SUB-SLAB DEPRESSURIZATION SYSTEM (SSDS)
PILOT STUDY AND DESIGN REPORT

520 Albany Avenue
Kingston, Ulster County, New York

December 17, 2013

DT CONSULTING SERVICES, INC.
1291 Old Post Road
Ulster Park, New York 12487
(845) 658-3484 phone/(845) 658-3320 fax
dtconsulting@hvc.rr.com

December 17, 2013

Krista Scibelli
111 Whalesback Road
Red Hook, New York 12571

RE: SUB-SLAB DEPRESSURIZATION SYSTEM PILOT STUDY AND DESIGN REPORT
520 Albany Avenue
Kingston, Ulster County, New York

Dear Mrs. Scibelli:

DT Consulting Services, Inc. (DTCS) is pleased to present the attached Sub-slab Depressurization System (SSDS) Pilot Study and Design Report as generated for the above referenced site. As required, a copy of this report will be forwarded to the New York State Department of Environmental Conservation (NYSDEC) for their review and comment. The necessity for further action is at the discretion of the NYSDEC.

If you have any questions regarding the enclosed, please feel free to contact me at (845) 658-3484. DTCS thanks you for the opportunity to work with you on this project.

Sincerely,
DT CONSULTING SERVICES, INC.

Deborah J. Thompson
Senior Geologist / Project Manager

Cc: E. Moore, P.E./NYSDEC Region III

DT CONSULTING SERVICES, INC.

SUB-SLAB DEPRESSURIZATION SYSTEM

PILOT STUDY AND DESIGN REPORT

Pertaining to:

520 Albany Avenue
Kingston, Ulster County, New York

Prepared for:

Krista Scibelli
111 Whalesback Road
Red Hook, New York 12571

Prepared by:

Ms. Deborah J. Thompson
Senior Geologist/Project Manager
DT CONSULTING SERVICES, INC.
1291 Old Post Road
Ulster Park, New York 12487

Date: December 17, 2013

DT CONSULTING SERVICES, INC.

TABLE OF CONTENTS

FIGURES

TABLES

ATTACHMENTS

1.0 INTRODUCTION/SITE INFORMATION

DT Consulting Services, Inc. (DTCS) was initially contracted by Krista Scibelli, property owner of 520 Albany Avenue, Kingston, Ulster County, New York (heretofore referenced as the site or subject property) to perform investigative-remedial actions on-site to quantify subsurface conditions and remediate previously detected soil contamination, respectively. Historically, the subject property was utilized as a dry cleaning establishment from the late 1950s – 1980s. The site was renovated in 2004, having been completely updated as a used car service and sales outlet. According to facility representatives, no known underground storage tanks have ever been employed on site. A site location map and a site (base) plan (Figures 1 and 2, respectively) are included for your reference.

The approximate 0.66-acre property is presently improved with a single-story masonry construction office/retail building with approximately 2,579 square feet of space with paved parking areas. The property is presently utilized by East Chester Auto Sales as a retail automobile sales and service center. The site is bounded by Albany Avenue and Quick Check Gasoline/Convenience Store the north-northwest, single family residences directly to the south, Wrentham Street and L. T. Begnal Motor Company to the east, while Tri-Star Auto Sales, Inc. - Auto Tech is present to the west. Town roadways adjoining the site include Albany Avenue to the north-northwest and Wrentham Street to the east. Site topography is generally level and at grade with Albany Avenue. Potable water and wastewater disposal are reportedly provided by the local municipality.

2.0 SITE BACKGROUND/INVESTIGATIVE WORK PERFORMED

On February 4, 2013, DTCS was on-site to perform a subsurface investigation. While performing the field survey, soil contamination was encountered as

displayed by stained soils, a petroleum film and positive field readings with a Photoionization Detector or PID. This material was documented along the southwest corner of the site structure, directly down gradient of several 55-gallon drums utilized by the tenant, Eastchester Auto, to store waste oil. On account of the contamination encountered, DTCS notified the New York State Department of Environmental Conservation (NYSDEC) and Spill Number 12-15279 was generated for the site. Upon review of field data with the NYSDEC, the Department requested remediation of the petroleum contaminated soils documented during the February 2013 survey. Subsequent remediation (April 22, 2013) of the source materials has been performed to remedy the impacts to soil and groundwater quality. The removal and ultimate off-site disposal of 34.82 tons of contaminated soils and 1,241 gallons of captured groundwater appears to have remediated this site impact. The Department concurred, and officially closed the spill number on September 4, 2013.

While conducting further investigation on the subject parcel in June 2013, it became apparent that historical dry cleaning operations have had an impact to the subsurface environment. To further delineate and quantify the compounds of concern, additional borings were advanced for the purpose of define the chlorinated solvent plume within subsurface materials including soil, soil gas and groundwater beneath the site. Based upon the results of this investigation, DTCS presented the following findings concerning subsurface quality:

- *Soil Chemistry*

Soil samples analyzed during the investigation showed some volatile organic compounds (VOCs) which exceeded Track I or Unrestricted Use Soil Cleanup Objectives or SCOs (NYSDEC, Part 375-6.8(a), December 2006). Of those VOCs reported, three compounds including Tetrachloroethylene (maximum 20,000 ppb) and its partial degradation daughter products including cis-1,2-Dichloroethylene (maximum 3200 ppb), and Trichloroethylene (maximum 640 ppb) were found to exceed their respective Track I SCOs.

- *Groundwater Quality*

Laboratory analysis of the groundwater collected for analysis during the investigation revealed mainly non-detect sample concentrations for most all targeted VOCs. Seven compounds including 1,1-Dichloroethylene (maximum 9.9 ppb), 1,2,4-Trimethylbenzene (maximum 9.2 ppb), Chloroform (maximum 11 ppb), cis-1,2-Dichloroethylene (maximum 4,900 ppb), Ethyl Benzene (maximum 5.6 ppb), sec-Butylbenzene (maximum 5.1 ppb), Tetrachloroethylene (maximum 29,000 ppb), trans-1,2-Dichloroethylene (maximum 55 ppb) and Trichloroethene (maximum 1,300 ppb) were found to exceed their respective groundwater quality guidance values as referenced in NYSDEC Division of Water TOGS 1.1.1, June 1998.

- *Soil Gas Quality*

The results of soil vapor sampling indicate that eighteen VOCs are present within the four soil gas samples collected on-site. Soil vapor samples collected during the investigation showed significant detections of tetrachloroethylene in soil vapor at concentrations ranging from 34,000 -220,000 $\mu g/m^3$, trichloroethylene at concentrations ranging from 240 – 5,500 $\mu g/m^3$, cis-1,2-Dichloroethylene at concentrations ranging from 42 – 7,300 $\mu g/m^3$ and Chloroform at a concentration of 1,400 $\mu g/m^3$ within SG-2. All other laboratory reportable compounds were below US Environmental Protection Agency (EPA) OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (November 2002) and/or NYS DOH Final Guidance on Soil Vapor Intrusion (October 2006). The on-site vapors in these samples are consistent with solvents found in building materials and dry cleaning chemicals as well as hydrocarbon constituents.

- *Investigative Conclusions*

VOCs in soil and groundwater, like those detected during this investigation, tend to partition or volatilize into the vapor phase, fill the interstitial (void) spaces of the soil, and subsequently migrate in the vapor phase via diffusive and/or

advective forces towards an area of lower concentration or pressure, along the underground pathway(s) of least resistance. In undeveloped areas, migration of vapor-phase contaminants is towards the ground surface and into the ambient air. The presence of a building or other subsurface structure, however, can provide an alternative advective or diffusive "sink". Under pressurization within a building (relative to the ambient atmosphere) can create a significant negative pressure differential between the building/basement air and the surrounding soil, and induce the advective transport of vapor-phase contaminants towards and into the structure. The existence of a frost layer tends to exacerbate vapor phase intrusion during winter months, by temporarily eliminating the ground surface/ambient-air transport pathway. This is also when combustion furnaces will be in operation, and when ventilation will be at a minimum. Vapor phase intrusion may occur within slab-on-grade structures; similar in construction to what is found on-site. To mitigate the intrusion of potential vapors form any residual contamination, DTCS recommended the installation of an active Sub-Slab Depressurization System or SSDS. In addition to mitigating potential vapors, the SSDS may also provide an ancillary effect. Specifically, by venting soil gases contaminated by VOCs, a SSD system facilitates the mass removal of contaminants from subsurface media. Moreover, every cubic foot of vented soil gas has to be replaced by a cubic foot of air, resulting in an influx of oxygen into contaminated areas, which may facilitate the aerobic biodegradation of contaminants.

3.0 SUBSLAB DEPRESSURIZATION PILOT TESTING

Based upon the investigative results, DTCS proposes installation of a SSDS within the open garage space of the above referenced site. The following paragraphs present design activities for the sub-slab system.

3.1 Pre-Design Activities Conducted

With approval from the Department, diagnostic tests to investigate and evaluate the development of a negative pressure field via the inducement movement of soil gases beneath the slab were conducted by DTCS and Todd J. Syska, Inc. on October 8, 2013. The objective of communication test was to evaluate the potential radius of influence of a single sub-slab soil vapor extraction point. The test involved drilling a one-half-inch extraction hole through the concrete floor slab (approximately 5 inches thick) at a central location within the garage space to serve as an extraction point, with communication test points consisting of one-half-inch holes drilled through the floor slab at varying distances (ten, fifteen, twenty, and twenty-five feet) from the extraction point (see Figure 3 for locations). All monitoring points were sealed at the floor slab using rapid hardening cement. To impart a vacuum at the extraction point a commercial shop vacuum (Rigid, 6.5 HP, 16-gallons) was placed within the extraction point hole. DTCS subsequently conducted an ASD pilot-study by applying a vacuum at the extraction point (denoted as EP-1 & EP-2) and measuring the vacuum imparted at the other locations using a manometer, which reads both pressure (positive values) and vacuum (negative values) at a precision of 0.01 inches of water column (W.C.). Manometer readings for monitoring points A through G were taken before, during and after the application of vacuum. Results of the pilot-test are presented in Table 1 and on Figure 3. As shown, operation of the vacuum fan resulted in a net increase in the vacuum imparted at most of the monitoring points; shown as effective vacuum in Table 1. The minimum effective vacuum measured during the pilot-study was 0.01 in. W.C. which exceeds the minimum industry standard of 0.002 in W.C. for the mitigation of sub-slab soil vapor. Attached for your review as Figures 4 & 5 are negative pressure readings as recording during the SSDS pilot study denoted as Extraction Point EP-1/Test 2 and Extraction Point EP-2/Test 3 respectively.

3.2 SSDS Design

Two extraction points will be installed below the floor slab (at or adjacent to EP-1 & EP-2). These extraction points will be created by cutting through the concrete slab and excavating a six inch diameter hole, two feet deep. A two inch diameter ten slot screen, eighteen inches long, connected to an appropriate length of solid riser pipe, will be installed in the excavation which will then be backfilled with pea gravel. The cement will be repaired, as necessary, to restore the surface and create a tight seal where the riser pipe penetrates the slab.

The two extraction points will be interconnected to form a single two-inch pipe connected to the suction side of a "Rotron DR454M Regenerative Blower." This blower will provide the suction necessary to maintain the required vacuum under the floor slab. A performance/cut sheet for this blower has been placed in Attachment A for your review.

The Rotron blower will be mounted to the outside of the building on the back wall. The exhaust stack for the sub-slab system will be attached to the wall and extended to a height above the roof line of the building.

Sampling ports will be installed in the piping to facilitate the collection of air quality samples and for routine monitoring of the system.

A fresh air bleed valve will also be installed in the suction side piping. The purpose of this valve is to allow the introduction of diluted air into the system.

3.3 Operation, Maintenance, and Monitoring Requirements

An evaluation of the soil vapor data suggests that the discharge, upon initial startup, may exceed the maximum permitted level of volatile organic compounds

or VOCs. Should this occur; the fresh air bleed will be used to dilute the airstream to acceptable levels until the initial purge of the system is complete and discharge levels are within acceptable regulatory limitations. VOC emissions during the start-up phase would be expected to decline rapidly and are expected to be well below any air permitting thresholds within a relatively short time, thereby negating the need for long-term emission treatment and the application for an air pollution control permit.

If after 90 days data indicates that the discharge levels remain sufficiently elevated that dilution air is still required, Granulated Activated Carbon (GAC) will be installed on the discharge side of the Rotron blower to reduce emissions to acceptable levels.

The proposed monitoring locations, frequency and analytical parameters are as follows:

- Start-up testing would be conducted for each individual extraction well within 30 minutes of start-up of the SSDS. This testing would consist of initial extraction well vacuum measurements, photoionization detector (PID) readings, and sampling and analysis of the untreated vapor, as well as sampling and analysis of the treated final SSDS discharge. Collection and analysis of the vapor samples would be conducted using 20 minute, 1-liter SUMMA type air canisters, submitted for VOC analysis via USEPA test method TO-15. This data will be available within approximately five business days.

- Subsequent monitoring would be conducted to determine when dilution and/or treatment of extracted vapor is no longer necessary, and to support adjustments to the SSDS extraction rate based upon contaminant concentrations. Monitoring would include sampling for VOCs using SUMMA type air canisters, as well as recording of PID readings and

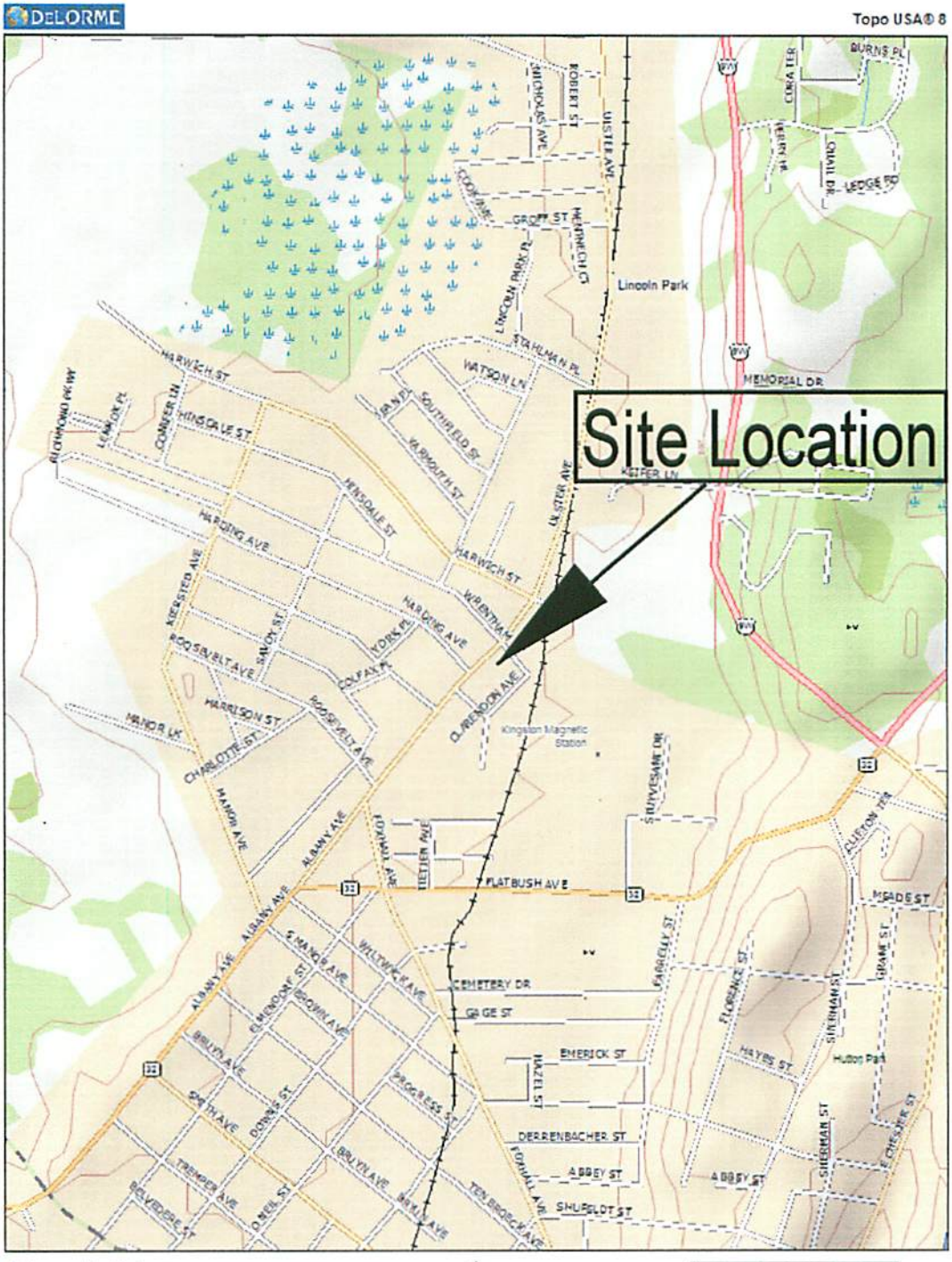
vacuum measurements at the extraction well sampling ports. This monitoring will be conducted weekly for the first four weeks of operation, monthly during months two and three; then revert to quarterly.

- Indoor air VOC monitoring will be conducted within the garage and office space monthly after system start-up to establish indoor air quality with the mitigation system in operation. Monitoring parameters of the indoor air will be the same as for the system stated above.

4.0 LIMITATIONS

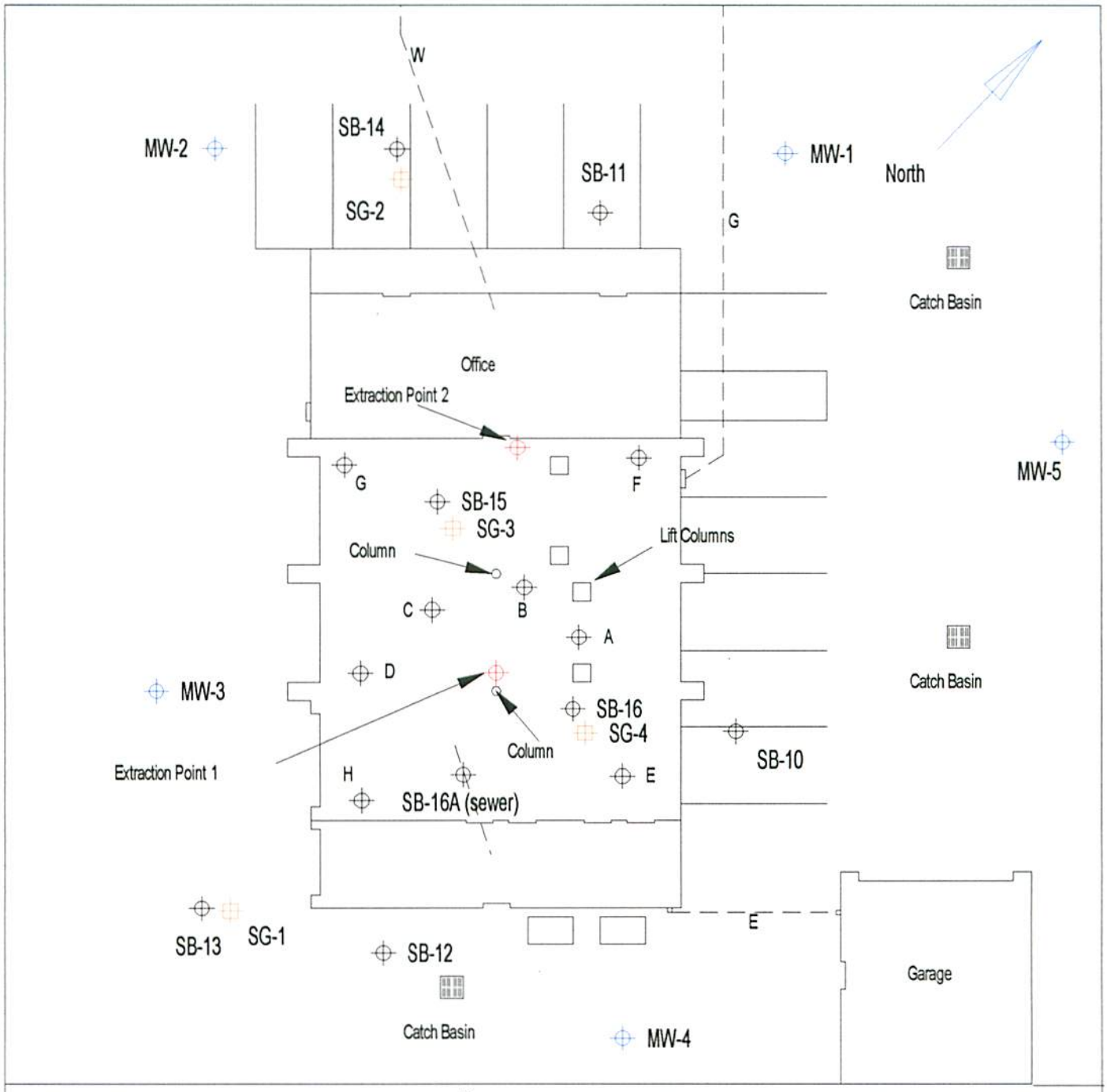
DTCS has prepared this assessment using reasonable efforts in each phase of its work to determine the extent of contamination within the locations of potential environmental concern. This report is not definitive, and should not be assumed to be a complete or specific definition of all conditions above or below grade. The conclusions/recommendations set forth herein are applicable only to the facts and conditions described at the time of this report.

FIGURES



DT Consulting Services, Inc.
1291 Old Post Road
Ulster Park, New York 12487
(845) 658-3484

Client:	Krista Scibelli		
Location:	520 Albany Avenue, Kingston, New York		
Title:	Site Location Map		Spill No: N/A
Scale:	Graphic	Drawn By: O.T.	Fig.#: 1



Key

0' 15' 30'

— — Underground Utilities

MW-XX Monitoring Well

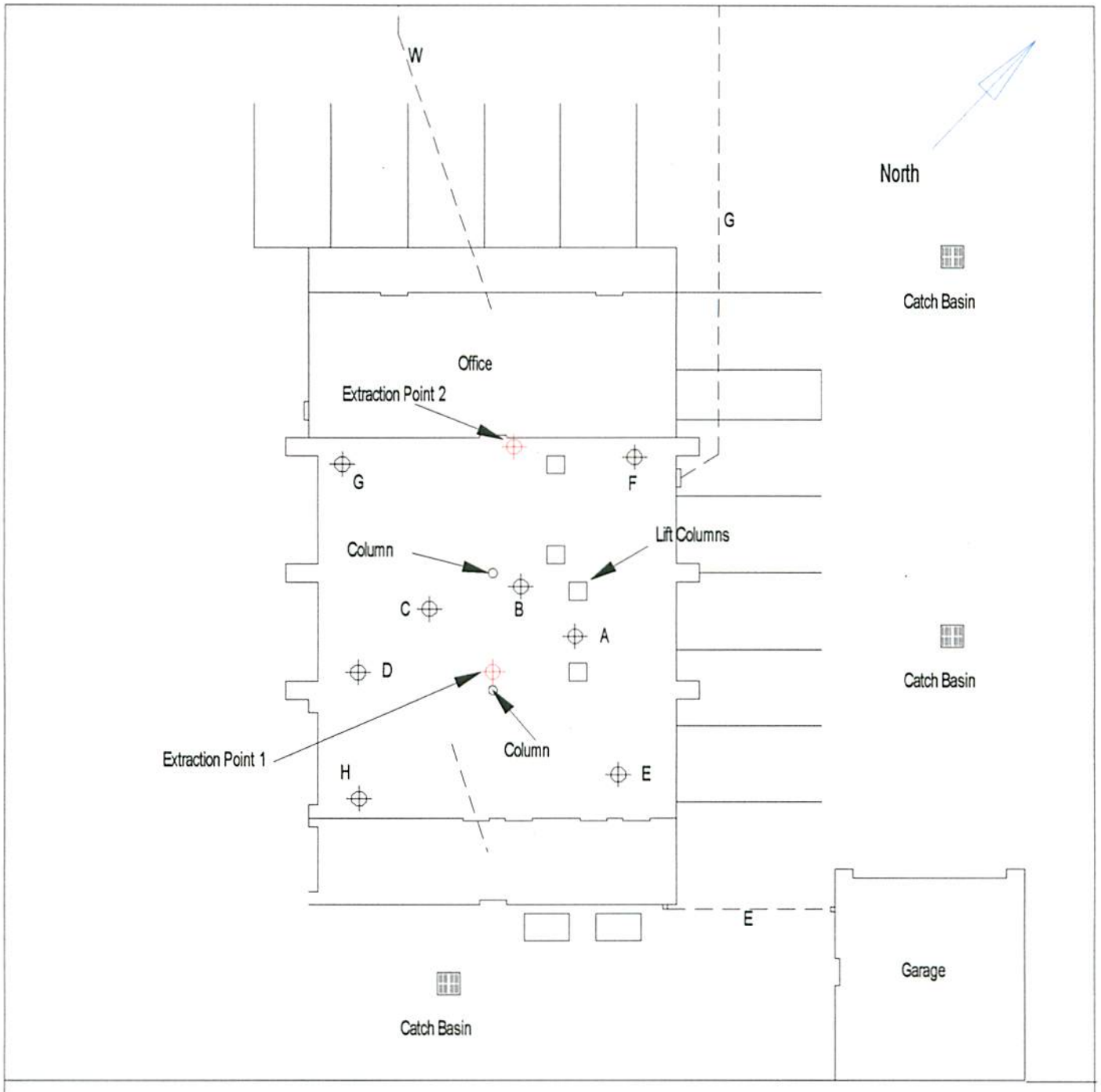
A-H Communication Test Points

SB-XX Soil Boring

SG-XX Soil Gas

DT Consulting Services, Inc.
1291 Old Post Road
Ulster Park, New York 12487
(845) 658-3484

Client: Krista Scibelli		
Location: 520 Albany Avenue, Kingston, New York		
Title: Site (base) Map		Spill No: N/A
Scale: Graphic	Drawn By: O.T.	Fig.#: 2



0' 15' 30'

Key

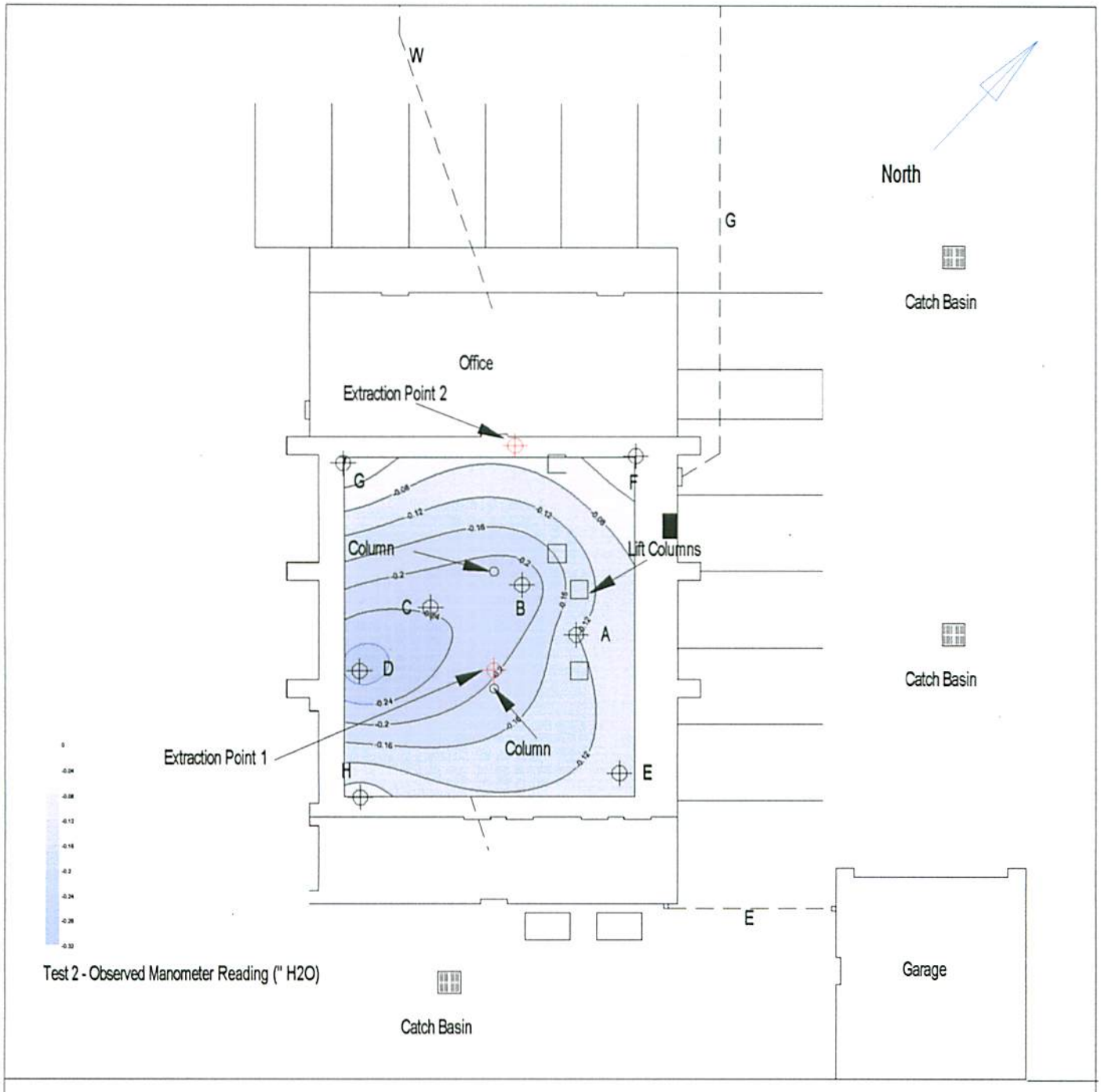
— — Underground Utilities

A-H Communication Test Points

SG-XX Soil Gas

DT Consulting Services, Inc.
1291 Old Post Road
Ulster Park, New York 12487
(845) 658-3484

Client:	Krista Scibelli		
Location:	520 Albany Avenue, Kingston, New York		
Title:	SSDS Monitoring Points		Spill No: N/A
Scale: Graphic		Drawn By: O.T.	Fig.#: 3



0' 15' 30'

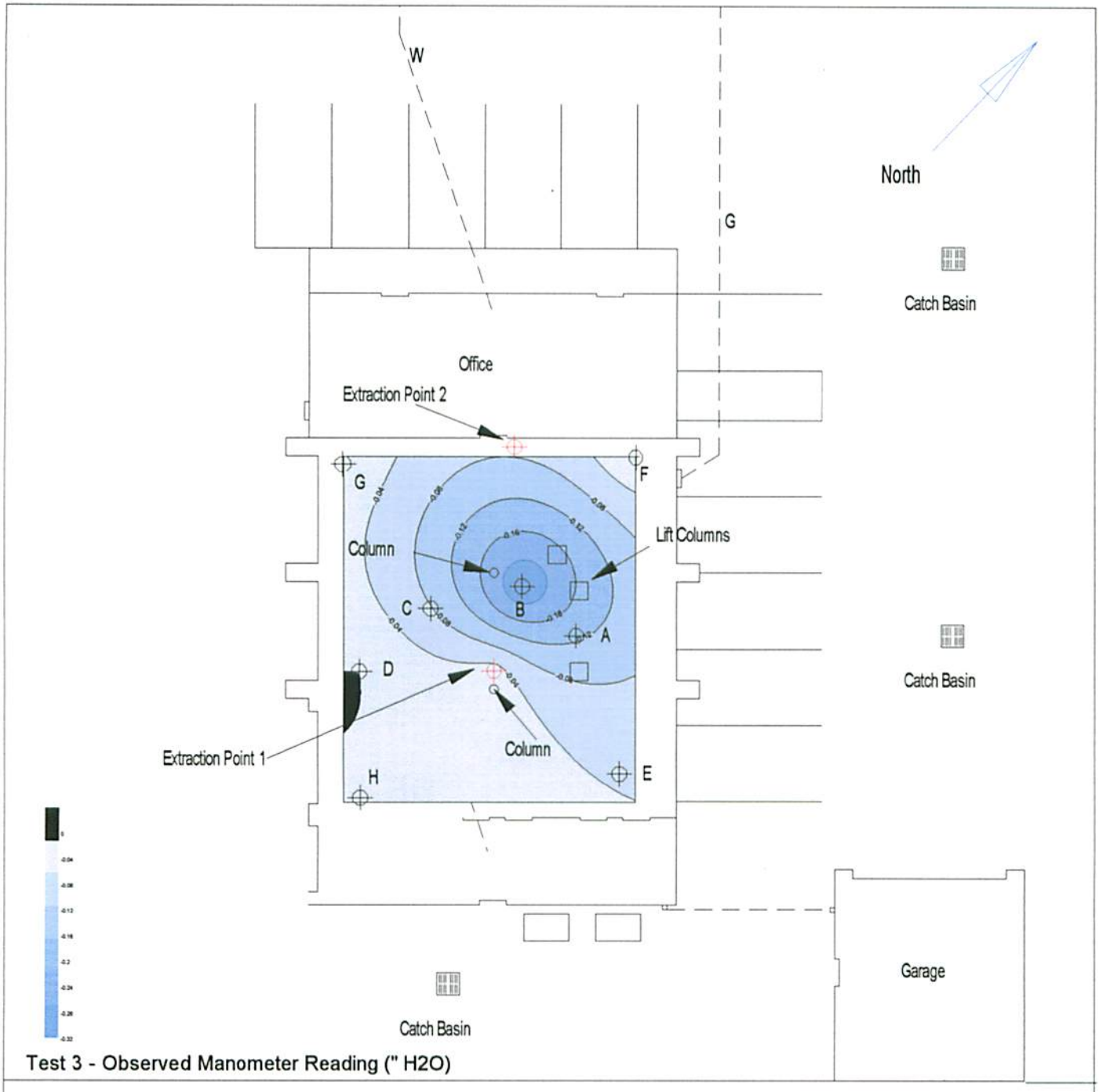
Key

— — Underground Utilities

⊕ A-H Communication Test Points

DT Consulting Services, Inc.
1291 Old Post Road
Ulster Park, New York 12487
(845) 658-3484

Client:	Krista Scibelli		
Location:	520 Albany Avenue, Kingston, New York		
Title:	Observed Negative Pressure Field - EP-1		Spill No: N/A
Scale:	Graphic	Drawn By: O.T.	Fig.#: 4



Test 3 - Observed Manometer Reading (" H2O)

0' 15' 30'

Key

— — Underground Utilities

⊕ A-H Communication Test Points

DT Consulting Services, Inc.
1291 Old Post Road
Ulster Park, New York 12487
(845) 658-3484

Client:	Krista Scibelli		
Location:	520 Albany Avenue, Kingston, New York		
Title:	Observed Negative Pressure Field - EP-2		Spill No: N/A
Scale: Graphic		Drawn By: O.T.	Fig.#: 5

TABLES

Table 1:

SSDS COMMUNICATION PILOT STUDY RESULTS

Site: Commerical Property
520 Albany Avenue
Kingston, New York
Spill #: 12-15279

Client Name: Scibelli
Address: 111 Whalesback Road
Red Hook, New York 12571

Consultant: DT Consulting Services, Inc.

VACUUM TEST RESULTS IN SUBSLAB

		Test 1		Test 2			
Well ID	PID Initial	Observed Manometer Reading (" H2O)	Flow Observed Manometer Reading (cfm - " H2O)	PID Initial	Observed Manometer Reading (" H2O)	Flow Observed Manometer Reading (cfm - " H2O)	Location
Extraction Point 1 (EP-1)	5.60		75 - 31			75 - 31	
A	5.40	-0.14			-0.12		10' from EP-1
B	3.60	-0.26			-0.24		10' from EP-1
C							Could not install - rebar
D	10.10	-0.33			-0.31		15' from EP-1
E				12.7	-0.11		16.5' from EP-1
F				5.7	0.00		27.5' from EP-1
G				4.9	0.00		27.5' from EP-1
H				10.6	-0.05		20.5' from EP-1

Notes:

1. PID Measurements recorded in parts-per-million.
2. Initial and Final Pressure Readings were all zero as measured with manometer.
3. All wells installed and sealed directly beneath concrete slab; approximately 2' below grade.

Table 1:
SSDS COMMUNICATION PILOT STUDY RESULTS

Site: Commerical Property
520 Albany Avenue
Kingston, New York
Spill #: 02-12872

Client Name: Scibelli
Address: 111 Whalesback Road
Red Hook, New York 12571

Consultant: DT Consulting Services, Inc.

VACUUM TEST RESULTS IN SUBSLAB

		Test 3		Test 4		
Well ID	**PID Initial**	**Observed Manometer Reading (" H2O)**	**Flow Observed Manometer Reading (cfm - " H2O)**	**Observed Manometer Reading (" H2O)**	**Flow Observed Manometer Reading (cfm - " H2O)**	**Location**
Extraction Point 2 (EP-2)	14.90		51 - 45 3/8		51 - 45 3/8	
A				-0.05		10' from EP-1
B		-0.24		-0.024		10' from EP-1
C						Could not install - rebar
D		0.00		0.00		15' from EP-1
E						16.5' from EP-1
F		0.00				27.5' from EP-1
G		-0.01				27.5' from EP-1
H		-0.01				20.5' from EP-1
EP-1		-0.02		-0.01		

Notes:

1. PID Measurements recorded in parts-per-million.
2. Initial and Final Pressure Readings were all zero as measured with manometer.
3. All wells installed and sealed directly beneath concrete slab; approximately 2' below grade.

ATTACHMENTS

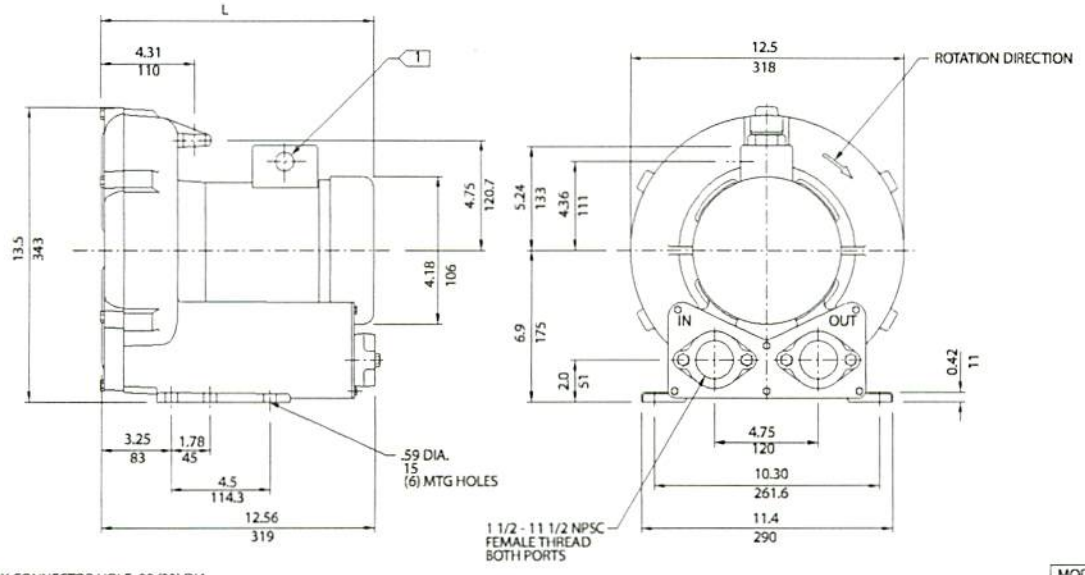
DT CONSULTING SERVICES, INC.

ATTACHMENT A

DR 454 & CP 454

ROTRON®

1.5 HP Regenerative Blower



NOTES
1. TERMINAL BOX CONNECTOR HOLE .88 (22) DIA.
2. DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
3. CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

MODEL	L (IN/MM)
DR454RS8M	14.47/367
DR454R72M	13.31/338

		Part/ Model Number			
		DR454RS8M	DR454R72M	DR454R86M	CP454EZ72MLR
Specification	Units	080481	080480	080482	080491
Motor Enclosure - Shaft Mtl.	-	TEFC - CS	TEFC - CS	TEFC - CS	Chem TEFC -SS
Horsepower	-	1.5	1.5	1.5	1.5
Voltage	AC	115/230	230/460	575	230/460
Phase - Frequency	-	Single - 50/60 Hz	Three - 50/60 Hz	Three - 50/60 Hz	Three - 50/60 Hz
Insulation Class	-	F	F	F	F
NEMA Rated Motor Amps	Amps (A)	15.6/7.8	4.6/2.3	1.8	4.6/2.3
Service Factor	-	1.15	1.15	1.15	1.15
Max. Blower Amps	Amps (A)	18/9	5.2/2.6	2.1	5.2/2.6
Locked Rotor Amps	Amps (A)	84/42	32/16	12.8	32/16
NEMA Starter Size	-	1/0	00/00	00	00/00
Shipping Weight	Lbs	73	60	60	60
	Kg	33.1	27.2	27.2	27.2

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

AMETEK TECHNICAL & INDUSTRIAL PRODUCTS
75 North Street, Saugerties, NY 12477
USA: +1 215-256-6601 - Europe: +44 (0) 845 366 9664 - Asia: +86 21 5763 1258
Customer Service Fax: +1 215.256.1338
www.ametektip.com

AMETEK®
TECHNICAL & INDUSTRIAL PRODUCTS

Industrial / Chemical Processing Blowers

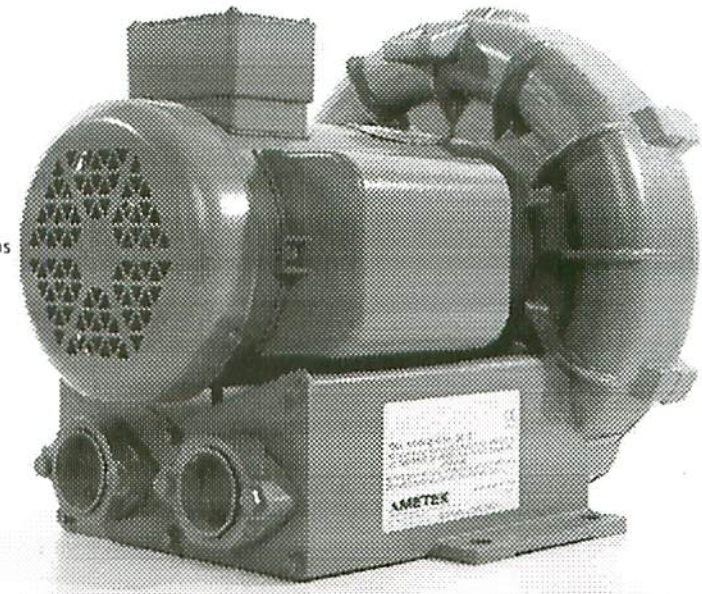
ROTRON®

DR 454 & CP 454

1.5 HP Regenerative Blower

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- CE compliant - Declaration of Conformity on file
- Maximum flow: 120 SCFM
- Maximum pressure: 65 IWG
- Maximum vacuum: 60 IWG
- Standard motor: 1.5 HP, TEFC
- Cast aluminum blower housing, impeller & cover; cast iron flanges (threaded)
- UL & CSA approved motor with permanently sealed ball bearings
- Inlet & outlet internal muffling
- Quiet operation within OSHA standards



MOTOR OPTIONS

- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

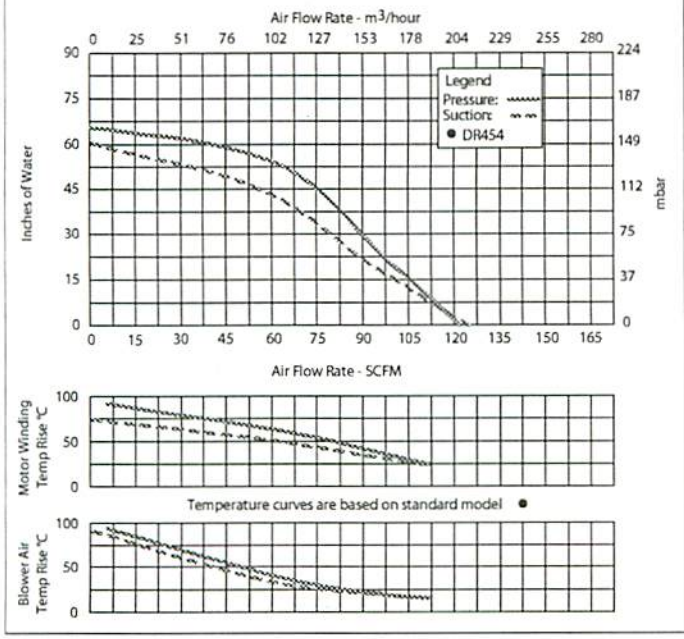
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES

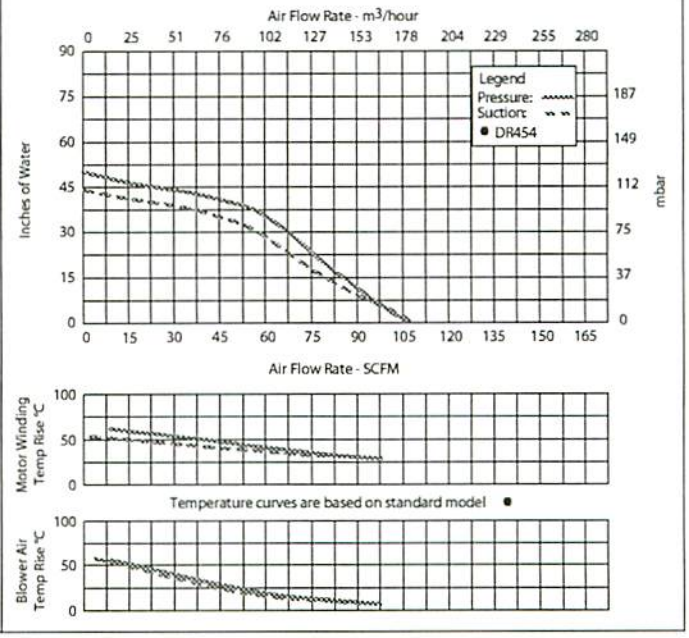
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

Blower Performance at Standard Conditions

60 Hz



50 Hz



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