Interim Remedial Measure Pilot Test Work Plan

Bridge Cleaners Site

Prepared for
Zhong Chuang Properties LLC
39-26 30th Street
Long Island City, NY 11101-2806

Prepared by
integral engineering p.c.
61 Broadway
Suite 1601
New York, NY 10006

May 29, 2015

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

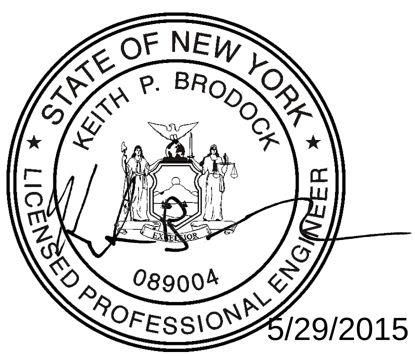
BCP	brownfield cleanup program
cfm	cubic feet per minute
CSM	conceptual site model
DER	division of environmental remediation
ft bgs	feet below ground surface
HASP	health and safety plan
"Hg	inches of mercury
IRM	interim remedial measure
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
PCE	tetrachloroethylene
PFD	process flow diagram
psig	pounds per square inch (gage)
PTFE	polytetrafluoroethylene
PVC	polyvinyl chloride
RIR	remedial investigation report
scfm	standard cubic feet per minute
SCO	soil cleanup objectives
SF	square foot or square feet
SSDS	sub-slab depressurization system
SVE	soil vapor extraction
TCE	trichloroethylene
USGS	U.S. Geological Survey
VOC	volatile organic compound

CERTIFICATION

I, Keith P. Brodock, P.E., certify that I am currently a New York State registered professional engineer as defined in 6 NYCRR part 375 and that this Interim Remedial Measure (IRM) Pilot Test Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by a New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

Date signed and sealed:



Keith P. Brodock, P.E.
NY License #089004

1 INTRODUCTION

Integral Engineering, P.C. (Integral) has prepared this Interim Remedial Measure (IRM) Pilot Test Work Plan (Work Plan) on behalf of Zhong Chuang Properties LLC (Zhong Chuang or Volunteer) for the property located at 39-26 30th Street, Long Island City, NY (Site). The Site is currently enrolled in the New York State Brownfield Cleanup Program (BCP) and listed as Site No. C241127.

This Work Plan has been prepared for pilot testing of a remediation technology to reduce subsurface contaminant mass and to mitigate soil vapor intrusion. The technology is currently anticipated to be a soil vapor extraction (SVE) system with air injection (sparge). The pilot testing and subsequent SVE installation would be performed as an IRM.

IRMs address both emergency and non-emergency site conditions, which can be undertaken without extensive investigation and evaluation, to prevent, mitigate, or remedy environmental damage or the consequences of environmental damage attributable to a site.

An SVE system with air injection uses one or more blowers to induce airflow through the subsurface (saturated and unsaturated zones) to volatilize contaminant vapors for exhaust to the atmosphere, typically with treatment. For this Site, the SVE system will also serve to create negative differential pressure beneath the Site building's slab relative to the pressure above the building's slab, thereby mitigating the infiltration of sub-slab vapors into the building.

1.1 SITE DESCRIPTION

The approximately 7,500 square foot (SF) Site is known as the former Bridge Cleaners and is designated as Block 399, Lot 31. A Site location map is provided as Figure 1. A map showing the Site property boundaries is included as Figure 2.

The Site is currently improved with a one-story building (without a basement) that covers the entire lot. The building is currently used as for the storage and cutting of fabrics. The Site is currently zoned as M1-3/R7X, which is a Special Long Island City Mixed Use District for mixed residential and commercial use.

1.2 SITE HISTORY

A number of previous investigations and assessments have been performed at the Site between 2011 and 2014. These investigations primarily consisted of limited subsurface assessments conducted by various consultants on behalf of the Site owner or the New York State

Department of Environmental Conservation (NYSDEC). Integral has been provided with the following investigation reports:

- Limited Sub-Surface Site Investigation, Long Island Laboratories, Inc., dated September 2011
- Site Characterization Report, Ecology and Environmental Engineering, P.C., May 2012
- Remedial Investigation Report, TechSolutions Engineering, P.C., June 2014 (most recent version)

According to the June 2014 Remedial Investigation Report (RIR) prepared by TechSolutions Engineering, P.C. (TechSolutions)[1], the Site was used as a dry cleaner from 1997 until about 2011. Other historical uses included warehousing and distribution.

The RIR summarized soil, groundwater, and soil vapor results from investigations performed at the Site between September 2011 and February 2014. In general, elevated tetrachloroethylene (PCE) and trichloroethylene (TCE) concentrations were found in groundwater and soil vapor samples collected within and nearby the Site. PCE and TCE were identified in soil samples at the Site, but did not exceed NYSDEC Unrestricted Soil Cleanup Objectives (SCOs).

A soil investigation conducted by Integral in December 2014, identified concentrations of PCE above the Unrestricted SCO, but below the Industrial SCO, in four soil samples collected from beneath the northern corner of the building. Pursuant to a Remedial Investigation Proposal dated November 11, 2014 and approved by NYSDEC, a total of five soil samples, inclusive of one duplicate, were collected at depths ranging from beneath the floor slab to a maximum of 18.5 feet below ground surface (ft bgs). PCE was the only analyte detected in any of the samples. In four of the five samples, PCE was identified above the Unrestricted SCO and the Protection of Groundwater SCO (to the extent the Protection of Groundwater SCO is applicable to this Site), both 1.3 mg/kg, but below the Industrial SCO of 300 mg/kg. The maximum observed concentration was 9.6 mg/kg.

1.3 PURPOSE

The purpose of this IRM is to perform a series of subsurface air communication tests to accomplish the following:

- Identify design parameters relevant to the SVE with air injection system design for the focused remediation of chlorinated volatile organic compounds; and,

[1] This RIR was rejected by the NYSDEC in a letter dated September 10, 2014, though it has been utilized in this Work Plan for reference.

- Evaluate the general appropriateness of SVE for mitigation of soil vapor intrusion.

2 BACKGROUND

2.1 PHYSICAL SETTING

The Site incorporates approximately 0.17 acres of fairly level land situated in Long Island City, Queens, New York. The Site is mapped on the Central Park, NY-NJ and Brooklyn Quadrant 7.5 Minute Topographic Map, published by the USGS. Review of the topographic map indicates that the Site is located approximately 40 ft above sea level (National Geodetic Vertical Datum 1988).

2.1.1 Geologic Setting

Previous reports have characterized the soil beneath the Site as medium or fine sand with trace silt. Bedrock geology in the vicinity of the Site is characterized from the RIR as:

> At the regional level, the subsurface geological units of Queens County consist of sequences of unconsolidated sediments of Late Cretaceous and Pleistocene pre-Sangamon and Sangamon ages. The unconsolidated sediments are underlain by crystalline bedrock of Precambrian age and overlain mostly by glacial upper Pleistocene deposits of Wisconian age but also to a lesser extent by Holocene deposits (Soren, USGS, 1978). From grade to bedrock, the primary geologic units in the region are artificial fill / surficial deposits, upper Pleistocene deposits, Gardiners Clay (where present), Jameco Gravel (not be present in the vicinity of the Site), Monmouth Group and Magothy Formation, and the Raritan Formation.
>
> Natural surficial glacial deposits in Queens County consist mostly of ground moraine in the northern part of Queens County near the [Site] and outwash in the southern portions of the county. However, artificial fill has been used in many places to extend and reinforce shorelines and to fill swampy areas in preparation for development. The surficial deposits are underlain by the upper Pleistocene deposits which range in thickness from 0 to 300 feet and are primarily composed of glacial drift material such as till, lacustrine deposits and outwash sand and gravel (Soren, USGS, 1978). Regionally, the upper Pleistocene deposits are unconformably underlain by the Gardiners Clay which is located in primarily the central and southern parts of Queens County. The Gardiners Clay consists of mostly grayish green and less commonly dark gray clay intercalated with sand and gravelly beds. The thickness of the Gardiners Clay varies widely and is absent in some sections of Queens County (i.e., Glendale, Woodhaven, Ozone Park areas) but generally ranges to a maximum of 150 feet thick. Importantly, the Gardiners Clay serves to confine water in the underlying

> Jameco Gravel regionally where present and Magothy-Matawan Formation (Soren, USGS, 1978) in much of the region.
>
> The Jameco Gravel is believed to have been deposited by streams in Queens County and unconformable underlies the Gardiners Clay where present. The Jameco deposits are mostly coarse sand and granule to cobble gravel with boulders having been reported by some drillers. The thickness of the Jameco Gravel ranges from 0 to 250 feet regionally; however, it is generally absent in the vicinity of the [Site] which is located north of the most-widely accepted extent of the Jameco Gravel…
>
> Underlying the Jameco Gravel (where present) is the Monmouth Group and the Magothy- Matawan Formation which ranges from 0 to 450 feet thick in Queens County. Magothy- Matawan strata may be missing in northern and northwestern Queens County and is typically present between 0 and 200 feet in thickness near the [Site]. The Raritan Formation underlies the Magothy-Matawan formation where present and consists of a clay and sand member. Bedrock is typically not encountered to a depth of between 100 and 200 feet in the vicinity of the [Site]. (TechSolutions 2014)

2.1.2 Hydrogeologic Setting

Groundwater has been measured at approximately twenty ft bgs at the Site. According to the RIR:

> The regional aquifer system in the general vicinity of the Site includes the following system from shallow to deep: the upper glacial aquifer which is underlain by the Magothy Aquifer. The Raritan clay unit then separates the Magothy Aquifer from the underlying Lloyd Aquifer which overlies bedrock. (TechSolutions 2014)

3 CONCEPTUAL SITE MODEL

The conceptual site model (CSM) is that there are residual chlorinated hydrocarbons in the unsaturated subsurface near the northern corner of the building, which are potentially causing secondary impacts to groundwater. This residual material may have discharged from a boiler drain in the northern corner of the building, and while there is a small concrete patch in this area, there is no evidence that a drain existed in the building. The CSM also must consider the possibility that a release occurred off-Site and is contributing to the observed conditions. The magnitude of the release, whether on-Site or off-Site (or both), is unknown, though the chlorinated hydrocarbon concentrations identified in the unsaturated on-Site soil lead to the conclusion that any on-Site release was minor.

Below is additional supporting information to the CSM:

- The groundwater at the Site, based on previous reports, generally flows from north to south. PCE concentrations in groundwater ranged from 176 to 340 µg/L, and were within the same order of magnitude across the Site, although slightly higher to the south.
- Soil vapor concentrations of PCE ranged from 21,400 to 668,000 $\mu g/m^3$ across the Site. The larger concentrations were found in the northern portion of the building, indicating potential residual source material nearby (in unsaturated soil).
- A boiler room was historically present in the northern corner of the building. In the past, it was not uncommon for buildings to construct a drain (dry well) for boiler condensate blow-down. No evidence of a drain or dry well has been observed or provided, although there appears to be a small concrete patch in this area.
- PCE was identified in soil samples collected from the northern corner of the Site building with a maximum concentration of 9.6 mg/kg, which is below the Industrial SCO of 300 mg/kg, but above the Unrestricted Use and Protection of Groundwater SCOs of 1.3 mg/kg, to the extent the Protection of Groundwater SCO is applicable to this Site.

4 SCOPE OF WORK

This section presents the approach and methods for performing a pilot test to collect data for the design of an SVE remediation system and vapor intrusion mitigation system at the Site.

A health and safety plan (HASP) will be prepared to provide specific guidelines and establish procedures to protect Integral personnel during the pilot test activities planned at the Site. The HASP will be reviewed and signed by each Integral staff member prior to the commencement of the work contained herein.

4.1 PILOT TEST

A two-part pilot test will be conducted, as described in detail in the below sections. The first part will be an SVE pilot test, and the second part will be an air sparge pilot test.

4.1.1 Soil Vapor Extraction Pilot Test

A subsurface air communication test will be performed to identify the design parameters for the SVE system and to evaluate the appropriateness of SVE for mitigation of soil vapor intrusion. The subsurface communication test will include the installation of one of the anticipated SVE recovery wells, application of negative pressure (vacuum) to the recovery well, and measurement of subsurface pressures at various distances from the recovery well.

With the assistance of a drilling contractor, Integral will install one of the anticipated SVE recovery wells and various vacuum monitoring wells (Figure 3). The construction details and purpose of the new wells are summarized in Section 4.1.3. During installation of the wells, the drilling spoils will be periodically screened with a photoionization detector (PID); any soils exhibiting gross contamination will be collected (via EPA Method 5035/5035A, as appropriate) for laboratory analysis of PCE, TCE, and their degradation products via EPA method 8260C. The vacuum monitoring wells will be installed to gain a working understanding of the subsurface and to accomplish the stated goals of the pilot test.

Once the wells are installed, a measured vacuum will be applied to the recovery well and the resulting vacuum measured in the surrounding subsurface vacuum monitoring wells. We anticipate using a Rotron EN606M5ML 6.0 HP regenerative blower (or similar) to apply up to six inches of mercury ("Hg) of vacuum (specifications for a Rotron 606 blower[2] are included in Appendix A). Multiple phases of the pilot test will be conducted, each with a different vacuum

[2] Only specifications for a "DR" 606 blower are available, as the Rotron 606 model is out of production. The proposed "EN" blower is the same as the "DR" version, only the "EN" version has upgraded features, such as a heavy-duty manifold, a spark-resistant housing cover, and a polytetrafluoroethylene (PTFE) lip seal. The performance of a "DR" blower is the same or similar to an "EN" blower.

applied to the recovery well. At present, we anticipate applying vacuums of 1”Hg, 3”Hg, and 5”Hg, though this will depend on subsurface conditions.

The resulting vacuum in the vacuum monitoring wells will be measured using a micromanometer or a manometer. We anticipate collecting measurements every five minutes for the first half-hour, then every fifteen minutes the next one and one-half hours, and then every thirty minutes until the end of the test. The frequency of measurements and the length of data collection will depend on the subsurface conditions. There is no minimum criteria for acceptable vacuum at the monitoring wells, since airflow is the primary driver of soil vapor extraction success and even lower magnitude vacuum measurements will be useful during evaluation of the results. The measured vacuum and flow data will be used to calculate the intrinsic permeability of the subsurface and to develop the system curve for the Site (a discussion of design parameters is included in Section 4.2.1).

During the pilot test, vapor samples will be collected from the recovery well and from the vacuum monitoring well at the southern corner of the building to evaluate the need for vapor-phase treatment for the future SVE system. The vapor samples will be analyzed for volatile organic compounds (VOCs) and moisture content. These data will inform the design of the vapor-phase treatment, as needed.

At the end of the SVE pilot test, the recovery well and vacuum monitoring wells will be temporarily capped.

4.1.2 Air Injection Pilot Test

The air injection pilot test will consist of two phases: a pressure slug test and a steady-state test. These are described in the sections below.

4.1.2.1 Pressure Slug Test

A pressure slug test will be performed to evaluate the hydraulic conductivity of the saturated zone. We plan to apply pressure to an air injection well (Figure 3 depicts the location) and measure the hydraulic or “piezometric” pressure in the air injection well and in the nearby groundwater monitoring wells (already installed) using transducers. We plan to utilize an air compressor with an adjustable output to induce pressure. The construction details and purpose of the wells are summarized in Section 4.1.3.

Once the groundwater levels have equilibrated, we will release the pressure on the air injection well and observe the effect on surrounding groundwater levels. During this test, we will also measure pressures and flow rates of the injected air, and will attempt to identify the pressure at which flow begins. All of these data will be evaluated to calculate the hydraulic conductivity and to inform the design of the air injection system.

4.1.2.2 Steady-State Test

We will conduct a steady-state pilot test, in addition to the hydraulic conductivity test. We will again apply pressure to the air injection well and attempt to maintain steady-state flow at approximately 5 scfm. An acceptable capacity range is 5-10 scfm at 6-20 psig. We will monitor the rise in groundwater elevation during this test. We plan to collect groundwater elevation data continuously using the same in-well transducers. In addition, we will evaluate the dissolved oxygen concentration in the air injection well prior to initiation of the air injection pilot test, and in GW-3 during the pilot test. We will also run the SVE extraction well for a period of time to observe how the performance of the SVE system may be affected by air injection.

4.1.3 New Well Details

The construction details and rationale for the new well locations are shown below.

Table 1. New Well Summary

Well	Type	Purpose	Diameter	End Depth	Screened Interval
RW-01	Extraction	Apply negative pressure and collect soil vapor sample	4-inch	18 ft bgs	1.5-18 ft bgs
VM-01	Vacuum Monitoring	Evaluate pressure response in (plan) north-south direction	1-inch	5 ft bgs	4.5-5 ft bgs
VM-02	Vacuum Monitoring	Evaluate pressure response near building corner and collect soil vapor sample	1-inch	5 ft bgs	4.5-5 ft bgs
VM-03	Vacuum Monitoring	Evaluate pressure response in (plan) north-south direction	1-inch	5 ft bgs	4.5-5 ft bgs
VM-04	Vacuum Monitoring	Evaluate pressure response in (plan) east-west direction	1-inch	5 ft bgs	4.5-5 ft bgs
VM-05	Vacuum Monitoring	Evaluate pressure response in (plan) east-west direction and in building corner	1-inch	5 ft bgs	4.5-5 ft bgs
VM-06	Vacuum Monitoring	Evaluate pressure response in (plan) east-west direction and in building corner	1-inch	5 ft bgs	4.5-5 ft bgs
VM-07	Vacuum Monitoring	Evaluate pressure response in building corner	1-inch	5 ft bgs	4.5-5 ft bgs
VM-08	Vacuum Monitoring	Evaluate pressure response in (plan) north-south direction	1-inch	5 ft bgs	4.5-5 ft bgs
AI-01	Air Injection	Inject air and evaluate hydraulic conductivity	2-inch	35 ft bgs	34-35 ft bgs

All wells will be constructed with schedule 40 PVC. The annular space around the wells will be filled with sand from the end of the boring to six inches above the top of the screen. Above the sand, the annulus will be filled with bentonite to within one foot of the ground surface (where appropriate). The borehole will be completed with a concrete to grade with a well cover installed.

4.1.4 Summary of Pilot Test Data Collection

The following data will be collected during the pilot test:

Table 2. Summary of Pilot Test Data

Item	Analysis Location	Location / Media	Utility
Pressure	Field	Recovery well, Vacuum monitoring wells	Develop system curve; Calculate intrinsic permeability
Pressure	Field	Air injection well	Measure piezometric pressure; Calculate hydraulic conductivity; Air injection radius of influence; Develop air injection system curve
Flow	Field	Recovery well	Develop system curve; Calculate intrinsic permeability
Flow	Field	Air injection well	Develop air injection system curve
VOCs in soil via PID	Field	Drilling spoils	Identify gross contamination, if any
PCE, TCE, Degradation Products	Laboratory	Drilling spoils, if gross contamination is observed	Locate potential source material
VOCs in Soil Vapor	Laboratory	Recovery well vapor; VM-02	Evaluate the need for vapor-phase treatment
Groundwater elevation	Field	Air injection well; existing groundwater monitoring wells	Calculate hydraulic conductivity; Air injection radius of influence
Dissolved Oxygen	Field	Air injection well; GW-1; GW-4	Air injection radius of influence

4.2 DESIGN DOCUMENT

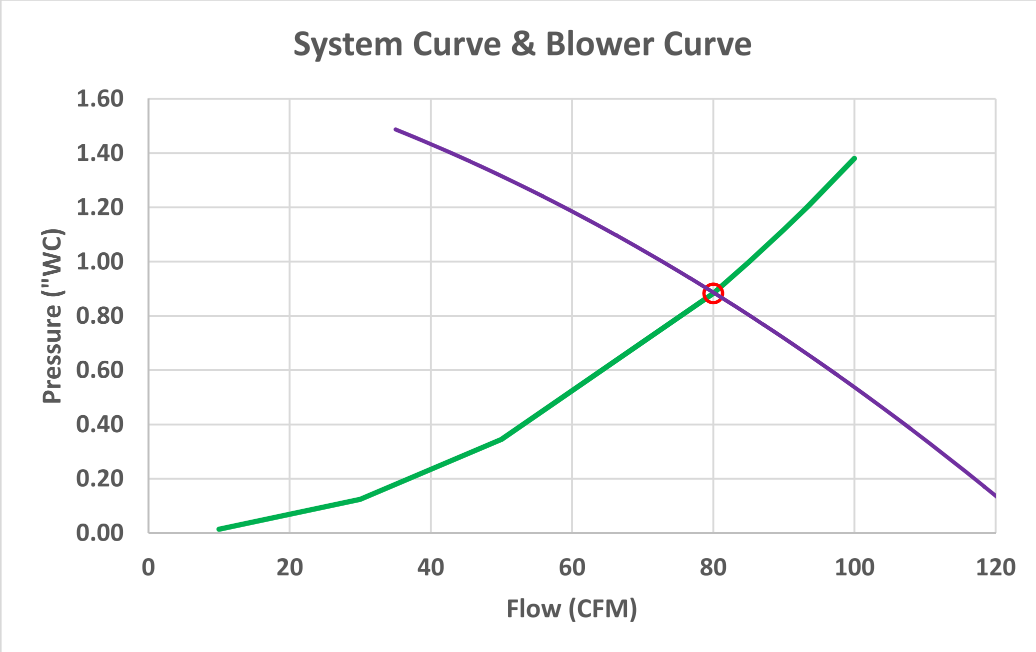
Integral will evaluate the data from the pilot test and prepare an SVE system design document for NYSDEC review and approval. The SVE system design document will provide the system design within the limitations of the building (such as the building layout, building structure, and immovable equipment). The design document will further include:

- Intrinsic permeability calculation
- System curve
- Blower(s) selection
- Recovery well layout
- Vacuum monitoring or venting well layout
- Pipe sizing and connections
- Prediction of airflow in the subsurface
- Vapor-phase treatment design, if needed
- Hydraulic conductivity
- Air injection operating pressure and flowrate

4.2.1 SVE System Curve Development

As part of the Design Document, we will develop the SVE system curve and compare it to the anticipated regenerative blower. The system curve is prepared by plotting pressure vs. flow for the various flow rates observed during the SVE pilot test. Figure 4, below, depicts an example system curve[3], which is shown in green.

Figure 4. Example System & Blower Curve



Also depicted above is the blower curve, shown in purple above, for this system. Where the two curves intersect is the design operating point for the system. Using this point and the other data generated from the SVE pilot test (e.g. intrinsic permeability), subsurface airflow and pressure field extension can be calculated.

4.2.2 Preliminary System Design

We anticipate designing and installing two SVE systems or one SVE system with two main branches (one in the northern portion of the building and one in the southern portion of the building) (Figure 3 also depicts these potential SVE recovery well locations). The SVE system in the northern portion of the building is anticipated to address residual PCE and related constituents in the subsurface and in the saturated zone. The SVE system in the southern portion of the building is anticipated to measure vapor concentrations and guard against vapor movement off-Site. Given that the southern SVE system is not intended to remediate soil in this area as the residual chlorinated hydrocarbons in the unsaturated subsurface are near the northern corner of the building, the silty clay layer expected to be present 6.0-9.5 ft bgs would not significantly impact the performance of this particular SVE system, assuming the SVE

[3] This system curve was prepared for a sub-slab depressurization system (SSDS), which operates at lower applied pressure than an SVE system; however, the process of developing the system curve is the same.

recovery well is screened above and below the silty clay layer, as is proposed for the pilot test. Both the northern and southern systems will support the soil vapor intrusion mitigation.

We have prepared a conceptual Process Flow Diagram (PFD) for an individual SVE system (Figure 5). For each system, we plan to pipe the recovery wells under the Site floor slab to a central location on the wall where system monitoring and adjustment equipment will be located. Each recovery well would combine into a single riser pipe that would penetrate the roof and connect into the mechanical equipment, including the blower, as shown. During design, we will consider connecting both systems, if both are installed, to one blower.

At present, we plan to phase the air injection while the SVE system operates continuously. We would initially run the SVE system without air injection to allow the SVE system to generate its maximum effective radius of influence before inducing air injection, which would decrease the effective SVE radius of influence. The SVE system alone would treat residual PCE and related constituents in the soil in the vadose zone, and surficial groundwater containing dissolved-phase volatile hydrocarbons by allowing the hydrocarbons at the surface of the groundwater, in the “smear zone”, and in the capillary fringe to volatilize. Running the SVE system without air injection would keep moisture levels low in the SVE system thereby increasing the vertical extent of the extraction and decreasing the amount of operational maintenance necessary. As the concentration of VOCs in the effluent of the SVE system reached asymptotic levels, the air injection would begin.

Once SVE / air injection is complete, the system would be modified to support a continuously-operated SSDS. The SVE design will be prepared with the eventual changeover to SSDS in mind.

5 SCHEDULE

Below is a schedule for the above scope of work. We understand from NYSDEC that no public comment period is anticipated and that we can proceed immediately upon NYSDEC approval.

We will notify NYSDEC one week prior to conducting the pilot test. Based upon current knowledge of the Site, the following schedule, subject to change, is proposed:

Table 3. Schedule

Task	Task Duration	Total Duration
NYSDEC/NYSDOH Approval of IRM WP	0	0
Mobilization/Coordination with Owner and Tenant	4 Weeks	4 Weeks
Install SVE Recovery Well, Monitoring Points, and Air Injection Well	3 Days	4 Weeks, 3 Days
Allow Well Seals to Set and Allow Wells to Equilibrate	1 Week	5 Weeks, 3 Days
Conduct SVE Pilot Test	1 Day	5 Weeks, 4 Days
Conduct Air Injection Pilot Test	1 Day	5 Weeks, 5 Days
Design SVE (with Air Injection) System	4 Weeks	9 Weeks, 5 Days
Prepare Design Document	2 Weeks	11 Weeks, 5 Days
Submit Results of Pilot Test and Final IRM Design	0 Days	11 Weeks, 5 Days
Public Notice of IRM Design	45 Days	18 Weeks, 1 Day
Coordination with Owner and Tenant / Procurement / Contracting	6 Weeks	24 Weeks, 1 Day
System Installation	2 Weeks	26 Weeks, 1 Day
System Start-up & Balancing	1 Week	27 Weeks, 1 Day
Prepare Site Management Plan	4 Weeks	31 Weeks, 1 Day

6 KEY PROJECT CONTACT LIST

Table 4. Key Contact List

Name	Title	Phone Number	E-mail
Ruth Curley	NYSDEC Project Manager	(518) 402-9480	ruth.curley@dec.ny.gov
Christopher Doroski	NYSDOH Project Manager	(518) 402-7870	christopher.doroski@health.ny.gov
Keith Brodock	Integral Project Manager	(212) 440-6702	kbrodock@integral-corp.com
Zhong Chuang Properties LLC	Volunteer		
James J. Periconi, Esq.	Attorney for Volunteer	(212) 213-5500	jpericoni@periconi.com

7 BIBLIOGRAPHY

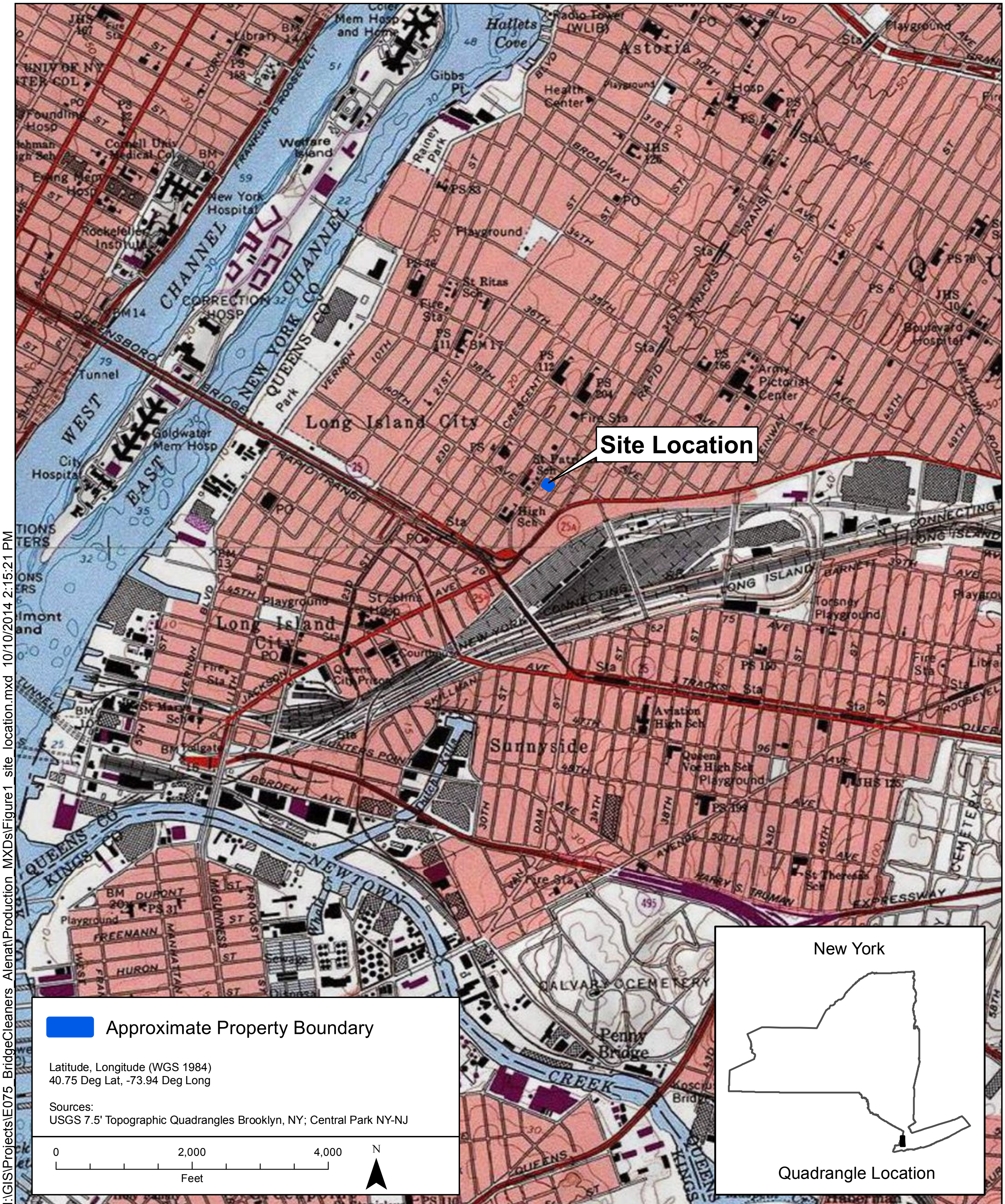
Kuo, Jeff. 1998. Practical design calculations for groundwater and soil remediation. Lewis Publishers, an imprint of CRC Press LLC.

NYSDEC. 2010. Technical guidance for site investigation and remediation (DER-10). New York State Department of Environmental Conservation, Division of Environmental Remediation.

Soren, Julian. 1978. Subsurface geology and paleogeography of Queens County, Long Island, New York. U.S. Geological Survey. February 1978.

TechSolutions Engineering, P.C. 2014. Remedial investigation report. Former Bridge Cleaners. June 2014.

FIGURES



N:\GIS\Projects\E075_BridgeCleaners_Alenat\Production_MXDs\Figure1_site_location.mxd 10/10/2014 2:15:21 PM

integral engineering p.c.
61 Broadway, Suite 1601
New York, New York 10006
www.integral-corp.com

Figure 1.
Site Location Map
39-26 30th St.
Long Island City, NY

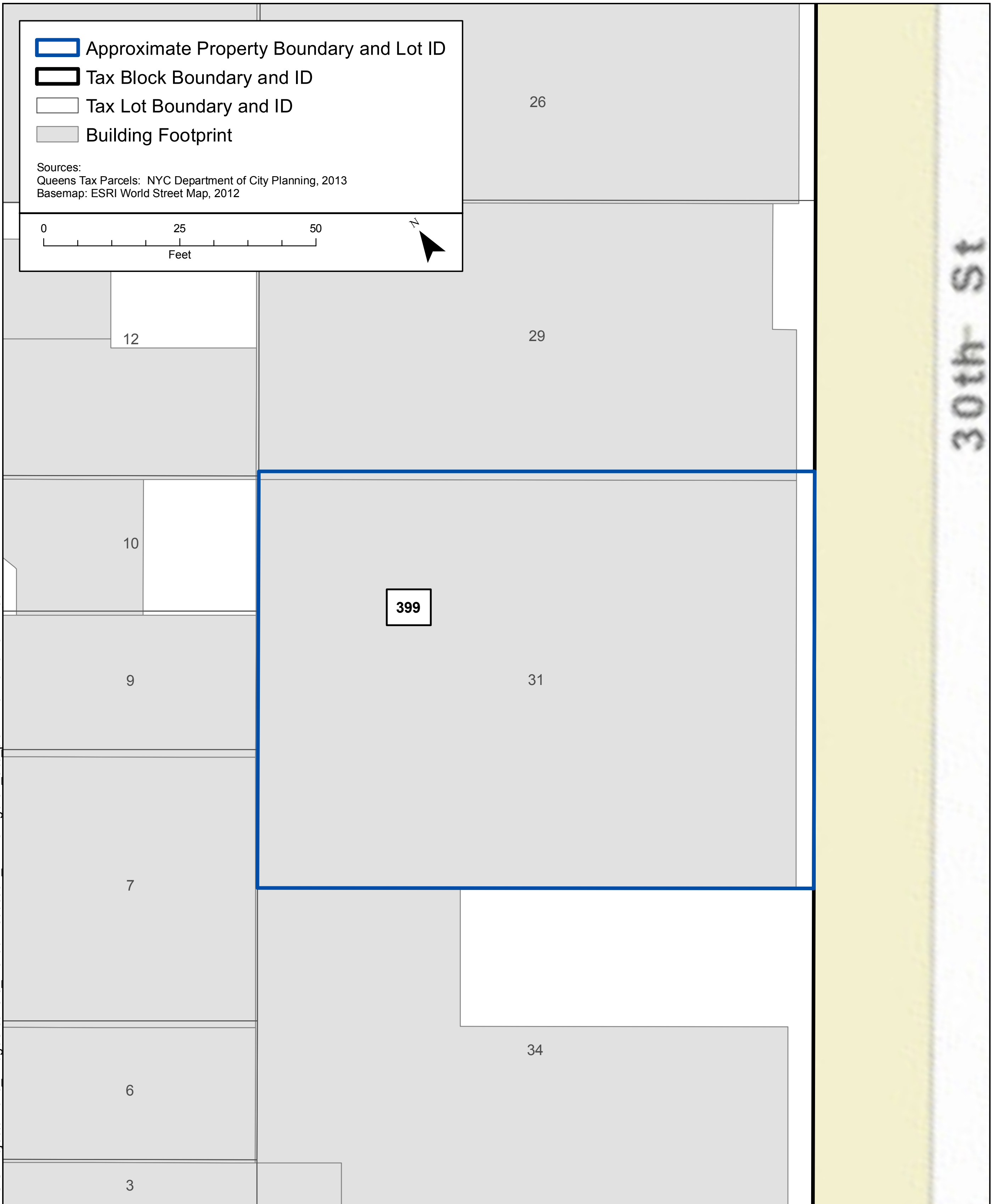
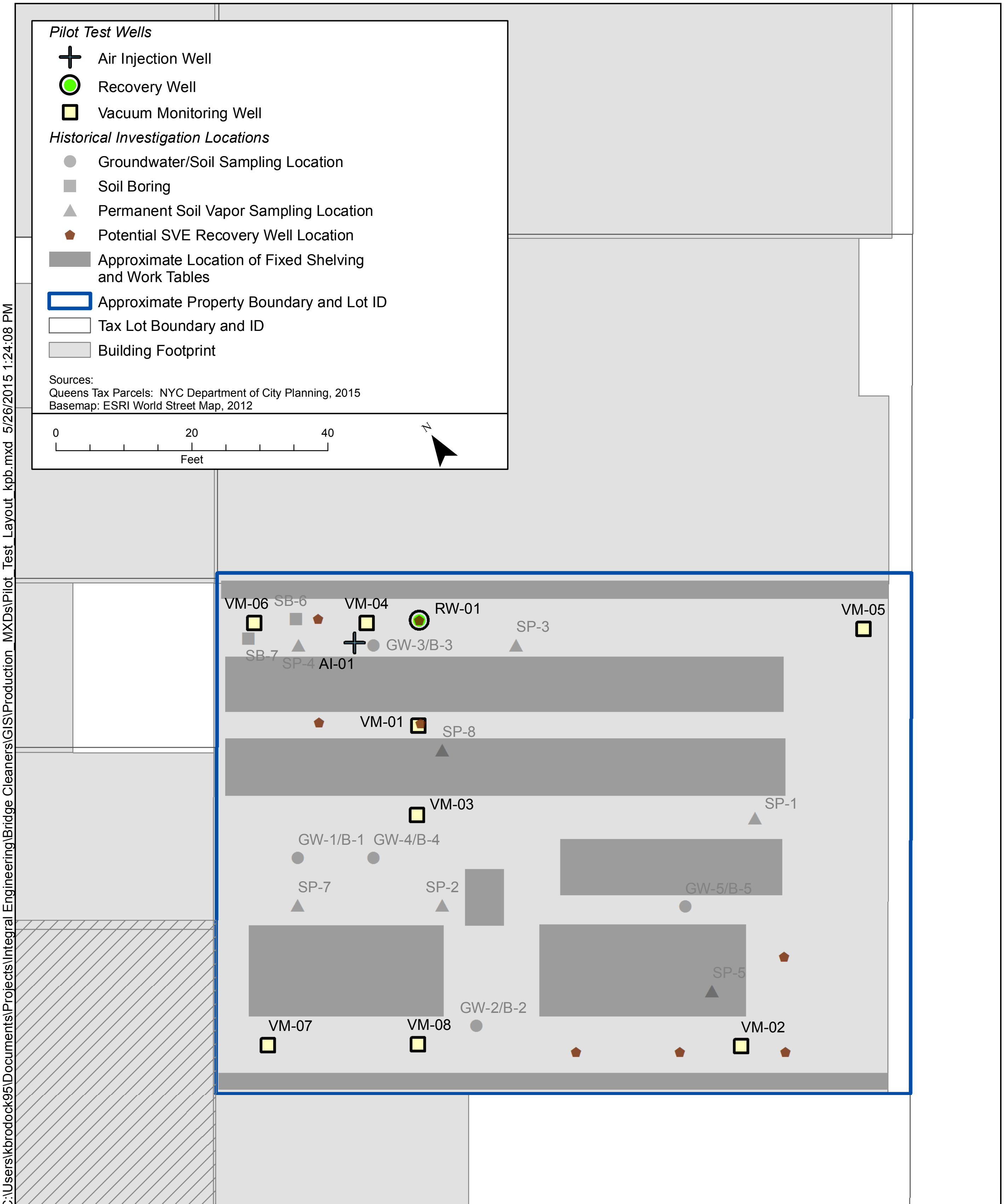


Figure 2.
Site Plan
39-26 30th St
Long Island City, NY

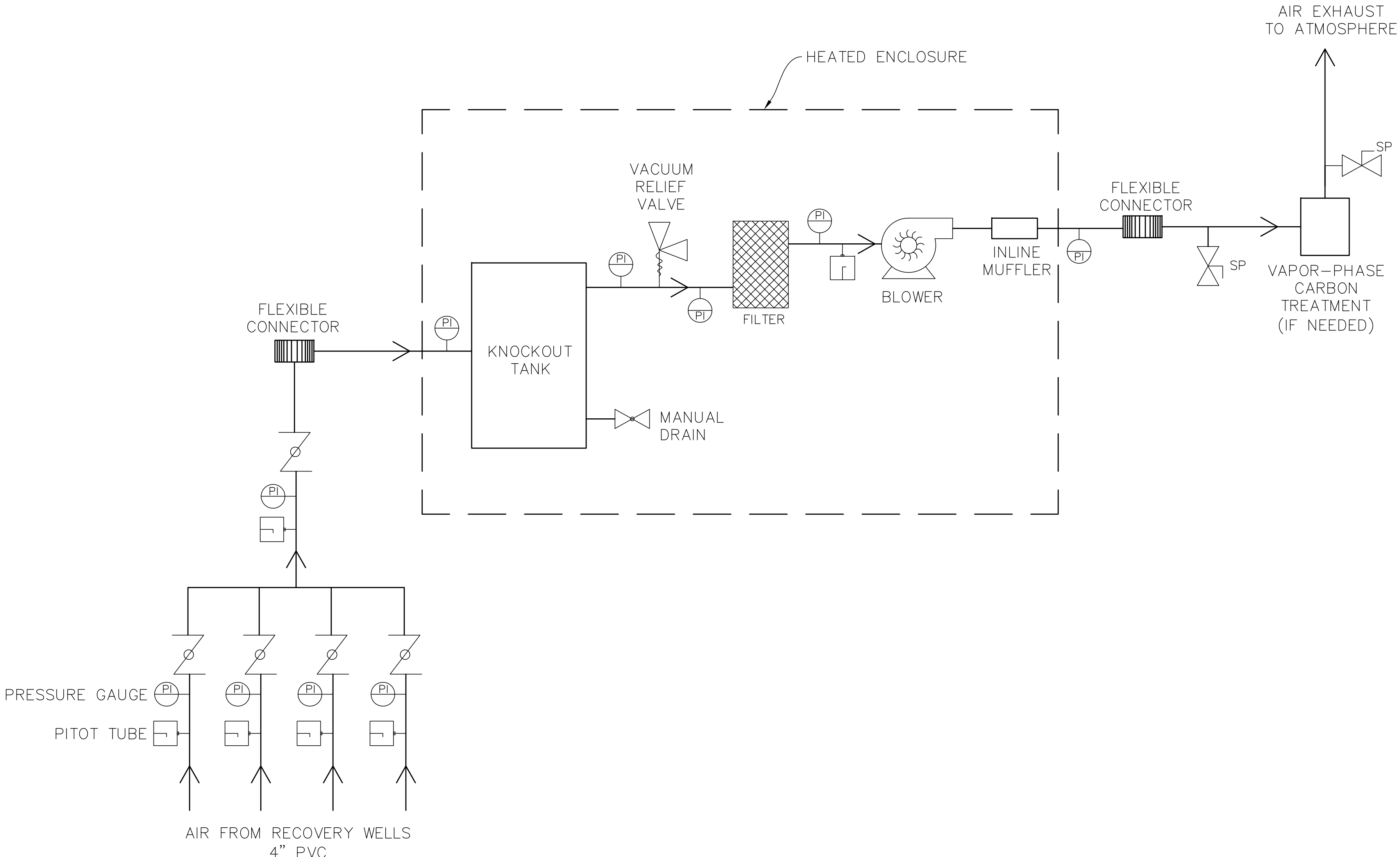
integral engineering p.c.
61 Broadway, Suite 1601
New York, New York 10006
www.integral-corp.com

N:\GIS\Projects\E075_BridgeCleaners_Alenat\Production_MXDs\Figure2_site_plan.mxd 10/10/2014 2:33:44 PM



integral engineering p.c.
61 Broadway, Suite 1601
New York, New York 10006
www.integral-corp.com

Figure 3.
Pilot Test Layout
39-26 30th St
Long Island City, NY



NOT TO SCALE

integral engineering p.c.
61 BROADWAY, SUITE 1601
NEW YORK, NEW YORK 10006
www.integral-corp.com

Figure 5.
Process Flow Diagram
39-26 30th St
Long Island City, NY

APPENDIX A

REGENERATIVE BLOWER SPECIFICATION

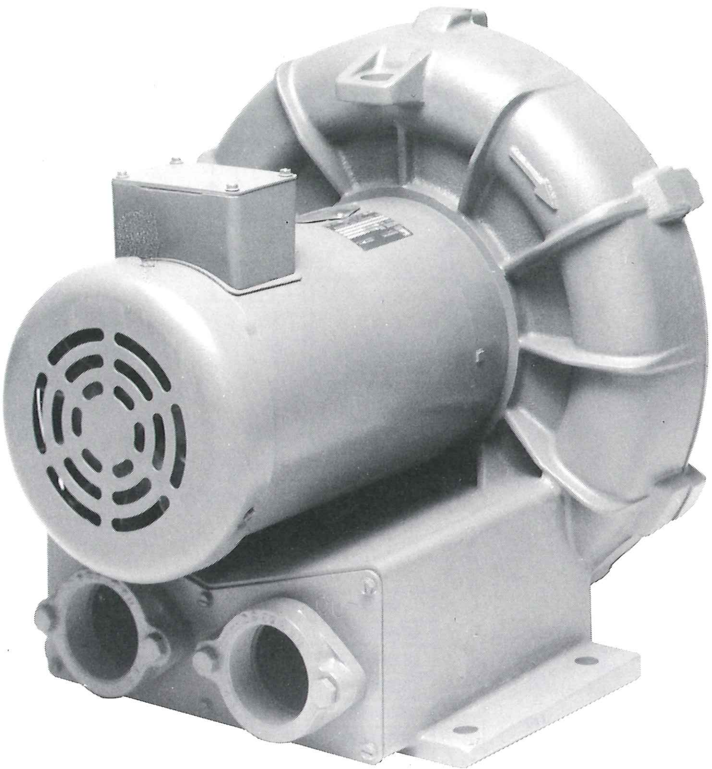
DR/CP 606
Regenerative Blower

FEATURES
- Manufactured in the USA
- CE compliant – Declaration of Conformity on file
- Maximum flow: 200 SCFM
- Maximum pressure: 100 IWG
- Maximum vacuum: 6.1" Hg
- Standard motor: 4.0 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

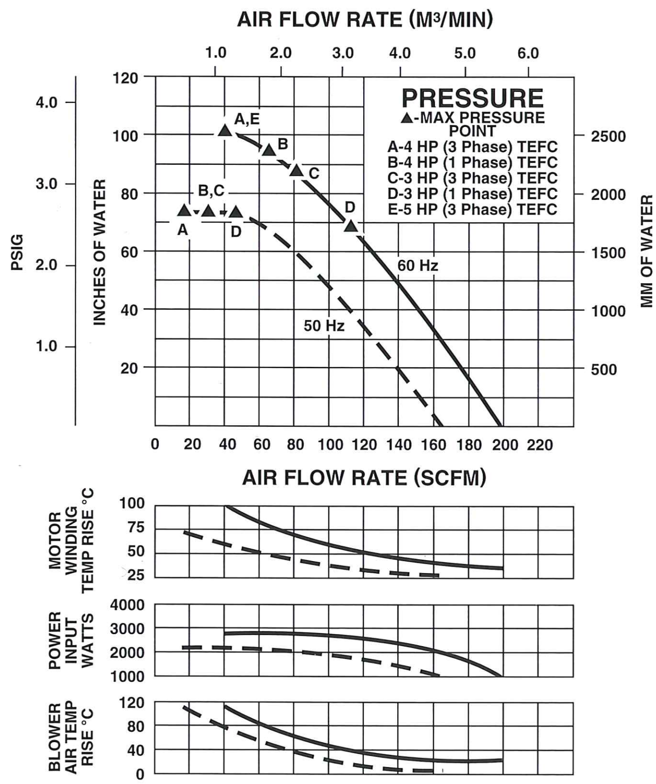
MOTOR OPTIONS
- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

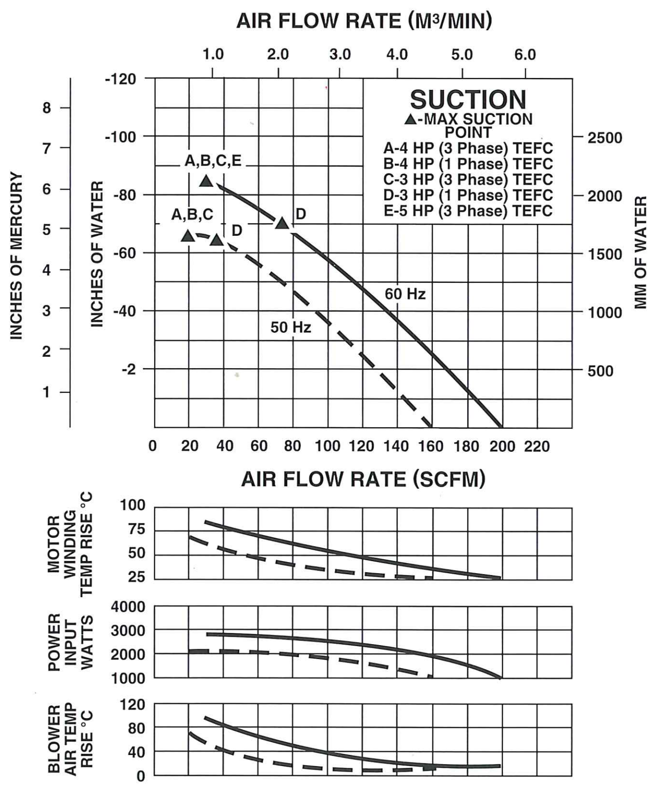
BLOWER OPTIONS
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES (See Catalog Accessory Section)
- 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)



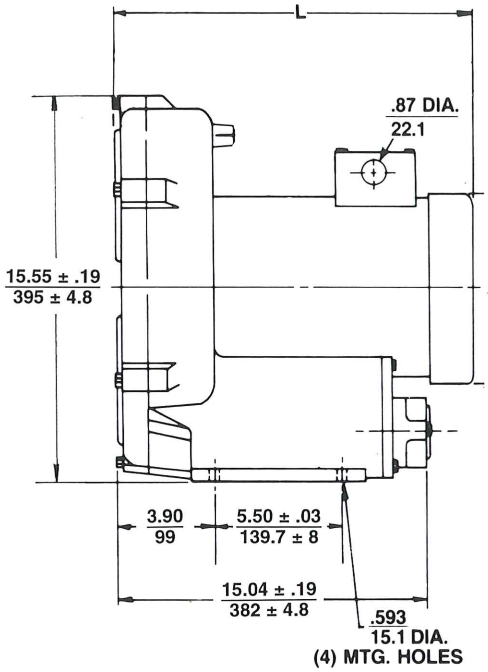
BLOWER PERFORMANCE AT STANDARD CONDITIONS

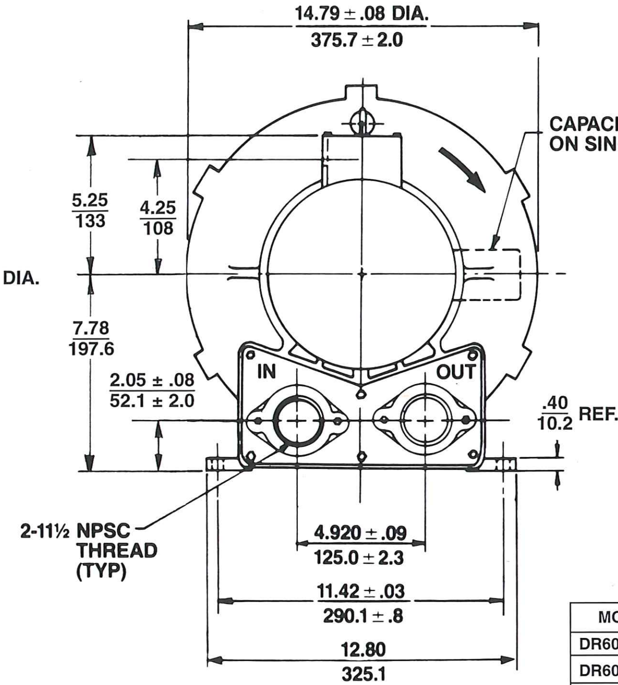




EG&G ROTRON, SAUGERTIES, N.Y. 12477 • 914/246-3401 • FAX 914/246-3802

DR/CP 606
Regenerative Blower





DIMENSIONS: IN/MM
TOLERANCES: .XX ± .08/2
(UNLESS OTHERWISE NOTED)

MODEL	L (IN)	L (MM)
DR606CK72M	17.1	434
DR606CK5M	16.7	424
DR606CK85M	17.1	434
DR606K72M	15.8	401
DR606K58M	17.1	434
CP606CR72MLR	16.7	424

SPECIFICATIONS

MODEL	DR606CK72M	DR606CK5M	DR606CK86M	DR606K72M	DR606K58M	DR606D72M	CP606CR72MLR
Part No.	038526	038532	038530	038527	038529	080077	038247
Motor Enclosure – Shaft Material	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	TEFC – **CS**	Chem TEFC – **SS**
Horsepower	4	4	4	3	3	5	Same as DR606CK72M – 038526 except add Chemical Processing (CP) features from catalog inside front cover
Voltage [1]	230/460	230	575	230/460	115/230	208-230/460	
Phase – Frequency [1]	Three - 60 Hz	Single - 60 Hz	Three - 60 Hz	Three - 60 Hz	Single - 60 Hz	Three - 60 Hz	
Insulation Class [2]	F	F	F	F	F	F	
NEMA Rated Motor Amps	10.4/5.2	17.4	4.1	7.6/3.8	24.9/12.4	14-12.8/6.4	
Service Factor	1.0	1.0	1.0	1.15	1.0	1.15	
Locked Rotor Amps	94/47	121	80	88/44	194/97	96/48	
Max. Blower Amps [3]	11.4/5.7	18	4.56	9.5/4.75	27.8/13.9	11-10/5	
Recommended NEMA Starter Size	1/0	2	0	0/0	1.5/1	1/1	
Shipping Weight	98 lb (45 kg)	106 lb (48 kg)	92 lb (42 kg)	96 lb (44 kg)	98 lb (45 kg)	98 lb (45 kg)	

1 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 **200-220/400-440 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.

2 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.

3 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.

Specifications subject to change without notice. Please contact factory for specification updates.