848 X

Data Report

BUILDING 14-09
THOMPSON-ISAACSON SITE INVESTIGATION

Prepared for

The Boeing Company

Prepared by

Landau Associates, Inc.

May 4, 1988

1.0 INTRODUCTION

This report presents the results of soil and ground water investigations at the adjoining Thompson and Isaacson properties (Thompson-Isaacson site) near the Boeing Advanced Systems Company (BASC) Developmental Center in south Seattle, Washington. These studies were conducted to provide information concerning soil and ground water quality prior to planned construction by BASC of a manufacturing facility at the site.

Section 2 of this report presents a description of the Thompson-Isaacson site and construction proposed for the site. Section 3 presents a brief history of the site and previous investigations conducted to characterize site soil and ground water quality. Section 4 presents a brief description of hydrogeologic conditions at this site based on all investigations conducted through March 1988. Section 5 summarizes the scope of the soil and ground water investigations conducted during this study, including the field program (consisting of 44 explorations and installation of 8 monitoring wells) and the results of soil and ground water sampling.

The appendices to this report present detailed data on field procedures (Appendix A), soil boring and well construction logs (Appendix B), and chemical analysis of soil samples (Appendix C) and ground water samples (Appendix D).

2.0 PROJECT DESCRIPTION

2.1 SITE DESCRIPTION

The Thompson-Isaacson site is located on the east shore of the Duwamish Waterway at approximately River Mile 5 (Figure 2-1). The site is in unincorporated King County, about one-half mile south of the Seattle City Limits. The site is bounded on the south by the Kenworth Truck facility, to the east by E. Marginal Way (the main vehicular access route to the site), to the north by the Jorgenson Steel Company, and to the west by the Duwamish Waterway (Figure 2-2).

The site comprises approximately 30 acres and is covered with impervious surfaces consisting of 14 acres of buildings and 16 acres of asphalt and concrete pavement. The site is generally flat with no more than 2.5 feet variation in surface elevations.

The two main buildings on the adjoining Thompson and Isaacson sites are Buildings 14-01 and 14-05. Building 14-01 (Figure 2-2) covers approximately 240,000 square feet. The building was formerly used for aircraft assembly and is currently used for manufacturing by BASC. Other buildings at the Thompson property (shown on Figure 2-2) consist of a boiler house (Building 14-02), a learning center (Building 14-03), a cafeteria (Building 14-04), a water tank (Building 14-13), and a mechanical/electrical equipment room (Building 14-14).

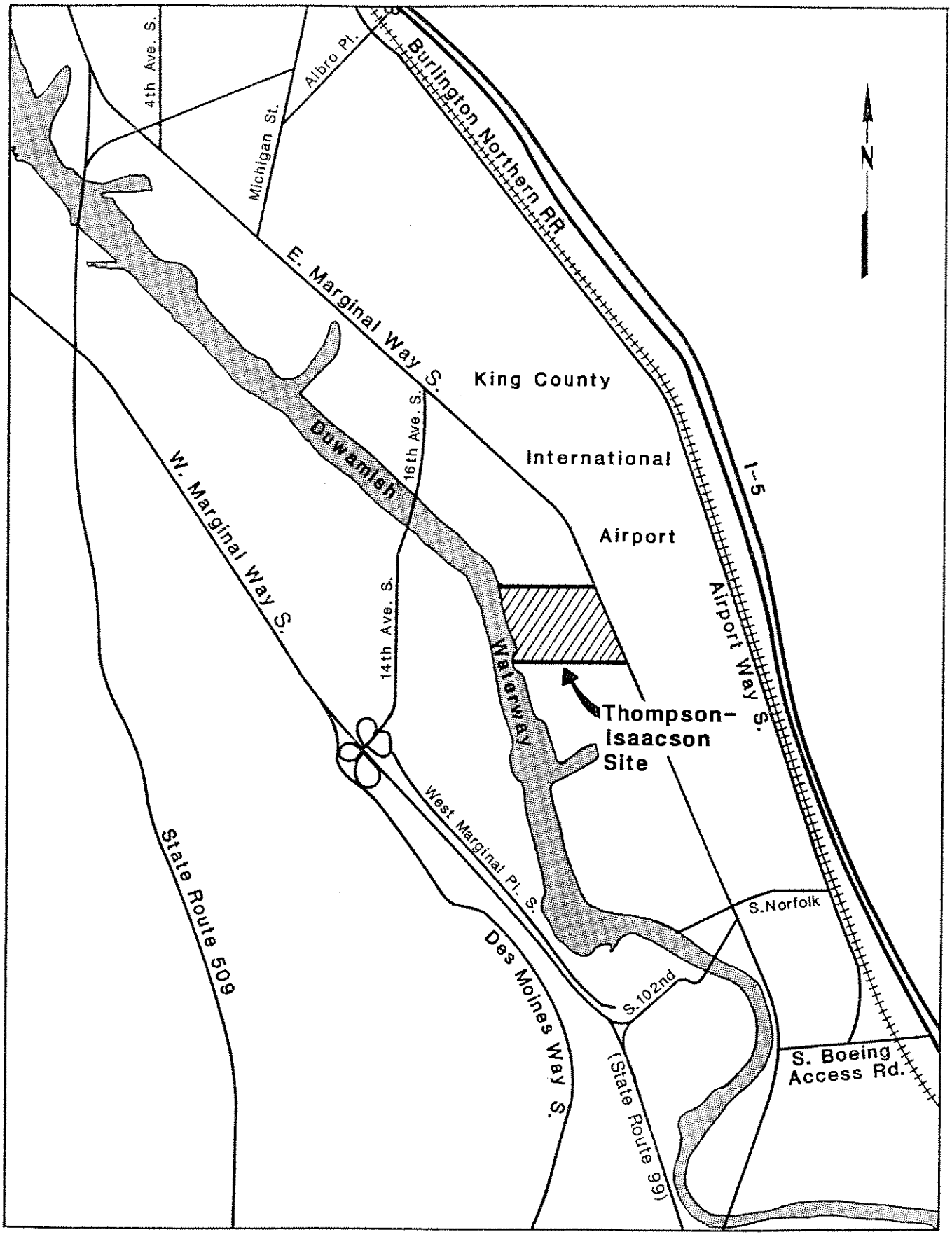
Building 14-05, located on the adjacent Isaacson property, consists of a series of interconnected metal-sided buildings constructed in the mid-1950s as a steel fabrication facility (see Site History below). Boeing has retained the building, which is

currently used for miscellaneous storage, in the same basic condition as when it was purchased. The bays have slab-on-grade concrete or asphalt floors, with some dirt floors.

2.2 PROPOSED CONSTRUCTION

BASC proposes to construct an industrial structure (designated as Building 14-09) on the Thompson-Isaacson site (Figure 2-3). Building 14-09 will be approximately 420 feet wide by 550 feet long by 60 feet high. The structure will be attached to a portion of the north side of existing Building 14-01, and will be similar in construction. Building 14-09 will be used primarily for manufacturing; however, internal space also will be made available for office and related use.

Existing Building 14-05 will be demolished as part of the project. Pedestrian tunnels also will be constructed and the existing 48-inch storm drain will be rerouted as shown on Figure 2-3.



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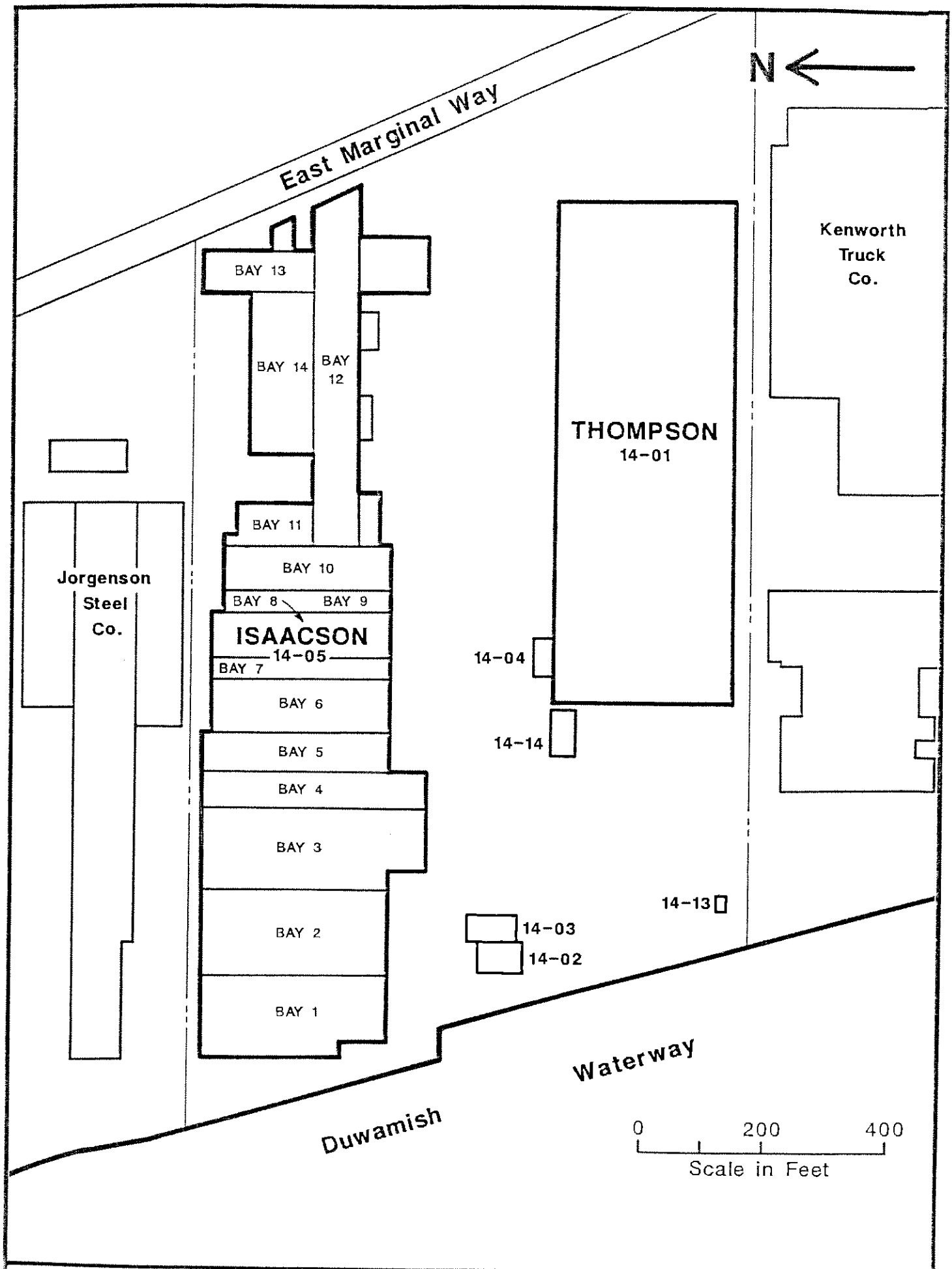
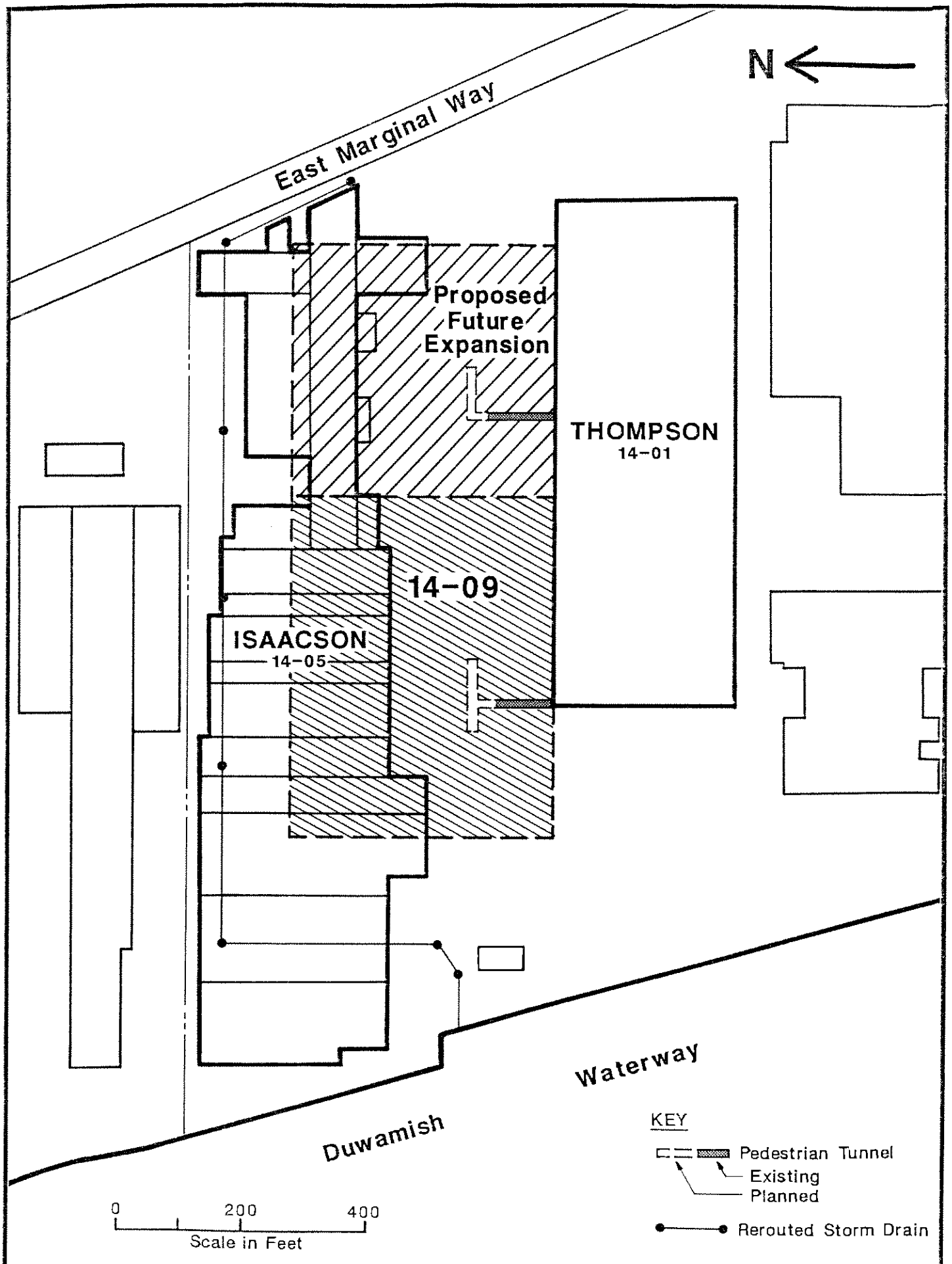
Project Location



LANDAU ASSOCIATES, INC. | Thompson - Isaacson Site Plan

Figure 2-2



LANDAU ASSOCIATES, INC.	Thompson - Isaacson Site: Proposed Building 14-09

Figure 2-3

3.0 BACKGROUND

3.1 SITE HISTORY

Records of dredging and filling activities during the development of the waterway (U.S. Army Corps of Engineers, Seattle District 1985; Port of Seattle 1973) and historical aerial photographs of the area taken from 1936 to 1985 (Walker & Associates 1985) indicate that the general area of the Thompson-Isaacson site (including the site) has been modified considerably through dredging, filling, and straightening the Duwamish channel since the early 1900s. The Duwamish River once flowed in an east-west direction through the approximate center of the Thompson-Isaacson site prior to rechanneling and straightening of the river. These river channel modifications resulted in the creation of a berth (Slip No. 5) at the Thompson-Isaacson site. This slip and low portions of the site were filled in increments beginning about 1936 and continuing through about 1966 (Figure 3-1).

Land use in the area evolved from wooded land and pastureland in the early 1900s to mixed industrial (lumber yard) and residential use in the 1930s. A U.S. Navy steel fabrication plant was developed at, and to the immediate north of, the Thompson-Isaacson site by 1941 (the current Jorgenson Steel plant site). The Isaacson Steel Company purchased the plant in the 1950s and expanded the steel fabrication facility to what is now Building 14-05 during the 1950s and 1960s.

The Boeing Company purchased the Isaacson site in 1984.

Boeing is currently using Building 14-Ø5 for miscellaneous storage. The open space between Buildings 14-Ø5 and 14-Ø1 (which was paved prior to Boeing's purchase of the property) is used for parking.

3.2 PREVIOUS STUDIES

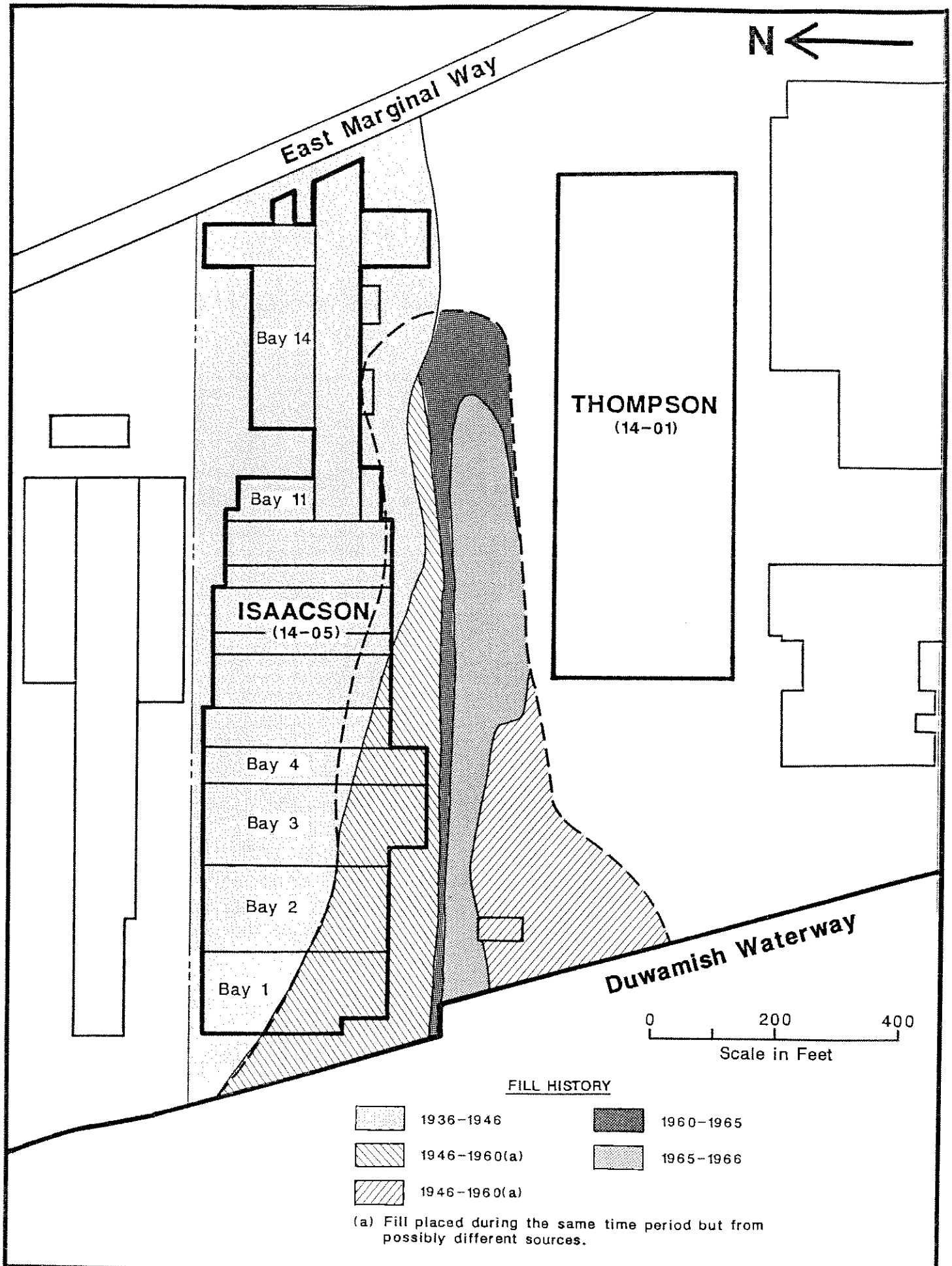
The Isaacson property has been the subject of several soil and ground water studies since 1983. Figure 3-2 shows the locations of previous explorations at the Thompson-Isaacson site. These previous studies are summarized below.

Initial studies (Dames & Moore 1983a,b; Wicks 1983) evaluated soil, water, sludge, and slag samples collected at the Isaacson property. Soil samples collected near Bays 11 and 14 were found to contain elevated concentrations of arsenic and zinc. At the time, the origin of the arsenic was uncertain; however, several possible sources have been documented by Wicks (1983), including the possibility that the arsenic was present in the fill placed to the north of the former slip. Sludge samples from a former steam-cleaning sump located to the east of Bay 11 had high zinc concentrations (up to 9.5 percent).

Prior to purchase by Boeing, a remedial action plan was proposed for the Isaacson Corporation (Wicks 1984a) and concurred with by the Washington State Department of Ecology (WDOE). The plan provided for removal of soil and continued monitoring of ground water. The plan was implemented and the results of these remedial actions were reported to the WDOE during a 3 October 1984 meeting and in Wicks (1984b). As a result of these actions, the concentrations of arsenic in the remaining soil were

evaluated to be "acceptably clean", as defined by the WDOE in their 9 February 1984 letter to the Isaacson Corporation (WDOE 1984). In a letter dated 13 February 1985, WDOE (1985) reported that cleanup was completed according to the remedial plan. While no additional cleanup was required at the time of the letter, WDOE (1985) maintained that further cleanup may be required if: "(1) Ground water monitoring shows a significant contamination problem; (2) Department of Ecology regulations change or are more clearly defined to require further site cleanup; or (3) The property owner decides to remove the buildings that are limiting (as of 1985) further soils excavation." WDOE (1985) also imposed a requirement for two years of ground water monitoring and reporting.

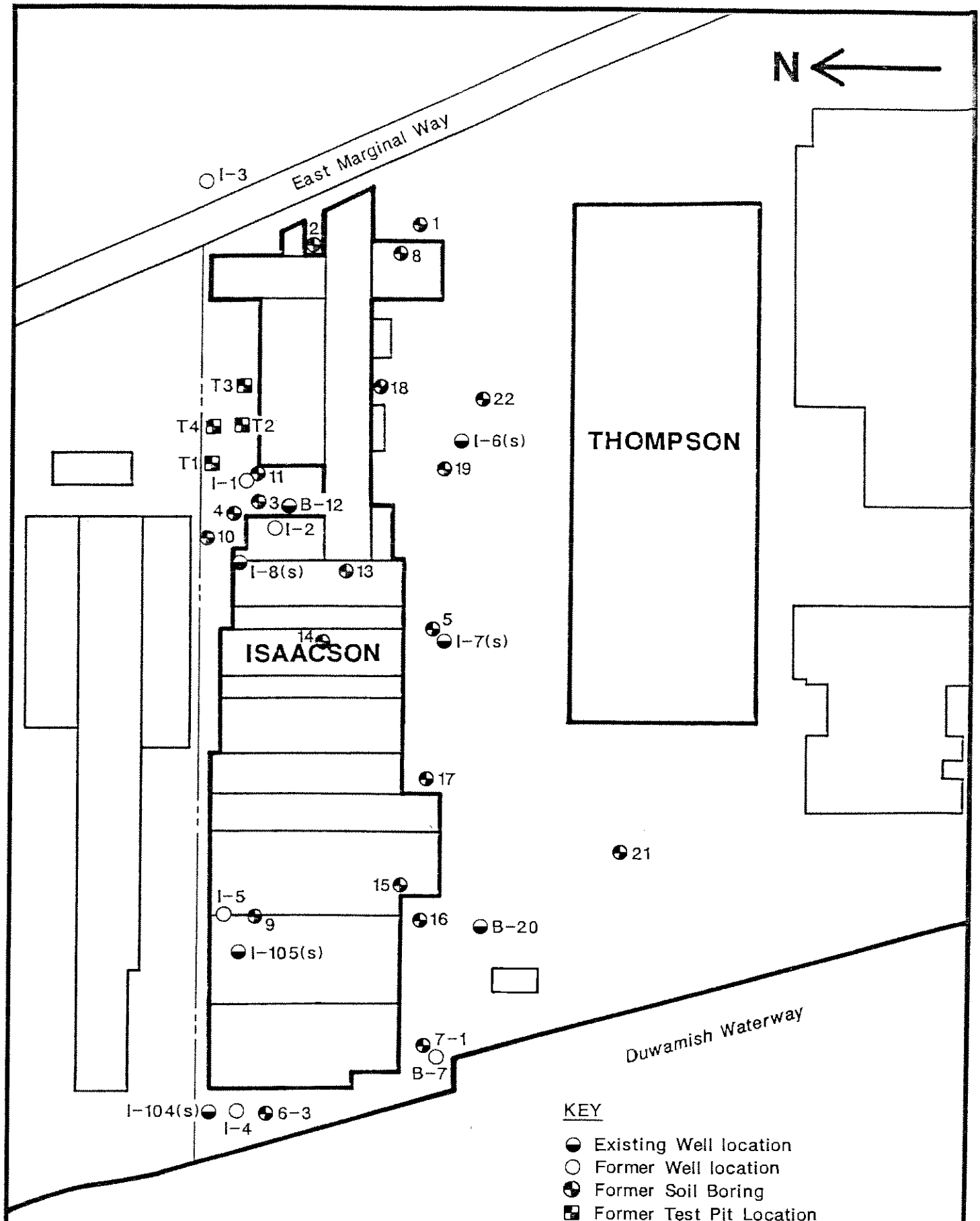
On 8 October 1985, Landau Associates, Inc. submitted to The Boeing Company a Ground Water Monitoring Plan (Landau Associates, Inc. 1985), which outlined a program for continued monitoring of arsenic levels in the ground water at the Isaacson property. The results of the 1985 and 1986 monitoring were presented in Landau Associates, Inc. (1987). This report maintained that, due to adsorption by soil and subsequent dilution in the waterway, the Isaacson property was unlikely to contribute sufficient arsenic to ground water to cause exceedance of the Freshwater Aquatic Life Criterion for arsenic in the Duwamish Waterway.



(a) Fill placed during the same time period but from possibly different sources.

LANDAU ASSOCIATES, INC.	Thompson - Isaacson Site: Slip Fill History

Figure 3-1



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Thompson - Isaacson Site:
Location of Previous Explorations

4.0 SITE HYDROGEOLOGIC CONDITIONS

This section presents a description of hydrogeologic conditions at the Thompson-Isaacson site based on data developed during previous site studies (Section 3). Hydrogeologic investigations conducted during this study generally confirm previously developed descriptions of soil and ground water conditions, which are summarized below. Cross-sections depicting geologic conditions and the ground water table are presented in Section 5.

4.1 GEOLOGY

Fill deposits, which extend from the ground surface to depths up to 25 feet, have been placed on the Isaacson and Thompson properties. These deposits generally consist of sand and silty sand, but also contain varying amounts of demolition waste, fire bricks, and slag. In some locations, silty sand or sandy silt deposits up to 12 feet in thickness underlie the fill. Beneath these deposits lie thick natural deposits of alluvial sand to a depth of 45 to 60 feet below ground surface. Underlying the alluvial sand deposits are thin layers of silty sand and sandy silt, which grade to silt at a depth of approximately 75 feet. Below approximately 75 feet, silt deposits, locally interbedded with sand, silty sand, and sandy silt layers, extend to a depth of at least 140 feet (Dames & Moore 1983a and GeoEngineers, Incorporated 1985).

4.2 HYDROGEOLOGY

Ground water levels seasonally range from around 11 to 12 feet below the ground surface in the eastern portion of the

Isaacson property (i.e. the area outside of the tidal influence). Fluctuations in ground water levels in response to tidal influences in the wells closest to the Duwamish Waterway are as much as 4 feet. During low tide, ground water flow in the vicinity of the Thompson-Isaacson site is generally to the west or northwest. During high tide, there is a general ground water flow reversal away away from the Duwamish Waterway on the western portion of the site. The ground water flow reversal was observed at a distance of 700 feet from the Duwamish Waterway. The average regional observed water table gradient is 1.9×10^{-3} foot per foot toward the Duwamish Waterway (Landau Associates, Inc. 1987).

5.0 SCOPE OF INVESTIGATION

Soil samples were collected at 44 explorations on the Thompson-Isaacson site. Eight (8) of these explorations were completed as monitoring wells. The locations of the 44 borings and monitoring wells are shown on Figure 5-1. The soil and monitoring well explorations are categorized as either "slip area" borings or wells (those located within the boundaries of former Slip No. 5) or "non-slip" borings or wells (those located outside the Slip No. 5 boundaries).

Drilling, sampling, and well installation procedures used during the investigation are described in Appendix A. Soil boring logs and well completion diagrams are contained in Appendix B.

5.1 SOIL INVESTIGATION

Those soil borings that did not have monitoring wells installed within them were drilled to the water table or to the bottom of the fill material, whichever was deepest. Soil samples were collected at 5-foot intervals and at changes in material when noted by changed drilling characteristics. The borings in which monitoring wells were installed were drilled to depths ranging from approximately 25 to 53 feet. In general, soil samples were collected from these borings as follows: (1) every 5 feet from the ground surface to the water table or to the bottom of the fill (whichever is deepest), and (2) thereafter, at 10-foot intervals to a depth of 50 feet.

Soil samples from all non-slip borings (except for Borings 212, 234, and 235 (see Figure 5-1) were analyzed for arsenic on a total basis and in the EP Toxicity extract. Soil samples from Borings 212, 234, and 235 were analyzed for total and EP Toxicity arsenic, total chromium, copper, lead, nickel, and zinc. Soil samples from the slip area borings (Borings 215, 224, 228, 230, 232, 233, 236, 237, 244, I-202, and I-203) were analyzed for arsenic, chromium (total), copper, lead, nickel, zinc (on a total basis and in the EP Toxicity extract), and PCBs. In addition to these parameters, slip area samples were analyzed for cyanide (total), cadmium, mercury, silver, volatiles, semi-volatiles, and pesticides. All samples were screened in the field using a photoionization detector (i.e. TIP meter). Based on the TIP meter readings, selected samples were analyzed for volatile organics. Samples were also visually inspected for petroleum hydrocarbons. If hydrocarbons had been observed in soil samples from the slip area, the sample would have been analyzed for total petroleum hydrocarbons. However, no petroleum hydrocarbons were observed in slip-area samples. The results of all chemical analyses of soil conducted during previous and the current investigations are contained in Appendix C.

Figure 5-2 presents the location of explorations conducted at the Thompson-Isaacson site during this study and previous investigations, as well as the locations of cross-section reference lines. A series of plan view maps and cross-sections displaying concentrations of arsenic (the constituent focused on during previous investigations) at depth in soil are presented on

Figures 5-3 through 5-7. These figures also show the geologic features discussed in Section 4 and the approximate location of the water table.

The cross-sections were developed using all past and current arsenic analyses (excluding material excavated during previous investigations). The three plan view maps display arsenic concentrations in soil located between Ø and 5 feet (Figure 5-8); 5 and 11 feet (Figure 5-9); and 11 and 15 feet (Figure 5-1Ø) below the ground surface. All soil below approximately 11 feet depth is below the high ground water level.

5.2 GROUND WATER INVESTIGATION

The ground water monitoring network consists of 7 pre-existing monitoring wells and 8 new monitoring wells. Locations of these wells are shown on Figure 5-1. The wells are screened at two different depth intervals. The shallow wells (identified by an "s" following the well designation) are screened near the water table to a maximum depth of 3Ø feet below ground surface, and the intermediate ("i") wells are screened within the depth interval of 3Ø to 5Ø feet below the ground surface. The logs and well completion diagrams for the pre-existing wells are displayed in previous reports (i.e. Wicks 1983; Landau Associates, Inc. 1986; and Dames & Moore 1983).

Ground water samples from all non-slip wells (B-12[s], I-8[s,i], I-1Ø4[s], I-1Ø5[s], I-2ØØ[s], and I-2Ø1[s]) were analyzed for dissolved arsenic, chromium, copper, lead, nickel, and zinc. Ground water samples from all slip wells (B-2Ø[s], I-6[s], I-7[s], I-2Ø2[s], I-2Ø3[s,i], I-2Ø5[s], and I-2Ø6[s])

were analyzed for dissolved arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc, as well as volatiles, semi-volatiles, and pesticides. The results of all chemical analysis of ground water conducted through the current investigations are contained in Appendix D. Figure 5-11 shows the concentrations of arsenic in ground water from the shallow wells.

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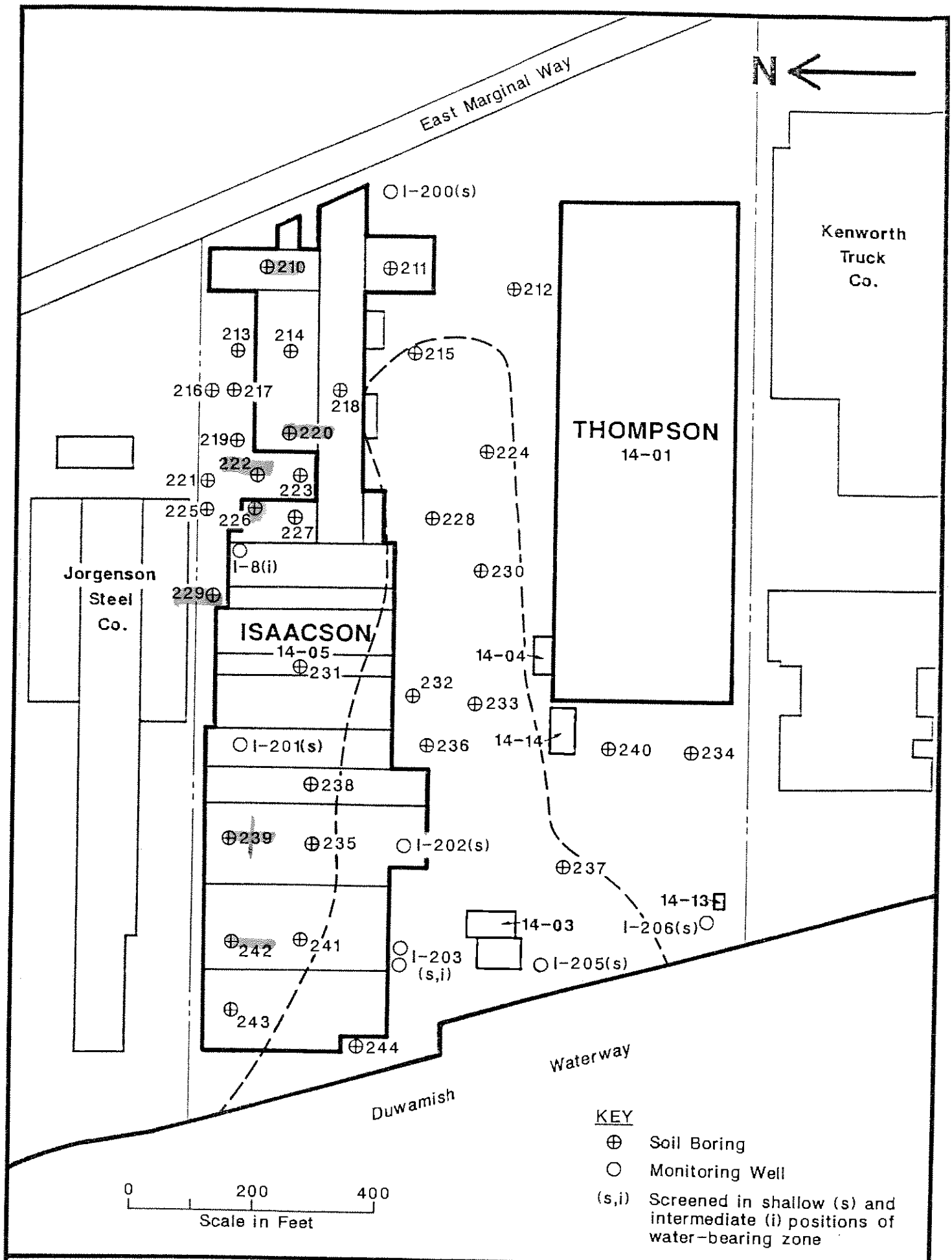
Respectfully submitted,

LANDAU ASSOCIATES, INC.

By:

Henry G. Landau, Ph.D., P.E.



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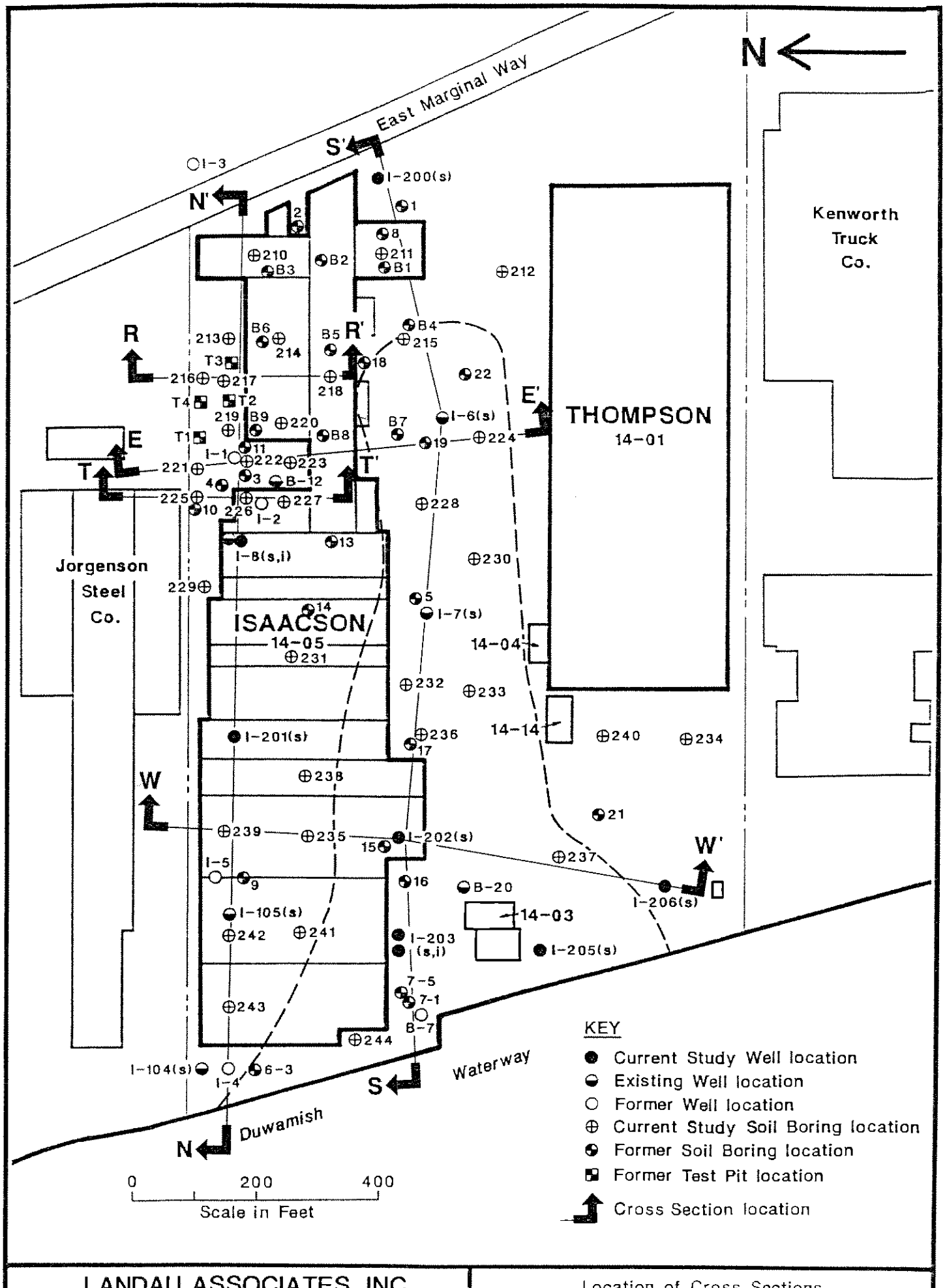
Thompson – Isaacson: Location of Current Study Soil Borings and Monitoring Wells



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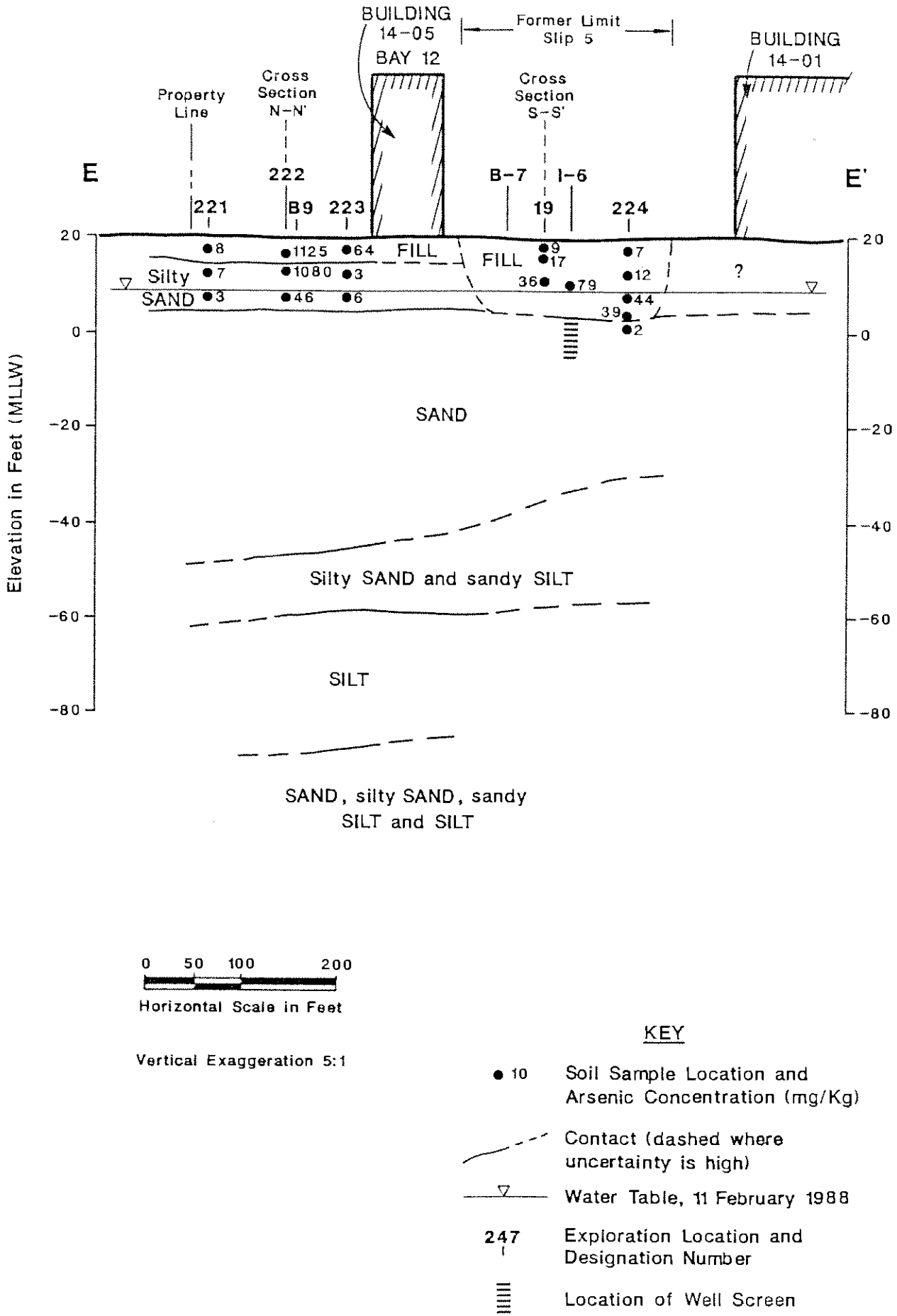
Location of Cross Sections



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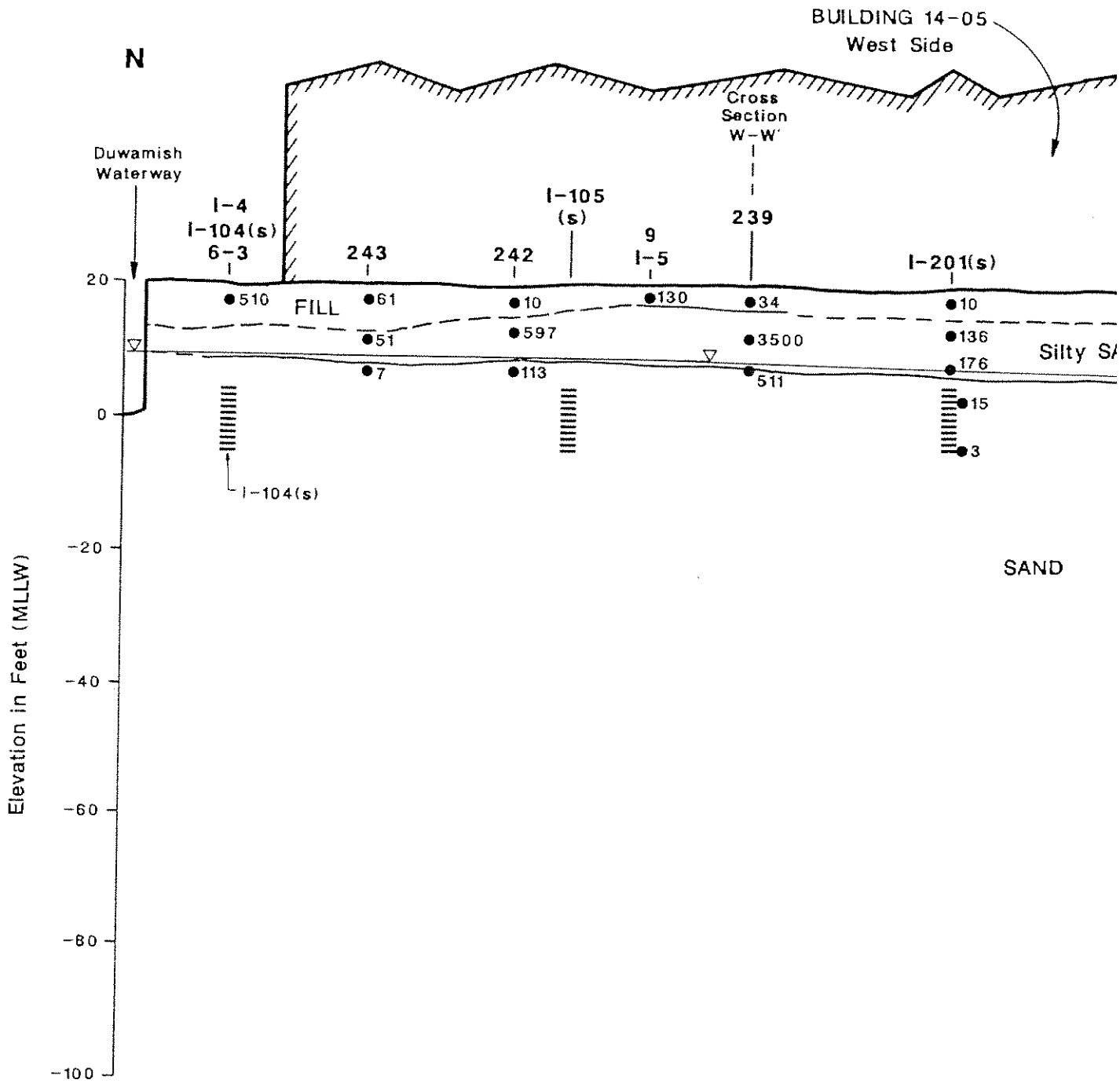
Arsenic Cross Section E-E'

Figure 5-3



KEY

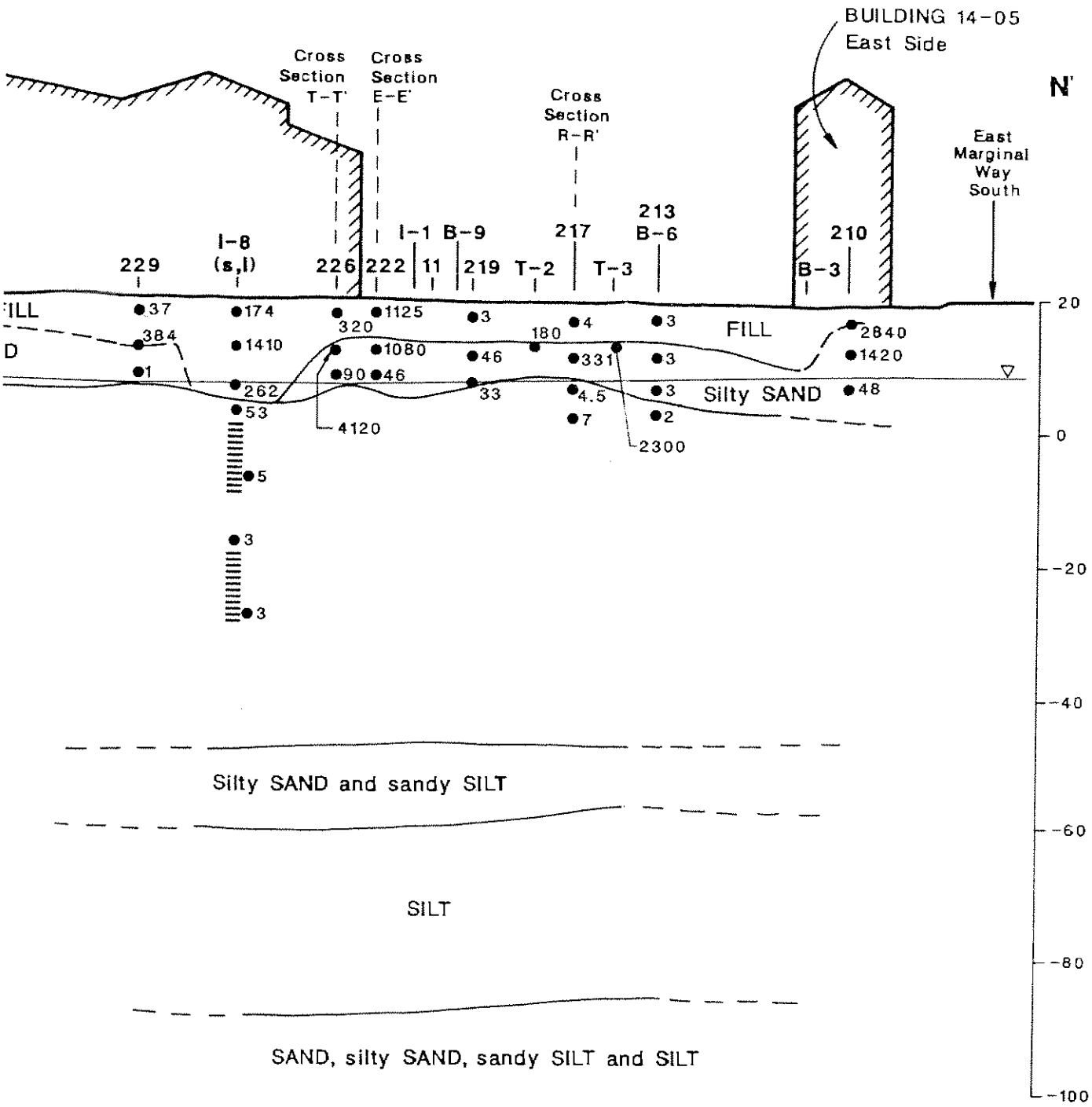
Contact (dashed where uncertainty is high)

Water Table, 11 February 1988

247 Exploration Location and Designation Number

Location of Well Screen

● 10 Soil Sample Location and Arsenic Concentration (mg/Kg)



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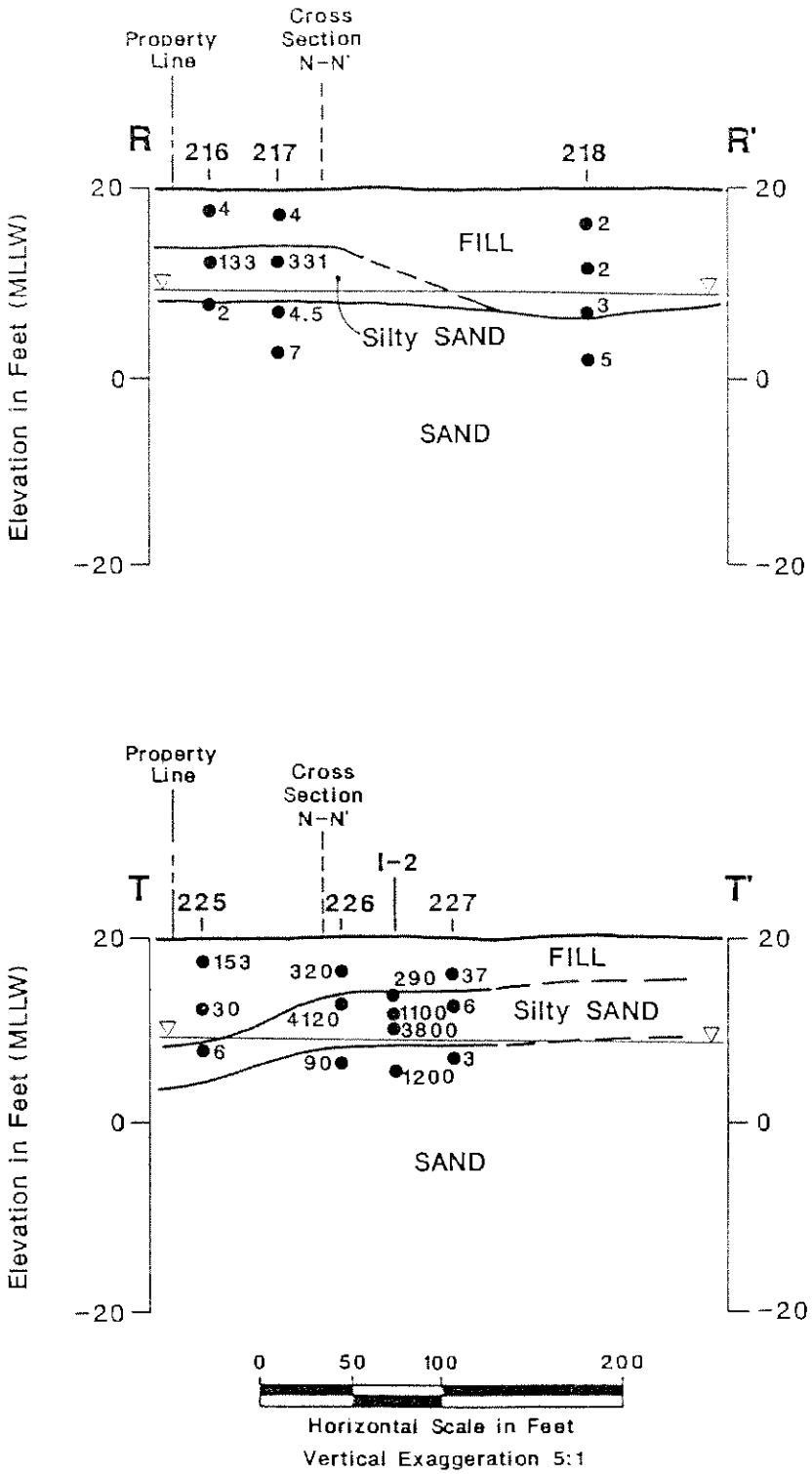
Arsenic Cross Section N-N'



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Water Table, 11 February 1988

● 10 Soil Sample Location and Arsenic Concentration (mg/Kg)

247 Exploration Location and Designation Number

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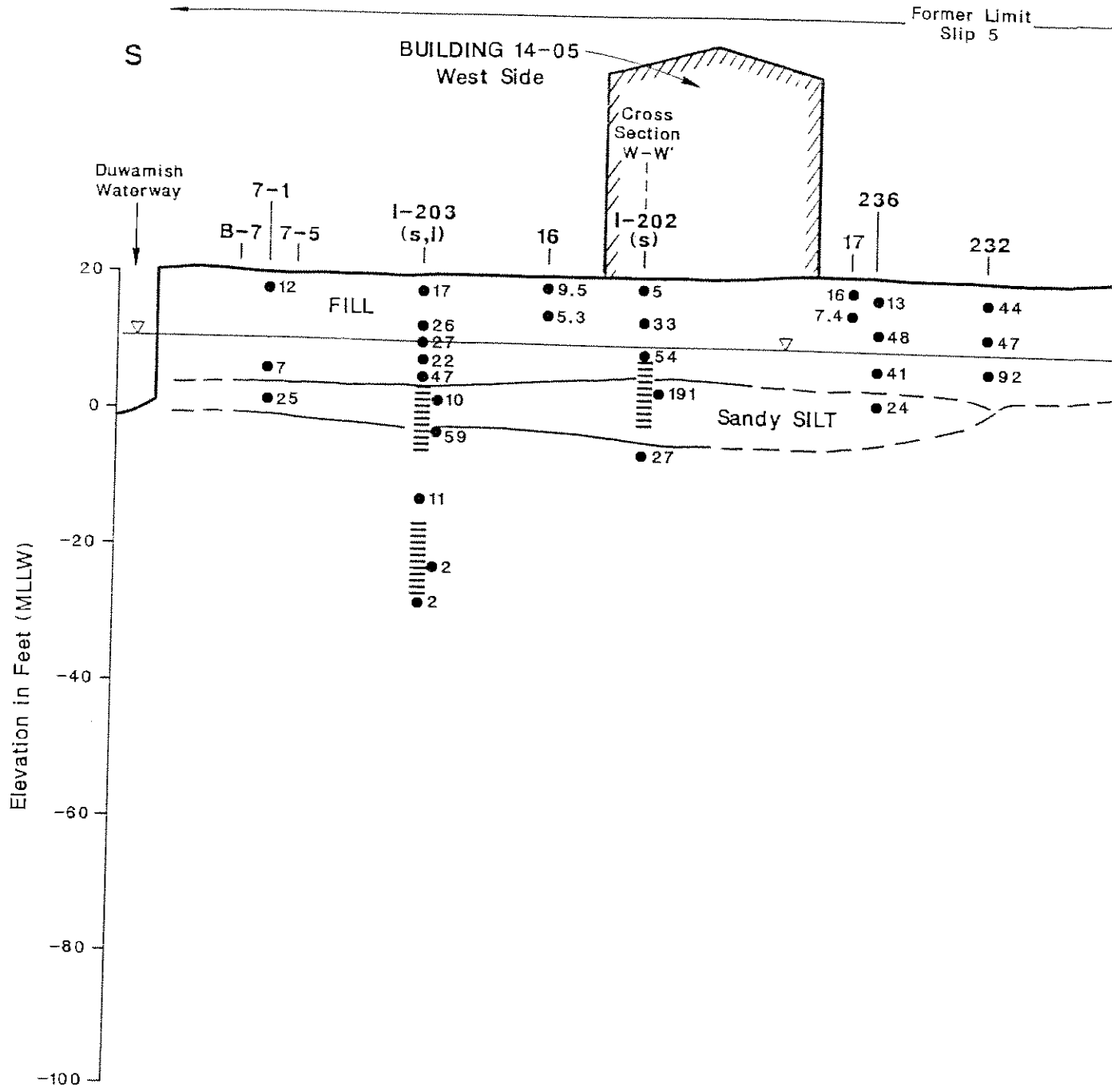
Arsenic Cross Sections R-R' and T-T'

Figure 5-5



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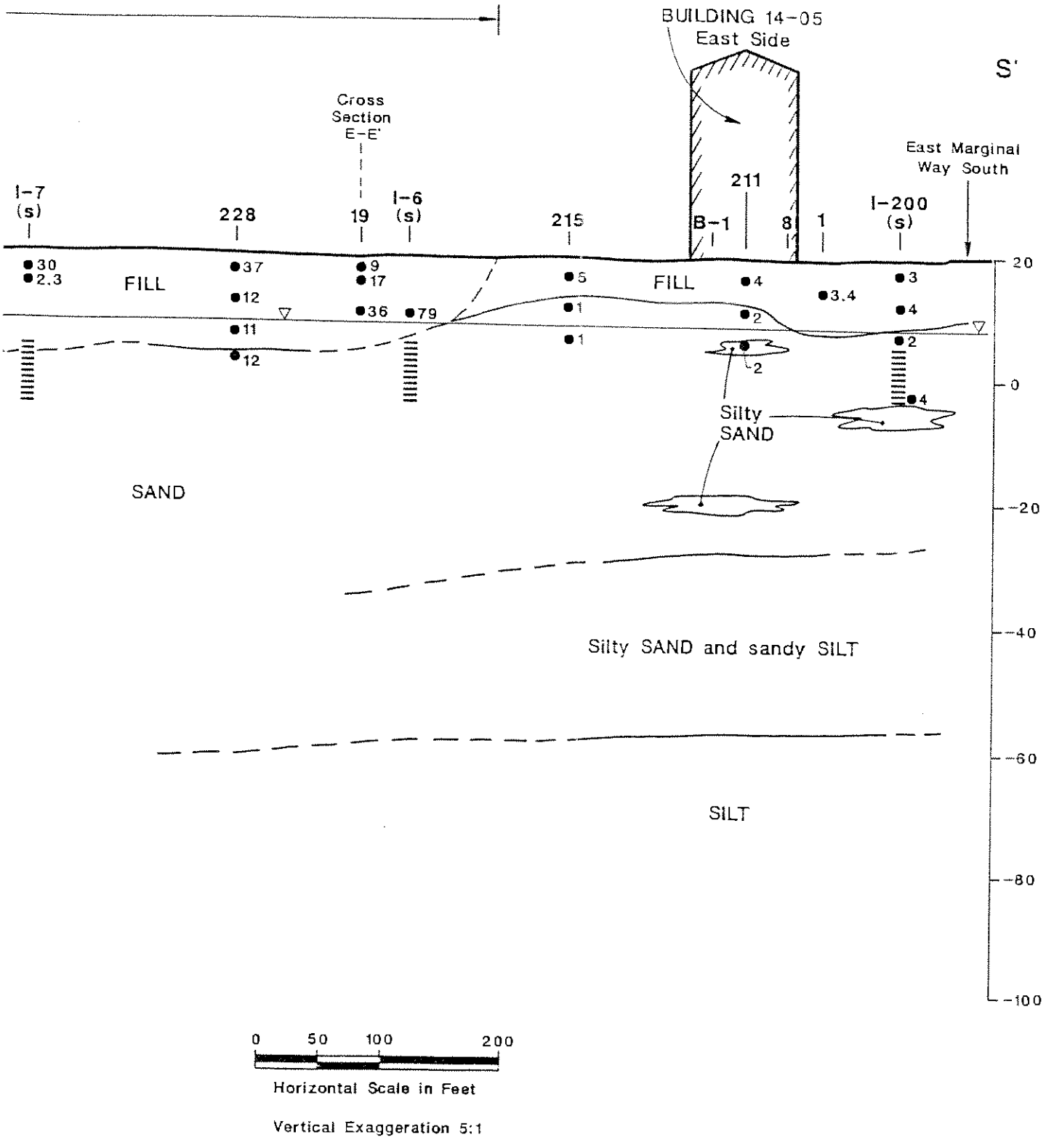
Water Table, 11 February 1988

247 Exploration Location and Designation Number

Location of Well Screen

● 10 Soil Sample Location and Arsenic Concentration (mg/Kg)



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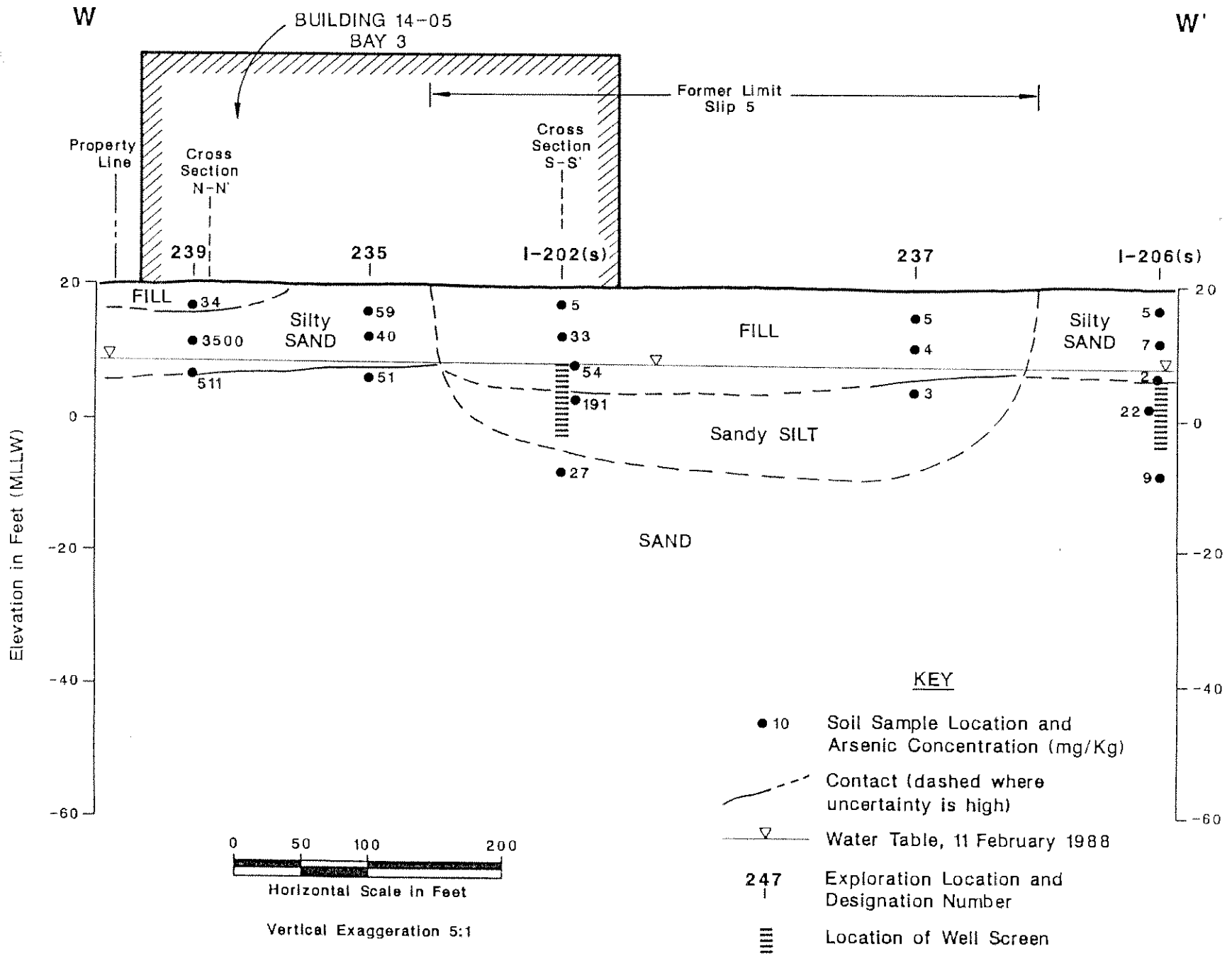
Arsenic Cross Section S-S'



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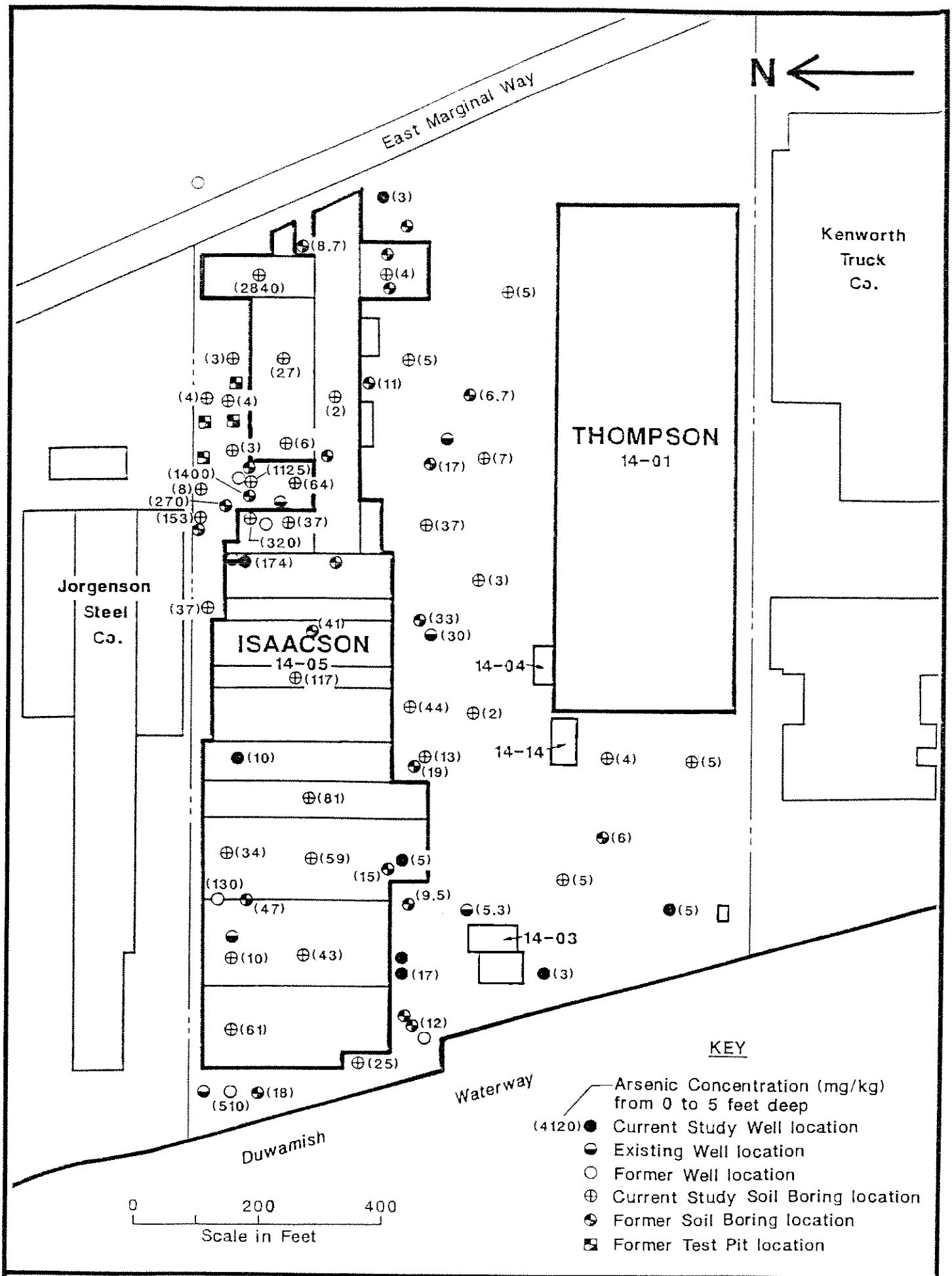
Arsenic Cross Section W-W'

Figure 5-7

APPENDIX A

APPENDIX B



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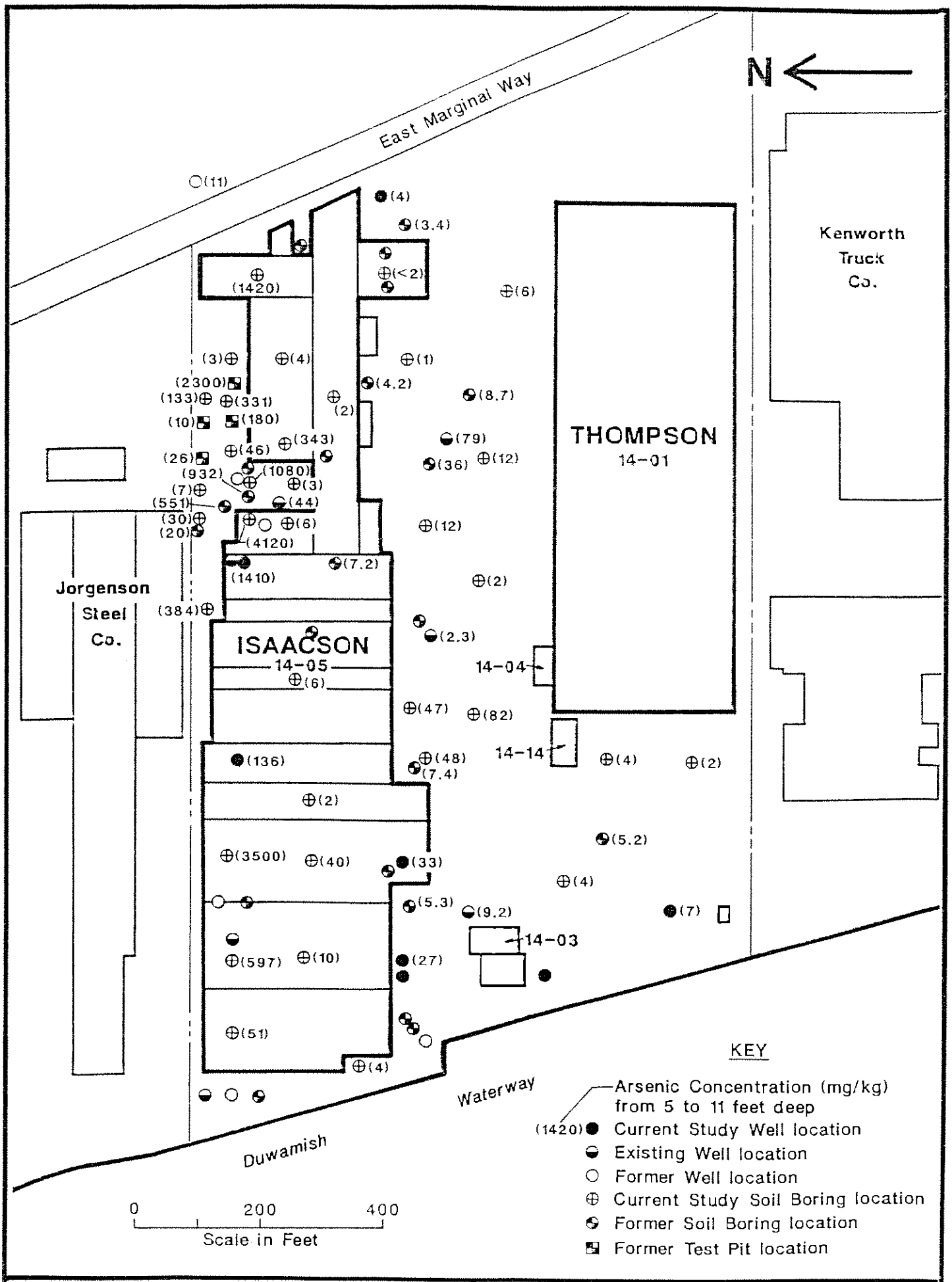
Distribution of Arsenic in Soil
0 to 5 Feet Deep

Figure 5-8



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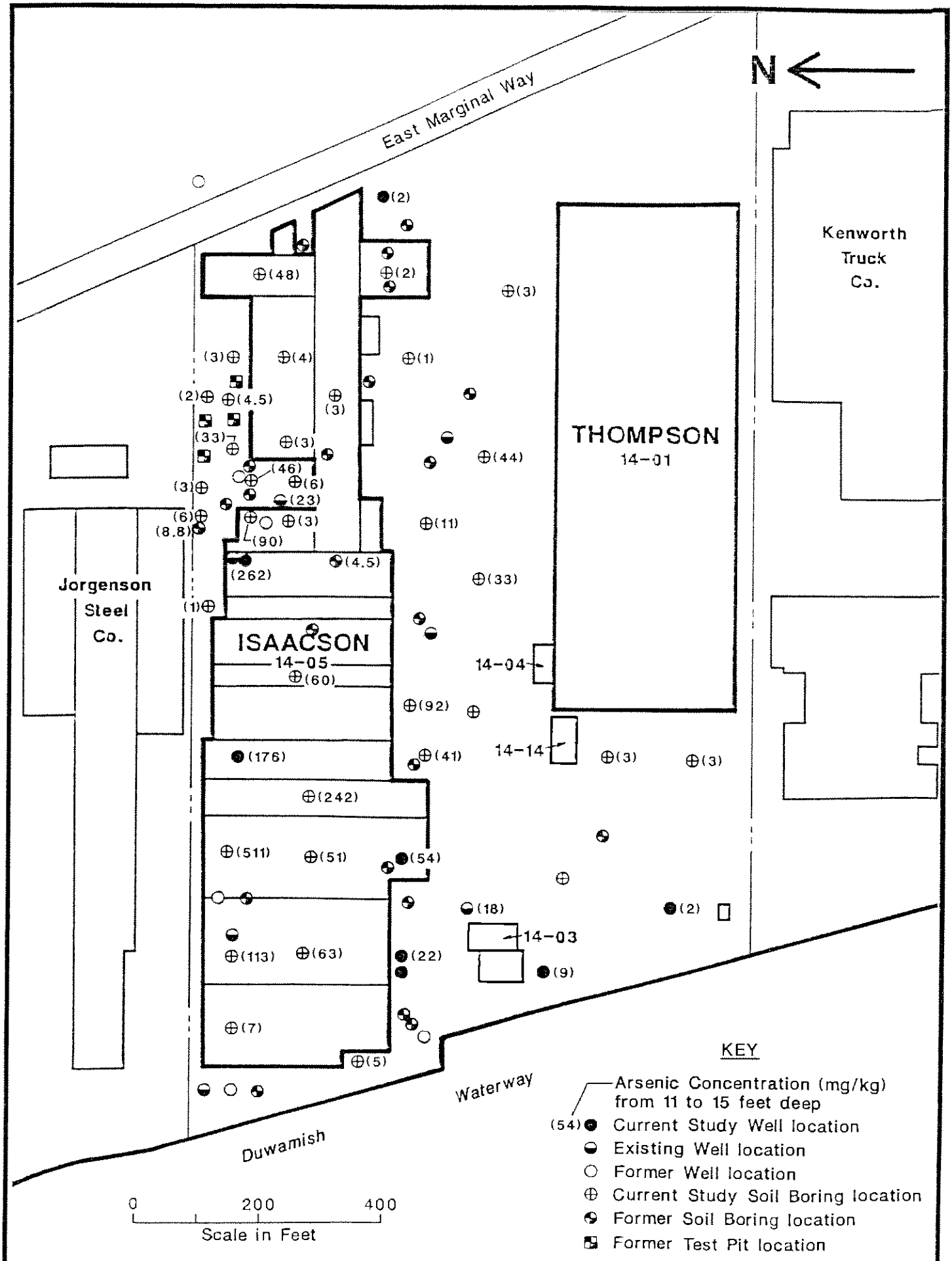
Distribution of Arsenic in Soil
5 to 11 Feet Deep

Figure 5-9



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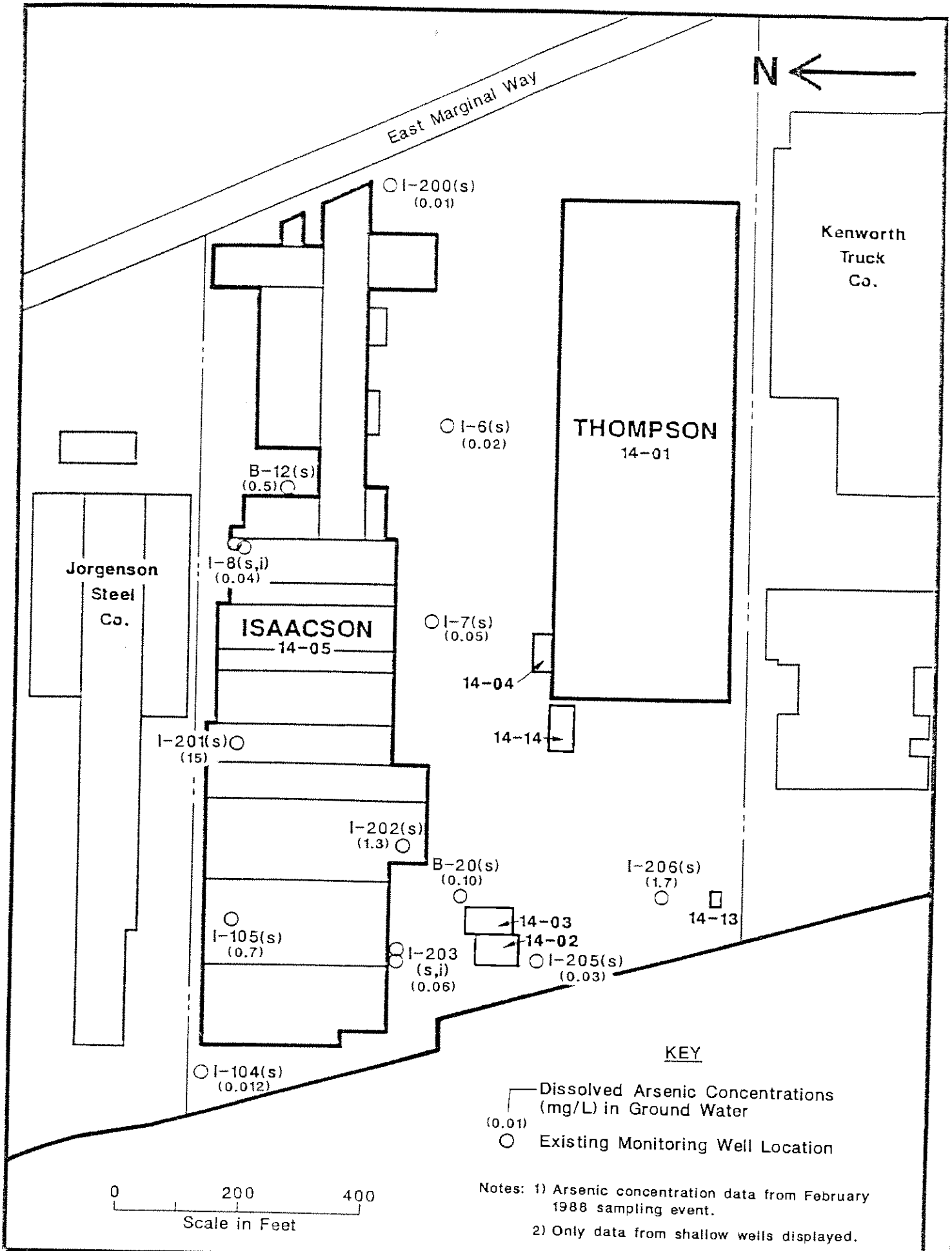
Distribution of Arsenic in Soil
11 to 15 Feet Deep

Figure 5-10



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Dissolved Arsenic Concentrations
in Ground Water

Figure 5-11

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