INNOVATIVE TECHNICAL SOLUTIONS, Inc.

ITSI

October 28, 1996

Mr. Dale Klettke, CHMM
Hazardous Materials Specialist
Division of Environmental Protection
Department of Environmental Health
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, 2nd Floor
Alameda, California

Results of Geophysical Investigation
Former Carnation Terminal Site, Berth 30 (STID-5801)
2700 7th Street
Oakland, California

Dear Mr. Klettke:

Attached please find the results of the geophysical investigation performed at the former Carnation Terminal site in the area of a former underground diesel fuel tank (CF-31R). The geophysical investigation was performed to locate the limits of the former excavation associated with removal of the underground tank. Since removal of the underground tank in 1988, the site and surrounding area has undergone sgnificant redevelopment. Existing facilities and structures were largely removed, the upper six feet of soil was removed and replaced with compacted fill, new facilities and structures built, and the wharf extended. The redevelopment of the site and surrounding area has significantly impacted the ability to locate the former excavation. The redevelopment removed the landmarks referenced as part of the closure report for the underground tank, and removed the upper six feet of the former excavation.

A substantial effort was undertaken by ITSI to overcome the difficulties indicated above and locate the remnants of the former excavation. Aerial photographs of the site taken during the time of the underground tank removal and subsequent redevelopment were reviewed. The approximate location of the former excavation was identified on an aerial photograph, and was delineated relative to current site structures by overlaying the outline of the former excavation on a more recent aerial photograph. The approximate location of the former excavation was then marked on the ground using references identified from the recent aerial photograph.

The geophysical investigation was then performed on September 13, 1996 by JR Associates of San Jose. Both magnetics and ground penetrating radar (GPR) were used to look for indications of the remnants of the former excavation. Specific field methodologies are provided in the attached geophysical investigation report. Numerous magnetic anomalies were identified in the target area. However, the anomalies were suspected to be related to the presence of surface metal throughout the target area, including K-rails, rail lines, utilities, and curbs. An anomaly possibly related to buried metal was identified southeast of the approximate location of the former excavation. GPR could not find any indications of the remnants of the former excavation, likely due to the removal and recompaction of of soils during redevelopment. Multiple reflections were observed in the radar profile which could indicate either a thin layer of different material or a void developing

1330 Broadway, Suite 1625, Oakland, CA 94612 (510) 286-8888 (510) 286-8889 fax

beneath the asphalt. The multiple reflections were observed in several locations within the investigation area.

The results of the geophysical investigation were inconclusive. No conclusive evidence of the location of the former excavation was identified.

Please give us a call if you have any questions.

Sincerely,

Jeffrey D. Hess
Project Director

Attachment

cc: John Prall

J R ASSOCIATES

Engineering Geophysics
1886 Emory Street
San Jose, CA 95126
(408) 293-7390

GEOPHYSICAL INVESTIGATION AT BERTH 30
PORT OF OAKLAND
OAKLAND, CALIFORNIA

September 20, 1996

For

Innovative Technical Solutions, Incorporated
2855 Mitchell Drive, Suite 118
Walnut Creek, CA 94598

By

James Rezowalli, GP-921

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

I INTRODUCTION

This report presents the results of a geophysical investigation performed at Berth 30 at the Port of Oakland in Oakland, California. The investigation was performed for Innovative Technical Solutions Incorporated (ITSI) by J R Associates. The purpose of the investigation was to look for geophysical indications of an old excavation. James Rezowalli, Principal Geophysicist, and John Gurly, Technician, of J R Associates performed the field work on September 13, 1996.

A. Site

The site is at Berth 30 in the Port of Oakland. It is located near the intersection of 7th Street and Terminal Street (Drawing 1). ITSI provided us information indicating that a tank was removed from the site. An air photograph taken in December of 1988 shows an excavation where the tank was removed. The area has been renovated since the 1988 photograph. A wharf engineer informed us the loading docks were extended into the bay, crane tracks were added or moved, and the top six feet of soil had been dug up and recompacted. Except for a few buildings, most of the features shown on the photograph are no longer there. The remaining buildings were used to locate the approximate center of the excavation. ITSI marked the approximate center of the excavation on the asphalt (Drawing 1). J R Associates was requested to

perform a geophysical investigation in the area of the excavation. The purpose of this investigation was to look for geophysical evidence of the excavation's boundaries.

II METHODS

Several geophysical techniques can detect buried objects. The most appropriate method for this site was a combination of magnetics and ground penetrating radar. A magnetic investigation maps the vertical magnetic gradient. The magnetic gradient is uniform throughout a site free of metal. The magnetic gradient over an area that contains ferrous metal is not uniform. Buried metal such as product lines or tanks can produce magnetic anomalies. The magnetic technique was used to look for metal that might have been left behind when the tank was removed.

We used a ground penetrating radar system to augment the magnetic data. Radars can detect many types of objects buried near the ground surface. The radar can also map shallow geologic structures such as bedding planes. The radar was used to look for indications of the sides of the excavation.

A. Magnetic Instrumentation

We used a Geometrics model 856AG proton precession magnetometer to collect magnetic data. The magnetometer had two sensors and an electronics package. The magnetometer collected both total field data and vertical gradient data. The magnetometer can discriminate to 0.2 gammas in a total field of 40,000 to 60,000 gammas. Magnetic readings were stored in memory with the time of day, station numbers, and line numbers of the readings. The data were downloaded to a computer and contoured.

B. Magnetic Field Procedures

Drawing 1 shows the area where data were collected. Magnetic data were collected on ten-foot centers in a 130-foot by 200-foot grid. A data collection station is shown by "+" on the magnetic contour map (Drawing 2). An anomaly is indicated by a series of concentric magnetic contours. There were many magnetic anomalies in the area. These anomalies will be discussed later in the report.

C. Radar Instrumentation

We used a SIR 3 ground penetrating radar system to collect radar data at the site. The SIR 3 had a radar control unit, a graphic profiler, and a 500-MHz antenna. The antenna transmitted a radio frequency electromagnetic pulse into the ground. The pulse traveled through the ground at approximately 2½ nanoseconds per foot. Buried features, such as tanks, could reflect the pulse back to the ground surface. The radar detected the returning reflections and plotted them on the graphic profiler.

D. Depth of Radar Penetration

The depth of penetration of the ground penetrating radar depends largely on the clay and alkalinity of the soils investigated. Radar penetration probably did not exceed 3 to 4 feet at this site.

E. Radar Field Procedures

Radar data were collected along scan lines spaced 10 feet apart in the 130-foot by 200-foot area. Radar data collection began by marking the beginning and the end of a radar scan line. A tape measure was then laid on the ground between the beginning and end marks. The antenna, connected to the control unit by a cable, was dragged along the traverse and a radar profile was collected next to the tape measure. After a traverse was completed, the antenna was moved and the above process was repeated.

III RESULTS

A. Magnetic Contours

Drawing 2 illustrates the magnetic contour map. There are numerous magnetic anomalies throughout the area. We suspect most of the anomalies in the area of the approximate center of the excavation were caused by surface metal. The surface metal included K-rails, crane rails, utilities, and curbs. There was an area in the southeast portion of the area investigated that had magnetic anomalies caused by buried metal. This anomalous area is labeled in Drawing 2 and was approximately 80 feet from the approximate center of the excavation. We could not determine from the anomalies or the radar data what the buried metal was.

B. Radar Anomalies

We could not find any indication of the sides of the excavation in the radar data. If the dirt at the site was removed and recompacted to a depth of six feet, then the radar would not have penetrated to the native soils that might still contain indications of the old excavation. We did see multiple reflections in the radar profiles near the approximate center of the excavation (Drawing 3). Multiple reflections are caused by a change in electrical properties at the base of the asphalt. The change could be due to a thin layer of material that is different from the recompacted soils or it could be due to a void developing under the asphalt. If the fill material in the excavation was settling, it could

cause the multiple reflections seen in the radar profiles. Drawing 3 shows the location of the multiple reflections. The multiple reflections are a possible indication of the old excavation but are less conclusive than a reflection from the side of the excavation.

C. Limitations

Magnetic methods locate ferrous objects from the anomalies they produce in the earth's magnetic field. It is possible some ferrous objects will not produce an anomaly. Some possible reasons are that the object is buried too deep, the object is too small, the object is buried under or near another ferrous object, or an object is buried near a utility. Anomalies from discarded metal, reinforced concrete, utilities, and fences at the site could mask an anomaly caused by buried metal.

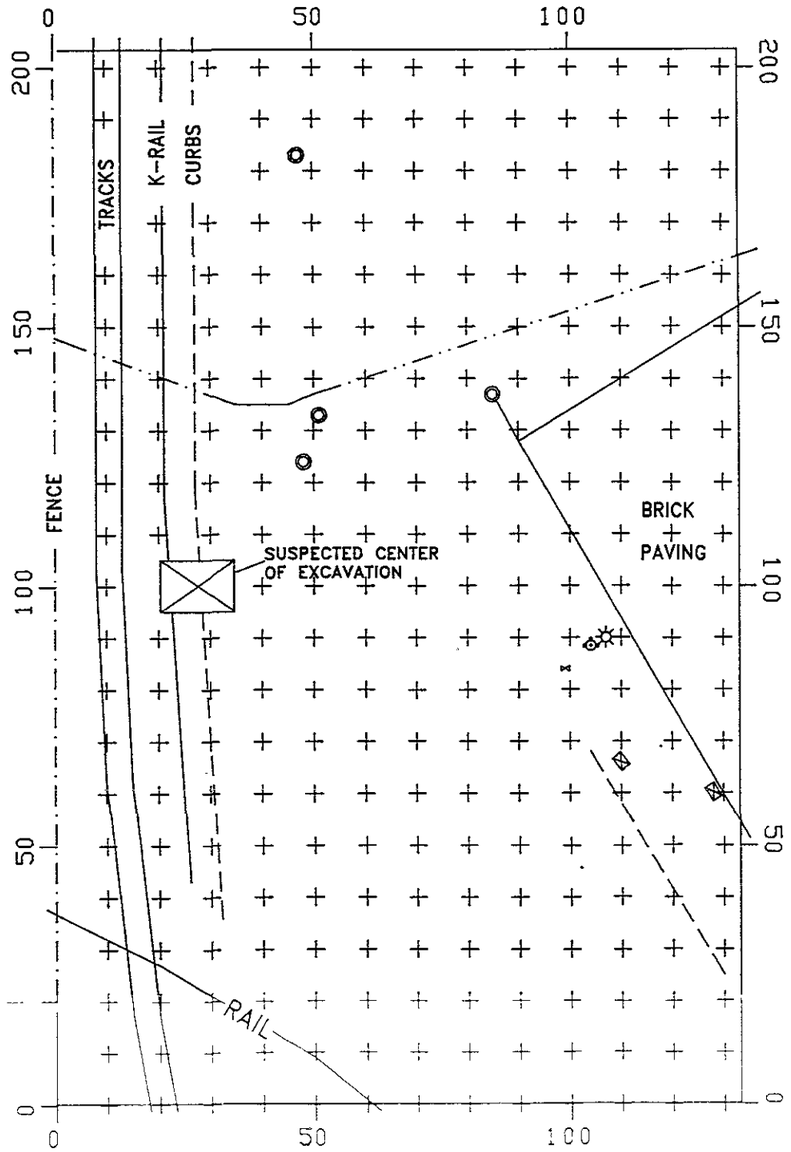
The radar's usefulness is limited by its depth of penetration. The depth of penetration can vary from a few inches to several feet. If a clear reflection is created by a buried object, the reflection can be used to help determine the size and depth of the object. If we see no reflections in an area, the results might be inconclusive. There could be no reflections because there are no buried objects or because the objects were buried deeper than the radar could penetrate.

D. Summary

Magnetic and radar data were collected in a 130-foot by 200-foot area at Berth 30 in the Port of Oakland. The purpose of the investigation was to look for geophysical indications of the limits of an old excavation. The approximate center of the excavation was marked on the asphalt at the start of our

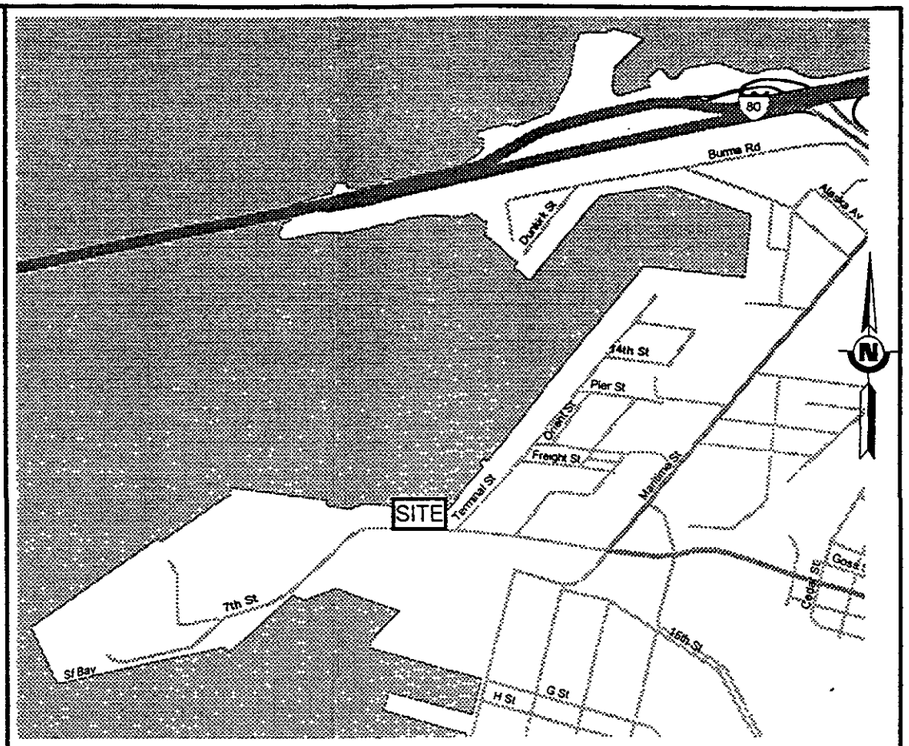
investigation. The approximate center was found by comparing a 1988 air photograph showing the excavation to a 1996 air photograph. Magnetic data were collected to look for buried pipes or other metal associated with a tank removed from the excavation. The magnetic data were inconclusive because of interference from surface metal. There were indications of buried metal about 80 feet from the approximate center of the excavation. The buried objects could not be identified. Radar data were collected to look for reflections from the sides of the excavation. We did not see any reflections from the sides of the excavation but did note multiple reflections around the approximate center of the excavation. Settlement in the excavation could indirectly cause multiple reflections. The multiple reflections are a possible indication of the old excavation but are less conclusive than a reflection from the side of the excavation.

IV DRAWINGS



EXPLANATION:

- MANHOLE OR DRAIN
- ELECTRIC BOX
- STREET LIGHT
- WATER VALVE
- FIRE HYDRANT
- BURIED PIPE
- MAGNETIC DATA POINT

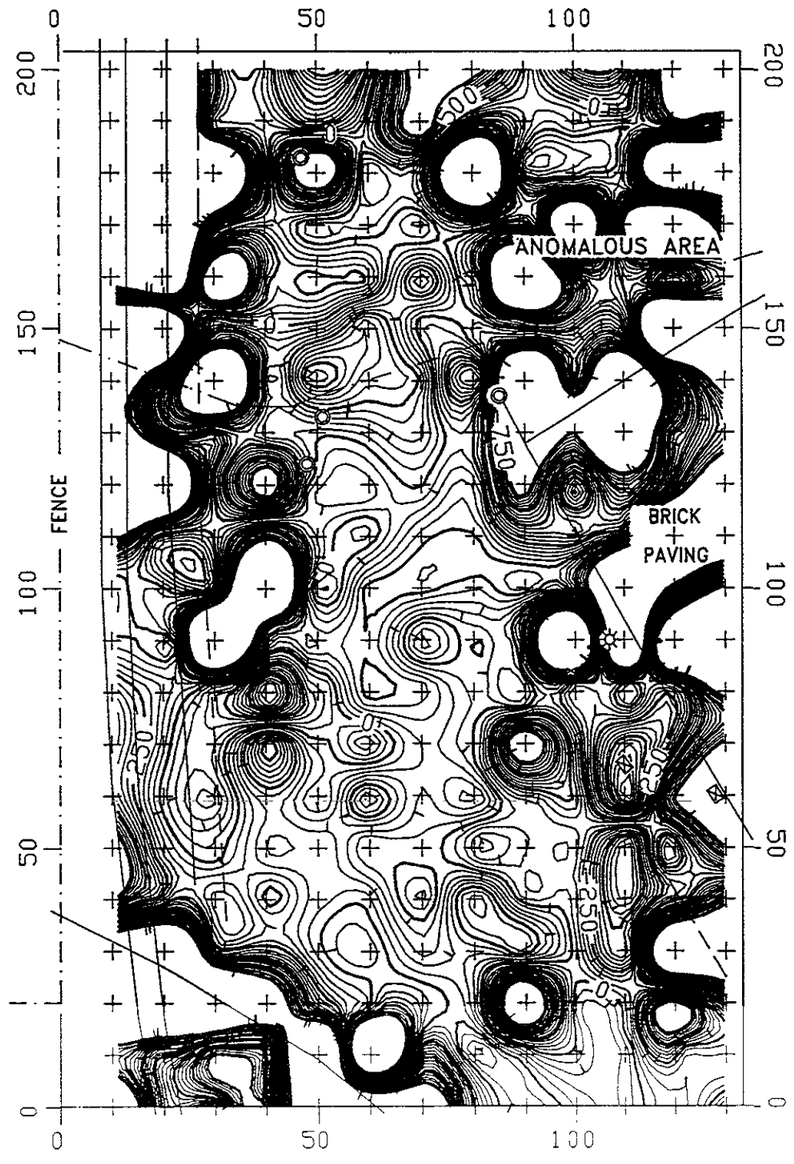


VICINITY MAP

Site Map
Berth 30
Port of Oakland
Oakland, California

SCALE: 1" = 30'
DATE: 9-16-1996
DRAWN: J.J.R.
REVISED:
JOB: 121138-96
DRAWING
1

J R ASSOCIATES
CIVIL AND ENVIRONMENTAL GEOPHYSICS
1886 EMORY STREET, SAN JOSE, CA 95126
(408) 293-7390



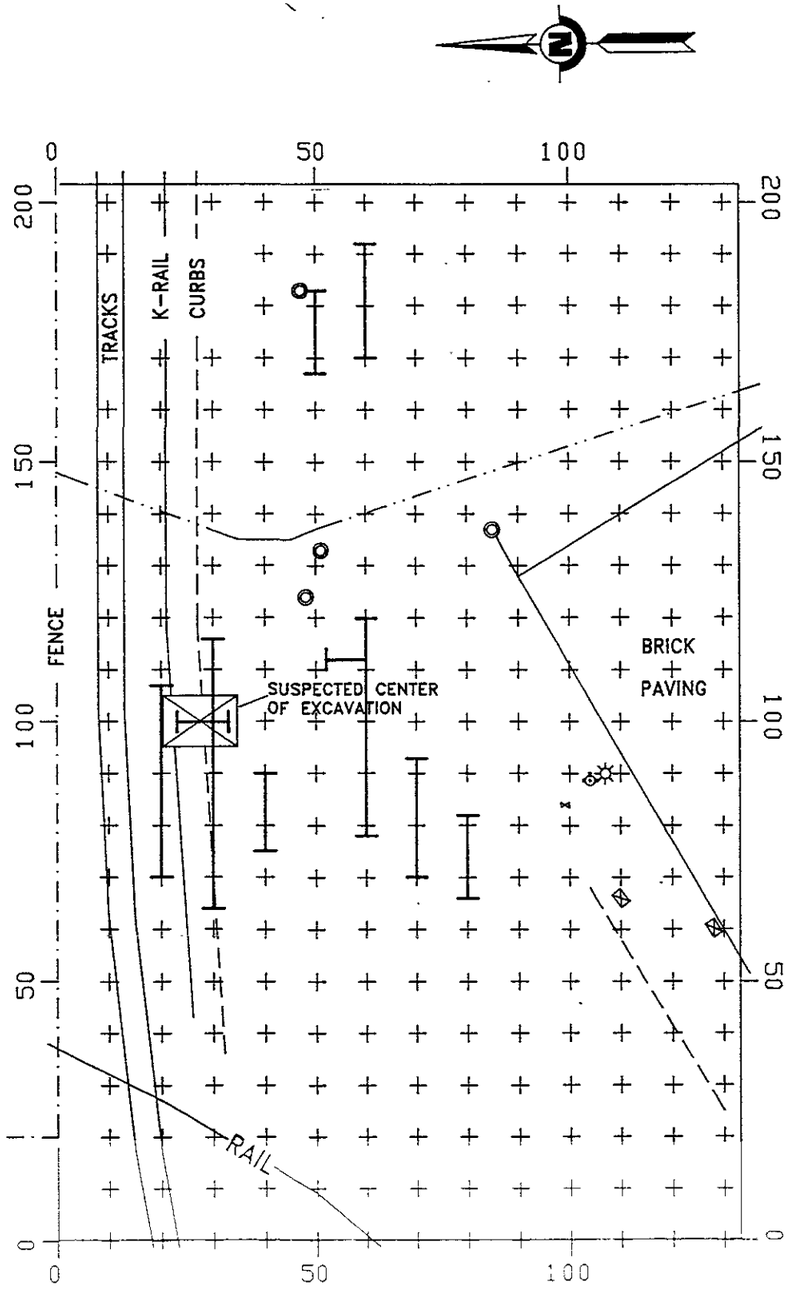
EXPLANATION:

- MANHOLE OR DRAIN
- ELECTRIC BOX
- STREET LIGHT
- WATER VALVE
- FIRE HYDRANT
- BURIED PIPE
- MAGNETIC DATA POINT
- MAGNETIC CONTOURS

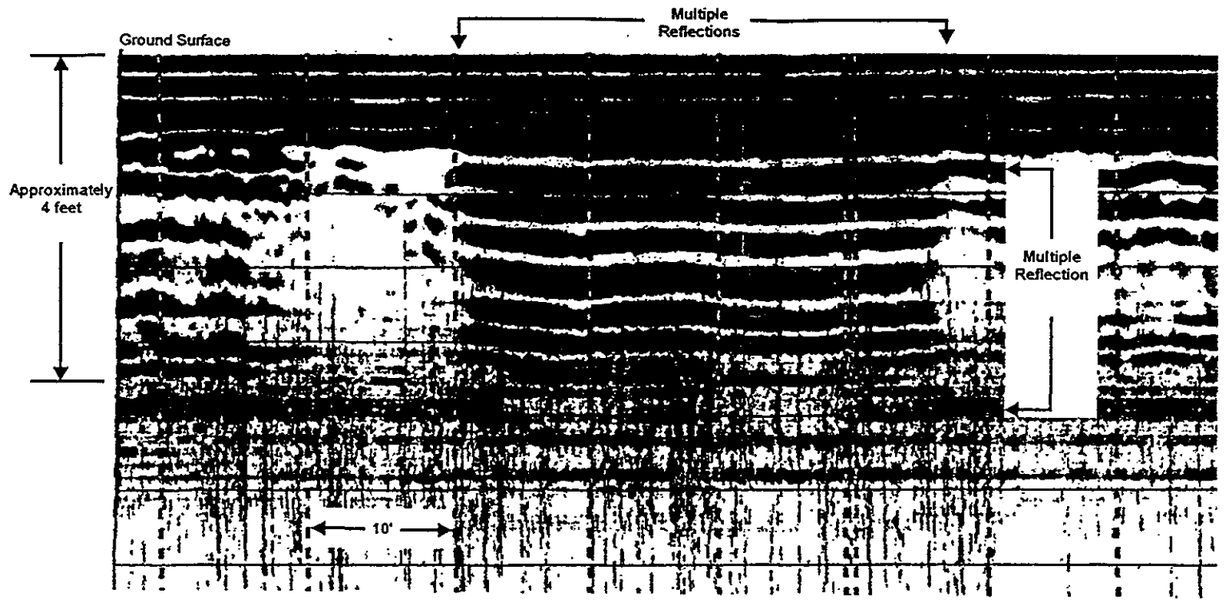
Magnetic Contour Map
Berth 30
Port of Oakland
Oakland, California

SCALE: 1" = 30'
DATE: 9-16-1996
DRAWN: J.J.R.
REVISED:
JOB: 121138-96
DRAWING 2

J R ASSOCIATES
CIVIL AND ENVIRONMENTAL GEOPHYSICS
1886 EMORY STREET, SAN JOSE, CA 95126
(408) 293-7390



EXAMPLE RADAR PROFILE



EXPLANATION:

- MANHOLE OR DRAIN
- ELECTRIC BOX
- STREET LIGHT
- WATER VALVE
- FIRE HYDRANT
- BURIED PIPE
- MAGNETIC DATA POINT
- MULTIPLE REFLECTIONS

Radar Anomalies
Berth 30
Port of Oakland
Oakland, California

SCALE: 1" = 30'
DATE: 9-16-1996
DRAWN: J.J.R.
REVISED.
JOB: 121138-96
DRAWING
3

J R ASSOCIATES
CIVIL AND ENVIRONMENTAL GEOPHYSICS
1886 EMORY STREET, SAN JOSE, CA 95126
(408) 293-7390