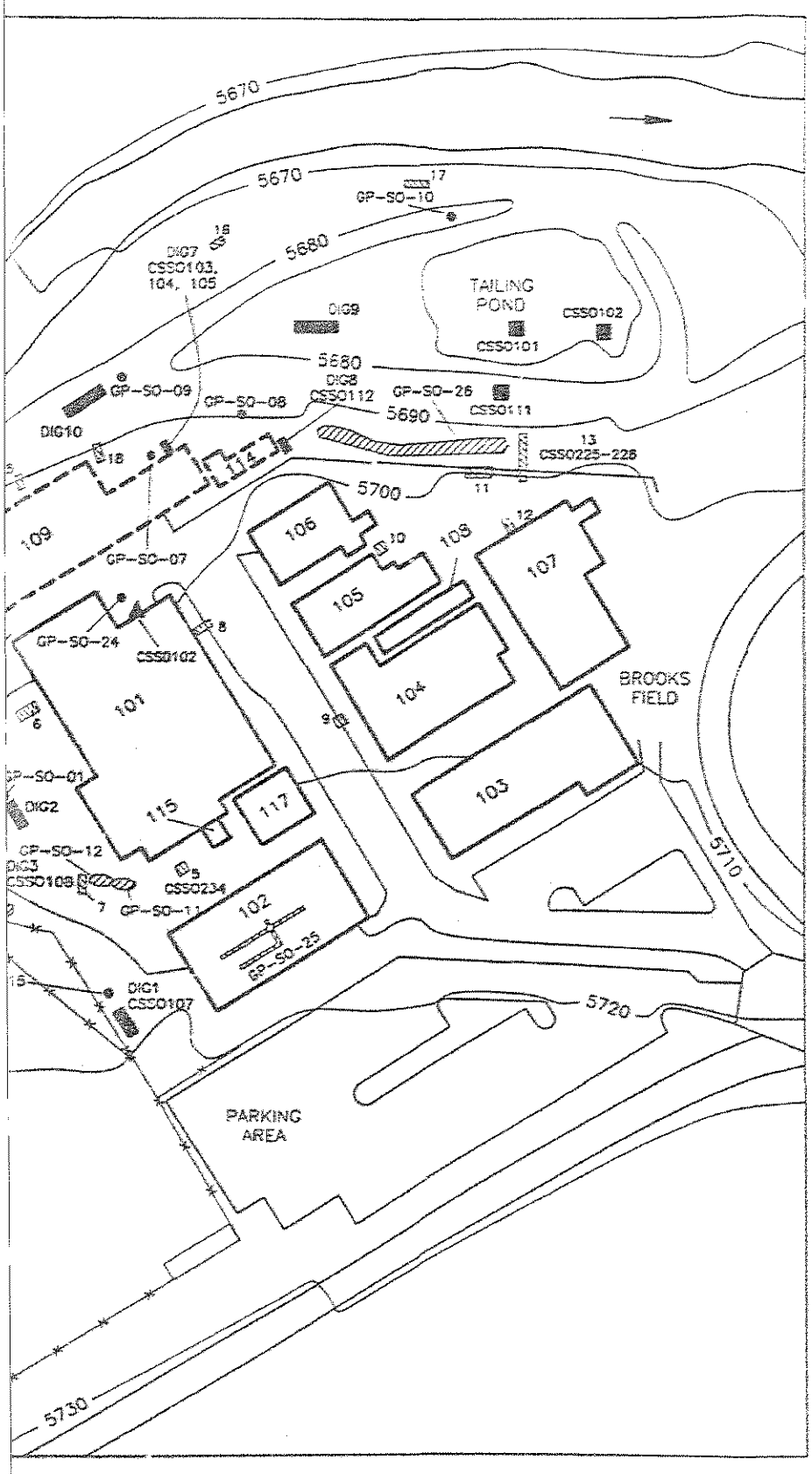
LEGEND

R — Limits if elevated radiation measurments from survey instruments

µR/hr
mR/hr
cpm∝

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-WO-0037	
TITLE: CSMRI Golden, Colorado ZONES WITH ELEVATED RADIATION DATA FROM JACOBS REPORT WITH MODIFICATIONS AS OF 05/92 T08-9202-017, T08-9205-018 T.D.D. T08-9210-011, T08-9210-012	
ecology & environment, inc. DENVER, COLORADO	FIG. 4
Date: 03/93 Drawn by: RSM Scale:	

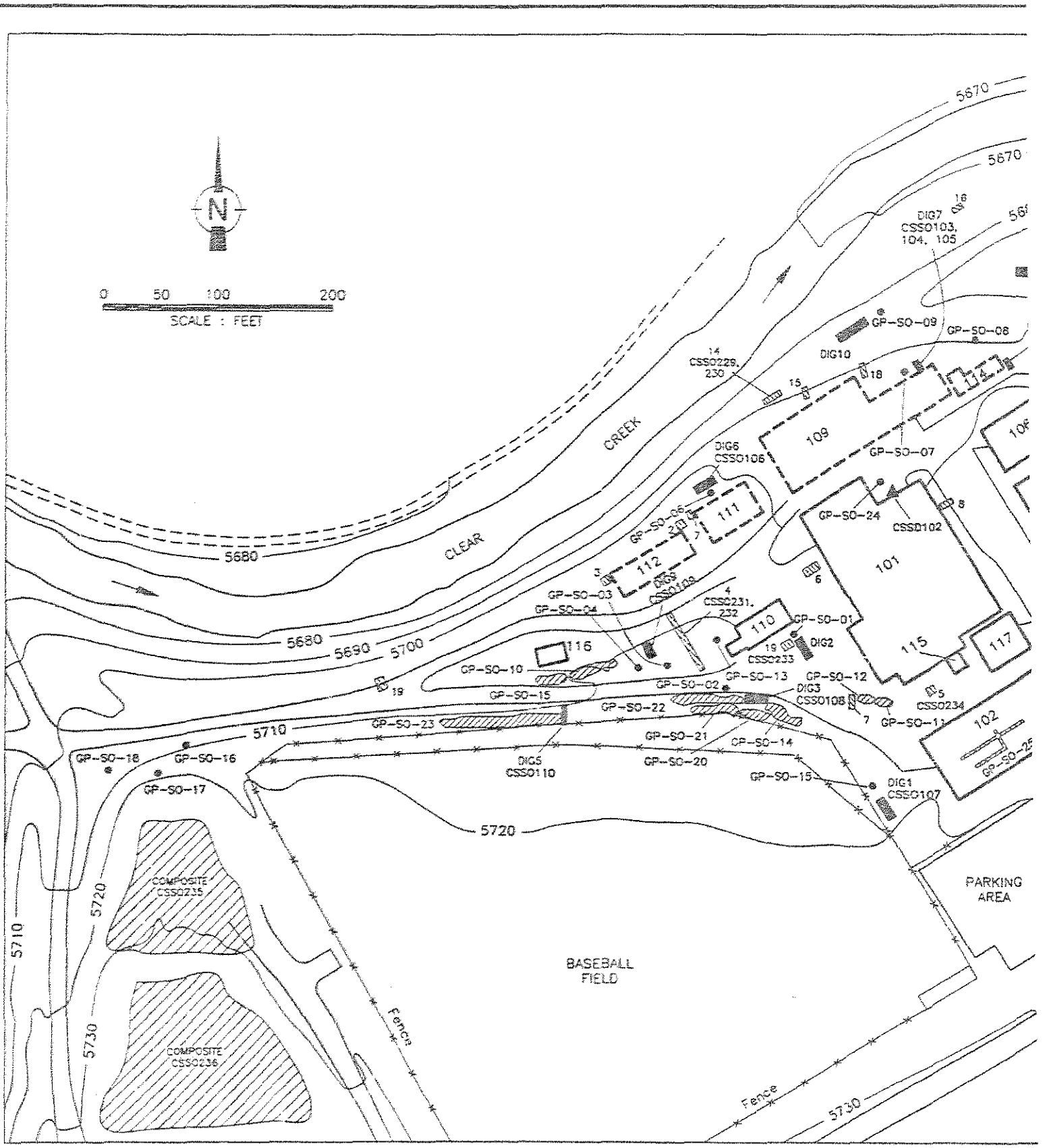

N
0 50 100 200
SCALE : FEET
5670
5680
5690
5700
5710
5720
5730
CREEK
CLEAR
109
DRUM STORAGE
Hg POND?
1 mR/hr
70 μR/hr
300 μR/hr
111
112
BURRIED PIPE
DRUM STORAGE
100 μR/hr
110
116
300 μR/hr
SUSPECTED RAD SPILL UNDER SIDEWALK
50 μR/hr
101
200 cpm α IN STRUCTURE FRAME
CONCRETE 200 μR/hr
115
117
200 μR/hr
102
5 mR/hr
SMALL SPILL
WASTE DUMPS (HI METALS)
1 mR/hr
WASTE DUMPS (HI METALS)
NIOBIUM DUMP SUSPECTED
PARKING AREA
BASEBALL FIELD
Fence
Fence

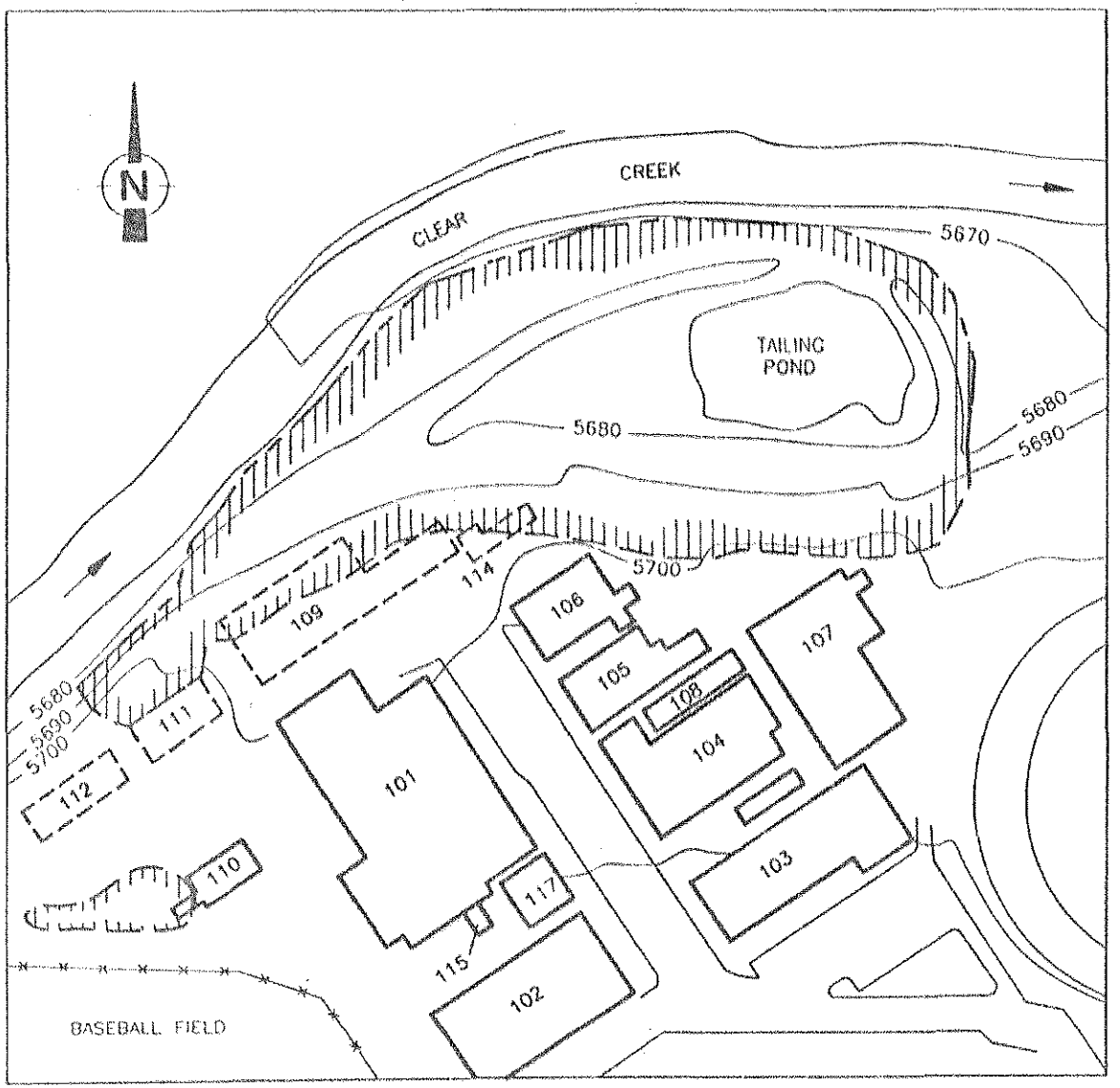


LEGEND

- Soil sample location (04/14/92)
- Trenches
- Dig soil sample (04/27/92)
- Surface soil sample location
- Sediment sample location
- Geo probe sample location

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-WO-0037	
TITLE: CSMRI Golden, Colorado SOIL SAMPLE LOCATION MAP TO8-9202-017, TO8-9205-018 T.D.D. TO8-9210-011, TO8-9210-012	
ecology & environment, inc. DENVER, COLORADO	FIG. 5
Date: 03/93 Drawn by: PSM Scale:	


N
0 50 100 200
SCALE : FEET
5670
5680
5690
5700
5710
5720
5730
CREEK
CLEAR
109
111
112
116
110
101
115
117
102
DIG7 CSS0103, 104, 105
DIG10
DIG6 CSS0106
DIG8 CSS0109
DIG2
DIG3 CSS0108
DIG5 CSS0110
DIG1 CSS0107
CSS0229, 230
CSS0231, 232
CSS0233
CSS0102
CSS0234
GP-SO-01
GP-SO-02
GP-SO-03
GP-SO-04
GP-SO-05
GP-SO-06
GP-SO-07
GP-SO-08
GP-SO-09
GP-SO-10
GP-SO-11
GP-SO-12
GP-SO-13
GP-SO-14
GP-SO-15
GP-SO-16
GP-SO-17
GP-SO-18
GP-SO-20
GP-SO-21
GP-SO-22
GP-SO-23
GP-SO-24
COMPOSITE CSS0235
COMPOSITE CSS0236
BASEBALL FIELD
PARKING AREA
Fence
Fence



LEGEND

Boundary estimated

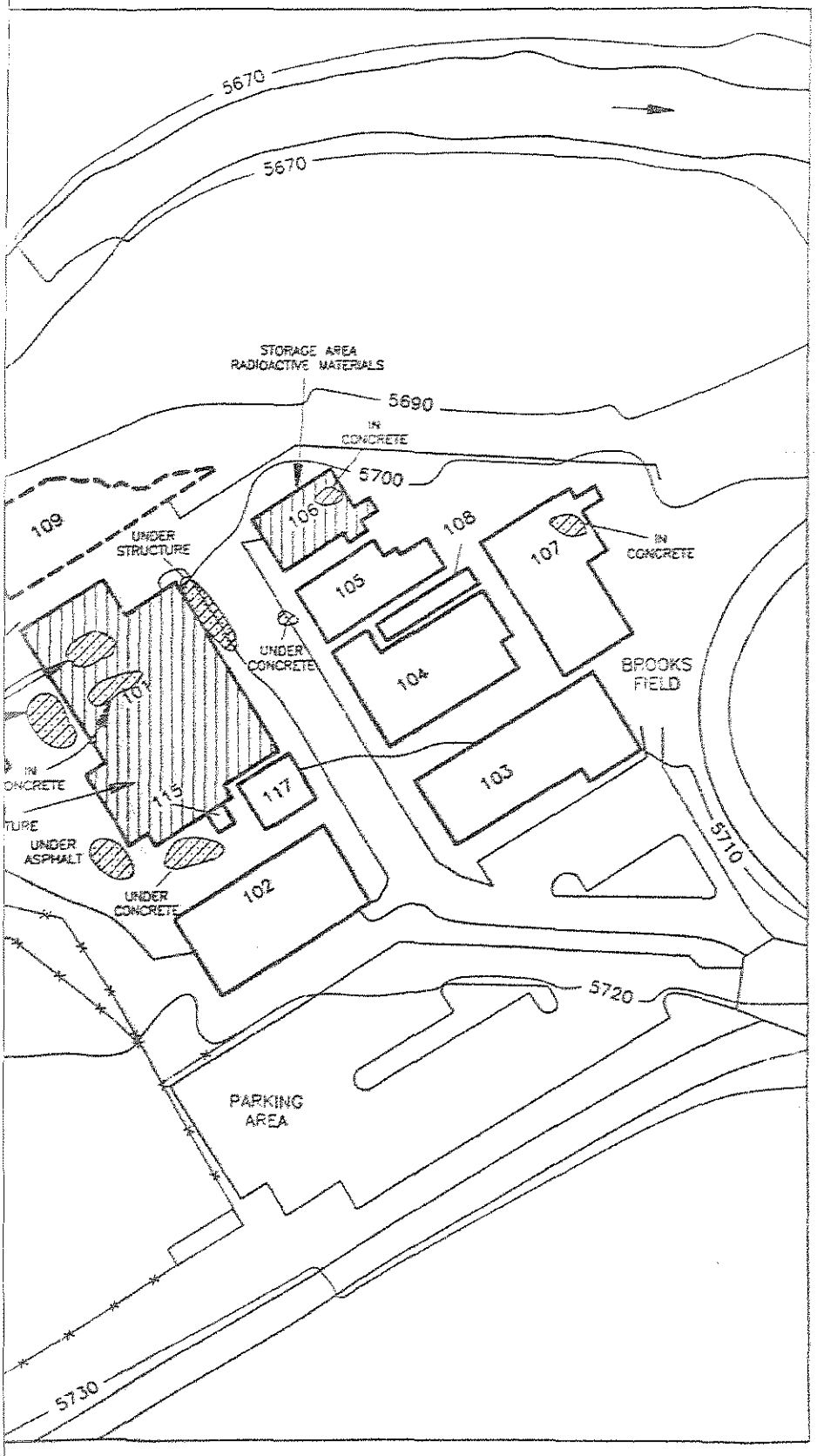
TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION
EPA CONTRACT 68-W0-0037

TITLE: CSMRI
Golden, Colorado
ESTIMATED SOIL REMOVAL AREAS
AS OF 6/1/92
T08-9202-017, T08-9205-018
T.D.D. T08-9210-011, T08-9210-012

ecology & environment, inc.
DENVER, COLORADO

FIG. 6

Date: 03/93 Drawn by: RSM Scale:

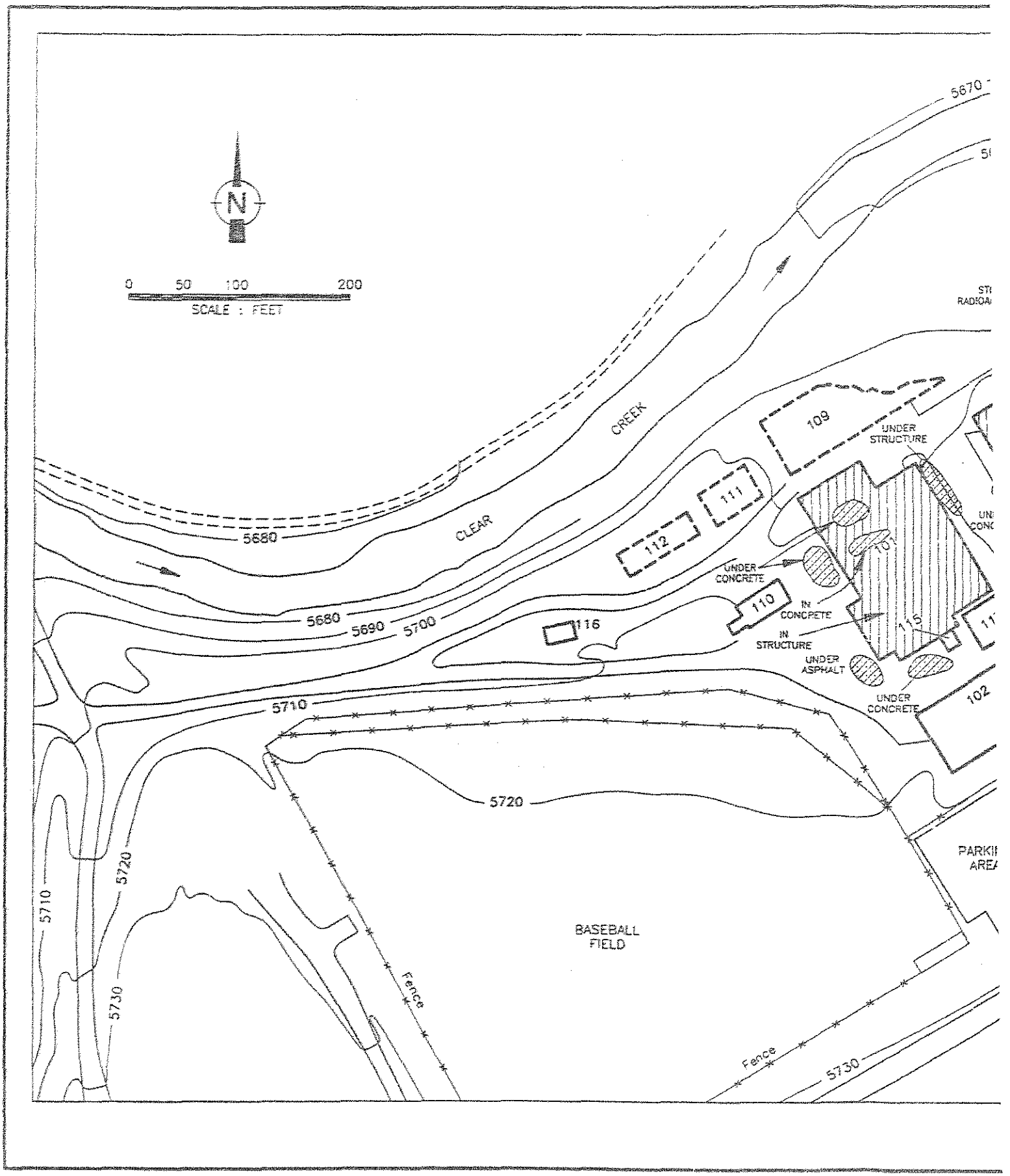


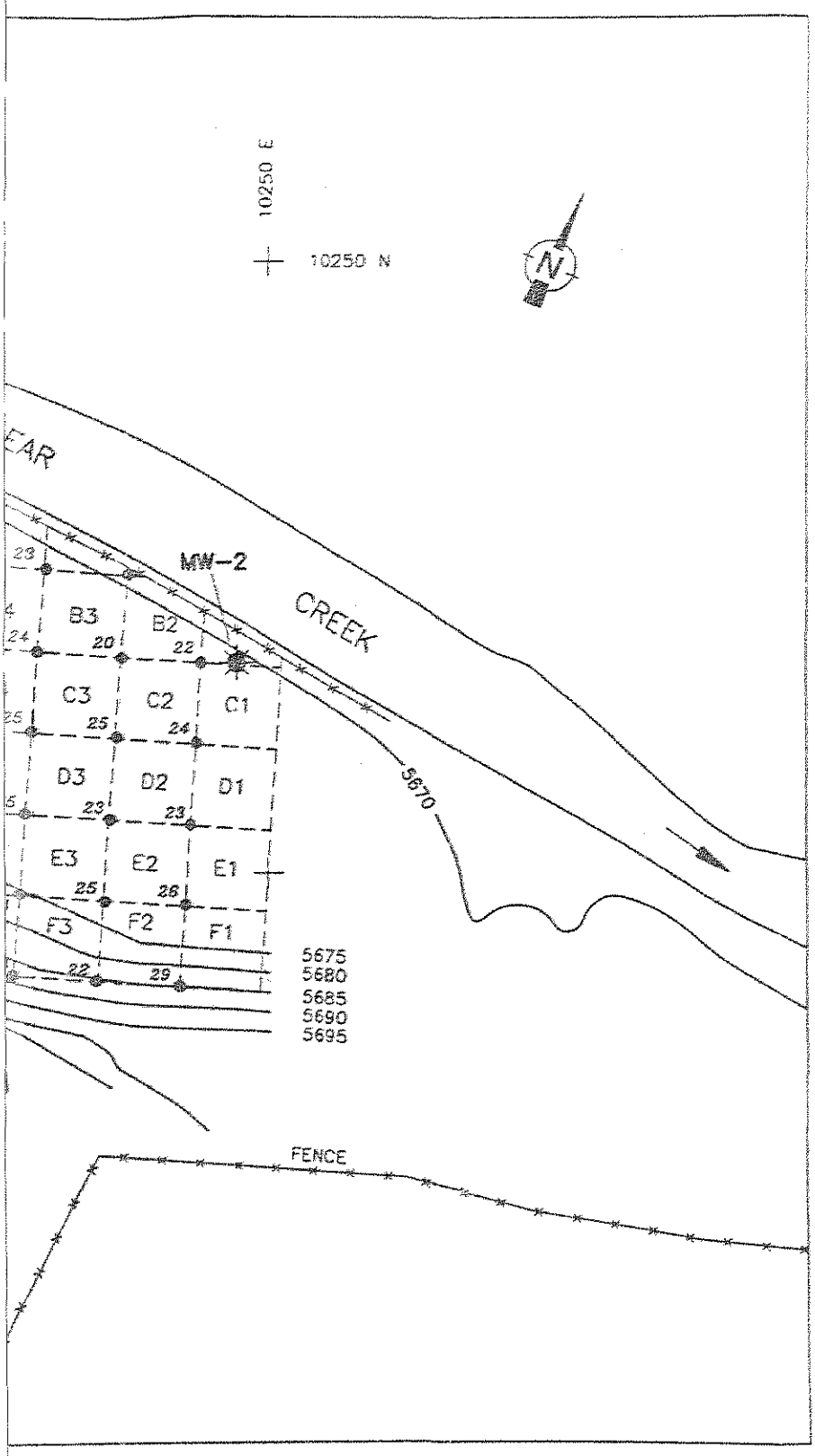
LEGEND

Immobile radioactive hazard area

Remaining building concrete foundations

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-WO-0037	
TITLE: CSMRI Golden, Colorado REMAINING IMMOBILE RADIOACTIVE HAZARDS T08-9202-017, T08-9205-018 T.D.O. T08-9210-011, T08-9210-012	
ecology & environment, inc. DENVER, COLORADO	FIG. 7
Date: 03/93 Drawn by: RSM Scale:	


N
0 50 100 200
SCALE : FEET
5670
5680
5690
5700
5710
5720
5730
CREEK
CLEAR
109
UNDER STRUCTURE
111
112
110
116
101
115
UNDER CONCRETE
IN CONCRETE
IN STRUCTURE
UNDER ASPHALT
UNDER CONCRETE
102
BASEBALL FIELD
Fence
Fence

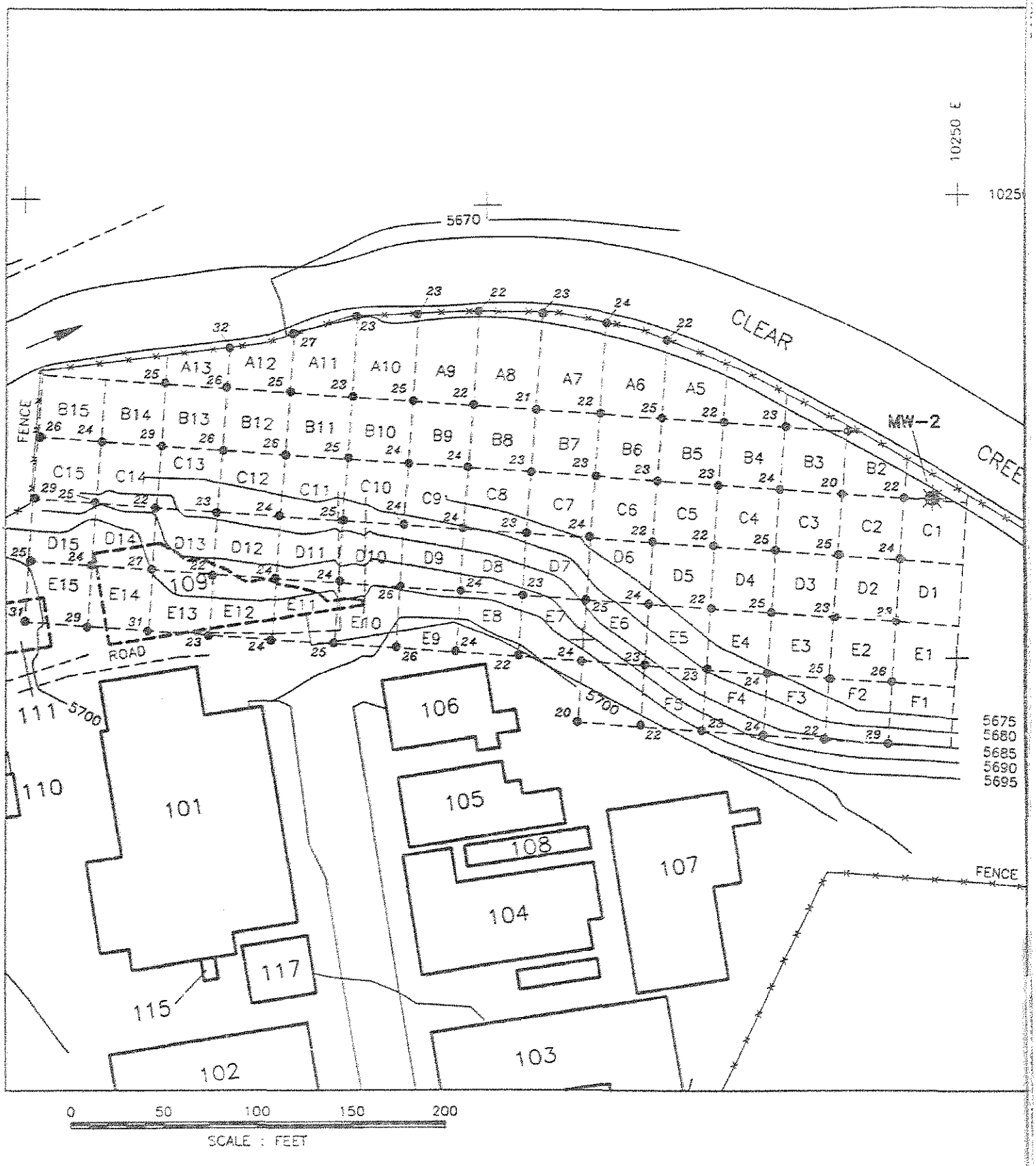


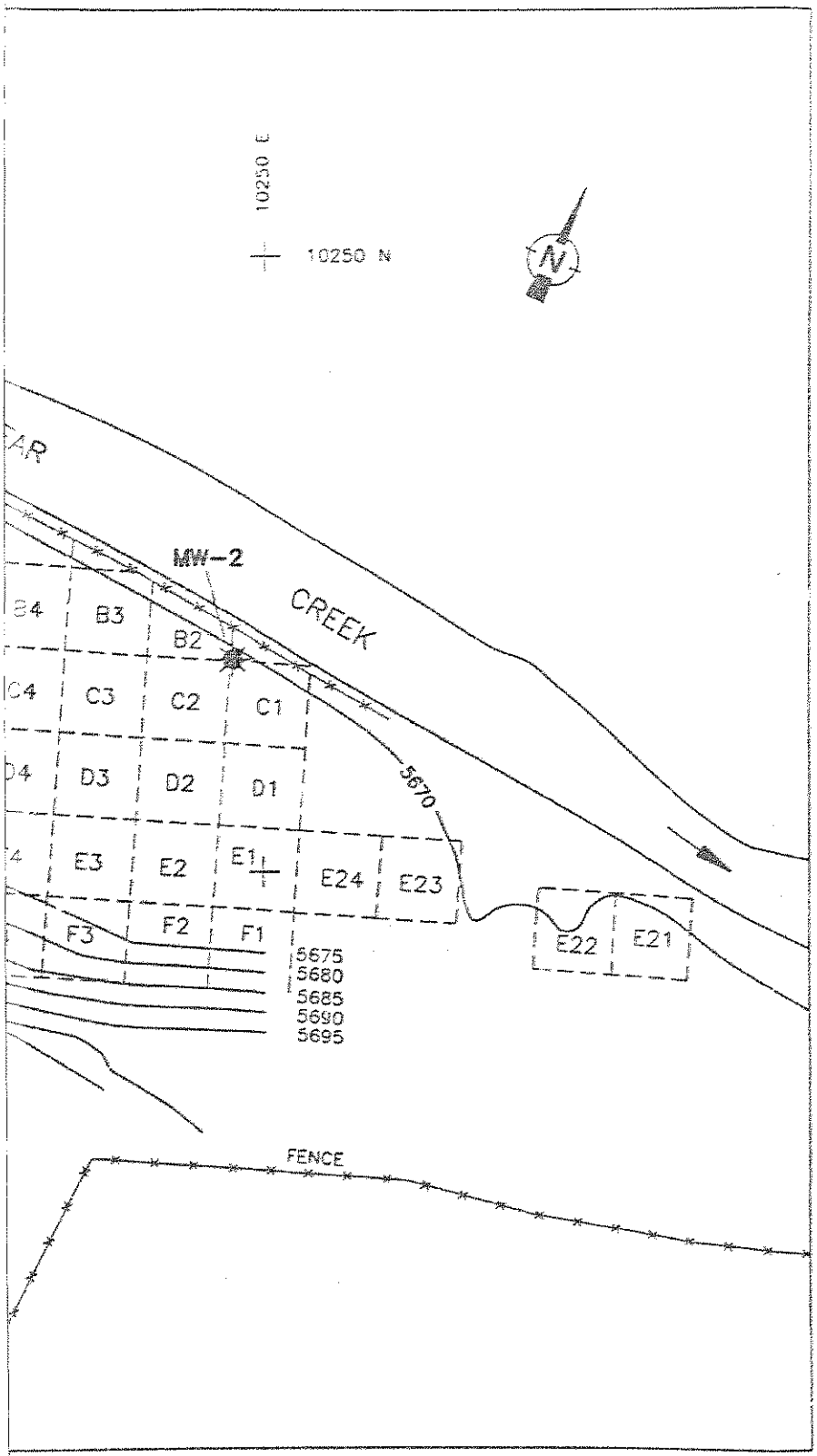
LEGEND

Remaining building concrete foundations

22 μR/hr

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-W0-0037	
TITLE: CSMRI Golden, Colorado SUBSURFACE SAMPLE AND SURVEY DATA MAP T08-9202-017, T08-9205-018 T.D.D. T08-9210-011, T08-9210-012	
ecology & environment, inc. DENVER, COLORADO	FIG. 8
Date: 03/93 Drawn by: RSM Scale:	


10250 E
1025
5670
CLEAR
CREE
MW-2
FENCE
ROAD
A13 A12 A11 A10 A9 A8 A7 A6 A5
B15 B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2
C15 C14 C13 C12 C11 C10 C9 C8 C7 C6 C5 C4 C3 C2 C1
D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1
E15 E14 E13 E12 E11 E10 E9 E8 E7 E6 E5 E4 E3 E2 E1
F5 F4 F3 F2 F1
109
111
110
101
106
105
108
104
107
117
115
102
103
5700
5675
5680
5685
5690
5695
0 50 100 150 200
SCALE : FEET



LEGEND

Remaining building concrete foundations

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE, REMOVAL AND PREVENTION EPA CONTRACT 68-W0-0037	
TITLE: CSMRI Golden, Colorado TOPSOIL SAMPLE GRID T08-9202-017, T08-9205-018 T.D.D. T08-9210-011, T08-9210-012	
ecology & environment, inc. DENVER, COLORADO	FIG. 9
Date: 03/93 . Drawn by: RSM Scale:	


10250 E
5670
CLEAR
FENCE
MW-2
A10 A9 A8 A7 A6 A5
B14 B13 B12 B11 B10 B9 B8 B7 B6 B5 B4 B3 B2
C14 C13 C12 C11 C10 C9 C8 C7 C6 C5 C4 C3 C2 C1
D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1
E14 E13 E12 E11 E10 E9 E8 E7 E6 E5 E4 E3 E2 E1
F5 F4 F3 F2 F1
109
ROAD
111
5700
5700
106
105
108
107
104
101
110
117
115
102
103
FENC
0 50 100 150 200
SCALE : FEET