Clifton

20 August 2021 **File CG3418 E09**

Suncor Energy Products Partnership

Additional Environmental Installations Report
Hounsfield Heights Adjacent 1620 14 Avenue NW, Calgary Alberta 9445

PROFESSIONAL ENGINEER ALBERTA
DANIEL BUDAI
24/08/21

PROFESSIONAL GEOLOGIST ALBERTA
DAVID G. PRITCHARD
#55585
2021-08-24

Prepared by:
Daniel Budai, P.Eng.
Environmental Engineer

Reviewed by:
Stephen d'Abadie, P.Eng., P.Biol.
Project Manager

Reviewed by:
David Pritchard, P.Geol.
Director, Environmental Services

PERMIT TO PRACTICE
CLIFTON ENGINEERING GROUP INC.
RM SIGNATURE:
RM APEGA ID #: 55585
DATE: 2021-08-24
PERMIT NUMBER: P014800
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Distribution List

Recipient	Date	Revision No.	By	Sent Via	Document Type	Description	No. of Hard Copies
Clifton Engineering Group Inc.	25 August 2021	1	SD	E-mail	PDF	Final Report	0
Suncor Energy Inc.	25 August 2021	1	SD	E-mail	PDF	Final Report	0
Alberta Environment and Parks – Barbara Mcewen, Rick McClelland, Craig Knaus and EAS Communications	25 August 2021	1	SD	E-mail	PDF	Final Report	0
City of Calgary – Tyson Allan	25 August 2021	1	SD	E-mail	PDF	Final Report	0
Alberta Health Services – David Crowe	25 August 2021	1	SD	E-mail	PDF	Final Report	0
Hounsfield Heights Briar Hill – Beacon, Plume Committee and General Manager	25 August 2021	1	SD	E-mail	PDF	Final Report	0
HHLG – Gary Molnar	25 August 2021	1	SD	E-mail	PDF	Final Report	0
Linda Barron	25 August 2021	1	SD	E-mail	PDF	Final Report	0
Clifton Engineering Group Inc.	25 August 2021	1	SD	E-mail	PDF	Final Report	0
Clifton Engineering Group Inc.	25 August 2021	1	SD	E-mail	PDF	Final Report	0
Suncor Energy Inc.	25 August 2021	1	SD	E-mail	PDF	Final Report	0

Executive Summary

Clifton Engineering Group Inc. (“Clifton”) is pleased to present this Additional Environmental Installations Report (the “Report”) prepared for Suncor Energy Products Partnership (“Suncor EPP”). The Report describes in detail the activities in the Hounsfield Heights community (the “Site”) within the City of Calgary conducted by Clifton in November and December 2020 as a part of the soil vapour sampling program refinement at the Site. Described additional installations were based on the conclusions and recommendations stated in the Clifton Associates Ltd.: *Soil Vapour Monitoring Report, Summer 2019, Hounsfield Heights and North Hill Mall, Calgary, Alberta* report dated 1 June 2019, and soil vapour sampling data available from additional environmental monitoring and sampling carried out as a part of the Risk Management and Contingency Plan in June and July 2020. These recommendations for the soil vapour sampling refinement at the Site were approved by Alberta Environment and Parks (AEP) for implementation in November 2020.

The soil vapour analytical laboratory results collected during the March 2019 sampling event showed that vapour migration from groundwater or soil in the vicinity of soil vapour sampling point SV32 might be a potential active exposure pathway of concern for indoor vapour inhalation. Based upon those findings, Clifton implemented the additional Risk Management and Contingency Plan soil vapour sampling, which includes an additional environmental investigation focused on the potentially affected private properties near SV32.

Soil vapour samples collected at SV32 on 10 June 2020, and 6 July 2020 again recorded exceedances for several CoPC concentrations in soil vapour.

In view of the available soil vapour sampling data at the Site, Clifton proposed a refinement/expansion of the environmental monitoring and sampling network in the immediate vicinity of SV32 to address the following environmental data gaps:

- Incomplete soil vapour concentrations delineation in the area around SV32;
- Insufficient understanding of the relationship between groundwater contamination in water-bearing strata closest to the surface in this portion of the Site (Unit 3) and soil vapour concentration; and
- Inability to investigate if the underground natural gas utility line to the west of SV32 might present a preferential pathway for soil vapour intrusions.

To rectify these data gaps, Clifton proposed installation of additional 4 soil vapour sampling points and 2 groundwater monitoring wells completed in Unit 3.

The proposed additional environmental installations were successfully concluded on 22 December 2020 using methodology described in detail in Section 4.0 of the Report. In Clifton's opinion, these installations will make a significant contribution to addressing identified environmental data gaps related to the repeated soil vapour concentration exceedances recorded in this portion of the Site.

Table of Contents

Appendices

List of Tables

1.0 Introduction

Clifton Engineering Group Inc. (“Clifton”) is pleased to present this Additional Environmental Installations Report (the “Report”) prepared for Suncor Energy Products Partnership (“Suncor EPP”). The Report describes in detail the activities in the Hounsfield Heights community (the “Site”) within the City of Calgary conducted by Clifton in November and December 2020 as a part of the soil vapour sampling program refinement. The described additional installations were based on the conclusions and recommendations stated in the Clifton Associates Ltd. *Soil Vapour Monitoring Report, Summer 2019, Hounsfield Heights and North Hill Mall, Calgary, Alberta* dated 1 June 2019, and soil vapour sampling data available from additional environmental monitoring and sampling carried out as a part of the Risk Management and Contingency Plan in June and July 2020. These recommendations for the soil vapour sampling refinement at the Site were approved by Alberta Environment and Parks (AEP) for implementation in November 2020.

2.0 Project Background

Since 1998, site investigations have revealed the presence of Petroleum Hydrocarbons (“PHCs”) in the subsurface soils and groundwater beneath City of Calgary properties in the Hounsfield Heights community in Calgary, Alberta. The source of the PHCs is interpreted to be a former gasoline station on the property formerly owned by Sears located at the North Hill Shopping Centre as stipulated in the Revised Remediation Plan (Version 3.0). Evidence suggests that gasoline may have leaked from underground fuel storage tanks prior to their removal in the mid-1990s when the gasoline station was decommissioned.

As a part of the Site Management approach, a community-wide soil vapour sampling program has been carried out by Clifton since 2016. The sampling program at the Site is conducted in accordance with the Clifton Associates Ltd. *Sears Canada Inc. Revised Soil Vapour Monitoring Program (Update Fall 2016), Hounsfield Heights and North Hill Mall, Calgary, Alberta* document approved by AEP (the “Regulator”), using an established network of soil vapour sampling points at the Site.

Soil vapour inhalation is currently the only potentially active exposure pathway at the Site that might lead to a deleterious effect for human health. Soil vapour sampling at the Site should thus continue until the exposure risk to the residents at the Site can be considered eliminated.

A total of 43 soil vapour sampling points are currently installed at the Site. Of these, three soil vapour points were developed as nested sampling points, providing a total of 49 soil vapour samples available at the Site. Except for three sampling points installed on private residential properties, all installations are within the City of Calgary-owned Right-Of-Ways. The soil vapour sampling network at the Site approved by

the Regulator covers both areas to the north of 11th Avenue NW (a total of 17 points), and to the south of 11th Avenue NW (a total of 26 points).

The 2015 Human Health Risk Assessment conducted by Intrinsik Environmental Sciences included detailed investigation of the vapour inhalation pathway for human receptors present at the Site for both soil and groundwater and compared the results against the Residential/Parkland Land Use Guidelines (Hounsfield Heights area) and Commercial Land Use Guidelines (North Hill Mall area) as defined by AEP Tier 1 and 2 Guidelines. The following Contaminants of Potential Concern (CoPC) in soil and groundwater at the Site were identified for the vapour inhalation pathway:

- Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
- Petroleum Hydrocarbons (PHC) fraction F1-BTEX (C_6—C_{10});
- PHC fraction F2 (C_{10}-C_{16});
- Naphthalene; and
- 1,2 Dichloroethane (1,2-DCA).

A total of eight community-wide sampling events have been conducted to-date providing soil vapour concentration distribution. With the exception of soil vapour sampling point SV32, there were no recorded exceedances for the investigated CoPCs in soil vapour compared either to the Site-specific Soil Vapour Quality Guidelines (SVQG) protective of indoor air quality, soil vapour remediation guidelines protective of indoor air quality for a commercial building, or to the increased sampling frequency trigger values during these sampling events. Due to the fact that there have never been any exceedances of the SVQG in areas north of 11th Avenue, the program now only includes sampling of probes on 11th Avenue and to the south of 11th Avenue.

The soil vapour analytical laboratory results collected during the March 2019 sampling event showed that vapour migration from groundwater or soil in the vicinity of soil vapour sampling point SV32 might be an active exposure pathway of concern for indoor vapour inhalation. Based upon those findings, Clifton implemented the additional Risk Management and Contingency Plan (RMCP) soil vapour sampling, which included an additional environmental investigation focused on the potentially affected private properties near SV32.

Soil vapour samples collected at SV32 on 10 June 2020 and 6 July 2020 again recorded exceedances for several CoPC concentrations in soil vapour.

3.0 Rationale for Additional Environmental Installations at the Site

In view of the soil vapour sampling data summarized above, Clifton proposed a refinement/expansion of the environmental monitoring and sampling network in the immediate vicinity of SV32 to address the following environmental data gaps:

- Incomplete soil vapour concentration delineation in the area around SV32;
- Insufficient understanding of the relationship between groundwater contamination in water-bearing strata closest to the surface in this portion of the Site (Unit 3) and soil vapour concentrations; and
- Uncertainty as to whether the underground natural gas utility line to the west of SV32 might present a preferential pathway for soil vapour intrusions.

To rectify these data gaps, Clifton proposed the installation of an additional four soil vapour sampling points and two groundwater monitoring wells in the uppermost water-bearing unit. Scientific rationale for the proposed installations is summarized in the following tables:

Table 3.1 – Summary of Proposed Additional Soil Vapour Monitoring Points

ID	Location	Estimated TD (m bgs)	Reason for Installation
SV401	Laneway, N of SV32	1.25-1.50	Soil Vapour Delineation
SV402	Laneway, Gas Pipe Corridor	1.25-1.50	Pathway Investigation
SV403	S curb of 10th Ave, NW	1.0-1.25	Soil Vapour Delineation
SV404	N curb of 10th Ave. NW	1.0-1.25	Soil Vapour Delineation

Table 3.2 – Summary of Proposed Additional Groundwater Monitoring Points

ID	Location	Estimated TD (m bgs)	Reason for Installation
MW5001	Laneway	Up to 5.0	Groundwater contamination concentrations, upgradient of SV32
MW5002	Laneway	Up to 5.0	Groundwater contamination concentrations, downgradient of SV32

These recommendations for the soil vapour sampling refinement at the Site were approved by the Regulator for implementation in November 2020.

4.0 Installation Methods

4.1 Permitting

All soil vapour sampling points were installed within the City of Calgary-owned Right-Of-Ways (ROWs). The extent of the installation area is shown in Appendix A.

In order to satisfy The City of Calgary (City) requirements for the environmental installations within the City-owned ROWs, Clifton applied for and was granted the following permits for the installations:

- Utility Line Assignment;
- License of Occupation Amending Agreement ID 54138-0;
- Excavation Permits;
- ENMAX Overhead Power Line Clearance;
- Street Use Permit from the City of Calgary; and
- City Parks Department Approval.

In accordance with the valid ground disturbance regulations, prior to installations, utility locates were cleared with Alberta One Call and a private locating company. Where required, daylighting techniques were used to uncover existing utilities at the Site before installation.

4.2 Safety

Installation activities were conducted in accordance with the POST work safety management system required to be applied at all Suncor-owned projects. A Site-specific safety plan was prepared by Clifton's Project Manager for the installation. The safety plan focused on hazard mitigation by using safe separation of an active installation site from local vehicular and pedestrian traffic, local traffic control, and appropriate Personal Protective Equipment (PPE). Local traffic control measures were pre-approved by the City prior to the commencement of the work.

The POST Project Safety Clearance application was prepared and submitted to Suncor for approval as a part of the work preparation. Clifton personnel and all sub-contractors taking part in the installation work were POST-certified.

This general safety plan was complemented daily by a field Job Safety Assessment (JSA) conducted at the beginning of workday and whenever changing work conditions required adjustments to a JSA.

4.3 Soil Vapour Sampling Probe Installation

Clifton installed the permanent soil vapour sampling probes SV401, SV403 and SV404 in boreholes using a 4 in (101.6 mm) direct push drilling rig. Drilling equipment and personnel was provided by All Service Drilling Inc. Boreholes were advanced to a depth pre-determined in advance for each location based on the expected depth to the groundwater in the installation location.

For soil vapour sampling installation point SV402, the depth to the investigated utility was a determining factor for the total installation depth. This installation borehole was opened using a hydrovac daylighting technique.

After reaching the final borehole depth for the soil vapour probes, coarse sand (4-10) was used to surround the screened portion of the soil vapour probe and was extended at least 0.15 m above the screened zone. A competent bentonite seal was subsequently placed above the screened zone using dry granular bentonite (16 mesh) hydrated in at least three lifts with distilled water. The created seal needed to have a minimum thickness of 0.3 m. The remainder of the borehole annulus was then sealed by mixing bentonite powder with water to create thick slurry (Volclay grout). Each sampling point was assigned a unique identification code, as shown on Figure 4, Appendix A. The installations were completed with a 4 in. (101.6 mm) flush-mounted cast aluminum heavy duty cover set in concrete to protect the monitoring point.

"As-Built" installation schematics for the soil vapour sampling points are presented in Appendix B.

4.4 Soil Vapour Sampling Probe Construction

Materials used for soil vapour sampling probe construction are inert, non-porous, and with minimal sorption, in order to avoid material-induced bias of soil vapour measurements, especially with respect to Volatile Organic Compounds (VOCs). Stainless-steel and polytetrafluoroethylene (Teflon, PTFE) were the primary materials used for the monitoring probe construction, as follows:

- A permanent soil vapour intake point constructed of stainless-steel mesh and equipped with a PTFE-constructed protective umbrella;
- An appropriate length of ¼ in. (6.35 mm) diameter PTFE tubing pre-tested by the laboratory for presence of VOCs; and
- A brass compression fitting with a needle valve installed at the upper end of the tubing with female Swagelok-type connector for a sampling train connection.

All metal parts used in the construction were washed before use in distilled water to remove any residual chemicals, which might have been used during manufacturing.

4.5 Groundwater Monitoring Well Installation

As a part of the installation work, two groundwater monitoring wells were installed upgradient and downgradient of the assumed groundwater flow direction relative to SV32. The objective was to install wells screened within the groundwater bearing unit closest to the surface at the locations.

Boreholes were advanced using a direct-push drilling rig. Clifton conducted soil logging in approximately 0.3 m increments during the drilling, with a focus on the local soil stratigraphy and soil wetness. Based on the field soil logging, both wells were installed to a Total Depth (TD) of 3.05 m bgs, with a screen length of 1.5 m. Boreholes were developed as groundwater monitoring wells by installing PVC Schedule 40 tubing with a diameter of 50 mm, sand pack around the screened portion and bentonite seal above the sand pack. The remainder of the borehole annulus was then sealed by mixing bentonite powder with water to create thick slurry (Volclay grout). The installation was completed with a 4 in. (101.6 mm) flush-mounted cast aluminium heavy duty cover set in concrete to protect the sampling point.

Borehole logs are presented in Appendix C. Post-installation survey data for the newly-installed soil vapour sampling points and groundwater monitoring wells can be found in Appendix D.

5.0 Conclusions

The additional environmental installations described in this Report were successfully concluded on 22 December 2020 in accordance with the proposed installation plan and observing scientific rationale behind the installations. These installations will contribute to addressing the identified environmental data gaps related to the repeated soil vapour concentration exceedances recorded in this portion of the Site.

These installations will be monitored on a regular basis as a part of the community-wide regular semi-annual and RMCP-based (where required) soil vapour and groundwater monitoring and sampling events at the Site.

6.0 Closure

This Report was prepared by Clifton Engineering Group Inc. for the account of Suncor Energy Products Partnership. The material in it reflects Clifton Engineering Group Inc. best judgment available to it at the time of preparation. Any use that a third party makes of this Report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Clifton Engineering Group Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Report.

This Report has been prepared in accordance with generally accepted engineering practice common to the local area. No other warranty expressed or implied is made.

This report focuses exclusively on soil vapour quality at the investigated areas. No conclusions should be made based on this report regarding any concentrations of substances in other areas of the Site. Other Contaminants of Concern may be present at the Site in areas that were not investigated. Clifton Engineering Group Inc. accepts no responsibility for any deficiencies or inaccuracies in the information provided in this report that are the direct result of intentional or unintentional misrepresentations, errors or omissions of the persons interviewed, or information reviewed.

No environmental site investigation or remediation can wholly eliminate uncertainty regarding environmental conditions in connection with a property. This investigation is intended to reduce, but not eliminate the uncertainty regarding environmental conditions. Conclusions regarding the condition of the Site do not represent a warranty that all areas within the site and beneath structures are of the same quality as those sampled. Further, contamination could also exist in forms not indicated by the investigation.

The work was based in part upon the environmental quality guidelines and regulations in effect when the work was begun. Future regulatory changes may require reassessment of the findings of this investigation.

Reference List

Alberta Environment and Parks. (2019). *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*

Alberta Environment and Parks. (2019). *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*

British Columbia Ministry of Environment: *Technical Guidance on Contaminated Sites 4,* version 1, September 2010

Canadian Council of Ministers of the Environment: *A Protocol for the Derivation of Soil Vapour Quality Guidelines for Protection of Human Exposures via Inhalation of Vapors*, 2014

Clifton Associates Ltd.: *Subsurface Investigation - Mall Area and Hounsfield Heights,* 22 January 2016

Clifton Engineering Group Inc.: *Revised Remediation Plan (Version 3.0), Hounsfield Heights and Mall Areas, 1620-14th Avenue NW, Calgary, Alberta,* 03 March 2021.

Clifton Associates Ltd.: *Sears Canada Inc., Revised Soil Vapour Monitoring Program (Update Fall 2016), Hounsfield Heights and North Hill Mall, Calgary, Alberta*, 20 October 2016.

Clifton Associates Ltd.: *Sears Canada Inc., Soil Vapour Monitoring Points Installation Report, Hounsfield Heights and North Hill Mall, Calgary, Alberta*, 20 October 2016.

Intrinsik Environmental Sciences Inc.: *Draft Report*, *Human Health and Ecological Risk Assessment for the Hounsfield Heights Community and North Hill Mall, Calgary, Alberta,* December 2015

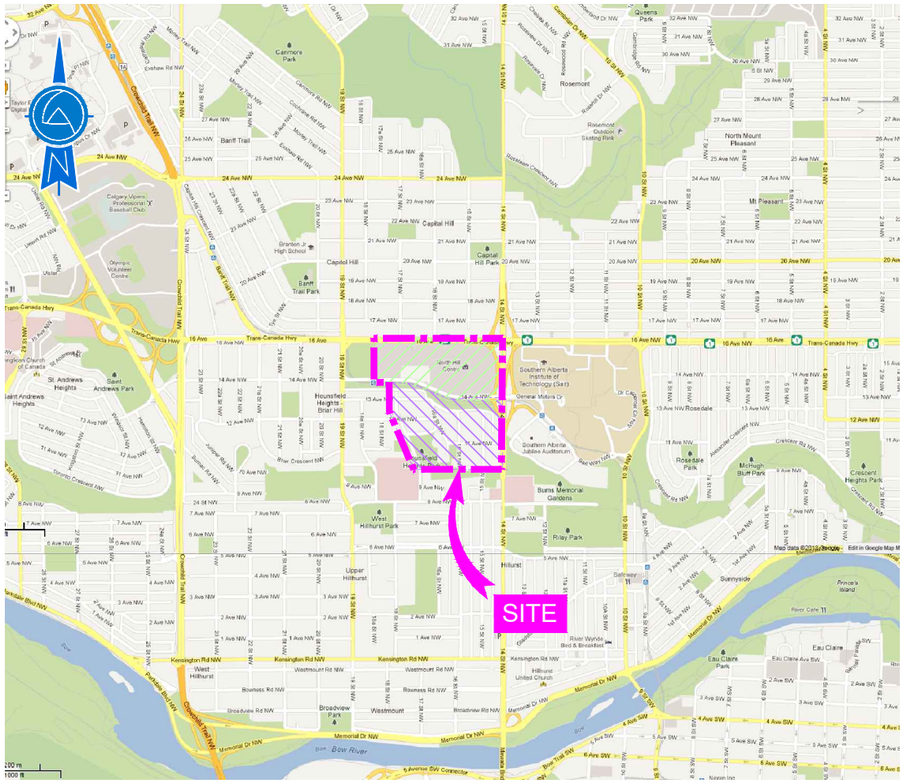
Health Canada: *Federal Contaminated Site Risk Assessment in Canada, Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites*, September 2010

Johnson, P.C., & R. Ettinger: *Heuristic Model for predicting the Intrusion Rate of Contaminant Vapours into Buildings*, 1991

The United States Environmental Protection Agency. *Compendium of Methods for the Determination of Compounds in Ambient Air, Second Edition, Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GCMS).* EPA/625/R96/01b, 1999.

Appendix A
Figures

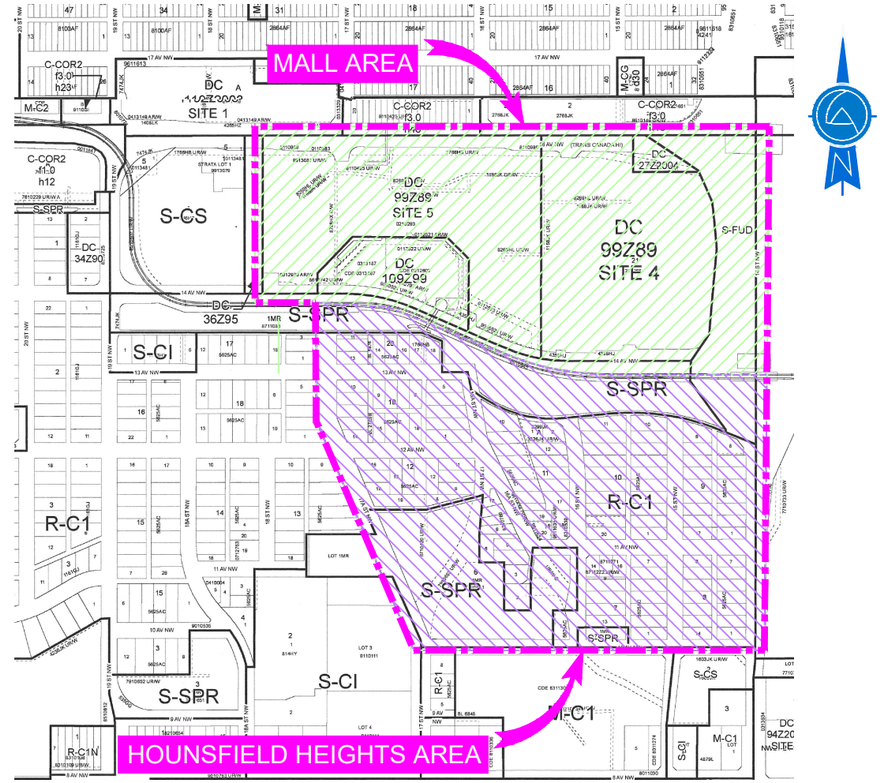
Clifton



GENERAL SITE LOCATION

SCALE 1:30,000

0 0.5 1.0 1.5 km



SURROUNDING LAND USE

SCALE 1:7,500

0 100 200 300 m

LEGEND:

- SITE BOUNDARY
- MALL AREA
- HOUNSFIELD HEIGHTS AREA
- CITY OF CALGARY BY-LAW ZONING

LAND USE DISTRICTS:

RESIDENTIAL - CONTEXTUAL ONE DWELLING DISTRICT	R-C1
MULTI-RESIDENTIAL - CONTEXTUAL LOW-PROFILE DISTRICT	MC-1
MULTI-RESIDENTIAL - CONTEXTUAL GRADE-ORIENTED DISTRICT	MC-G
COMMERCIAL - CORRIDOR 2 DISTRICT	C-COR2
SPECIAL PURPOSE - SCHOOL, PARK, AND COMMUNITY RESERVE DISTRICT	S-SPR
SPECIAL PURPOSE - COMMUNITY INSTITUTION DISTRICT	S-CI
SPECIAL PURPOSE - COMMUNITY SERVICE DISTRICT	S-CS
SPECIAL PURPOSE - FUTURE URBAN DEVELOPMENT DISTRICT	S-FUD
DIRECT CONTROL DISTRICT	DC

NOTES:

1. CITY OF CALGARY ROAD MAP PROVIDED BY CANADIAN CARTOGRAPHICS CORPORATION, 2012.
2. LAND USE MAP PROVIDED BY THE CITY OF CALGARY.

ENGINEER: Clifton

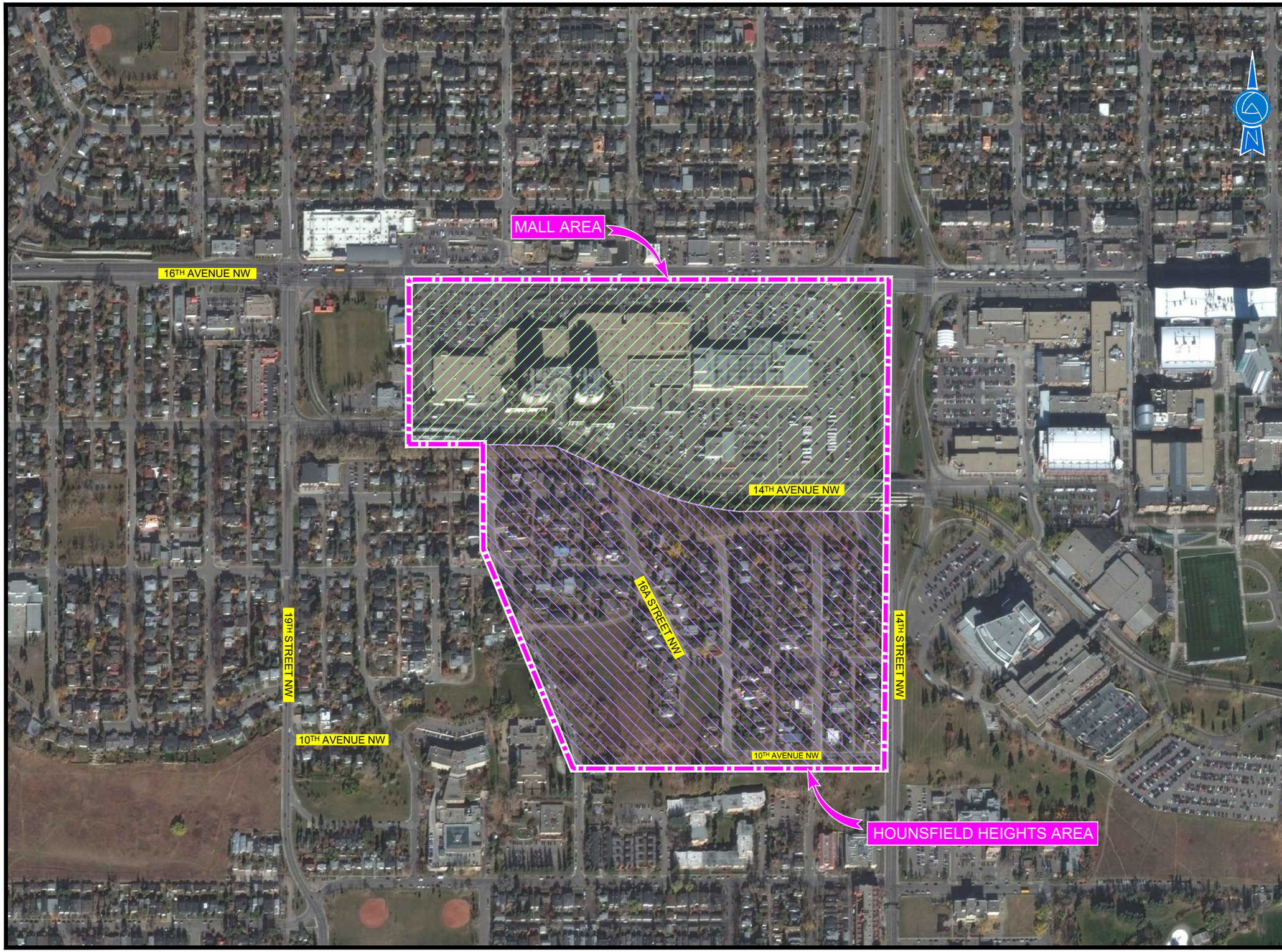
CLIENT: SUNCOR ENERGY PRODUCTS PARTNERSHIP

PROJECT: ADDITIONAL ENVIRONMENTAL INSTALLATIONS REPORT HOUNSFIELD HEIGHTS, CALGARY 9445, ALBERTA

TITLE: SITE LOCATION AND SURROUNDING LAND USE

DESIGNED	SCALE	DATE
	AS SHOWN	2021-02-09
DRAWN: DMP	PROJECT NO. CG3418E09	FIG. 1
CHECKED: DB	FILE NO. CG3418E09-1	

A:\Projects\Calgary\CG3418E09\CURRENT DRAWINGS\CG3418E09-1.dwg, 02/10/2021 2:23:51 PM



LEGEND:

- SITE BOUNDARY
- MALL AREA
- HOUNSFIELD HEIGHTS AREA

NOTES:

1. AERIAL PHOTOGRAPH PROVIDED BY GOOGLE EARTH PRO. AIR PHOTO DATE: OCT 23, 2015.

0 50 100 150 200 250 m

SCALE 1:5000 PLOT SIZE 11x17

ENGINEER: Clifton

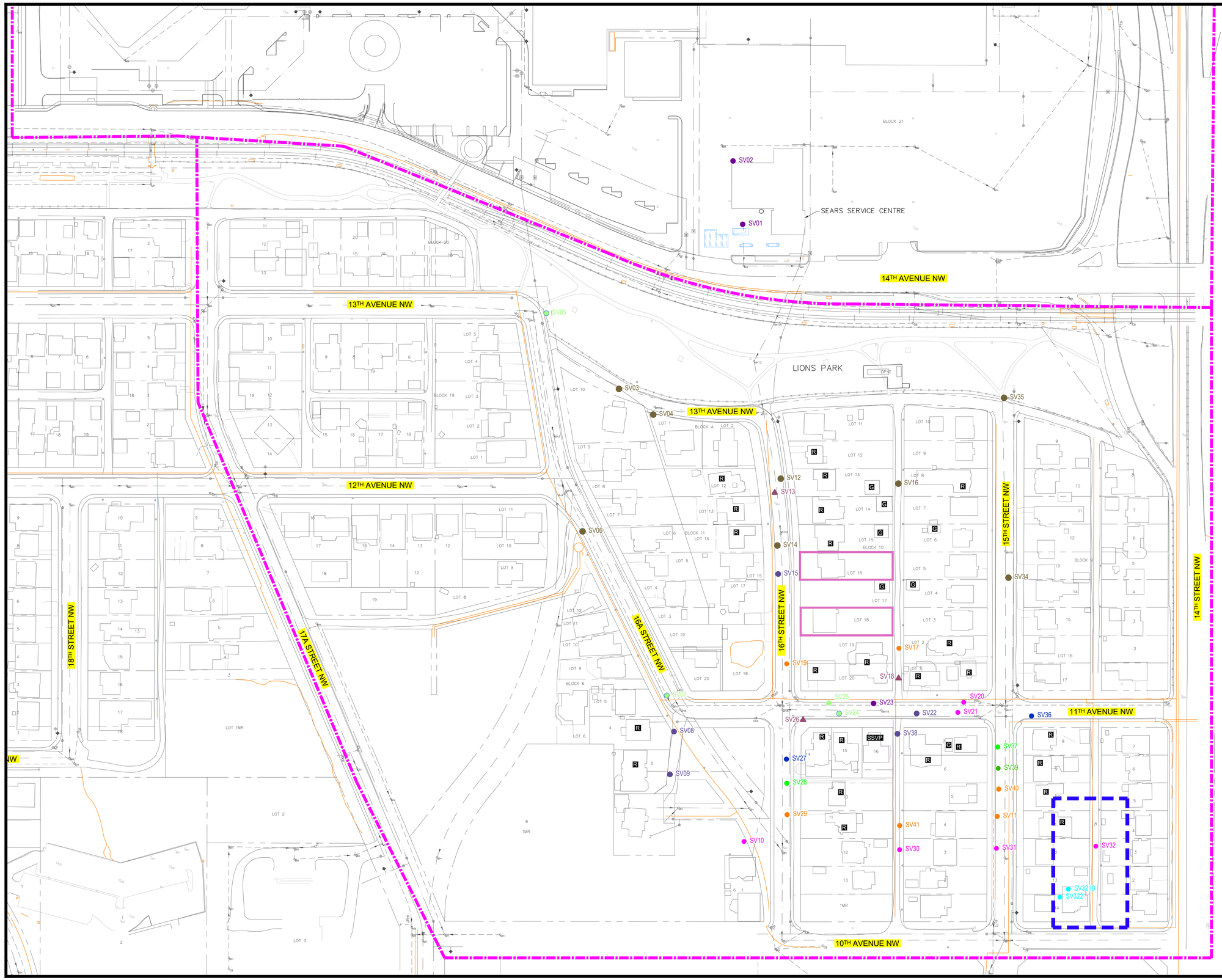
CLIENT: SUNCOR ENERGY PRODUCTS PARTNERSHIP

PROJECT: ADDITIONAL ENVIRONMENTAL INSTALLATIONS REPORT HOUNSFIELD HEIGHTS, CALGARY 9445, ALBERTA

TITLE: SITE AND SURROUNDING PROPERTIES

DESIGNED	SCALE 1:5000	DATE 2021-02-09
DRAWN DMP	PROJECT NO. CG3418E09	FIG. 2
CHECKED DB	FILE NO. CG3418E09-2	

A:\Projects\Calgary\CG3418E09\CURRENT DRAWINGS\CG3418E09-2.dwg, 02/10/2021 9:57:36 AM



LEGEND

SITE BOUNDARY	
LRT TRACKS	
FENCE LINE	
LEGAL LINE	
FORMER FACILITY/FEATURE	
BUILDING	
SOIL VAPOUR PROBES INSTALLED AT 1.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 1.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 2.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 2.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 3.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 3.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 4.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 4.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 5.0 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 5.5 mbgs	SV#
SOIL VAPOUR PROBES INSTALLED AT 6.0 mbgs	SV#
NESTED SOIL VAPOUR SAMPLING POINT	SV#
ADDITIONAL SOIL VAPOUR SAMPLING POINTS INSTALLED IN MAY 2019	SV#
RESIDENTIAL STRUCTURES WITH REPORTED UNUSUAL FEATURES (EARTHEN FLOORS)	
RESIDENTIAL	R
DETACHED GARAGE	G
SUB-SLAB SOIL VAPOUR POINT	SSVP

UTILITY LINES & SYMBOLS

NATURAL GAS LINE	
SANITARY SEWER	
STORM SEWER	
WATER	
CATCH BASIN	
FIRE HYDRANT	
LIGHT STANDARD	
MANHOLE	
UTILITY POLE	
INSTALLATION AREA	

NOTES:

1 DRAWING COMPILED FROM PLANIMETRIC FILES SUPPLIED BY THE CITY OF CALGARY (INCLUDING U/G UTILITIES) & FROM SITE ASSESSMENT INFORMATION. ADDITIONAL REFERENCES FROM SEACOR ENVIRONMENTAL ENGINEERING INC., DRAWINGS 149-5A11.DWG, 149-5A6.DWG.

0 10 20 30 40 50 m

PLOT SIZE 22x34

ENGINEER

Clifton

CLIENT

SUNCOR ENERGY PRODUCTS PARTNERSHIP

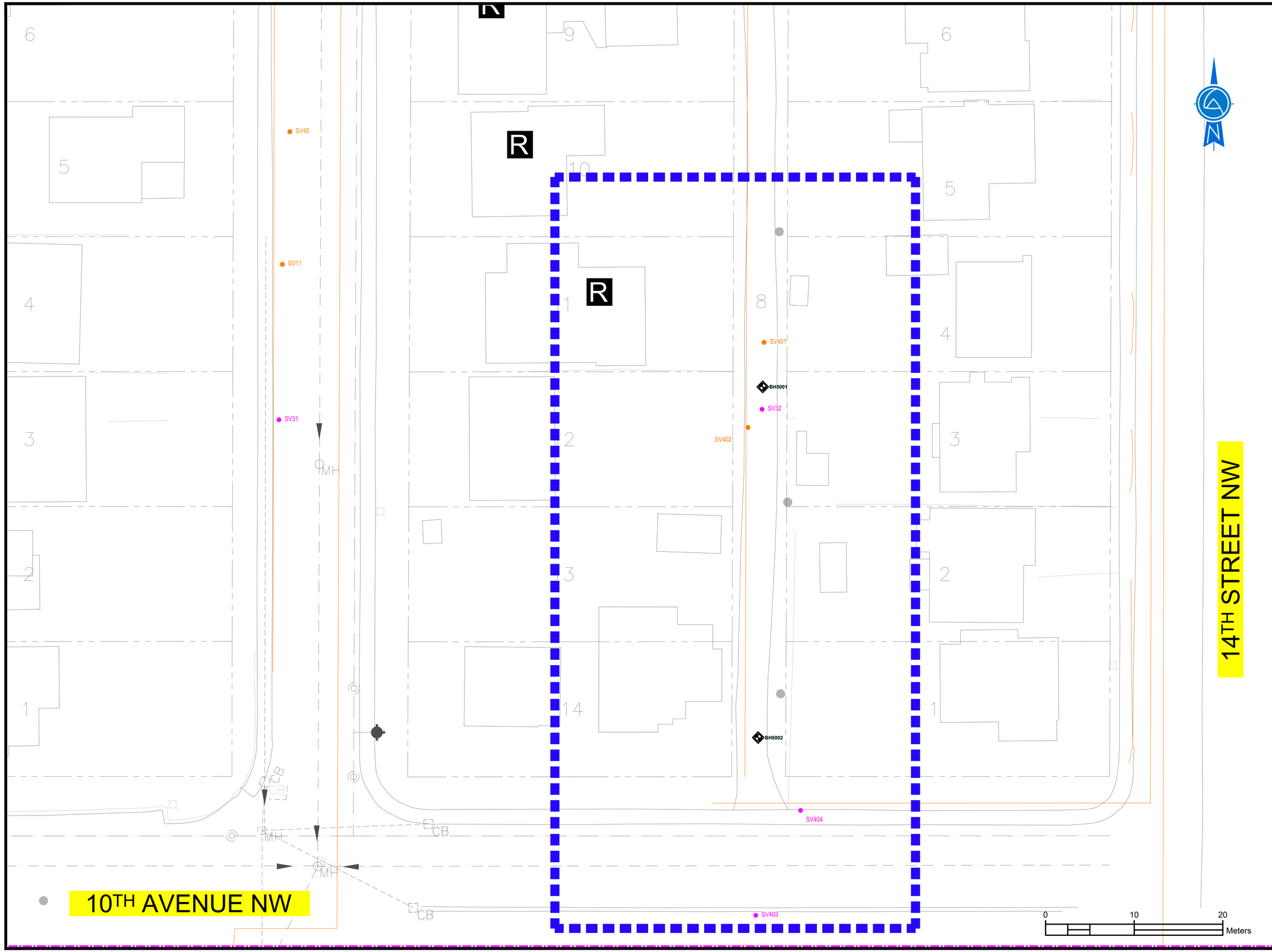
PROJECT

ADDITIONAL ENVIRONMENTAL INSTALLATIONS REPORT
HOUNSFIELD HEIGHTS
CALGARY 9445, ALBERTA

TITLE

SOIL VAPOUR SAMPLING POINTS
INSTALLATION LAYOUT
(AS OF NOVEMBER 2020)

DESIGNED	SCALE 1:1000	DATE 2021-08-19
DRAWN DMP	PROJECT NO. CG3418E09	FIG. 3
CHECKED DB	FILE NO. CG3418E09-3	



LEGEND

SITE BOUNDARY
LRT TRACKS
FENCE LINE
LEGAL LINE
FORMER FACILITY/FEATURE
BUILDING
GROUNDWATER SAMPLING WELL
SOIL VAPOUR PROBES INSTALLED AT 1.0 mbgs — SV#
SOIL VAPOUR PROBES INSTALLED AT 1.5 mbgs — SV#
NESTED SOIL VAPOUR SAMPLING POINT — SV#
ADDITIONAL SOIL VAPOUR SAMPLING POINTS INSTALLED IN MAY 2019 — SV#
RESIDENTIAL STRUCTURES WITH REPORTED UNUSUAL FEATURES (EARTHEN FLOORS)

RESIDENTIAL — R
DETACHED GARAGE — G
SUB-SLAB SOIL VAPOUR POINT — SSVP

UTILITY LINES & SYMBOLS

NATURAL GAS LINE
SANITARY SEWER
STORM SEWER
WATER
CATCH BASIN
FIRE HYDRANT
LIGHT STANDARD
MANHOLE
UTILITY POLE

INSTALLATION AREA

NOTES:

1 DRAWING COMPILED FROM PLANIMETRIC FILES SUPPLIED BY THE CITY OF CALGARY (INCLUDING U/G UTILITIES) & FROM SITE ASSESSMENT INFORMATION. ADDITIONAL REFERENCES FROM SEACOR ENVIRONMENTAL ENGINEERING INC., DRAWINGS 149-5A11.DWG, 149-5A6.DWG.

ENGINEER: Clifton

CLIENT: SUNCOR ENERGY PRODUCTS PARTNERSHIP

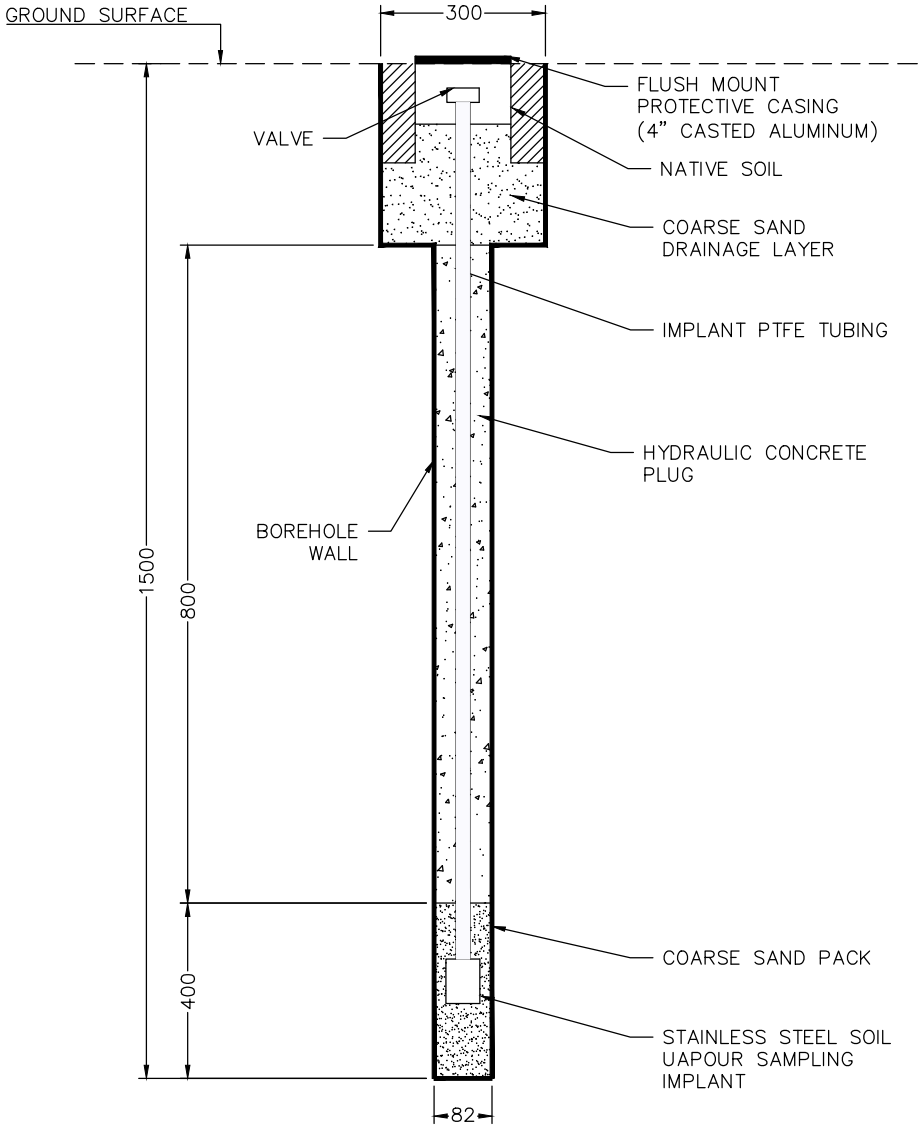
PROJECT: ADDITIONAL ENVIRONMENTAL INSTALLATIONS REPORT
HOUNSFIELD HEIGHTS
CALGARY 9445, ALBERTA

TITLE: DETAILED INSTALLATION LAYOUT

DESIGNED	SCALE 1:200	DATE 2021-08-19
DRAWN DMP	PROJECT NO. CG3418E09	FIG. 4
CHECKED DB	FILE NO. CG3418E09-4	

Appendix B
“As-Built” Cross Sections

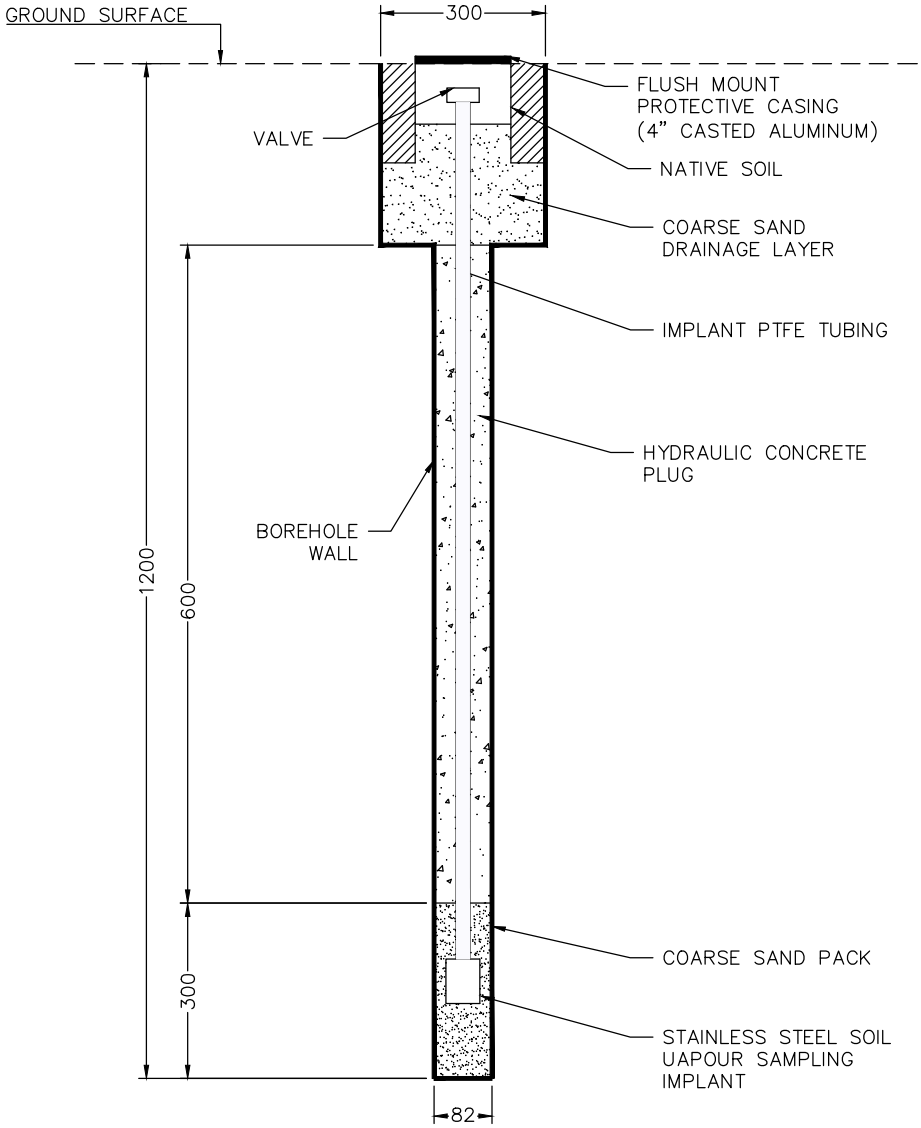
Clifton



ENGINEER	PROJECT	SCALE
Clifton	ADDITIONAL ENVIRONMENTAL INSTALLATIONS REPORT HOUSFIELD HEIGHTS CALGARY 9445, AB	NTS
CLIENT SUNCOR ENERGY PRODUCTS PARTNERSHIP	TITLE SOIL VAPOUR SAMPLING POINT SV401 "AS BUILT" CROSS SECTION	DRAWING NO. 1

PROJECT NO.	FILE NO.	DATE
CG3418E09	CG3418E09-1 -SV401.dwg	2021-08-19

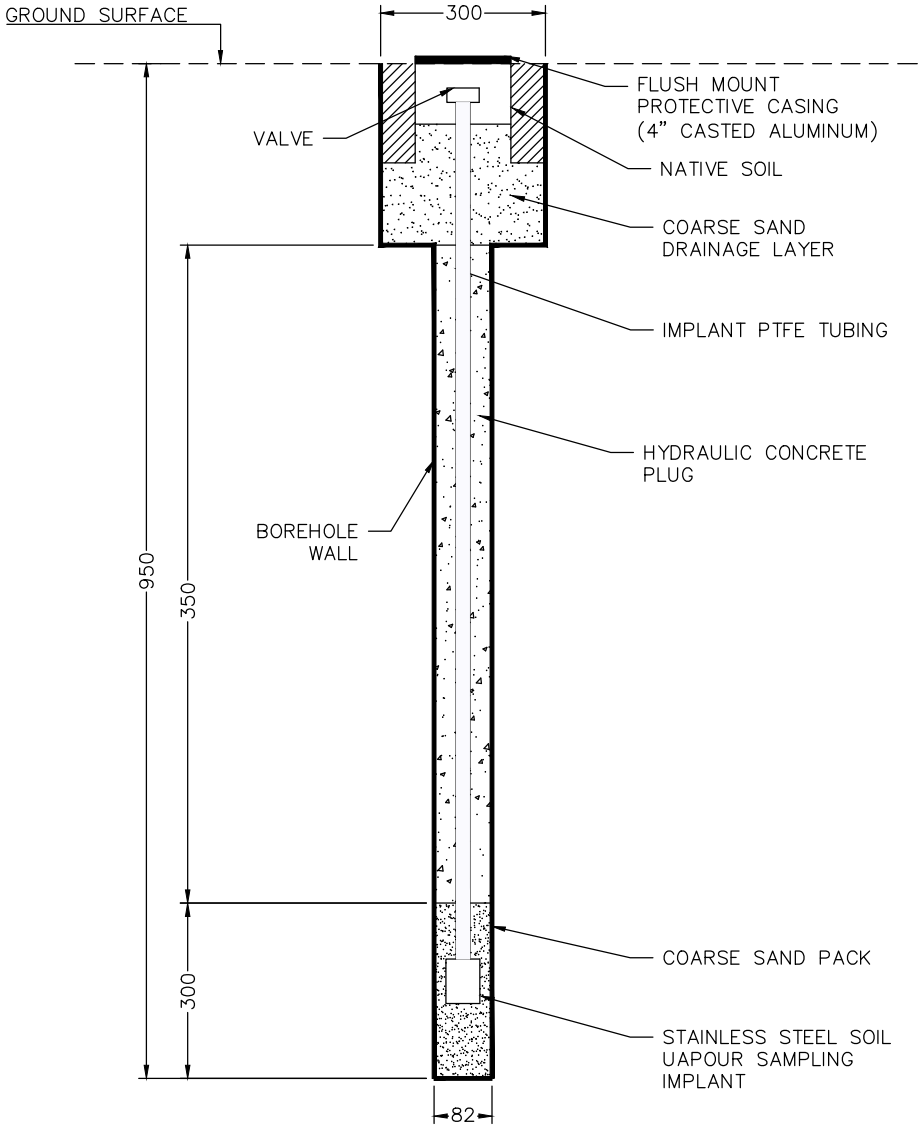
Z:\Shared\Civil Design and Drafting\Projects\Calgary\CG3418E09\!CURRENT DRAWINGS\CG3418E09-1 -SV401.dwg



ENGINEER	PROJECT	SCALE
Clifton	ADDITIONAL ENVIRONMENTAL INSTALLATIONS REPORT HOUSFIELD HEIGHTS CALGARY 9445, AB	NTS
CLIENT SUNCOR ENERGY PRODUCTS PARTNERSHIP	TITLE SOIL VAPOUR SAMPLING POINT SV402 "AS BUILT" CROSS SECTION	DRAWING NO. 2

PROJECT NO.	FILE NO.	DATE
CG3418E09	CG3418E09-2 -SV402.dwg	2021-08-19

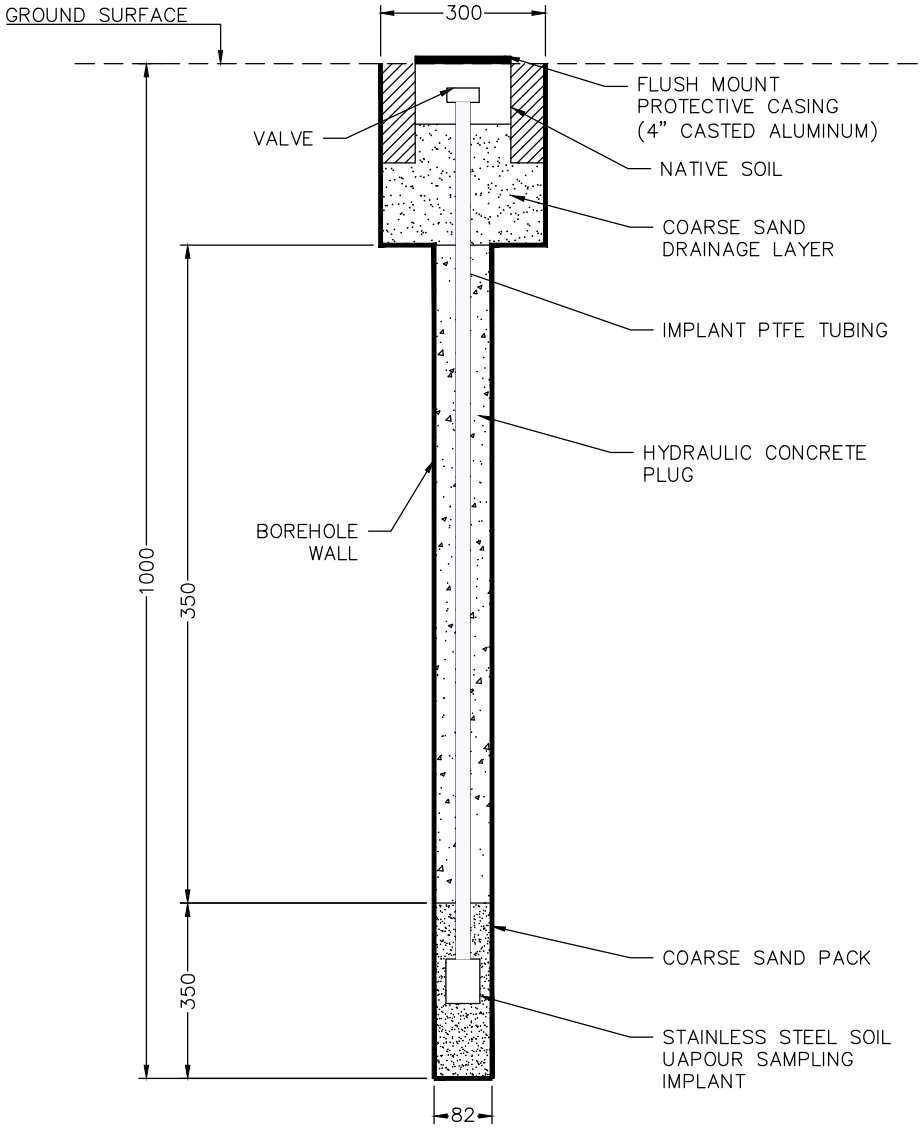
Z:\Shared\Civil Design and Drafting\Projects\Calgary\CG3418E09\!CURRENT DRAWINGS\CG3418E09-2 -SV402.dwg



ENGINEER	PROJECT	SCALE
Clifton	ADDITIONAL ENVIRONMENTAL INSTALLATIONS REPORT HOUSFIELD HEIGHTS CALGARY 9445, AB	NTS
CLIENT SUNCOR ENERGY PRODUCTS PARTNERSHIP	TITLE SOIL VAPOUR SAMPLING POINT SV403 "AS BUILT" CROSS SECTION	DRAWING NO. 3

PROJECT NO.	FILE NO.	DATE
CG3418E09	CG3418E09-3 -SV403.dwg	2021-08-19

Z:\Shared\Civil Design and Drafting\Projects\Calgary\CG3418E09\!CURRENT DRAWINGS\CG3418E09-3 -SV403.dwg



ENGINEER	PROJECT	SCALE
Clifton	ADDITIONAL ENVIRONMENTAL INSTALLATIONS REPORT HOUSFIELD HEIGHTS CALGARY 9445, AB	NTS
CLIENT SUNCOR ENERGY PRODUCTS PARTNERSHIP	TITLE SOIL VAPOUR SAMPLING POINT SV404 "AS BUILT" CROSS SECTION	DRAWING NO. 4

PROJECT NO.	FILE NO.	DATE
CG3418E09	CG3418E09-4 -SV404.dwg	2021-08-19

Z:\Shared\Civil Design and Drafting\Projects\Calgary\CG3418E09\!CURRENT DRAWINGS\CG3418E09-4 -SV404.dwg

Appendix C
Borehole Logs

Clifton

Env BH m elev CAL v09.tdf

Clifton Associates

BOREHOLE LOG

Borehole: MW5001

Client:	Suncor	Northing:	5658380.96	Date:	22 Dec 2020
Project:	Hounsfield Heights	Easting:	-6688.86	Driller:	Geoprobe 7822
Location:	1502 - 10 Ave. NW	Ground Elev.:	1069.47	Method:	DP + SSA
Project No.:	CG3418 009	Top Casing Elev.:	1069.38	Logged by:	AM

Elev.(masl) Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	EC Reading dS/m (0 – 20)	OVA ppm (10 – 10000)	PID ppm (10 – 10000)	Monitoring Well Construction Detail
0		GRAVEL: sandy, augered							Flush mount road box
		GRAVEL: sandy, dark brown, moist							
1069		CLAY: silty, low plasticity, firm to soft, dark brown to brown, moist to wet, uniform							Schedule 40 PVC pipe, 50 mm ID
		@0.9m getting wet							
1									Hydrated bentonite chips
1068									
2									20 - 40 filter sand
1067									1.5 m screen, 0.25 mm slotted PVC
3		End of hole @ 3.05m							Hole Dia: 152 mm

Env BH m elev CAL v09.tdf

Clifton Associates

BOREHOLE LOG

Borehole: MW5002

Client:	Suncor	Northing:	5658341.37	Date:	22 Dec 2020
Project:	Hounsfield Heights	Easting:	-6689.37	Driller:	Geoprobe 7822
Location:	1502 - 10 Ave. NW	Ground Elev.:	1065.83	Method:	DP + SSA
Project No.:	CG3418 009	Top Casing Elev.:	1065.68	Logged by:	AM

Elev.(masl) Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	EC Reading dS/m (0 – 20)	OVA ppm (10 – 10000)	PID ppm (10 – 10000)	Monitoring Well Construction Detail
0		GRAVEL: sandy, augered							Flush mount road box
		GRAVEL: sandy, brown, moist, loose							
		CLAY: silty, low plasticity, firm to soft, light brown, moist to wet, uniform							Schedule 40 PVC pipe, 50 mm ID
1065		@0.85m getting wet							
1									Hydrated bentonite chips
									20 - 40 filter sand
1064									
2									1.5 m screen, 0.25 mm slotted PVC
		@2.3m wet change to moist							
1063									
3									Hole Dia: 152 mm
		End of hole @ 3.05m							

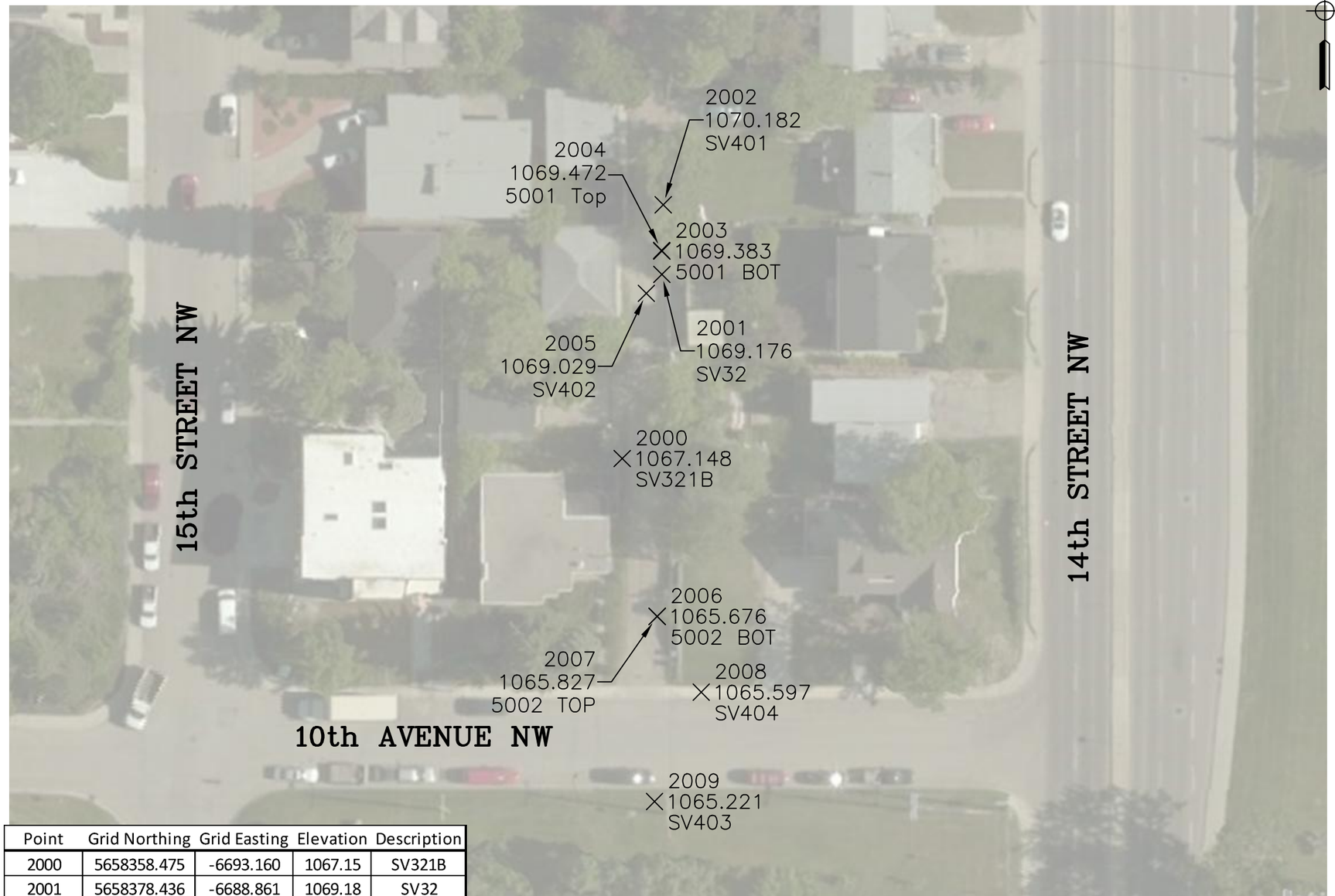
Appendix D
Legal Survey Data

Clifton

CITY OF CALGARY, ALBERTA

PLAN SHOWING SURVEY OF

MONITORING WELL LOCATIONS



Point	Grid Northing	Grid Easting	Elevation	Description
2000	5658358.475	-6693.160	1067.15	SV321B
2001	5658378.436	-6688.861	1069.18	SV32
2002	5658385.975	-6688.715	1070.18	SV401
2003	5658380.955	-6688.861	1069.38	5001 BOT
2004	5658381.029	-6688.890	1069.47	5001 Top
2005	5658376.378	-6690.539	1069.03	SV402
2006	5658341.366	-6689.373	1065.68	5002 BOT
2007	5658341.363	-6689.364	1065.83	5002 TOP
2008	5658333.150	-6684.593	1065.60	SV404
2009	5658321.302	-6689.653	1065.22	SV403

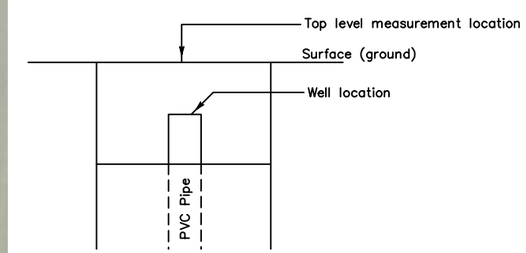
SCALE: 1:500 (0 2.5 5 10 25 50 METRES)

BY: NATHAN PRINS, A.L.S. 2021

LEGEND

Distances shown are in metres and decimals thereof.
Distances shown on curved boundaries are Arc distances.
Elevations are derived from ASCM 399014 = 1090.736
Bearings are Grid and derived from GPS observations.
The Coordinate System used for this plan is:

Datum	– North American Datum 1983
Projection	– 3° Transverse Mercator
Reference Meridian	– 114° West Longitude
Combined Scale Factor	– DRAWING IS GRID



DETAIL
Typical measurement locations

The survey was performed on Jan 08, 2021

Certified Correct this 8th Day of Jan, 2021

Alberta Land Surveyor

ALBERTA LAND SURVEYORS' ASSOCIATION PERMIT NUMBER P 078 TRONNES GEOMATICS INC.

CAUTION – PRIOR TO ANY CONSTRUCTION UNDERGROUND FACILITIES NEED TO BE LOCATED BY:

ALBERTA 1 CALL
CALL BEFORE YOU DIG 1-800-242-3447

CAD File: 19-1195-Grid.dwg

TRONNES GEOMATICS INC. 6135 – 10th Street S.E., Calgary, Alberta T2H 2Z9; 403-207-0303; File: 19-1195