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Formerly Utilized Sites Remedial Action Program (FUSRAP)
Contract No. DE-AC05-81OR20722

RADIOLOGICAL CHARACTERIZATION REPORT FOR THE MUNICIPAL PROPERTY AT FIREMAN'S MEMORIAL PARK (GARIBALDI AVENUE)

Lodi, New Jersey

September 1989

Bechtel National, Inc.

063982

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Attention: Robert G. Atkin
Technical Services Division

Subject: Bechtel Job No. 14501, FUSRAP Project
DOE Contract No. DE-AC05-81OR20722
Publication of Radiological Characterization Report for seventeen residential properties, four municipa properties, and seven commercial properties in Lodi and Maywood, New Jersey
Code: 7315/WBS: 138

Dear Mr. Atkin:

Enclosed is one copy each of the 28 subject published reports for the properties listed in Attachment 1. These reports incorporate all comments received in this review cycle (CCNs 063165, 063327, 062285, and 061568) and are being published wit approval of Steve Oldham, as reported in CCN 063868.

Also enclosed (as Attachment 2) is a proposed distribution list for these reports. Please send us any changes to the proposed distribution list at your earliest convenience so we may distribute the reports.

BNI would like to express our thanks to Mr. Oldham for his cooperation and efforts to review these drafts in an accelerate manner. His efforts have allowed us to publish these reports o schedule. If you have any questions about these documents, please call me at 576-4718.

Very truly yours,

R. C. Robertson
Project Manager - FUSRAP

RCR:wfs:1756x
Enclosure: As stated

cc: J. D. Berger, ORAU (w/e)
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CONCURRENCE

DOE				

DOE/OR/20722-250

RADIOLOGICAL CHARACTERIZATION REPORT FOR THE MUNICIPAL PROPERTY AT FIREMEN'S MEMORIAL PARK (GARIBALDI AVENUE) LODI, NEW JERSEY

SEPTEMBER 1989

Prepared for

UNITED STATES DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS OFFICE
Under Contract No. DE-AC05-81OR20722

By

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Bechtel Job No. 14501

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ABBREVIATIONS

cm	centimeter
cm^2	square centimeter
cpm	counts per minute
dpm	disintegrations per minute
ft	foot
h	hour
in.	inch
km^2	square kilometer
L	liter
L/min	liters per minute
m	meter
m^2	square meter
MeV	million electron volts
μR/h	microroentgens per hour
mi	mile
mi^2	square mile
min	minute
mrad/h	millirad per hour
mrem	millirem
mrem/yr	millirem per year
pCi/g	picocuries per gram
pCi/L	picocuries per liter
WL	working level
yd	yard
yd^3	cubic yard

1.0 INTRODUCTION AND SUMMARY

This section provides a brief description of the history and background of the Maywood site and its vicinity properties. Data obtained from the radiological characterization of this vicinity property are also presented.

1.1 INTRODUCTION

The 1984 Energy and Water Appropriations Act authorized the U.S. Department of Energy (DOE) to conduct a decontamination research and development project at four sites, including the site of the former Maywood Chemical Works (now owned by the Stepan Company) and its vicinity properties. The work is being administered under the Formerly Utilized Sites Remedial Action Program (FUSRAP) under the direction of the DOE Division of Facility and Site Decommissioning Projects. Several residential, commercial, and municipal properties in Lodi, New Jersey, are included in FUSRAP as vicinity properties. Figure 1-1 shows the location of the Lodi vicinity properties in relation to the former Maywood Chemical Works.

The U.S. Government initiated FUSRAP in 1974 to identify, clean up, or otherwise control sites where low-activity radioactive contamination (exceeding current guidelines) remains from the early years of the nation's atomic energy program or from commercial operations that resulted in conditions Congress has mandated that DOE remedy (Ref. 1).

FUSRAP is currently being managed by DOE Oak Ridge Operations. As the Project Management Contractor for FUSRAP, Bechtel National, Inc. (BNI) is responsible to DOE for planning, managing, and implementing FUSRAP.

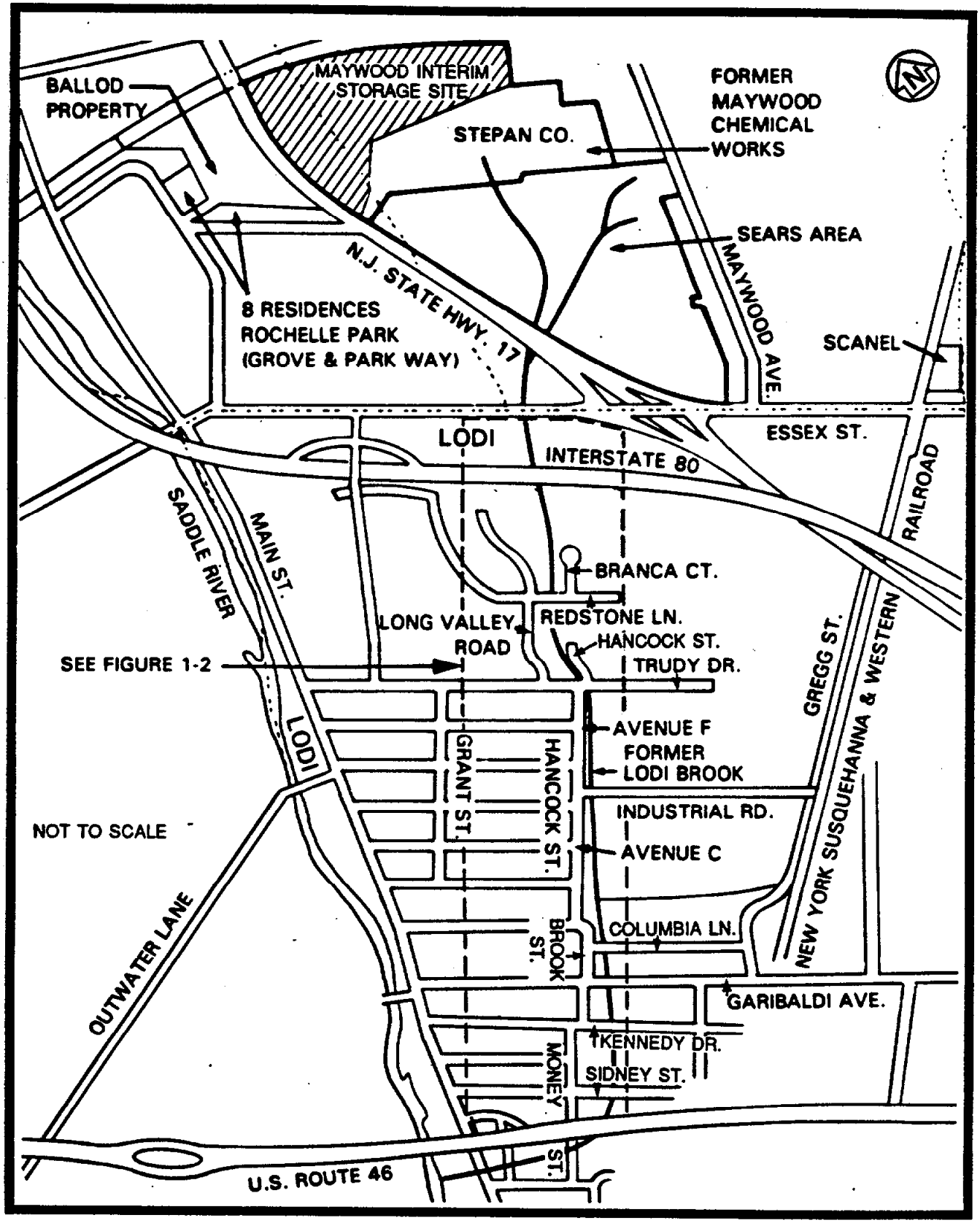

FIGURE 1-1 LOCATION OF LODI VICINITY PROPERTIES

1.2 PURPOSE

The purpose of the 1987 survey performed by BNI was to locate the horizontal and vertical boundaries of radionuclide concentrations exceeding remedial action guidelines.

1.3 SUMMARY

This report details the procedures and results of the radiological characterization of the property at Firemen's Memorial Park (Figure 1-2) in Lodi, New Jersey, which was conducted from September through November 1987.

Ultimately, the data generated during the radiological characterization will be used to define the complete scope of remedial action necessary to release the site.

Firemen's Memorial Park is a municipal property consisting of a grassy, landscaped park area with a memorial site, ornamental planter, and sidewalk areas. It is situated on the southeast corner of the intersection of Brook Street and Garibaldi Avenue. Entrance to the park is from Garibaldi Avenue. The park is located in a densely populated residential area. Other municipal properties and some commercial properties are also in this area. There are no buildings on the property, and its primary use is as a memorial site dedicated to local fire fighters.

This characterization confirmed that thorium-232 is the primary radioactive contaminant at this property. Results of surface soil samples for Firemen's Memorial Park showed maximum concentrations of thorium-232 and radium-226 to be less than 1.3 and 0.7 pCi/g, respectively. The maximum concentration of uranium-238 in surface soil samples was less than 3.7 pCi/g.

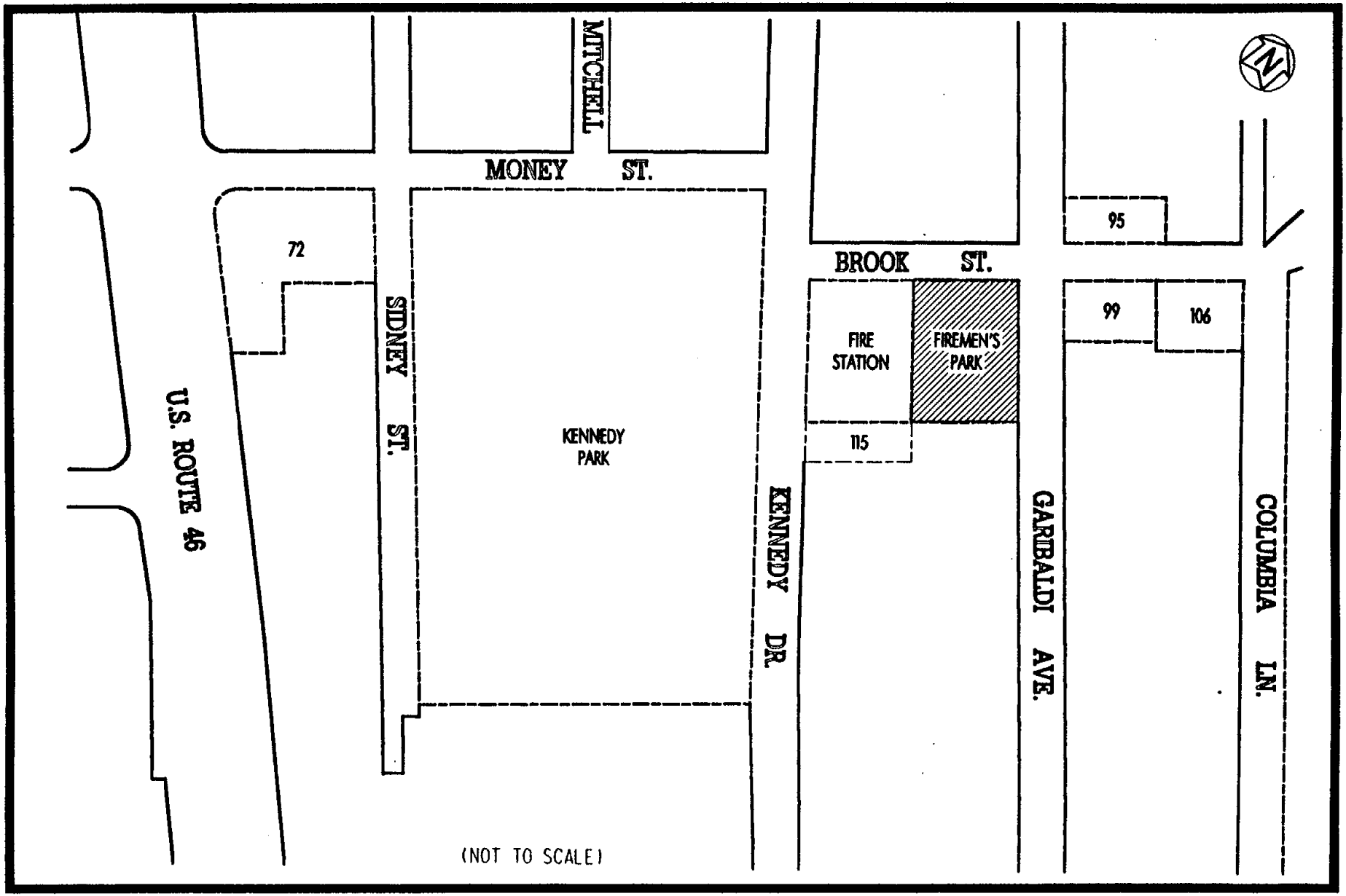

FIGURE 1-2 LOCATION OF FIREMEN'S MEMORIAL PARK

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Subsurface soil sample concentrations ranged from 0.4 to 31.6 pCi/g for thorium-232 and from less than 0.3 to less than 1.9 pCi/g for radium-226. The average background level in this area for both radium-226 and thorium-232 is 1.0 pCi/g. The concentrations of uranium-238 in subsurface soil samples ranged from less than 1.0 to 15.8 pCi/g. Because the major contaminants at the vicinity properties are thorium and radium, the decontamination guidelines provide the appropriate guidance for the cleanup activities. DOE believes that these guidelines are conservative for considering potential adverse health effects that might occur in the future from any residual contamination. The dose contributions from uranium and any other radionuclides not numerically specified in these guidelines are not expected to be significant following decontamination. In addition, the vicinity properties will be decontaminated in a manner so as to reduce future doses to levels that are as low as reasonably achievable (ALARA) (Ref. 2).

Soil analysis data for this property did not indicate surface contamination. Subsurface investigation by gamma logging indicated contamination to a depth of 2.13 m (7.0 ft).

Exterior gamma radiation exposure rates ranged from 6 to 13 μR/h, including background.

No buildings are present on this property; therefore, no indoor measurements were made.

All data tables for this property appear at the end of this report.

1.4 CONCLUSIONS

Evaluation of data collected, analyses performed, and historical documentation reviewed indicates the presence of radiological contamination on the property located at Firemen's Memorial Park. This contamination is primarily subsurface contamination ranging from a depth of 0.46 m (1.5 ft) to 2.13 m (7.0 ft). In addition, the contamination appears to extend beneath the park's memorial site and a major portion of the ornamental planter that adjoins the memorial site. In addition, there is a high probability that the contamination extends beneath a portion of the streets (Brook Street and Garibaldi Avenue) that border the park. The total affected area is estimated to be approximately 45 percent of the property. These conclusions are supported by documentation that establishes the presence of the former channel of Lodi Brook in this area. This channel is the suspected transport mechanism for the radiological contamination.

2.0 SITE HISTORY

The Maywood Chemical Works was founded in 1895. The company began processing thorium from monazite sand in 1916 (during World War I) for use in manufacturing gas mantles for various lighting devices. Process wastes from manufacturing operations were pumped to two areas surrounded by earthen dikes on property west of the plant. Subsequently, some of the contaminated wastes migrated onto adjacent and vicinity properties.

In 1928 and again between 1944 and 1946, some of the residues from the processing operations were moved from the company's property and used as mulch and fill in nearby low-lying areas. The fill material consisted of tea and coca leaves mixed with other material resulting from operations at the plant. Some fill material apparently contained thorium process wastes (Ref. 3).

Uncertainty exists as to how the properties in Lodi were contaminated. According to an area resident, fill from an unknown source was brought to Lodi and spread over large portions of the previously low-lying and swampy area. For several reasons, however, a more plausible explanation is that the contamination migrated along a drainage ditch originating on the Maywood Chemical Works property. First, it can be seen from photographs and tax maps of the area that the course of a previously existing stream known as Lodi Brook, which originated at the former Maywood Chemical Works, generally coincides with the path of contamination in Lodi. The brook was subsequently replaced by a storm drain system as the area was developed. Second, samples taken from Lodi properties indicate elevated concentrations of a series of elements known as rare earths. Rare earth elements are typically found in monazite sands, which also contain

thorium. This type of sand was feedstock at the Maywood Chemical Works, and elevated levels are known to exist in the by-product of the extraction process. Third, the ratio of thorium to other radionuclides found on these Lodi properties is comparable to the ratio found in contaminated material on other properties in Lodi (Ref. 4). And finally, long-time residents of Lodi recalled chemical odors in and around the brook in Lodi and steam rising off the water. These observations suggest that discharges of contaminants occurred upstream.

The Stepan Chemical Company (now called the Stepan Company) purchased Maywood Chemical Works in 1959. The Stepan Company itself has never been involved in the manufacture or processing of any radioactive materials (Ref. 5).

2.1 PREVIOUS RADIOLOGICAL SURVEYS

Numerous surveys of the Maywood site and its vicinity properties have been conducted. Among the past surveys, three that are pertinent to this vicinity property are detailed in this section.

January 1981--The Nuclear Regulatory Commission directed that a survey be conducted of the Stepan Company property and its vicinity properties in January 1981. Using the Stepan Company plant as the center, a 10.3-km^2 (4-mi^2) aerial survey was conducted by the EG&G Energy Measurements Group, which identified anomalous concentrations of thorium-232 to the north and south of the Stepan Company property. The Lodi vicinity properties were included in this survey (Ref. 6).

June 1984--In June 1984, Oak Ridge National Laboratory (ORNL) conducted a "drive-by" survey of Lodi using its

"scanning van." Although not comprehensive, the survey indicated areas requiring further investigation (Ref. 7).

September 1986--At the request of DOE, ORNL conducted radiological surveys of the vicinity properties in Lodi in September 1986 to determine which properties contained radioactive contamination in excess of DOE guidelines and would, therefore, require remedial action (Ref. 8).

2.2 REMEDIAL ACTION GUIDELINES

Table 2-1 summarizes the DOE guidelines for residual contamination. The thorium-232 and radium-226 limits listed in Table 2-1 will be used to determine the extent of remedial action required at the vicinity properties. DOE developed these guidelines to be consistent with the guidelines established by the U.S. Environmental Protection Agency (EPA) for the Uranium Mill Tailings Remedial Action Program.

TABLE 2-1
SUMMARY OF RESIDUAL CONTAMINATION GUIDELINES

BASIC DOSE LIMITS

The basic limit for the annual radiation dose received by an individual member of the general public is 100 mrem/yr.

SOIL GUIDELINES

Radionuclide	Soil Concentration (pCi/g) Above Background[a,b,c]
Radium-226 Radium-228 Thorium-230 Thorium-232	5 pCi/g when averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over any 15-cm-thick soil layer below the surface layer.
Other Radionuclides	Soil guidelines will be calculated on a site-specific basis using the DOE manual developed for this use.

STRUCTURE GUIDELINES

Airborne Radon Decay Products

Generic guidelines for concentrations of airborne radon decay products shall apply to existing occupied or habitable structures on private property that has no radiological restrictions on its use; structures that will be demolished or buried are excluded. The applicable generic guideline (40 CFR 192) is: In any occupied or habitable building, the objective of remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 WL[d]. In any case, the radon decay product concentration (including background) shall not exceed 0.03 WL. Remedial actions are not required in order to comply with this guideline when there is reasonable assurance that residual radioactive materials are not the cause.

External Gamma Radiation

The average level of gamma radiation inside a building or habitable structure on a site that has no radiological restrictions on its use shall not exceed the background level by more than 20 μR/h.

Indoor/Outdoor Structure Surface Contamination

Radionuclide[f]	Allowable Surface Residual Contamination[e] (dpm/100 cm²) Average[g,h]	Maximum[h,i]	Removable[h,i]
Transuranics, Ra-226, Ra-228, Th-230, Th-228 Pa-231, Ac-227, I-125, I-129	100	300	20
Th-Natural, Th-232, Sr-90, Ra-223, Ra-224 U-232, I-126, I-131, I-133	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay products	5,000 α	15,000 α	1,000 α
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above	5,000 β - γ	15,000 β - γ	1,000 β - γ

TABLE 2-1
(CONTINUED)

[a]These guidelines take into account ingrowth of radium-226 from thorium-230 and of radium-228 from thorium-232, and assume secular equilibrium. If either thorium-230 and radium-226 or thorium-232 and radium-228 are both present, not in secular equilibrium, the guidelines apply to the higher concentration. If other mixtures of radionuclides occur, the concentrations of individual radionuclides shall be reduced so that 1) the dose for the mixtures will not exceed the basic dose limit, or 2) the sum of ratios of the soil concentration of each radionuclide to the allowable limit for that radionuclide will not exceed 1 ("unity").

[b]These guidelines represent allowable residual concentrations above background averaged across any 15-cm-thick layer to any depth and over any contiguous 100-m^2 surface area.

[c]Localized concentrations in excess of these limits are allowable, provided that the average concentration over a 100-m^2 area does not exceed these limits. In addition, every reasonable effort shall be made to remove any source of radionuclide that exceeds 30 times the appropriate soil limit, regardless of the average concentration in the soil.

[d]A working level (WL) is any combination of short-lived radon decay products in 1 liter of air that will result in the ultimate emission of 1.3 x 105 MeV of potential alpha energy.

[e]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[f]Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the limits established for alpha- and beta-gamma-emitting radionuclides should apply independently.

[g]Measurements of average contamination should not be averaged over more than 1 m^2. For objects of less surface area, the average shall be derived for each such object.

[h]The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

[i]The maximum contamination level applies to an area of not more than 100 cm^2.

[j]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. The numbers in this column are maximum amounts.

3.0 HEALTH AND SAFETY PLAN

BNI is responsible for protecting the health of personnel assigned to work at the site. As such, all subcontractors and their personnel were required to comply with the provisions of BNI health and safety requirements and as directed by the on-site BNI Health and Safety Officer.

3.1 SUBCONTRACTOR TRAINING

Before the start of work, all subcontractor personnel attended an orientation session presented by the BNI Health and Safety Officer to explain the nature of the material to be encountered in the work and the personnel monitoring and safety measures that are required.

3.2 SAFETY REQUIREMENTS

Subcontractor personnel complied with the following BNI requirements:

- Bioassay--Subcontractor personnel submitted bioassay samples before or at the beginning of on-site activity, upon completion of the activity, and periodically during site activities as requested by BNI.
- Protective Clothing/Equipment--Subcontractor personnel were required to wear the protective clothing/equipment specified in the subcontract or as directed by the BNI Health and Safety Officer.
- Dosimetry--Subcontractor personnel were required to wear and return daily the dosimeters and monitors issued by BNI.
- Controlled Area Access/Egress--Subcontractor personnel and equipment entering areas where access and egress were controlled for radiation and/or chemical safety purposes were surveyed by the BNI Health and Safety Officer (or personnel representing BNI) for contamination before leaving those areas.

- Medical Surveillance--Upon written direction from BNI, subcontractor personnel who work in areas where hazardous chemicals might exist were given a baseline and periodic health assessment defined in BNI's Medical Surveillance Program.

Radiation and/or chemical safety surveillance of all activities related to the scope of work was under the direct supervision of personnel representing BNI.

Health and safety-related requirements for all activities involving exposure to radiation, radioactive material, chemicals, and/or chemically contaminated materials and other associated industrial safety hazards are generated in compliance with applicable regulatory requirements and industry-wide standards. Copies of these requirements are located at the BNI project office for use by project personnel.

4.0 CHARACTERIZATION PROCEDURES

A master grid was established by the surveyor. BNI's radiological support subcontractor, Thermo Analytical/Eberline (TMA/E), established a grid on individual properties. The size of the grid blocks was adjusted to characterize each property adequately. The grid origin allows the grid to be reestablished during remedial action and is correlated with the New Jersey state grid system. All data correspond to coordinates on the characterization grid. The grid with the east and north coordinates is shown on all figures included in Sections 4.0 and 5.0 of this report.

4.1 FIELD RADIOLOGICAL CHARACTERIZATION

This section provides a description of the instrumentation and methodologies used to obtain exterior surface and subsurface measurements during radiological characterization of this property.

4.1.1 Measurements Taken and Methods Used

An initial walkover survey was performed using an unshielded gamma scintillation detector [5.0- by 5.0-cm (2- by 2-in.) thallium-activated sodium iodide probe] to identify areas of elevated radionuclide activity. Near-surface gamma measurements taken using a cone-shielded gamma scintillation detector were also used to determine areas of surface contamination. The shielded detector ensured that the majority of the radiation detected by the instrument originated from the ground directly beneath the unit. Shielding against lateral gamma flux, or shine, from nearby areas of contamination minimized potential sources of error in the measurements. The measurements were taken 30.4 cm (12 in.) above the ground at the intersections of

3.0-m (10-ft) grid lines. The shielded detector was calibrated at the Technical Measurements Center (TMC) in Grand Junction, Colorado, to provide a correlation of counts per minute (cpm) to picocuries per gram (pCi/g). This calibration demonstrated that approximately 11,000 cpm corresponds to the DOE guideline of 5 pCi/g plus local average background of 1 pCi/g for thorium-232 in surface soils (Ref. 9).

A subsurface investigation was conducted to determine the depth to which the previously identified surface contamination extended and to locate subsurface contamination where there was no surface manifestation. The subsurface characterization consisted of drilling 15 boreholes (Figure 4-1), using either a 7.6-cm- (3-in.-) or 15.2-cm- (6-in.-) diameter auger bit, and gamma logging them. The boreholes were drilled to depths determined in the field by the radiological and geological support representatives.

The downhole gamma logging technique was used because the procedure can be accomplished in less time than collecting soil samples, and the need for analyzing these samples in a laboratory is eliminated. A 5.0- by 5.0-cm (2- by 2-in.) sodium iodide gamma scintillation detector was used to perform the downhole logging. The instrument was calibrated at TMC where it was determined that a count rate of approximately 40,000 cpm corresponds to the 15-pCi/g subsurface contamination guideline for thorium-232. This relationship has also been corroborated by results from previous characterizations where thorium-232 was found (Ref. 9).

Gamma radiation measurements were taken at 15.2-cm (6-in.) vertical intervals to determine the depth and concentration

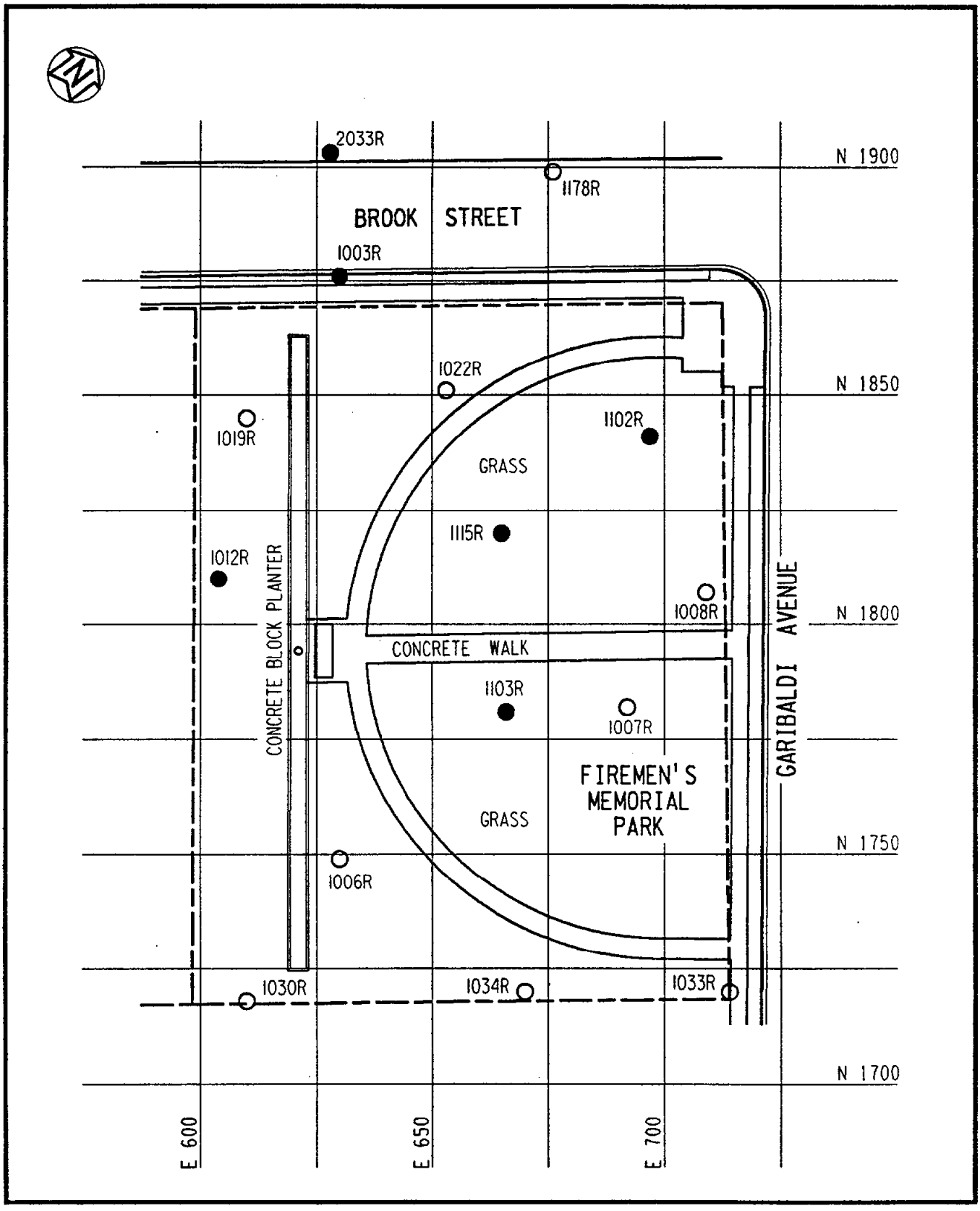

FIGURE 4-1 BOREHOLE LOCATIONS AT FIREMEN'S MEMORIAL PARK

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of the contamination. The gamma-logging data were reviewed to identify trends, whether or not concentrations exceeded the guidelines.

4.1.2 Sample Collection and Analysis

To identify surface areas where the level of contamination exceeded the DOE guideline of 5 pCi/g for thorium-232, areas with measurements of more than 11,000 cpm were plotted. Using these data as well as data from previous surveys (Refs. 5, 6, 7, and 8), the locations of biased surface soil samples were selected to better define the limits of contamination. Surface soil samples were taken at eight locations (Figure 4-2) and analyzed for thorium-232, uranium-238, and radium-226. Each sample was dried, pulverized, and counted for 10 min using an intrinsic germanium detector housed in a lead counting cave lined with cadmium and copper. The pulse height distribution was sorted using a computer-based, multichannel analyzer. Radionuclide concentrations were determined by comparing the gamma spectrum of each sample with the spectrum of a certified counting standard for the radionuclide of interest.

Subsurface soil samples were collected from 15 locations (Figure 4-2) using a 7.6-cm (3.0-in.) outside diameter (O.D.) split-spoon sampler mounted on a tripod or attached to a truck-mounted auger stem. The subsurface soil samples were analyzed for radium-226, uranium-238, and thorium-232 in the same manner as the surface soil samples.

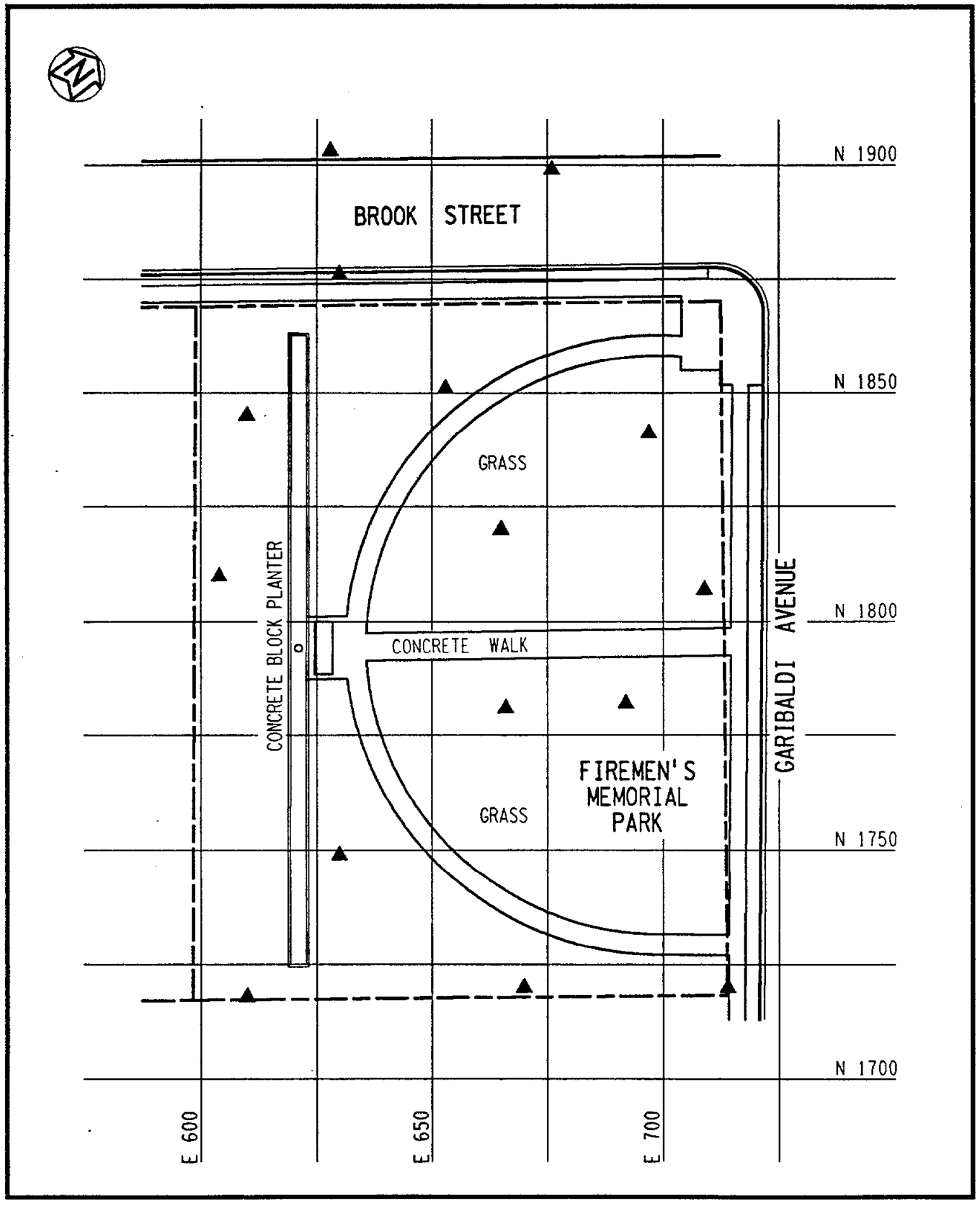

FIGURE 4-2 SURFACE AND SUBSURFACE SOIL SAMPLING LOCATIONS AT FIREMEN'S MEMORIAL PARK

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4.2 BUILDING RADIOLOGICAL CHARACTERIZATION

No buildings are present on this property; therefore, this element of the characterization activities was not conducted.

Exterior gamma exposure rate measurements were made at eight locations throughout the property grid system. To obtain these measurements, either a 5.0- by 5.0-cm (2- by 2-in.) thallium-activated sodium iodide gamma scintillation detector designed to detect gamma radiation only or a pressurized ionization chamber (PIC) was used. Measurement locations are shown in Figure 4-3. The PIC instrument has a response to gamma radiation that is proportional to exposure in roentgens. A conversion factor for gamma scintillation to the PIC was established through a correlation of these two measurements at four locations in the vicinity of the property. The unshielded gamma scintillation detector readings were then used to estimate gamma exposure rates for each location. These measurements were taken 1 m (3 ft) above the ground. The locations were determined to be representative of the entire property.

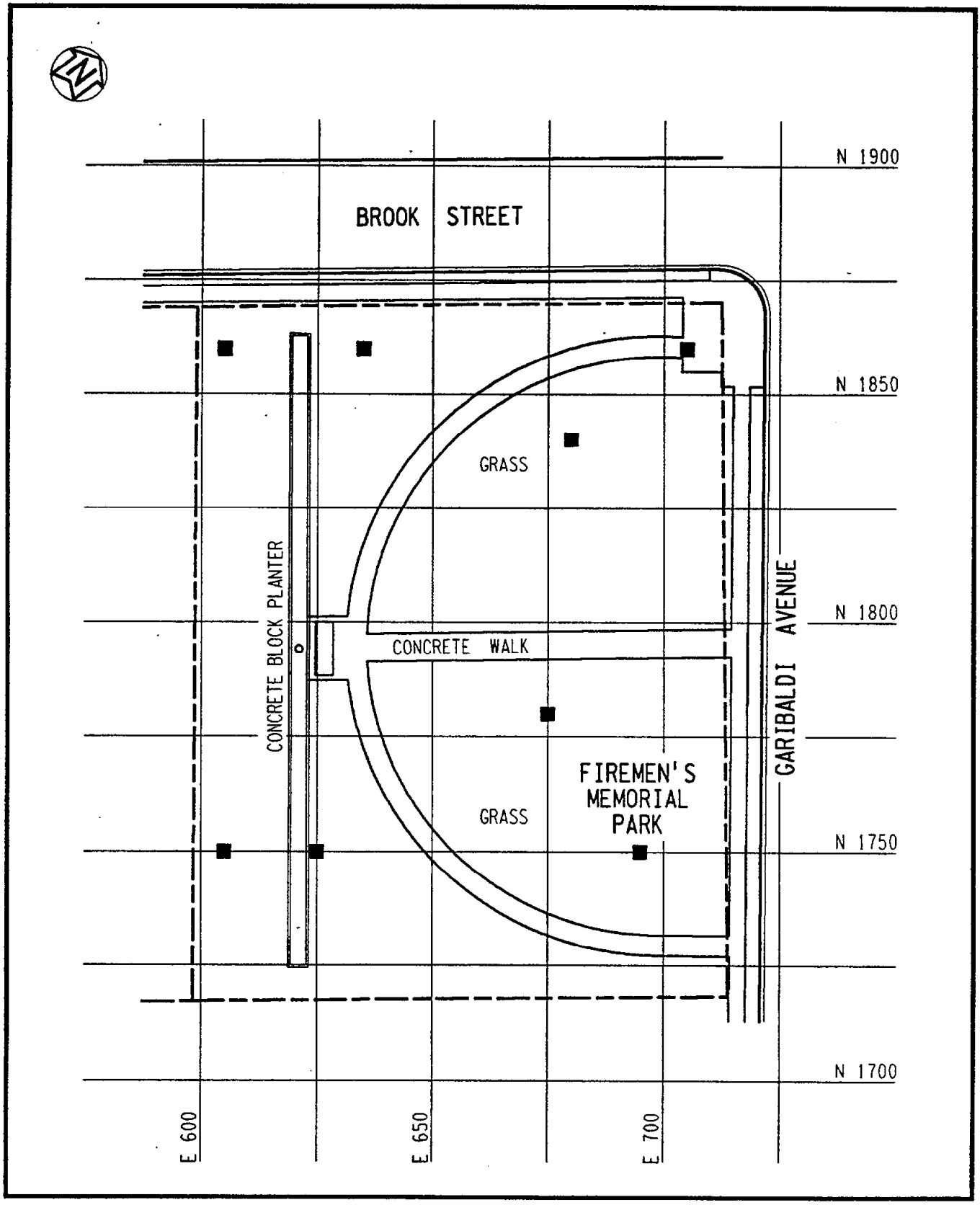

FIGURE 4-3 GAMMA EXPOSURE RATE MEASUREMENT LOCATIONS AT FIREMEN'S MEMORIAL PARK

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5.0 CHARACTERIZATION RESULTS

Radiological characterization results are presented in this section. The data included represent exterior surface and subsurface radiation measurements and interior radiation measurements.

5.1 FIELD RADIOLOGICAL CHARACTERIZATION

Near-surface gamma radiation measurements on the property ranged from 6,000 cpm to approximately 14,000 cpm. The average background level for this area is 5,000 cpm. A measurement of 11,000 cpm is approximately equal to the DOE guideline for thorium-232 of 5 pCi/g above background for surface soil contamination. Using this correlation, the near-surface gamma measurements were used to determine the extent of surface contamination and the basis for selecting the locations of soil samples. No areas of surface contamination were indicated by near-surface gamma measurements.

Surface soil samples [depths from 0.0 to 15.2 cm (6.0 in.)] were taken at five locations on the property and three locations in or near the street (Brook Street) adjacent to the property (Figure 4-2). These samples were analyzed for thorium-232, uranium-238, and radium-226. The concentrations in these samples ranged from less than 2.0 to less than 3.7 pCi/g for uranium-238, from less than 0.7 to less than 1.3 pCi/g for thorium-232, and from less than 0.5 to 0.7 pCi/g for radium-226. Analytical results for surface soils are provided in Table 5-1; these data showed that concentrations of thorium-232 do not exceed DOE guidelines (5 pCi/g plus background of 1 pCi/g for surface soils) with a maximum concentration of less than 1.3 pCi/g. Use of the "less than" (<) notation in reporting results indicates that

the radionuclide was not present in concentrations that are quantitative with the instruments and techniques used. The "less than" value represents the lower bound of the quantitative capacity of the instrument and technique used. The "less than" value is based on various factors, including the volume, size, and weight of the sample; the type of detector used; the counting time; and the background count rate. The actual concentration of the radionuclide is less than the value indicated. In addition, since radioactive decay is a random process, a correlation between the rate of disintegration and a given radionuclide concentration cannot be precisely established. For this reason, the exact concentration of the radionuclide cannot be determined. As such, each value that can be quantitatively determined has an associated uncertainty term ($\pm$), which represents the amount by which the actual concentration can be expected to differ from the value given in the table. The uncertainty term has an associated confidence level of 95 percent.

Thorium-232, the primary contaminant at the site, is the radionuclide most likely to exceed a specific DOE guideline in soil. Parameters for soil sample analysis were selected to ensure that the thorium-232 would be detected and measured at concentrations well below the lower guideline value of 5 pCi/g in excess of background level. Radionuclides of the uranium series, specifically uranium-238 and radium-226, are also potential contaminants but at lower concentrations than thorium-232. Therefore, these radionuclides (considered secondary contaminants) would not be present in concentrations in excess of guidelines unless thorium-232 was also present in concentrations in excess of its guideline level. Parameters selected for the thorium-232 analyses also provide detection sensitivities for uranium-238 and radium-226 that demonstrate that concentrations of these radionuclides are below guidelines. However, because of the

relatively low gamma photon abundance of uranium-238, many of the uranium-238 concentrations were below the detection sensitivity of the analytical procedure; these concentrations are reported in the data tables as "less than" values. To obtain more sensitive readings for the uranium-238 radionuclide with these analytical methods, much longer instrument counting times would be required than were necessary for analysis of thorium-232, the primary contaminant.

Analytical results for subsurface soil samples are given in Table 5-1, and gamma logging data are given in Table 5-2. The results in Table 5-2 showed a range from 6,000 cpm to 127,000 cpm. A measurement of 40,000 cpm is approximately equal to the DOE guideline for subsurface contamination of 15 pCi/g. Analyses of subsurface soil samples indicated uranium-238 concentrations ranging from less than 1.0 to 15.8 pCi/g, thorium-232 concentrations ranging from 0.4 to 31.6 pCi/g, and radium-226 concentrations ranging from less than 0.3 to less than 1.9 pCi/g.

On the basis of near-surface gamma radiation measurements, surface and subsurface soil sample analyses, and downhole gamma logging, contamination on this property is believed to consist primarily of subsurface contamination at depths ranging from 0.46 m (1.5 ft) to 2.13 m (7.0 ft). The areas of subsurface contamination are shown in Figure 5-1. The subsurface contamination appears to extend beneath the park's memorial site, the ornamental planter, and the streets (Brook Street and Garibaldi Avenue) that border the property.

It is apparent from review of historical documentation (e.g., aerial photographs of the area, interviews with local

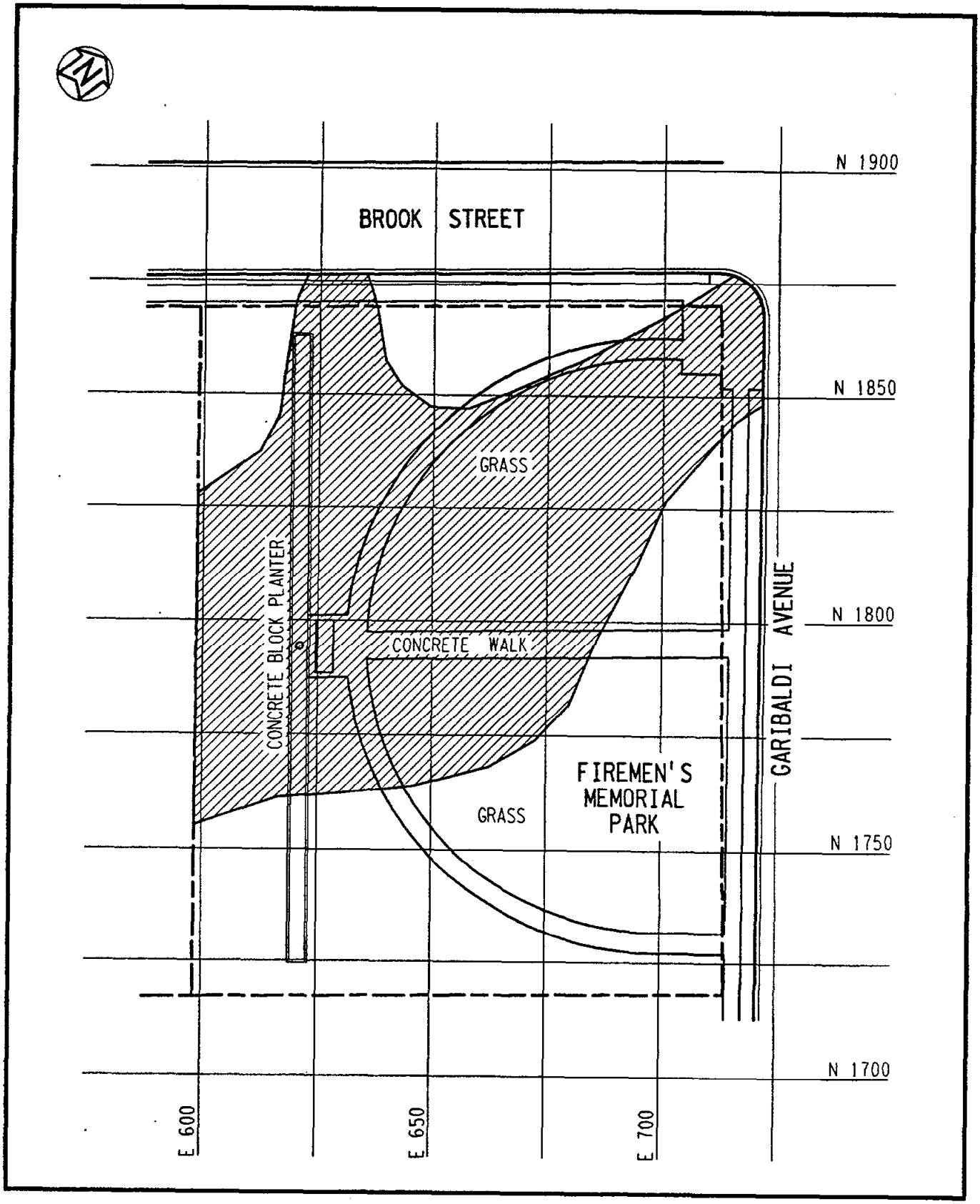

FIGURE 5-1 AREAS OF SUBSURFACE CONTAMINATION AT FIREMEN'S MEMORIAL PARK

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residents, and previous radiological surveys) that the subsurface contamination on this property lies along the former channel of Lodi Brook and its associated floodplain. The contamination on this property is similar to contamination found on a municipal property and a residential property, both in close proximity to this property. It has been established that the Lodi Brook channel through these neighboring properties once occupied locations connecting to those where stream sediments were found at Firemen's Memorial Park. Thus, the elevated gamma readings shown on gamma logs from boreholes drilled on this property serve as further indication of the suspected mechanism of transport for radiological contamination (i.e., stream deposition from Lodi Brook).

The vertical and horizontal limits of contamination as determined by this characterization effort are being evaluated to determine the volume of contaminated material that will require remedial action. To develop this estimate, BNI will consider the location of the contamination, construction techniques, and safety procedures.

5.2 BUILDING RADIOLOGICAL CHARACTERIZATION

This property is a municipal property used primarily as a memorial to local fire fighters. No buildings are on the property; therefore, indoor characterization activities were not performed.

Exterior gamma radiation exposure rate measurements ranged from 7 to 13 μR/h, including background. These results can be found in Table 5-3. The average exposure rate for the property is 9 μR/h and is equivalent to the average background level of 9 μR/h; Ref. 10). Therefore, assuming occupants of the park use all areas of the park equivalently,

they receive no dose above average background as a result of the contamination present on this property.

Based on the above information, the exposure rates and doses at this property are within DOE guidelines. Further, it should be emphasized that natural background exposure rates vary widely across the United States and are often significantly higher than average background for this area.

TABLE 5-1

SURFACE AND SUBSURFACE RADIONUCLIDE CONCENTRATIONS IN SOIL

FOR FIREMAN'S MEMORIAL PARK

Coordinates[a] East	Coordinates[a] North	Depth (ft)	Concentration (pCi/g ± 2 sigma) Uranium-238	Radium-226	Thorium-232
604	1810	0.0 - 1.0	< 2.0	0.5 ± 0.2	1.0 ± 0.4
604	1810	2.0 - 4.0	7.3 ± 1.5	< 0.8	3.6 ± 0.3
604	1810	4.0 - 6.0	< 2.0	0.5 ± 0.1	1.0 ± 0.2
604	1810	6.0 - 8.0	< 2.0	< 1.0	1.5 ± 0.7
604	1810	9.0 - 10.0	< 3.0	0.8 ± 0.3	1.3 ± 0.5
604	1810	10.0 - 12.0	< 2.0	0.7 ± 0.3	1.1 ± 0.3
604	1810	12.0 - 13.0	< 2.0	0.6 ± 0.2	< 1.0
604	1810	13.0 - 14.0	< 2.0	0.7 ± 0.1	1.1 ± 0.5
604	1810	14.0 - 15.0	< 2.0	< 1.0	0.8 ± 0.1
604	1810	15.0 - 16.0	< 2.0	0.9 ± 0.2	1.3 ± 0.7
604	1810	16.0 - 18.0	< 1.0	0.4 ± 0.2	0.5 ± 0.2
610	1718	0.0 - 0.5	< 2.3	< 0.5	< 0.9
610	1718	0.0 - 1.0	< 2.2	< 0.6	< 1.1
610	1718	5.8 - 7.0	< 2.6	< 0.7	< 1.3
610	1718	7.0 - 7.9	< 2.2	< 0.4	< 0.8
610	1718	7.9 - 8.8	< 2.6	< 0.7	< 1.1
610	1718	8.8 - 10.8	< 1.9	< 0.4	< 0.7
610	1845	0.0 - 0.5	< 2.5	< 0.7	< 1.0
610	1845	5.8 - 7.0	< 3.7	< 0.7	< 1.1
610	1845	7.0 - 8.0	< 1.7	< 0.5	< 0.6
610	1845	8.0 - 9.0	< 3.3	< 0.8	< 1.1
610	1845	9.0 - 10.0	< 1.9	< 0.5	< 0.9
610	1845	10.0 - 11.0	< 3.1	< 0.6	< 1.1
610	1845	11.0 - 12.0	< 1.8	< 0.4	< 0.6

TABLE 5-1

(continued)

Coordinates[a] East	Coordinates[a] North	Depth (ft)	Concentration (pCi/g ± 2 sigma) Uranium-238	Radium-226	Thorium-232
610	1845	12.0 - 13.0	< 3.5	< 0.8	< 1.0
610	1845	13.0 - 14.0	< 3.0	< 0.7	< 1.0
610	1845	14.0 - 15.0	< 1.9	< 0.4	< 0.8
628	1903	0.0 - 0.5	< 2.0	0.5 ± 0.1	0.7 ± 0.3
628	1903	0.5 - 1.0	< 2.0	0.4 ± 0.3	< 1.0
628	1903	1.0 - 1.5	< 2.0	0.7 ± 0.1	< 1.0
628	1903	1.5 - 2.0	< 2.0	< 1.0	0.9 ± 0.1
628	1903	2.0 - 2.5	< 2.0	< 2.0	0.8 ± 0.4
628	1903	2.5 - 3.0	< 2.0	< 1.0	< 1.0
628	1903	3.0 - 3.5	< 2.0	< 1.0	< 1.0
628	1903	3.5 - 4.0	< 2.0	0.3 ± 0.3	< 1.0
628	1903	4.0 - 4.5	< 2.0	< 1.0	< 1.0
628	1903	4.5 - 5.0	1.3 ± 1.2	< 1.0	< 1.0
628	1903	5.0 - 5.5	< 2.0	< 1.0	< 1.0
628	1903	5.5 - 6.0	< 3.0	0.9 ± 0.6	1.8 ± 0.6
628	1903	6.0 - 6.5	2.4 ± 1.9	0.5 ± 0.1	< 1.0
628	1903	6.5 - 7.0	< 1.0	< 1.0	1.3 ± 0.4
628	1903	7.0 - 7.5	< 2.0	< 1.0	< 1.03
628	1903	7.5 - 8.0	< 2.0	< 1.0	< 1.0
628	1903	8.0 - 8.5	< 3.0	< 1.0	< 1.0
628	1903	8.5 - 9.0	< 3.0	0.7 ± 0.1	1.2 ± 0.6
628	1903	9.0 - 9.5	< 2.0	0.7 ± 0.1	< 1.0
628	1903	9.5 - 10.0	< 3.0	0.7 ± 0.1	1.4 ± 0.5

TABLE 5-1

(continued)

Coordinates[a] East	Coordinates[a] North	Depth (ft)	Concentration (pCi/g ± 2 sigma) Uranium-238	Radium-226	Thorium-232
630	1749	0.0 - 1.0	< 3.8	< 0.9	< 1.6
630	1749	1.0 - 2.0	< 4.2	< 0.9	< 1.4
630	1749	2.0 - 4.0	< 2.9	< 0.6	< 1.1
630	1749	4.0 - 5.0	< 2.3	< 0.4	< 0.7
630	1749	5.0 - 6.0	< 3.0	< 0.8	< 1.3
630	1749	6.0 - 7.0	< 2.0	< 0.6	< 1.1
630	1749	7.0 - 8.0	< 2.2	< 0.6	< 0.9
630	1749	8.0 - 9.0	< 2.6	< 0.6	< 0.9
630	1749	9.0 - 10.0	< 4.4	< 1.0	< 1.7
630	1749	10.0 - 11.0	< 2.6	< 0.5	< 0.8
630	1749	11.2 - 12.2	< 2.2	< 0.5	< 1.0
630	1749	12.2 - 13.0	< 2.2	< 0.6	< 1.0
630	1749	13.0 - 14.0	< 4.3	< 1.0	< 1.7
630	1749	14.0 - 16.0	< 2.4	< 0.6	< 0.7
630	1876	0.0 - 0.5	< 2.0	0.7 ± 1.5	0.8 ± 0.4
630	1876	0.5 - 1.0	< 2.0	0.8 ± 0.3	1.4 ± 0.5
630	1876	1.0 - 3.0	< 2.0	0.7 ± 0.2	0.6 ± 0.2
630	1876	3.0 - 4.0	< 2.0	< 1.0	< 1.0
630	1876	4.0 - 6.0	< 1.0	0.3 ± 0.1	0.4 ± 0.1
630	1876	6.0 - 7.0	< 7.0	< 1.0	16.7 ± 1.6
653	1851	0.0 - 0.5	< 2.9	< 0.7	< 1.3
653	1851	1.0 - 2.0	< 4.1	< 1.0	< 1.3
653	1851	2.0 - 3.5	< 3.5	< 0.8	< 1.7
653	1851	6.5 - 7.5	< 3.5	< 0.8	< 0.8
653	1851	7.5 - 8.5	< 1.7	< 0.5	< 0.6

TABLE 5-1

(continued)

Coordinates[a] East	Coordinates[a] North	Depth (ft)	Concentration (pCi/g ± 2 sigma) Uranium-238	Radium-226	Thorium-232
653	1851	8.5 - 9.5	< 3.0	< 0.7	< 1.0
653	1851	9.5 - 10.5	< 3.3	< 0.7	< 1.0
653	1851	10.5 - 12.5	< 5.2	< 1.1	< 1.8
665	1820	3.0 - 4.0	< 7.3	< 1.6	13.8 ± 0.9
665	1820	4.0 - 5.0	<10.9	< 1.5	31.6 ± 1.4
665	1820	5.0 - 6.0	< 8.6	< 1.6	11.1 ± 1.9
665	1820	6.0 - 7.0	< 5.3	< 1.1	< 1.4
665	1820	7.0 - 8.0	< 4.0	< 1.1	< 1.4
665	1820	8.0 - 10.0	< 3.8	< 0.9	< 1.6
666	1781	0.0 - 2.0	< 3.6	< 0.9	< 1.4
666	1781	3.0 - 4.0	< 3.4	< 0.7	< 1.1
666	1781	4.0 - 5.0	< 4.2	< 1.2	< 1.3
666	1781	8.0 - 10.0	< 3.0	< 0.7	< 1.2
666	1781	10.0 - 12.0	< 3.6	< 1.0	< 1.3
666	1781	12.0 - 14.0	< 3.4	< 0.9	< 1.0
666	1781	14.0 - 16.0	< 2.0	< 0.4	< 0.7
666	1781	16.0 - 18.0	< 3.1	< 0.7	< 1.1
670	1720	0.0 - 0.5	< 3.0	< 0.6	< 1.1
670	1720	0.0 - 1.0	< 2.5	< 0.6	< 1.0
670	1720	3.5 - 4.5	< 2.1	< 0.4	< 0.8
670	1720	7.5 - 8.3	< 2.4	< 0.5	< 0.9
670	1720	8.3 - 9.5	< 1.7	< 0.4	< 0.6

TABLE 5-1

(continued)

Page 5 of 7

Coordinates[a] East	Coordinates[a] North	Depth (ft)	Concentration (pCi/g ± 2 sigma) Uranium-238	Radium-226	Thorium-232
670	1720	9.5 - 10.5	< 1.8	< 0.4	< 0.6
670	1720	10.5 - 11.5	< 1.8	< 0.4	< 0.6
670	1720	11.5 - 12.5	< 1.7	< 0.3	< 0.5
670	1720	12.5 - 13.5	< 1.7	< 0.4	< 0.7
670	1720	13.5 - 14.5	< 1.6	< 0.4	< 0.7
670	1720	14.5 - 15.1	< 2.2	< 0.5	< 0.9
676	1899	0.0 - 0.5	< 3.7	< 0.6	< 1.0
676	1899	0.0 - 1.0	< 7.1	< 1.4	< 1.8
676	1899	4.0 - 5.0	< 6.4	< 1.0	< 1.8
676	1899	8.0 - 9.0	< 6.1	< 0.9	< 1.6
676	1899	9.0 - 10.0	< 2.0	< 0.5	< 0.7
692	1782	0.0 - 1.0	< 2.3	< 0.7	< 0.9
692	1782	1.0 - 2.0	< 2.6	< 0.4	< 0.8
692	1782	2.0 - 4.0	< 2.9	< 0.5	< 1.0
692	1782	4.0 - 4.5	< 2.3	< 0.4	< 0.9
692	1782	4.5 - 5.5	< 2.8	< 0.5	< 0.9
692	1782	5.5 - 6.5	< 3.6	< 0.6	< 1.3
692	1782	6.5 - 7.5	< 3.0	< 0.6	< 1.0
692	1782	7.5 - 8.5	< 2.8	< 0.5	< 1.0
692	1782	8.5 - 9.5	< 2.4	< 0.4	< 0.9
692	1782	9.5 - 9.8	< 3.8	< 0.6	< 1.5
692	1782	9.8 - 11.0	< 2.4	< 0.4	< 0.7
692	1782	11.0 - 12.2	< 2.1	< 0.4	< 1.0
692	1782	12.2 - 13.8	< 2.5	< 0.4	< 0.9

TABLE 5-1

(continued)

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Coordinates[a] East	Coordinates[a] North	Depth (ft)	Concentration (pCi/g ± 2 sigma) Uranium-238	Radium-226	Thorium-232
692	1782	13.8 - 15.2	< 4.3	< 0.7	< 1.5
692	1782	15.2 - 16.2	< 2.5	< 0.5	< 0.8
692	1782	16.2 - 17.2	< 2.3	< 0.4	< 0.9
692	1782	17.2 - 19.6	< 2.4	< 0.4	< 0.9
692	1782	19.6 - 19.6	< 2.5	< 0.7	< 0.9
697	1841	0.0 - 2.0	< 6.0	< 1.1	10.2 ± 0.1
697	1841	2.0 - 3.0	< 9.1	< 1.5	29.2 ± 1.1
697	1841	3.0 - 4.0	15.8 ± 2.8	< 1.9	< 4.5
697	1841	4.0 - 5.0	< 3.9	< 1.7	< 1.5
697	1841	6.0 - 7.0	< 3.8	< 0.9	< 1.3
697	1841	8.0 - 10.0	< 2.4	< 0.6	< 1.0
709	1807	0.0 - 1.0	< 2.5	< 0.5	< 0.7
709	1807	1.0 - 2.2	< 3.3	< 0.7	< 1.2
709	1807	2.2 - 4.0	< 2.4	< 0.7	< 0.9
709	1807	4.0 - 5.0	< 3.2	< 0.5	< 1.0
709	1807	5.0 - 6.0	< 2.9	< 0.5	< 1.0
709	1807	6.0 - 7.0	< 2.9	< 0.6	< 1.0
709	1807	7.0 - 7.5	< 3.2	< 0.8	< 1.1
709	1807	7.5 - 8.7	< 3.0	< 0.6	< 1.1
709	1807	8.7 - 9.2	< 2.6	< 0.6	< 0.8

TABLE 5-1

(continued)

Page 7 of 7

Coordinates[a] East	Coordinates[a] North	Depth (ft)	Concentration (pCi/g ± 2 sigma) Uranium-238	Radium-226	Thorium-232
709	1807	9.2 - 10.0	< 2.9	< 0.7	< 1.2
709	1807	10.0 - 11.0	< 3.4	< 0.8	< 1.3
709	1807	11.0 - 12.5	< 3.8	< 0.7	< 1.1
709	1807	12.5 - 13.5	< 3.5	< 0.8	< 1.1
709	1807	13.5 - 14.0	< 2.6	< 0.6	< 0.9
709	1807	14.0 - 17.5	< 2.1	< 0.6	< 0.8
714	1720	0.0 - 0.5	< 2.6	< 0.6	< 1.3
714	1720	0.0 - 1.0	< 6.0	< 1.7	< 2.1
714	1720	3.0 - 4.0	< 2.4	< 0.6	< 1.0
714	1720	7.5 - 8.5	< 1.7	< 0.4	< 0.6
714	1720	8.5 - 9.5	< 1.9	< 0.4	< 0.7
714	1720	9.5 - 10.5	< 1.9	< 0.4	< 0.7
714	1720	9.5 - 11.5	< 1.6	< 0.4	< 0.6

[a]Sampling locations are shown in Figure 4-2.

TABLE 5-2

DOWNHOLE GAMMA LOGGING RESULTS

FOR FIREMEN'S MEMORIAL PARK

Coordinates[a] East	Coordinates[a] North	Depth[b] (ft)	Count Rate[c] (cpm)
Borehole 1012R[d]			
604	1810	0.5	11000
604	1810	1.0	12000
604	1810	1.5	14000
604	1810	2.0	14000
604	1810	2.5	36000
604	1810	3.0	39000
604	1810	3.5	20000
604	1810	4.0	12000
604	1810	4.5	11000
604	1810	5.0	12000
604	1810	5.5	12000
604	1810	6.0	13000
604	1810	6.5	12000
604	1810	7.0	12000
604	1810	7.5	11000
604	1810	8.0	12000
604	1810	8.5	11000
604	1810	9.0	11000
Borehole 1030R[d]			
610	1718	0.5	7000
610	1718	1.0	7000
610	1718	1.5	7000
610	1718	2.0	6000
610	1718	2.5	7000
610	1718	3.0	7000
610	1718	3.5	8000
610	1718	4.0	8000
610	1718	4.5	8000
610	1718	5.0	7000
610	1718	5.5	8000
610	1718	6.0	7000
610	1718	6.5	8000

TABLE 5-2

(continued)

Coordinates[a] East	North	Depth[b] (ft)	Count Rate[c] (cpm)
Borehole 1019R[d]			
610	1845	0.5	9000
610	1845	1.0	9000
610	1845	1.5	9000
610	1845	2.0	9000
610	1845	2.5	9000
610	1845	3.0	8000
610	1845	3.5	8000
610	1845	4.0	8000
610	1845	4.5	8000
610	1845	5.0	8000
610	1845	5.5	8000
610	1845	6.0	8000
610	1845	6.5	8000
Borehole 2033R[d]			
628	1903	0.5	11000
628	1903	1.0	12000
628	1903	1.5	11000
628	1903	2.0	11000
628	1903	2.5	11000
628	1903	3.0	11000
628	1903	3.5	11000
628	1903	4.0	11000
628	1903	4.5	11000
628	1903	5.0	11000
628	1903	5.5	12000
628	1903	6.0	12000
628	1903	6.5	12000
628	1903	7.0	14000
628	1903	7.5	13000
628	1903	8.0	13000
628	1903	8.5	13000
628	1903	9.0	13000
628	1903	9.5	14000

TABLE 5-2

(continued)

Coordinates[a] East	Coordinates[a] North	Depth[b] (ft)	Count Rate[c] (cpm)
Borehole 1006R[d]			
630	1749	0.5	10000
630	1749	1.0	13000
630	1749	1.5	13000
630	1749	2.0	10000
630	1749	2.5	9000
Borehole 1003R[d]			
630	1876	0.5	10000
630	1876	1.0	11000
630	1876	1.5	13000
630	1876	2.0	12000
630	1876	2.5	9000
630	1876	3.0	6000
630	1876	3.5	5000
630	1876	4.0	5000
630	1876	4.5	8000
630	1876	5.0	17000
630	1876	5.5	89000
630	1876	6.0	127000
Borehole 1022R[d]			
653	1851	0.5	8000
653	1851	1.0	10000
653	1851	1.5	17000
653	1851	2.0	28000
653	1851	2.5	21000
653	1851	3.0	12000
653	1851	3.5	9000
653	1851	4.0	9000
653	1851	4.5	9000
653	1851	5.0	9000
653	1851	5.5	9000
653	1851	6.0	9000
Borehole 1115R[d]			
665	1820	0.5	11000
665	1820	1.0	11000
665	1820	1.5	13000

TABLE 5-2

(continued)

Coordinates[a] East	Coordinates[a] North	Depth[b] (ft)	Count Rate[c] (cpm)
Borehole 1115R (continued)[d]			
665	1820	2.0	15000
665	1820	2.5	17000
665	1820	3.0	24000
665	1820	3.5	80000
665	1820	4.0	87000
665	1820	4.5	82000
665	1820	5.0	66000
665	1820	5.5	62000
665	1820	6.0	72000
665	1820	6.5	59000
665	1820	7.0	46000
665	1820	7.5	26000
665	1820	8.0	16000
665	1820	8.5	17000
Borehole 1103R[d]			
666	1781	0.5	10000
666	1781	1.0	12000
666	1781	1.5	13000
666	1781	2.0	20000
666	1781	2.5	14000
666	1781	3.0	16000
666	1781	3.5	17000
666	1781	4.0	50000
666	1781	4.5	50000
666	1781	5.0	16000
666	1781	5.5	12000
666	1781	6.0	11000
666	1781	6.5	10000
666	1781	7.0	10000
666	1781	7.5	11000
666	1781	8.0	11000
Borehole 1034R[d]			
670	1720	0.5	9000
670	1720	1.0	10000
670	1720	1.5	10000
670	1720	2.0	9000
670	1720	2.5	9000

TABLE 5-2

(continued)

Coordinates[a] East	Coordinates[a] North	Depth[b] (ft)	Count Rate[c] (cpm)
Borehole 1034R (continued)[d]			
670	1720	3.0	10000
670	1720	3.5	9000
670	1720	4.0	9000
670	1720	4.5	9000
670	1720	5.0	10000
670	1720	5.5	11000
670	1720	6.0	11000
670	1720	6.5	11000
670	1720	7.0	10000
670	1720	7.5	8000
670	1720	8.0	7000
Borehole 1178R[d]			
676	1899	0.5	7000
676	1899	1.0	9000
676	1899	1.5	9000
676	1899	2.0	9000
676	1899	2.5	8000
676	1899	3.0	9000
676	1899	3.5	9000
676	1899	4.0	9000
676	1899	4.5	10000
676	1899	5.0	9000
676	1899	5.5	11000
676	1899	6.0	9000
676	1899	6.5	8000
676	1899	7.0	8000
676	1899	7.5	8000
676	1899	8.0	9000
676	1899	8.5	11000
Borehole 1007R[d]			
692	1782	0.5	8000
692	1782	1.0	9000
692	1782	1.5	10000
692	1782	2.0	9000
692	1782	3.0	8000
692	1782	4.0	8000

TABLE 5-2

(continued)

Page 6 of 7

Coordinates[a] East	North	Depth[b] (ft)	Count Rate[c] (cpm)
Borehole 1007R (continued)[d]			
692	1782	5.0	9000
692	1782	6.0	11000
692	1782	7.0	11000
Borehole 1102R[d]			
697	1841	0.5	15000
697	1841	1.0	24000
697	1841	1.5	30000
697	1841	2.0	55000
697	1841	2.5	49000
697	1841	3.0	29000
697	1841	3.5	20000
697	1841	4.0	11000
697	1841	4.5	9000
697	1841	5.0	9000
697	1841	5.5	8000
697	1841	6.0	9000
697	1841	6.5	9000
697	1841	7.0	9000
697	1841	7.5	10000
697	1841	8.0	11000
697	1841	8.5	11000
697	1841	9.0	12000
697	1841	9.5	12000
Borehole 1008R[d]			
709	1807	0.5	9000
709	1807	1.0	10000
709	1807	1.5	9000
709	1807	2.0	8000
709	1807	3.0	8000
709	1807	4.0	8000
709	1807	5.0	8000
709	1807	6.0	10000
709	1807	7.0	11000
709	1807	7.5	11000

TABLE 5-2

(continued)

Coordinates[a] East	Coordinates[a] North	Depth[b] (ft)	Count Rate[c] (cpm)
Borehole 1033R[d]			
714	1720	0.5	8000
714	1720	1.0	9000
714	1720	1.5	9000
714	1720	2.0	8000
714	1720	2.5	9000
714	1720	3.0	9000
714	1720	3.5	9000
714	1720	4.0	8000
714	1720	4.5	8000
714	1720	5.0	8000
714	1720	5.5	8000
714	1720	6.0	8000
714	1720	6.5	8000
714	1720	7.0	8000
714	1720	7.5	8000

[a]Borehole locations are shown in Figure 4-1.

[b]The variations in depths of boreholes and corresponding results given in this table are based on the boreholes penetrating the contamination or the drill reaching refusal.

[c]Instrument used was 5.0- by 5.0-cm (2- by 2-in.) thallium-activated sodium iodide gamma scintillation detector.

[d]Bottom of borehole collapsed.

TABLE 5-3

GAMMA RADIATION EXPOSURE RATES

FOR FIREMEN'S MEMORIAL PARK

Coordinates[a]		Rate[b]
East	North	(μR/h)
605	1750	13
605	1860	12
625	1750	7
635	1860	6
675	1780	9
680	1840	12
695	1750	6
705	1860	8

[a]Measurement locations are shown in Figure 4-3.

[b]Measurements include background.

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GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1012R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,810 E 604	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
9-25-87	9-25-87	G. Engel; BNI	Minuteman Auger	4"	18.0		18.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
11.5/63		13			▽ / ▼ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE "N" BLOWS % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE
SS	1.0	0.4								
SS	1.0	0.5								
SS	2.0	0.9								
SS	2.0	0.8						5		
SS	2.0	1.3								
SS	1.0	1.0								
SS	1.0	0.9								
SS	2.0	1.2						10		
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0						15		
SS	2.0	2.0								

DESCRIPTION AND CLASSIFICATION

0.0 - 5.8 Ft. Silty clayey SAND (SM). Dusky brown (5YR2/2), fine- to very coarse-grained.

1.0-3.0 Ft. Specks of light brown (5YR5/6).

2.0 ft. Pieces of coal up to 0.5 in. Bituminous?

3.0-5.0 Ft. Mixed dusky brown (5YR2/20 and light brown (5YR5/6).

4.5 Ft. Decreasing zones of dusky brown.

5.0-5.8 Ft. Dark yellowish brown (10YR4/2) fine- to medium-grained sand.

5.8 - 9.6 Ft. Silty CLAY (CL-ML). Moderate brown (5YR4/4) and light brown (5YR5/6).

9.6 - 11.5 Ft. Clayey SILT (ML-CL). Grayish brown (5YR3/2).

10.8-11.0 Ft. Dark yellowish brown (10YR4/2) clay zone.

11.5 - 14.1 Ft. Silty SAND (SM). Brownish gray (5YR4/1). Very fine- to fine-grained.

12.0-13.2 Ft. Grayish brown (5YR3/2).
13.2-13.7 Ft. Grayish red (5R4/2).

13.7-14.1 Ft. Grayish brown (5YR3/2) silty clay zone.

14.1 - 15.2 Ft. Clayey SILT (ML-CL). Brownish gray (5YR4/1).

15.2 - 18.0 Ft. Silty CLAY (CL-ML). Moderate brown (5YR4/4).

15.6-16.0 Ft. Moderate reddish brown (10R4/6). Some cohesiveness.

16.0-18.0 ft. Moderate yellowish brown (10YR5/4) with pebbles mixed with moderate reddish brown. Pebbles are granite and up to 1.0 in. in diam.

Bottom of borehole at 18.0 Ft.
Borehole backfilled with grout, 9/25/87.

NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.

Borehole advanced 0-18.0 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers.

Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.

15.0 Ft. Very wet.

Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1012R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1030R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,718 E 610	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
10-22-87	10-22-87	Bechtel National	Minuteman Auger	4"	10.8		10.8

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
8.8/81		8			▽ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140 lbs/30 in	NA	D. Harnish

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE
SS	1.0	0.6								
SS	1.4	0.6								
SS	2.2	1.5								
SS	1.2	1.1						5		
SS	1.2	1.2								
SS	0.9	0.9								
SS	0.9	0.9								
SS	2.0	2.0						10		

DESCRIPTION AND CLASSIFICATION

0.0 - 3.6 Ft. Silty SAND and SILT FILL (SM, OL).

0.0-2.4 Ft. Silty SAND. Dark brown (7.5YR3/2), fine-grained, organic, slightly moist, loose.

2.4-3.6 Ft. SILT. Very dark grayish brown (10YR3/2), damp, soft.

3.6 - 5.8 Ft. SAND (FILL?) (SP). Light yellowish brown (2.5Y6/4) mottled with purplish brown toward base, very fine-grained, uniformly graded.

5.8 - 10.8 Ft. Silty SAND (SM). Dark grayish brown (2.5Y4/2), medium- and fine-grained, minor gravel.

5.8-8.8 ft. Medium-grained, fining downward.

8.8-10.8 Ft. Pale brown (10YR6/3), minor gravel and interbedded silt.

Bottom of borehole at 10.8 Ft.
Borehole backfilled with spoils, 10/22/87.

NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.

Borehole advanced 0-10.8 Ft. using 3" i.d. split spoon sampler and 4" o.d. solid stem augers.

Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.

3.6-8.8 Ft. Samples have strong chemical odor.

Purple discoloration at 10.0 Ft. may be due to chemicals?

Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1030R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1019R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,845 E 610	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
10-8-87	10-8-87	G. Engel; BNI	Minuteman Auger	4"	15.0		15.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
12.2/81		15			▽ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE
SS	1.0	0.5								
SS	1.0	0.5								
SS	1.5	1.2								
SS	0.7									
SS	0.4	0.4								
SS	0.7	0.6								
SS	1.2	1.0						5		
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0						10		
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0						15		

DESCRIPTION AND CLASSIFICATION

0.0 - 4.6 Ft. Silty sandy CLAY (CL-ML). Dark reddish brown (10R3/4), fine- to medium-grained.

1.0-3.0 Ft. Moderate brown (5YR4/4) mottled with dusky yellowish brown (10YR2/2).

3.0-4.6 Ft. Dusky yellowish brown.

4.6 - 7.5 Ft. Silty clayey SAND (SM). Moderate brown (5YR4/4) and dark yellowish brown (10YR4/2), fine- to coarse-grained.

5.2-5.8 Ft. Decrease in grain size of fine- to medium-grained.

5.8-7.5 Ft. Dark yellowish brown. Increase in grain size of fine- to coarse-grained.

7.5 - 8.6 Ft. Sandy SILT (ML). Moderate brown (5YR4/4), fine- to coarse-grained sand.

7.9-8.6 Ft. decreasing sand content.

8.6 - 9.0 Ft. Silty CLAY (CL-ML). Dusky yellowish brown (10YR2/2).

9.0 - 10.4 Ft. SAND (SP). Pale brown (5YR5/2). Fine- to coarse-grained.

10.4 - 11.0 Ft. Clayey SILT (ML-CL). Pale red (5R6/2).

11.0 - 13.8 Ft. SAND (SP). Pale brown (5YR5/2). Fine- to coarse-grained.

13.8 - 15.0 Ft. Silty CLAY (CL-ML). Grayish red (10R4/2) mixed with a trace of sand.

14.3-15.0 Ft. No sand.

Bottom of borehole at 15.0 Ft.
Borehole backfilled with spoils, 10/8/87.

NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.

Borehole advanced 0-15.0 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers.

Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.

Augered to 9.0 Ft; gamma-logged to 6.5 Ft.

Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1019R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	2033R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Brook St. (LODI)	N 1,903 E 628	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
9-20-88	9-20-88	EMPIRE SOILS	CME 45B	12"	10.0		10.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
/		5			▽ 7.0/ 9/20/88 /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140 lbs. / 30 in.*	NONE	J. Lord

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS	2.0	2.0	6-5-2-4								0.0 - 1.0 Ft. TOPSOIL. Moderate brown silty sandy loam. Top 2" is grass and roots. Slightly moist, crumbly. FILL.	0-10 ft. advanced using 6 1/4 in. i.d. hollow stem augers. Sampled and gamma scanned by TMA-Eberline, Inc.
SS	2.0	2.0	4-9-12 20								1.0 - 7.2 Ft. Silty SAND (SM). Moderate yellowish brown (10YR3/4) medium grain sand. Loose, slightly moist, slightly adhesive. Subangular. 3.0-4.0 Ft. grading fine to coarse, moderately well sorted sand. Dry to slightly moist.	
SS	2.0	1.9	36-28 41-38					5			6.0-7.2 Ft. Becoming saturated. Grading to a well sorted COARSE SAND at 7.2 Ft.	Ground water detected in hole at 7.0 Ft.
SS	2.0	2.0	20-17 12-20								7.2 - 10.0 Ft. Clayey SILT (ML-CL). Moderate yellowish brown (10YR5/4). Very slightly moist, cohesive, stiff, dense. No sand seen. Very slight dilatancy, no thread.	
SS	2.0	2.0	20-30 19-20					10			Bottom of borehole at 10.0 Ft. Borehole backfilled with spoils, 9/20/88.	Top of undisturbed soil 8.2 Ft.
												* 300 lb. hammer used for first 2 Ft. 140 lb. hammer thereafter.
												Description and classification of soils by visual examination of samples.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Brook St. (LODI)

HOLE NO. 2033R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1006R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,749 E 630	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
9-17-87	9-18-87	G. Engel; BNI	Minuteman Auger	4"	16.0		16.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
10.9/66		12			▽ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS	1.0	0.6									0.0 - 2.0 Ft. Sandy silty CLAY (CL-ML). Very dusky red (10R2/2). Some Brunswick SS clasts, moderate red (5R4/6).	Borehole advanced 0-16.0 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers.
SS	1.0	0.5										
SS	2.0	0.6									2.0 - 7.0 Ft. Silty sandy CLAY and silty SAND (CL-ML; SM). Mixed material. Clay is a moderate red (5R4/5), sand is dusky red (5R3/4), fine- to medium-grained.	
SS	2.0	1.3						5				Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.
SS	1.0	1.0										
SS	1.0	1.0									6.5-7.0 Ft. Brownish black (5YR2/1).	
SS	1.0	1.1									7.0 - 11.2 Ft. Silty CLAY (CL-ML). Moderate yellowish brown (10YR5/4) and dark yellowish brown (10YR4/2).	
SS	2.0	1.0						10				Augered to 10.0 Ft., hole collapsed. Set a temporary casing to 6.0 ft. for gamma-scan.
SS	1.0	1.0									10.0-11.2 Ft. Moderate reddish brown (10R4/6).	
SS	1.0	0.9									11.2 - 15.5 Ft. Silty SAND (SM). Moderate yellowish brown (10YR5/4). Very fine- to fine-grained.	
SS	1.0	0.9										
SS	2.0	0.5						15			13.4-14.0 Ft. Dark yellowish brown (10R4/6) with some fine- to coarse-grained sand.	
											15.5 - 16.0 t. Sandy SILT (ML). Dark yellowish brown (10YR4/2). Sand is fine- to medium-grained.	
											Bottom of borehole at 16.0 Ft. Borehole backfilled with spoils, 9/18/87.	Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1006R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1003R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,876 E 630	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
9-2-87	9-2-87	G. Engel; BNI.	Minuteman Auger	4"	7.0		7.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
3.6/51		7			▽ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS	0.5	0.3									0.0 - 3.8 Ft. Sandy Silty CLAY (CL-ML). Dusky brown (5YR2/2) with clumps of blackish red (5R2/2) scattered pebbles (0.5 to 1.0 in. diam.) of granitic composition.	Borehole advanced 0-7 Ft. using 3" split-spoon sampler and 4 in. o.d. solid-stem auger. Borehole radiologically sampled and gamma-logged by TMA-Eberline, Corp.
SS	1.0	0.5										
SS	1.8	0.5									1.5-3.0 Ft. Some asphalt	
SS	0.5	0.5										
SS	2.2	0.4									3.3-3.8 Ft. Transition to dusky brown.	
								5			3.8 - 7.0 Ft. Silty SAND (SM). Dusky brown (5YR2/2). Fine- to medium-grained.	
SS	0.8	0.8										Increased moisture at 6.0 Ft.
SS	0.2	0.2									6.8-7.0 Ft. Increased clay.	
											Bottom of borehole at 7.0 Ft. Borehole backfilled with grout, 9/2/87.	Borehole abandoned at 7.0 Ft. due to high ENMET toxic readings.
												Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1003R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1022R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,851 E 653	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
10-13-87	10-13-87	G. Engel; BNI	Minuteman Auger	4"	12.5		12.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
8.0/64		10			▽ / ▼ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE "N" BLOWS % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS	1.0	0.3									0.0 - 1.0 Ft. Sandy silty CLAY (CL-ML). Dusky brown (5YR2/2), fine- to medium-grained sand. Plenty of humus, including an unusual amount of grass roots.	Borehole advanced 0-12.5 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers. 3.4-4.0 Ft. is a transitional contact.
SS	1.0	0.7										
SS	1.4	1.0									1.0 - 3.4 Ft. Clayey sandy SILT (ML). Dusky brown (5YR2/2) with patches of brownish black (5YR2/1), fine- to coarse-grained sand. A few small pebbles up to 0.5 in. in diameter.	
SS	2.1	0.7						5			2.0-3.4 Ft. Brownish black (5YR2/1) material. Some mottling with moderate brown (5YR4/4).	Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp. 7.5-10.5 Ft. very easy drilling.
SS	1.0	0.8									3.4 - 6.5 Ft. Clayey silty SAND (SC). Moderate brown (5YR4/4), fine- to very coarse-grained.	
SS	1.0	1.0										
SS	1.0	1.0									5.5-6.5 Ft. Dark yellowish brown (10YR4/3).	
SS	1.0	1.0										
SS	1.0	1.0						10			6.5 - 9.4 Ft. Silty SAND (SM). Moderate yellowish brown (10YR5/4).	Augered and gamma-logged to 6.0 Ft.
SS	2.0	0.5									9.4 - 12.5 Ft. CLAY (CL). Pale reddish brown (10R5/4) and brownish gray (5YR4/1).	
											Bottom of borehole at 12.5 Ft. Borehole backfilled with spoils, 10/13/87.	
												Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1022R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1115R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,820 E 665	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
11-4-87	11-4-87	E.D.I.	MOBILE B-57	6.5"	10.0		10.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
6.1/61		5			▽ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140 lbs./30 in.	NONE	D. Harnish

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE "N" BLOWS % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS	2.0	0.3	1-10-11 21							0.0 - 5.3 Ft. Gravelly SILT and SILT FILL. (GM, ML).	Borehole advanced 0-10.0 Ft. using 2" split-spoons and 6.5" o.d. hollow stem augers. Borehole radiologically sampled and gamma-logged by TMA-Eberline, Corp.
SS	2.0	1.8	6-15-9-6							0.0-2.0 Ft. Gravelly topsoil, dark brown (10YR3/3).	
SS	2.0	1.6	1/12" 1-5					5		2.0-3.0 Ft. SAND. Yellowish brown (10YR5/6), and SILT, reddish brown (2.5YR5/4).	
SS	2.0	1.9	1-3-2-5							3.0-5.3 Ft. SILT. Black (5YR2.5/1), some broken pea gravel, pieces of wood, few thin beds of gray sand.	
SS	2.0	0.5	6-13 19-14							5.3 - 10.0 Ft. CLAY (CL). Some silt, minor sand.	7.9-8.3 Ft. Distinct chemical odor.
										5.3-6.2 Ft. CLAY. Reddish brown (2.5YR4/4).	
										6.2-6.6 Ft. SILT. Black, soft.	
										6.6-6.7 Ft. SAND. Coarse-grained, rounded.	
										6.7-7.9 Ft. CLAY. Very dark gray to black (2.5YR3/0), minor reddish brown iron stain.	
										7.9-8.3 Ft. Silty SAND (SM). Light bluish gray.	
										8.3-10.0 Ft. CLAY. Reddish gray (5YR5/2), stiff.	
										Bottom of borehole at 10.0 Ft. Borehole backfilled with spoils, 11/4/87.	Description and classification of soil samples by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; O = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1115R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1103R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,781 E 666	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
11-2-87	11-2-87	E.D.I.	MOBILE B-57	6.5"	18.5	6.5	25.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
14.3/79		9			▽ /	18.5/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140 lbs./30 in.	NA	D. Harnish

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.
SS	2.0	1.4	3-3-5-10				
SS	2.0	1.3	2-6-8-10				
SS	2.0	2.0	5-5-4-1				
SS	2.0	2.0	3-4-7-7				
SS	2.0	1.1	3-8-11 10				
SS	2.0	1.6	6-8-9-12				
SS	2.0	1.4	4-8-10 11				
SS	2.0	1.5	4-12 13-9				
SS	2.0	2.0	5-4-8-33				

DEPTH: 5, 10, 15, 20, 25

GRAPHICS / SAMPLE

DESCRIPTION AND CLASSIFICATION

0.0 - 6.6 Ft. Gravelly SILT and Silty SAND FILL (GM, SM).

0.0-0.5 Ft. Dark brown topsoil.

0.5-2.7 Ft. SILT. Reddish brown (5YR4/3), with some minor amounts of yellowish brown (10YR5/4) gravel and silty sand mixed in.

2.7-4.0 Ft. Silty SAND. Black (10YR2/1), very fine-grained, minor gravel.

4.0-6.6 Ft. SAND. Black (10YR2/1), fine-grained, mixed with yellowish brown (10YR5/4), gravel, light gray (N7) silt, bits of glass.

6.6 - 7.1 Ft. Clayey SAND FILL (SC). Gray (N7).

7.1 - 10.3 Ft. Silty clayey SAND (SM-SC).

7.1-7.9 Ft. CLAY. Light brownish gray (10YR6/2) mottled with iron-oxide stain.
7.9-8.9 Ft. Silty SAND. Yellowish brown (10YR5/6), medium-grained.

8.9-10.3 Ft. CLAY. Light yellowish brown (10YR 6/4).

10.3 - 15.0 Ft. CLAY and SAND (SP). Very fine-grained, interbedded laminae of 5-20 mm.

10.3-12.0 Ft. SAND, weak red; CLAY, dark gray (10YR4/1).

12.0-14.0 Ft. Pale brown (10YR6/3).

14.0-14.3 Ft. SAND. Brown (10YR5/3), medium-grained.

14.3-15.0 Ft. CLAY. Brown.

15.0 - 18.5 Ft. SAND (SP). Dark brown (7.5YR4/2), medium-grained with some gravel, round to subround, loose, saturated.

15.5-16.0 ft. Sandy GRAVEL, rounded.

18.5 - 25.0 Ft. WEATHERED BEDROCK. Brunswick formation.

Bottom of borehole at 25.0 Ft.
Borehole backfilled with spoils, 11/2/87.

NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.

Borehole advanced 0-25.0 Ft. using 3" split-spoons and 6.5" o.d. hollow stem augers.
Borehole radiologically sampled and gamma-logged by TMA-Eberline, Corp.

15.0 Ft. Groundwater observed. Water rose to 2.0 Ft. below surface immediately. Bit stuck in hole at 16.0 ft.
17.5 Ft. Liquefied sands filled augers while driving sampler 17.5 - 18.0 ft.
Augered 18.0 - 25.0 ft., no samples taken.
Drilling alternately slow and fast as different weathered zones penetrated.

Description and classification of soil samples by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1103R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1034R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,720 E 670	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
10-27-87	10-27-87	G. Engel; BNI	Minuteman Auger	4"	15.1		15.1

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
13.9/92		15			▼ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS	1.0	0.7									0.0 - 2.0 Ft. Sandy silty CLAY (CL-ML). Dusky brown (5YR2/2), fine- to medium-grained. Humus.	Borehole advanced 0-15.1 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers.
SS	1.0	0.6										
SS	1.5	0.8									1.0-2.0 Ft. Dusky yellowish brown (10YR2/2) with some patches of moderate yellowish brown (10YR5/4).	
SS	1.0	0.9									2.0 - 3.1 Ft. Silty SAND (SM). Moderate brown (5YR4/4), fine- to medium-grained sand.	
SS	1.0	0.8						5				
SS	1.0	1.2									3.1 - 3.5 Ft. Silty CLAY (CL-ML). Dusky yellowish brown (10YR4/6).	Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.
SS	1.0	1.3									3.5 - 4.3 Ft. Sandy CLAY (CL). Moderate reddish brown (10R4/6) and grayish red (10R4/2).	
SS	0.8	1.0										Augered and gamma-logged to 8.0 Ft.
SS	1.2	1.1									4.3 - 8.3 Ft. CLAY (CL). Dusky yellowish brown (10YR2/2).	
SS	1.0	1.0						10				9.5-11.3 Ft. Very easy drilling.
SS	1.0	1.0									4.7-5.5 Ft. Increasing sand content.	
SS	1.0	1.0									5.0-5.5 Ft. Moderate reddish brown (10YR4/6).	
SS	1.0	1.0									5.5-7.8 Ft. Decreasing sand content.	
SS	1.0	1.0									5.7-6.0 Ft. Moderate brown (5YR4/4).	
SS	0.6	0.6						15			6.0-6.5 Ft. Moderate reddish brown (10YR4/6).	
											6.5-6.8 Ft. Moderate brown.	
											6.8-7.1 Ft. Light brown (5YR5/6).	
											7.1-7.5 Ft. Moderate reddish brown (10YR4/6).	
											7.5-7.8 Ft. Pale brown (5YR5/2) with patches of dusky yellowish brown (10YR2/2).	
											7.8-8.3 Ft. Grayish red (5R4/2). Increasing sand content with a few pebbles to 0.25 in.	
											8.3 - 9.5 Ft. Clayey SAND (SC). Moderate brown (5YR3/4).	
											9.5 - 12.5 Ft. Silty SAND (SM). Pale brown (5YR5/2), fine- to coarse-grained.	
											11.2-11.5 Ft. Increased clay content.	
											11.5-12.5 Ft. Decreased clay content.	
											12.5 - 15.0 Ft. SAND (SP). Pale yellowish brown (10YR6/2) fine- to very coarse-grained.	Description and classification of soils by visual examination.
											13.7-14.5 Ft. Pale brown (5YR5/2).	
											14.5-15.0 Ft. Grayish brown (5YR3/2).	
											Bottom of hole at 15.1 Ft. Small plug of CLAY (CL). in the end of the sampler. Borehole backfilled with spoils, 10/27/87.	

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO.: 1034R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1178R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Brook St. (LODI)	N 1,899 E 676	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
11-30-87	11-30-87	E.D.I.	Mobile B-57	6.5"	10.0		10.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
6.2/62		5			▽ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140 lbs./ 30 in.	NONE	D. Harnish

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION	NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
SS	2.0	1.6	12-16 7-7								0.0 - 4.0 Ft. Sandy SILT, SILT, Silty SAND, Sandy GRAVEL FILL (ML, SM, GW).	Borehole advanced 0-10.0 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers.
SS	2.0	1.8	4-4-3-6								0.0-2.0 Ft. Sandy SILT, dark yellowish brown (10YR4/4), sand is very fine-grained. Occasional New Brunswick sandstone gravel, slightly damp.	
SS	2.0	1.8	3-5-8 13					5			2.0-2.4 Ft. SILT, dark grayish brown (10YR3/2).	
SS	2.0	0.5	8-10-12 10								2.4-2.9 Ft. Sandy GRAVEL, black sand, broken basalt gravel.	Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.
SS	2.0	0.5	7-13 12-12								2.9-4.0 Ft. Silty SAND, yellowish brown (10YR5/4), fine-grained, very minor gravel.	
								10			4.0 - 7.9 Ft. Silty SAND (SM). Fine- to medium-grained.	
											4.0-6.0 Ft. Brown (10YR5/4), damp.	
											6.0-7.9 Ft. Dark grayish brown (2.5Y4/2) fine- to medium-grained, saturated.	
											6.9-6.9 Ft. Medium- to coarse-grained sand.	
											7.9 - 10.0 Ft. SILT (ML). Reddish brown (5YR4/3), laminated.	
											Bottom of borehole at 10.0 Ft. Borehole backfilled with spoils, 11/30/87.	Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE;
O = DENNISON; P = PITCHER; O = OTHER

SITE: Brook St. (LODI)

HOLE NO.: 1178R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1007R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,782 E 692	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
9-21-87	9-22-87	G. Engel; BNI	Minuteman Auger	4"	19.6		19.6

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
11.1/60		17			▽ / ▼ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE
SS	1.0	0.3								
SS	1.0	0.6								
SS	2.0	0.8								
SS	0.5	0.5								
SS	1.0	1.0						5		
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0								
~~SS~~	~~0.3~~	~~0.3~~								
SS	1.2	0.9						10		
SS	1.2	1.0								
SS	1.6	1.1								
SS	1.4	0.3						15		
SS	1.0	1.0								
SS	1.0	0.1								
SS	2.4	0.0								

DESCRIPTION AND CLASSIFICATION

0.0 - 4.0 Ft. Silty sandy CLAY (CL-ML). Grayish brown (5YR3/2), with fine- to medium-grained sand.

3.0-4.0 Ft. Color changes to moderate brown (5YR4/4). Increased fine- to coarse-grained sand content.

4.0 - 4.3 Ft. Silty clayey SAND (SM). Dark yellowish brown (10YR4/2), fine- to very coarse-grained sand. Light olive gray (5Y2/2) at the base.

4.3 - 6.5 Ft. Silty CLAY (CL). Moderate reddish brown (10R4/6).

6.5 - 7.6 Ft. SAND (SP). Moderate yellowish brown (10YR5/4) and yellowish orange (10YR6/6) mixed. Fine- to coarse-grained.

7.6 - 8.5 Ft. Silty CLAY (CL). Grayish red (5R4/2) to 7.9 Ft., and brownish gray (5Y4/1) from there to 8.5 ft.

8.5 - 9.4 Ft. Silty SAND (SM). Dark yellowish brown (10YR5/4), fine- to very coarse-grained.

9.4 - 12.2 Ft. Silty CLAY (CL). Light olive gray (5Y5/2) with brownish black (5YR4/1) stringers. Increasing silt content with depth.

12.2 - 16.0 Ft. Clayey SILT (ML-CL). Light olive gray (5Y5/2) mixed with brownish black (5YR2/1) and grayish red (5R4/2) streaks.

16.0 - 19.6 Ft. Silty sandy pebbly CLAY (CL). Grayish red (5R4/2), fine- to coarse-grained sand and pebbles to 0.25 in.

18.3 Ft. Moderate red (5R4/6). Rounded pebbles up to 1.5 in. in diam. at 19.5 Ft.

Bottom of borehole at 19.6 Ft.
Borehole backfilled with spoils, 9/22/87.

NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.

Borehole advanced 0-19.6 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers.

Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.

Augered and gamma-scanned to 7.0 Ft.

Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO.: 1007R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1102R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,841 E 697	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
11-2-87	11-2-87	E.D.I.	MOBILE B-57	6.5"	10.0		10.0

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
7.0/70		5			▽ / /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
140 lbs./30 in.	NONE	D. Harnish

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE "N" BLOWS % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE	DESCRIPTION AND CLASSIFICATION
SS	2.0	1.2	2-8-8-8								0.0 - 4.0 Ft. Gravelly SILT and Silty SAND FILL (GM, SM).
SS	2.0	1.4	3-1-1-2								0.0-2.0 Ft. Gravelly SILT. Organic topsoil, dark brown (10YR3/3), with broken basalt gravel.
SS	2.0	2.0	4-5-5-6								2.0-4.0 Ft. Silty SAND. Dark grayish brown (10YR4/2), very-fine, some broken basalt gravel.
SS	2.0	1.1	9-15-8-9					5			4.0 - 4.5 Ft. SILT (OL). Very dark grayish brown (10YR3/2), organic ,natural material. May be swamp silt.
SS	2.0	1.3	5-6-9-12								4.5 - 5.2 Ft. SAND (SP). Dark reddish gray (5YR4/2), medium-grained. May be stream sand.
								10			5.2 - 6.4 Ft. SAND and SILT (SP-ML). Gray (10YR5/1) with occasional yellowish brown iron-oxide stain, medium-grained, minor gravel.
											6.4 - 10.0 Ft. SILT and CLAY (ML-CL).
											6.4-8.5 Ft. SILT. Brown (7.5YR5/6).
											8.5-10.0 Ft. SILT and CLAY. Grayish red (10R4/2) and brownish gray (5YR4/1), laminated.
											Bottom of borehole at 10.0 Ft. Borehole backfilled with spoils, 11/2/87.

NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.

Borehole advanced 0-10.0 Ft. using 2" i.d. split-spoon sampler and 6.5" o.d. solid stem augers.

Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.

Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1102R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1008R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,807 E 709	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
9-22-87	9-23-87	G. Engel; BNI	Minuteman Auger	4"	19.2		19.2

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
11.1/57		16			▽ / ▼ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE
SS	1.0	0.4								
SS	1.2	0.7								
SS	1.8	0.9								
SS	1.0	0.8								
SS	1.0	0.5						5		
SS	1.0	1.0								
SS	0.5	0.5								
SS	1.2	1.2								
SS	0.5	0.5								
SS	0.8	0.5								
SS	1.0	0.6						10		
SS	1.5	0.3								
SS	1.0	1.0								
SS	0.5	0.5								
SS	2.4	0.0								
SS	1.1	0.0						15		
SS	1.0	1.0								
SS	0.7	0.7								

DESCRIPTION AND CLASSIFICATION

0.0 - 4.0 Ft. Sandy silty CLAY (CL). Dusky brown (5YR2/2).

0.5-1.0 Ft. Increasing sand. Moderate brown (5YR4/4), fine- to coarse-grained.

1.0-2.0 Ft. Dusky brown with small chunks of aluminum.

2.0-4.0 Ft. Moderate brown (5YR3/4) fine- to coarse-grained sand.

4.0 - 6.6 Ft. Clayey silty SAND (SM). Dark yellowish brown (10YR4/2), fine- to very coarse-grained with small pebbles to 0.25 in.

5.5-6.0 Ft. Decrease in clay and silt content.

6.0 Ft. Material in bit pale brown (5YR 5/2) from overheating.

6.6 - 7.7 Ft. Silty CLAY (CL-ML). Moderate reddish brown (10R4/6).

7.7 - 14.0 Ft. Clayey SILT (ML-CL). Brownish gray (5YR4/1).

9.5-10.0 Ft. Increased silt, brownish black (5YR2/1).

10.5-12.5 Ft. Mixed with grayish red (5R4/2).

12.9-14.0 Ft. Mixed with grayish red.

14.0 - 17.5 Ft. NO SAMPLE. Very rapid advance of augers, but not a drop. Switched to sand bit. Clay bit was not using a sample basket.

17.5 - 18.7 Ft. SAND (SM). Grayish red (10R4/2), fine- to very coarse-grained.

18.7 - 19.2 Ft. Clayey SAND (SC). Moderate red (5R5/4). Fine- to very coarse-grained sand.

Bottom of borehole at 19.2 Ft.
Borehole backfilled with spoils, 9/23/87.

NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.

Borehole advanced 0-19.2 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers.

Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.

Augered and gamma-scanned to 8.0 Ft. Auger refusal on concrete.

Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1008R

GEOLOGIC DRILL LOG

PROJECT	JOB NO.	SHEET NO.	HOLE NO.
FUSRAP	14501-138	1 OF 1	1033R

SITE	COORDINATES	ANGLE FROM HORIZ	BEARING
Firemen's Park (LODI)	N 1,720 E 714	Vertical	------

BEGUN	COMPLETED	DRILLER	DRILL MAKE AND MODEL	SIZE	OVERBURDEN	ROCK (FT.)	TOTAL DEPTH
10-27-87	10-27-87	G. Engel; BNI	Minuteman Auger	4"	11.5		11.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	EL. TOP CASING	GROUND EL.	DEPTH/EL. GROUND WATER	DEPTH/EL. TOP OF ROCK
9.9/86		11			▽ / ▼ /	/

SAMPLE HAMMER WEIGHT/FALL	CASING LEFT IN HOLE: DIA./LENGTH	LOGGED BY:
N/A	NONE	R. Migues

SAMP. TYPE AND DIAM.	SAMP. ADV. LEN CORE	SAMPLE REC. CORE REC.	SAMPLE BLOWS "N" % CORE RECOVERY	WATER PRESSURE TESTS: LOSS IN G.P.M	WATER PRESSURE TESTS: PRESS. P.S.I.	WATER PRESSURE TESTS: TIME IN MIN.	ELEV.	DEPTH	GRAPHICS	SAMPLE
SS	1.0	0.4								
SS	1.0	0.6								
SS	1.3	0.9								
SS	0.7	0.8								
SS	1.5	0.6						5		
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	1.0								
SS	1.0	2.0						10		
SS	0.6	0.6								

DESCRIPTION AND CLASSIFICATION

0.0 - 5.5 Ft. Silty sandy CLAY (CL-ML). Dusky brown (5YR2/2), fine- to medium-grained sand.

0.0-1.0 Ft. Considerable humus.

1.0-2.1 Ft. Dusky yellowish brown (10YR2/2).

2.1-2.9 Ft. Dusky brown mottled with pale brown (5YR5/2), and decreasing sand content.

2.9-3.3 Ft. Dusky brown mottled with moderate brown (5YR4/4).

3.3-5.5 Ft. Increasing sand content, fine- to medium-grained.

3.3-4.0 Ft. Dark yellowish orange (10YR6/6).

4.0-5.5 Ft. Moderate yellowish brown (10YR5/4).

5.5 - 6.5 Ft. Silty SAND (SM). Moderate yellowish brown (10YR4/6) with grayish orange (10R7/4) grains. Fine- to coarse-grained.

6.5 - 7.5 Ft. Clayey SAND (SC). Moderate reddish brown (10R4/6), fine- to very coarse-grained sand with pebbles to 0.25 inches.

7.5 - 8.8 Ft. Pebbly SAND (SP). Grayish red (10R4/2) fine- to very coarse-grained sand with pebbles to 1.0 inch. Mostly rounded quartz.

8.8 - 11.5 Ft. Silty Pebbly SAND (SP). Moderate reddish brown (10R4/6), fine- to coarse-grained sand with pebbles to 0.5 in. Pebbles decrease in number and size with depth.

Bottom of borehole at 11.5 Ft.
Borehole backfilled with spoils, 10/27/87.

NOTES ON: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.

Borehole advanced 0-11.5 Ft. using 3" i.d. split-spoon sampler and 4" o.d. solid stem augers. Borehole was radiologically sampled and gamma-logged by TMA-Eberline, Corp.

Augered and gamma-logged to 7.5 Ft.

Description and classification of soils by visual examination.

SS = SPLIT SPOON; ST = SHELBY TUBE; D = DENNISON; P = PITCHER; O = OTHER

SITE: Firemen's Park (LODI)

HOLE NO. 1033R