Geosyntec consultants

3530 Hyland Ave., Suite 100
Costa Mesa, California 92626
PH 714.969.0800
FAX 714.969.0820
www.geosyntec.com

27 July 2023

Mr. Patrick Bannon
Capital Projects Administrator
Public Works Department – Engineering
City of Huntington Beach
2000 Main Street
Huntington Beach, California 92648

Subject: Letter Report – Geophysical Oil Well Locating Survey
Edison Park, Huntington Beach, California

Dear Mr. Bannon:

Geosyntec Consultants, Inc. (Geosyntec) prepared this letter report for the City of Huntington Beach, Public Works Department (City). This letter documents the geophysical survey performed to locate the existing oil wells at the Edison Park, located at 21377 Magnolia Street, Huntington Beach, California (Site). The services documented in this letter were performed in general accordance with the Professional Services Contract between the City and Geosyntec for As-Needed General Environmental Engineering Services, dated February 2021 and the scope of work described in our proposal dated July 3, 2023.

BACKGROUND AND PROJECT UNDERSTANDING

A review of the State of California Geologic Energy Management Division (CalGEM) database indicated the presence of two historical oil wells [Aldrich Fee #1 (API: 0405905847) and Aldrich #2 (API: 0405901101)] located at the northeast corner of the Site, within the approximate areas of proposed park improvements. The status of the two oil wells are listed as "plugged" per CalGEM's database. While CalGEM records provide the approximate locations of the wells, the exact locations of these oil wells were unknown/needed to be confirmed to avoid potential disturbance to the wells.

Accordingly, the objective of this project was to perform a non-intrusive geophysical survey to attempt to identify the interpreted locations of the two oil wells at the Site.

GEOPHYSICAL SURVEY

Geosyntec retained the services of a **GEO***Vision* Geophysical Services (**GEO***Vision*), a geophysical specialty subcontractor to perform geophysical mapping survey at and near

the approximate locations of the two subject oil wells. The geophysical survey was performed on July 18, 2023, under the observation of Geosyntec field personnel.

The approximate location of the two oil wells were identified in the field using a Geometrics G858 cesium magnetometer (G858). This instrument measures the intensity of the magnetic field of the earth. Metallic-cased oil wells generally give rise to very high amplitude and broad magnetic anomalies and can typically be located using a magnetometer.

Once positive anomalies were detected for the two subject oil wells, magnetic data was acquired along a rectangular grid centered on the expected well locations. The magnetometer was used in conjunction with a Global Positioning System (GPS) for spatial control. The magnetometer was used to identify the magnetic field maxima associated with the well casing, the location of which was surveyed using GPS. The magnetic data and spatial data were stored in the instruments internal memory and downloaded to a laptop computer upon completion of the survey for data processing and interpretation.

Additional details on the geophysical method, field procedures, data processing, and results are provided in the Geophysical Oil Well Locating Survey Report prepared by **GEO***Vision* and included here as Attachment A. Geosyntec's Daily Field Report with photo logs summarizing the field activities is included here as Attachment B.

Approximate interpreted locations of the centers of the two Oil Wells based on the geophysical interpretation are shown in Figure 1 and summarized in Table 1.

Table 1. Approximate Interpreted Coordinates of the Center of the Identified Oil Wells

Oil Well Name	Interpreted Easting (US Survey Feet)	Interpreted Northing (US Survey Feet)
Aldrich Fee #1	6037822.8	2185799.7
Aldrich #2	6037540.1	2185767.1

LIMITATIONS

Please note, the geophysical survey to locate the existing wells is a non-intrusive method and results can be affected by several factors that include soil characteristics at the site,

condition of the well casing and soil cover. The accuracy of the location identified by this method can vary and is generally considered approximate. The actual location of the well will require confirmation/verification via intrusive (i.e., excavation) work.

CLOSURE

We appreciate the opportunity to assist the City on this important project. Should you have any questions about this letter or require additional information, please do not hesitate to call Yonas Zemuy at (714) 465-1256.

Sincerely,

Sneha Upadhyaya, Ph.D., E.I.T. (CA)
Senior Staff Professional

Yonas Zemuy, P.E. (AZ, CA, NV)
Senior Principal Engineer

Attachments:

Figure 1 – Approximate Inferred Locations of the Oil Wells
Attachment A: **GEO***Vision* Geophysical Oil Well Locating Survey Report
Attachment B: Geosyntec Daily Field Report

FIGURE

LEGEND

APPROXIMATE LIMITS OF EXISTING CANNERY STREET FORMER REFUSE DISPOSAL STATION WASTE [TRC, 2001]

LATERAL LIMITS OF WASTE MATERIAL DELINATED DURING GEOSYNTEC 2020 AND 2021 EXPLORATIONS

INTERPRETED LOCATION OF OIL WELL

N

0 50

SCALE IN FEET

APPROXIMATE INFERRED LOCATION OF THE OIL WELLS
GEOPHYSICAL OIL WELL LOCATING SURVEY
EDISON PARK
HUNTINGTON BEACH, CALIFORNIA

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FIGURE 1

PROJECT NO: SC1369 | JULY 2023

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ATTACHMENT A: GEOVISION GEOPHYSICAL OIL WELL LOCATING SURVEY REPORT

GEOVision
geophysical services

July 25, 2023
Project Number 23241

Mr. Yonas Zemuy
Geosyntec Consultants
3530 Hyland Avenue, Suite 100
Costa Mesa, California 92625

Subject: **Steel Oil Well Location at 21377 Magnolia Street, Huntington Beach, California**

Mr. Zemuy:

On July 18th, 2023, a geophysical investigation was conducted for two suspected oil wells at the site located above, in Edison Park in the city of Huntington Beach.

METHODOLOGY

The geophysical instrument used during this investigation consisted of a Geometrics G858 optically pumped cesium-vapor magnetometer (G858). This magnetometer measures the intensity of the earth's magnetic field in nanoteslas (nT) and, optionally, the vertical gradient of the earth's magnetic field in nanoteslas per meter (nT/m). Buried ferrous metallic objects give rise to anomalies in the earth's magnetic field. These anomalies are generally dipolar with a positive response south and a negative response north of the object. The dimensions and amplitude of a magnetic anomaly are a function of the size, mass, depth, and magnetic properties of the source. Magnetometers can typically locate a metallic-cased oil well to depths of over 15 feet providing background noise levels are not too high and the steel is not extensively corroded.

FIELD PROCEDURE

Before conducting a magnetic survey, an attempt was made to locate each of the existing oil wells using the magnetometer in search mode. Two areas with anomalies were relatively clear and therefore a magnetic survey was conducted in these areas. The magnetometer was used in conjunction with the GPS system for spatial control. GPS data were collected in the geodetic coordinate system and then converted to California State Plane 1983, NAD83 (Conus), Zone VI (0406) in US Survey Feet, during data processing. Positions were taken using a Spectra Precision GPS system with Centerpoint RTX corrections.

Prior to data acquisition, the G858 was programmed with the appropriate sampling interval and GPS input settings. Spatial information was sent to the console at 1 second intervals using a GGA NMEA stream. Magnetic data and spatial data were downloaded

to a laptop computer at the end of the survey using the program MAGMAP 2000 by Geometrics, Inc.

Details on the geophysical method can be found in the attached technical note titled "Magnetic Method".

DATA PROCESSING

A color-enhanced contour map of the magnetic data was generated using the GEOSOFT® Oasis montaj ™ geophysical mapping system. The map was color-enhanced to aid in the interpretation of subtle anomalies. Prior to map generation, a number of preprocessing steps were completed and included:

- Backup of all original field data files to computer.
- Correcting of all data acquisition errors (typically removing null data and erroneous GPS points).
- Reformatting field data files to free format XYZ files containing at a minimum GPS time and field measurements.
- Merging GPS position data and geophysical data using commercial and in-house software.
- Merging of multiple data files into a single file and sorting, if necessary.
- Converting of data files to State Plane northings and eastings.

These data adjustments were made using a combination of commercial and proprietary software. Adjustments made to data files and resulting file names were documented and are retained in project files.

The output of the data preprocessing was a data file containing the magnetic total field response. Data processing steps included the following:

- Reformatting of data files to GEOSOFT® format.
- Generating final map scale.
- Gridding data using down- and cross-line splines or minimum curvature.
- Masking grid in areas where data not acquired (i.e. around site perimeter or building).
- Applying Hanning filter to smooth the data, as necessary.
- Generating color zone file describing color for different data ranges.
- Contouring the data.
- Generating map surrounds (title block, legend, scale, color bar, north arrow, etc.).
- Annotating anomalies.
- Merging various plot files and plotting final map.

The names of the files generated and the processing parameters used were documented and are retained in project files. Files generated during the processing sequence were archived on a backup drive.

RESULTS

A site map with geophysical interpretation is presented in Figure 1. A map of total magnetic field response of the surveyed areas is presented in Figure 2. The coordinates

shown on the maps reference the California State Plane, NAD83 (Conus), Zone VI (0406), US survey feet coordinate system. The color bar indicates the amplitude of the measured quantity with magenta and dark blue indicating high and low amplitudes, respectively. Light orange, yellow, and light green indicate average "background" values of the measured quantity. A typical magnetic oil well response is a round anomaly that is high in amplitude, shown in the attached Technical Note. However, atypical magnetic oil well responses can occur, though less common.

There were two broad, positive high amplitude anomalies located within the surveyed areas, with values over 48,000 nT, indicative of metal oil wells. For reference, background magnetic field strength at this site was around 46,000 nT. GPS locations from the approximate center of each such anomaly are provided in Table 1. The characteristics of the anomalies indicate that the top of the metallic casings are likely located within the upper 15 feet. Other anomalies such as buried electric lines, an unknown line, and a small buried metallic object located within the survey area are labeled on the figures.

Well Name	Interpreted Easting (US Survey feet)	Interpreted Northing (US Survey feet)	Peak Amplitude (nT)
Aldrich Fee 1	6037822.8	2185799.7	49,800
Aldrich 2	6037540.1	2185767.1	48,300

Table 1: Coordinates of Possible Oil Well Anomalies

We recommend the source of each anomaly is uncovered to confirm its source and location.

If you have any questions concerning this investigation, please call us at 951-549-1234, or email at efeldman@geovision.com.

Sincerely,
GEO*Vision* Geophysical Services

Emily Feldman, PGp Project Geophysicist

Attachments:
Figure 1 – Site Map with Geophysical Interpretation
Figure 2 – Total Magnetic Field Response
Technical Note – Magnetic Method

Street Light Pole
Monitoring Well
Small Buried Metallic Object / Debris
Underground Electric Line
Underground Utility Line (Unknown type)
Interpreted Location of Oil Well

Notes:
Coordinate System: NAD 1983 StatePlane California VI FIPS 0406 Feet
Base map source: City of Huntington Beach (2022), Maxar

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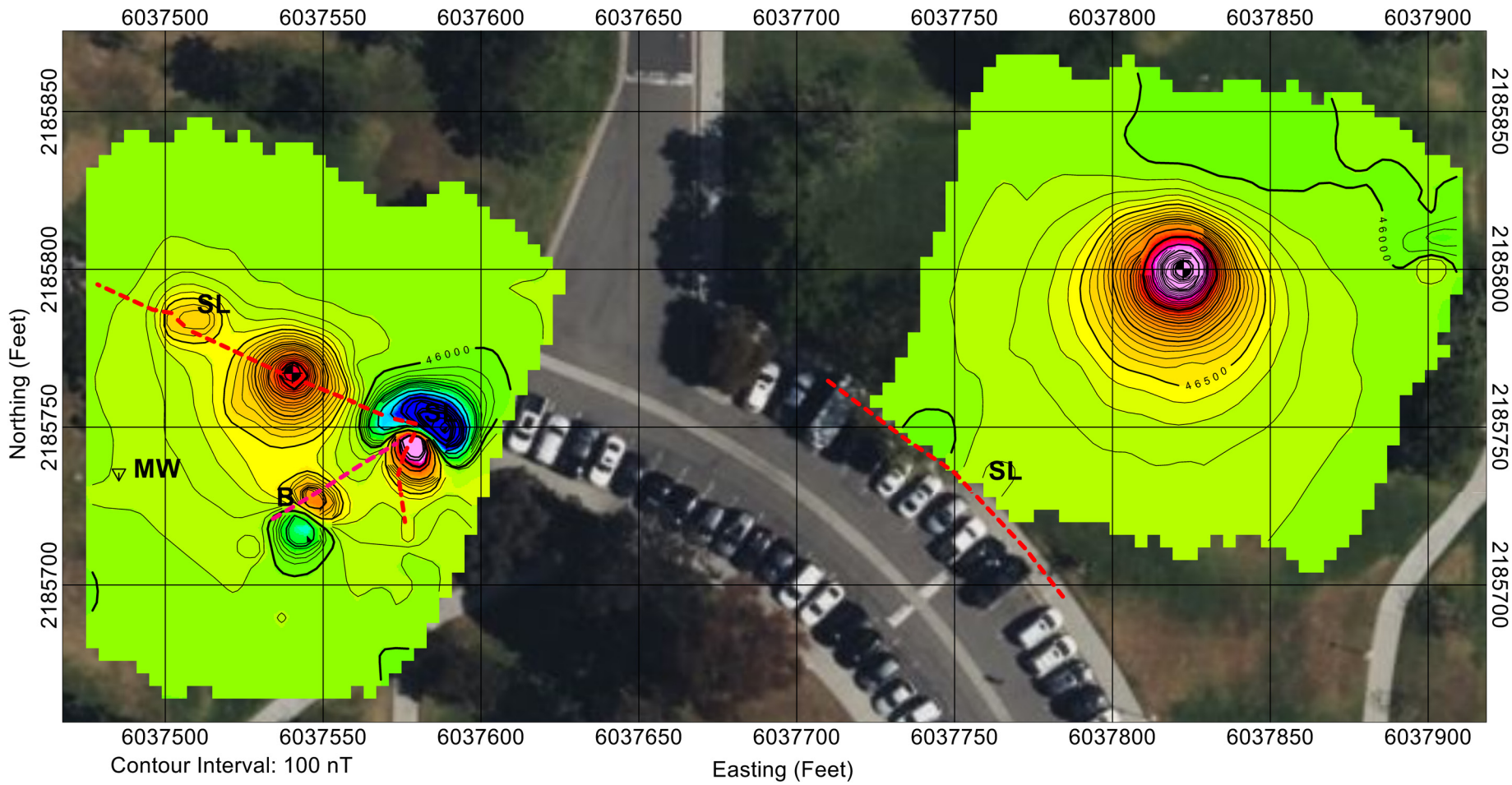
Date:	7/25/2023
GV Project:	23241
Developed by:	E Feldman
Drawn by:	T Rodriguez
Approved by:	A Martin
File Name:	GV_23241

FIGURE 1
SITE MAP
WITH GEOPHYSICAL INTERPRETATION

SITE LOCATED AT
21377 MAGNOLIA ST
HUNTINGTON BEACH, CALIFORNIA

CREATED FOR
GEOSYNTEC



44100 44400 44800 45200 45600 46000 46400 46800 47200 47600 47900 48300 48700

Total Magnetic Field Response
(nT)

25 0 25 50 75
US survey foot
NAD83 / California zone 6 (ftUS)

LEGEND

- Approximate GV Located Oil Well
- **MW** Monitoring Well
- **B** Buried Metallic Object
- **SL** Streetlight
- Located Utility Line

Aerial Source: Azure Maps Imagery, 2023

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Figure 2

Total Magnetic Field Response
G858 Magnetometer

Site Located at 21377 Magnolia St
Huntington Beach, California

Created for Geosyntec

MAGNETIC METHOD

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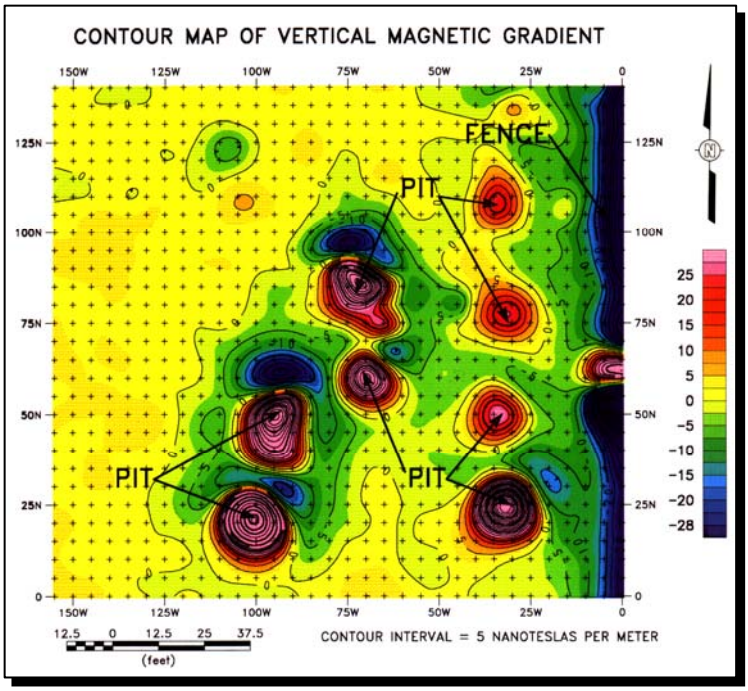
The magnetic method involves the measurement of the earth's magnetic field intensity. Typically the total magnetic field and/or vertical magnetic gradient is measured. Measurements of the horizontal or vertical component or horizontal gradient of the magnetic field may also be made.

Anomalies in the earth's magnetic field are caused by induced or remanent magnetism. Induced magnetic anomalies are the result of secondary magnetization induced in a ferrous body by the earth's magnetic field. The shape, dimensions, and amplitude of an induced magnetic anomaly is a function of the orientation, geometry, size, depth, and magnetic susceptibility of the body as well as the intensity and inclination of the earth's magnetic field in the survey area. Buried ferrous metallic objects, such as pipes, drums, tanks, and debris generally give rise to dipolar anomalies with a positive response south and a negative response north of the object. The magnetic method is an effective way to search for small metallic objects because magnetic anomalies have spatial dimensions much larger than those of the objects. An oil well typically gives rise to a monopolar anomaly with a very high amplitude, positive peak several feet south of the well and a low amplitude, broad negative response to the north. The magnetic anomaly over a buried oil well often has a diameter of over 50 feet and amplitude of several thousand nanoteslas, depending on depth and casing characteristics. Magnetometers can typically locate an abandoned oil well to depths of over 20 feet providing that background noise levels are not too high and the well casing is not significantly corroded. Magnetometers are not able to detect nonferrous metals such as aluminum and brass.

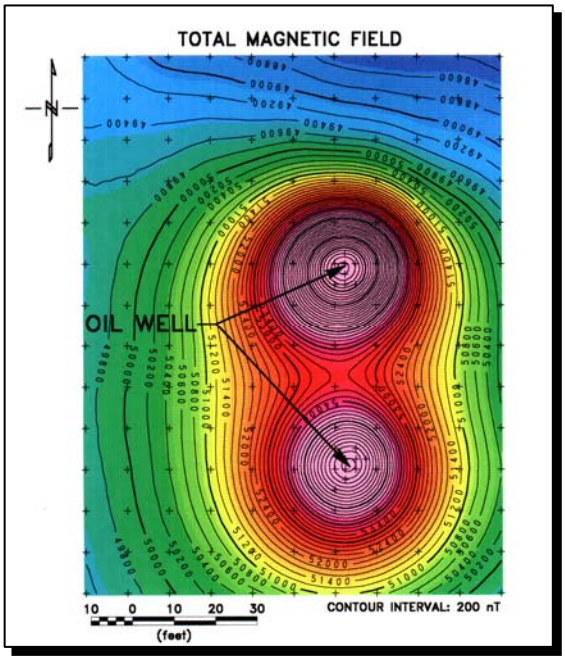
Geometrics G-858 Magnetometer

The magnetic method is typically used to:

- Locate abandoned steel well casings
- Locate buried tanks and pipes
- Locate pits and trenches containing buried metallic debris
- Detect buried unexploded ordnance (UXO)
- Map old waste sites and landfill boundaries
- Clear drilling locations
- Map basement faults and geology
- Investigate archaeological sites



Magnetic Survey to Locate Pits Containing Buried Metallic Containers



Magnetic Survey to Locate Abandoned Oil Wells

1124 Olympic Drive, Corona, California 92881, ph. 951-549-1234, fx. 951-549-1236, www.geovision.com

ATTACHMENT B: GEOSYNTEC DAILY FIELD REPORT

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DAILY FIELD REPORT

PROJECT: Edison Park Geotech Support		
LOCATION: Huntington Beach, California	PROJECT NO.: SC1369	TASK NO.: 03
DESCRIPTION: Geophysical Oil Well Locating Survey	CONTRACTOR: GEOVision	
DAY OF WEEK: Tuesday	DATE: July 18, 2023	
WEATHER: Sunny, Low 64°F High 82°F		

Time	Field Work Activities
0700	S. Upadhyaya (Geosyntec) arrived on site at the Edison Park and met with GEOVision crew E. Feldman and E. Vasquez.
0705	Geosyntec and GEOVision discussed health and safety.
0710	GEOVision started the geophysical oil well locating survey at the northeastern corner of the Edison Park using the Geometrics G858 cesium magnetometer. Other equipment used included Fisher metal detector and Ground Penetrating Radar (GPR).
0730-0945	GEOVision detected strong anomalies that were identified as the potential location of the two oil wells. GEOVision collected magnetic data around the center of the identified approximate locations of the two wells and surveyed the approximate location of the two oil wells using GPS units. GEOVision also marked the approximate centers of the wells in the field using stakes/whiskers (flushed to ground).
0945	GEOVision completed the survey.
1000	GEOVision departed the site. S. Upadhyaya (Geosyntec) measured straight line distances to the oil wells from atleast three fixed objects and removed the “No Parking” signs per City’s request.
1030	Geosyntec departed the site.
Hours on-site: 3.5 hrs; Travel time: 0.5 hrs	

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DAILY FIELD REPORT

PROJECT: Edison Park Geotech Support		
LOCATION: Huntington Beach, California	PROJECT NO.: SC1369	TASK NO.: 03
DESCRIPTION: Geophysical Oil Well Locating Survey	CONTRACTOR: GEOVision	
DAY OF WEEK: Tuesday	DATE: July 18, 2023	
WEATHER: Sunny, Low 64°F High 82°F		

Approximate Inferred Oil Well #1 location (looking west)

Approximate Inferred Oil Well #2 location (looking south)

Geophysical survey being performed using the magnetometer at Oil Well #1 location (looking south)

Geophysical survey being performed using the Fisher metal detector around the Oil Well #2 area.

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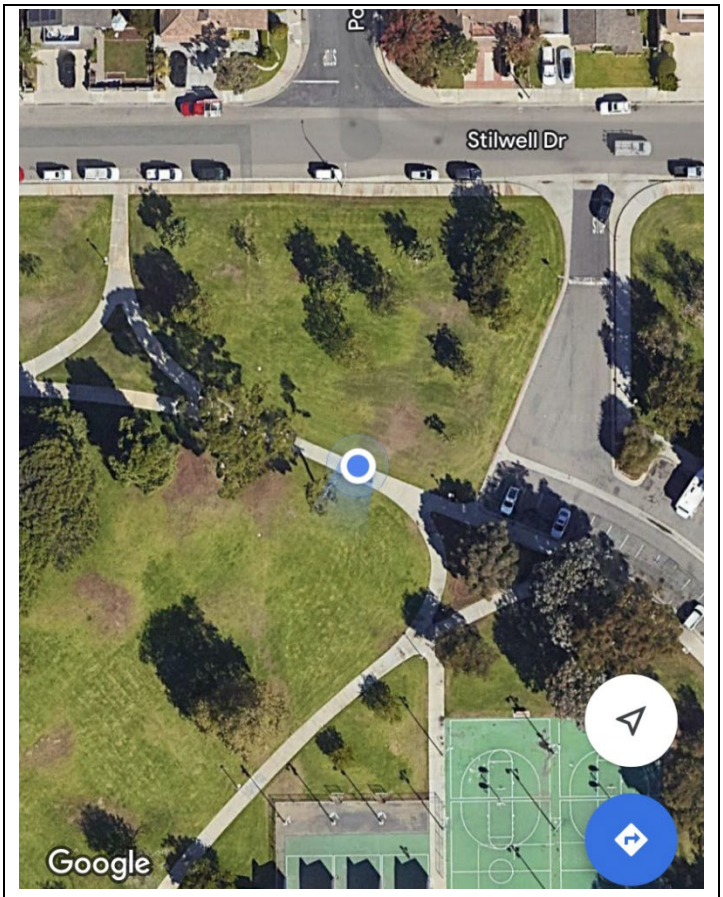
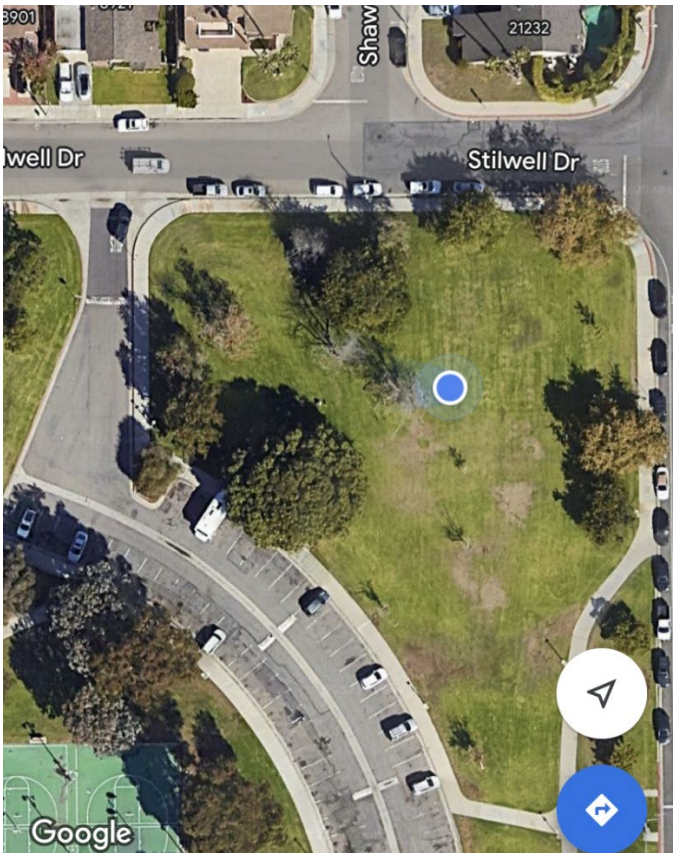
DAILY FIELD REPORT

PROJECT: Edison Park Geotech Support		
LOCATION: Huntington Beach, California	PROJECT NO.: SC1369	TASK NO.: 03
DESCRIPTION: Geophysical Oil Well Locating Survey	CONTRACTOR: GEOVision	
DAY OF WEEK: Tuesday	DATE: July 18, 2023	
WEATHER: Sunny, Low 64°F High 82°F		



Approximate inferred location of Oil Well #2



Approximate inferred location of Oil Well #1