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SITE MANAGEMENT PLAN
NYSDEC COSCO SITE
(ID NO. 3-44-035)
SPRING VALLEY, NY

RAMBOLL Bright ideas. Sustainable change.

SITE MANAGEMENT PLAN
NYSDEC COSCO SITE (ID NO. 3-44-035)
SPRING VALLEY, NY

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EXECUTIVE SUMMARY

In 1978, the Rockland County Department of Health (RCDOH) identified tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE), and 1,1,1-trichloroethane (1,1,1-TCA) in the well field operated by the Spring Valley Water Company. The Consolidated Stamp Company (COSCO) Site (the Site) and Continental Plastic Company (CPC) facility were identified as potential sources for the contamination at the former Spring Valley Well Field Site (ID No. 3-44-018). The results of a survey performed by Spring Valley Water Company in 1979 found that the CPC facility was discharging approximately 20 to 30 gallons per minute (gpm) of TCE and PCE contaminated non-contact cooling water into Reach B Diversion. In addition, The COSCO facility was using TCE as part of a vapor degreasing process and discharging the rinse water into Reach B Diversion (Aztech, 2020).

From 1987 to 1990, a Remedial Investigation/Feasibility Study (RI/FS) was performed to evaluate potential source areas for Site-related constituents of concern (COCs), PCE and its associated degradation products TCE, DCE, and vinyl chloride (VC). A Record of Decision (ROD) was issued by the New York State Department of Environmental Conservation (NYSDEC) for the Site in March 1990 and amended in 1999. Remedial actions to address the Site-related COCs were conducted between 1990 and 2010.

In November 2003, a groundwater extraction and treatment (GWE&T) system was placed into operation, consisting of two overburden recovery wells (RW-1S and RW-8S) and one bedrock recovery well (RW-3D). The GWE&T system initially included treatment of extracted groundwater via ultraviolet light and peroxide oxidation. In December 2011, the GWE&T system was redesigned, resulting in replacement of the ultraviolet light and peroxide oxidation treatment with an air stripper. Currently, only bedrock recovery well RW-3D is actively recovering groundwater. Overburden recovery wells RW-1S and RW-8S have been offline since the fall of 2015.

The current Institutional Controls governing the Site include: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the site to commercial/industrial uses only. The Engineering Controls at the Site consist of the asphalt cap installed over the Tailings Dump Area, a security perimeter fence, the sub-slab depressurization system (SSDS) installed off-Site at 47 Commerce Street, the GWE&T system, and the overburden and bedrock monitoring well network.

1. INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the Consolidated Stamp Company (COSCO) Site located in Spring Valley, New York (hereinafter referred to as the "Site"). A Site location Map is provided as **Figure 1-1**. The Site is managed under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program, Site No. 3-44-035, which is administered by New York State Department of Environmental Conservation (NYSDEC or Department).

A figure showing the Site location and boundaries is provided in **Figure 1-2**. The boundaries of the Site will be more fully described in the metes and bounds Site description that is part of the Environmental Easement to be granted.

After completion of the remedial work, some contamination was left at this Site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Rockland County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the Site and off-Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion;
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the Inactive Hazardous Waste Disposal Site Remedial Program (Site No. 3-44-035) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the Site is provided in **Appendix A** of this SMP.

This SMP was prepared Ramboll Americas Engineering Solutions, Inc. (Ramboll) on behalf of the NYSDEC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. The NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the site, the NYSDEC project manager will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

1. 60-day advance notice of any proposed changes in site use that are required under the terms of the Order on Consent 6 NYCRR Part 375 and/or Environmental Conservation Law.
2. 7-day advance notice of any field activity associated with the remedial program.
3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan. If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above mentioned 60-day advance notice is also required.
4. Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
5. Notice within 48 hours of any non-routine maintenance activities.
6. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
7. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

8. At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the Order on Consent, and all approved work plans and reports, including this SMP.
9. Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1-1 below includes contact information for the above notifications. The information on this table will be updated as necessary to provide accurate contact information. A full listing of Site-related contact information is provided in **Appendix A**.

Table 1-1: Notifications*

Name	**Contact Information**	**Required Notification****
Robert Strang	518-402-8642 robert.strang@dec.ny.gov	All Notifications
Jeff Dyber	518-402-9621 jeffrey.dyber@dec.ny.gov	All Notifications
Kelly Lewandowski	518-402-9553 kelly.lewandowski@dec.ny.gov	Notifications 1 and 8
Stephen Lawrence	518-402-0450 beei@health.ny.gov	Notifications 4, 6, and 7

* Note: Notifications are subject to change and will be updated as necessary.

** Note: Numbers in this column reference the numbered bullets in the notification list in this section.

2. SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is the location of the former COSCO facility located at 15 West Street, and the former Continental Plastic Company (CPC) facility, located at 2 North Cole Avenue, about 200 feet northwest of the former COSCO facility. The Site is in the Town of Spring Valley, Rockland County, New York and is identified as parcel 57.46-1-1 on the Rockland County Tax Map. The Site is an approximately 2.5-acre area and is bounded bound to the east by West Street, to the south by West Central Avenue and to the north by an inactive Conrail line and right-of-way. Industrial and commercial facilities are located on the north side of the right-of-way including the former CPC facility, a communications tower, and the Spring Valley Department of Public Works (DPW) maintenance facility.

A drainage way, known as the Reach B Diversion, runs between the facilities. The drainage way originates to the southwest and continues to the northeast and discharges into the West Branch of Pascack Brook, east of the Site. The Tailings Dump Area is an approximate 18,750 square-foot (0.3 acre), triangular-shaped, and fenced area at the western end of the property. At present, the Tailings Dump Area is the only portion of the original Site that remains within the Site boundaries as defined by NYSDEC. The owner(s) of the site parcel(s) at the time of issuance of this SMP is/are:

- Metropolitan Transit Authority

The operator(s) of the site parcel(s) at the time of issuance of this SMP is/are:

- Labella Associates (Formerly Aztech Environmental)
- Ramboll

Site monitoring and reporting activities are performed by Ramboll Americas Engineering Solutions, Inc, (Ramboll), and Operation and Maintenance activities are performed by LaBella Associates.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: various buildings associated with the former COSCO facility and CPC facility, a wooded area surrounding the inactive railroad and right-of-way and various paved areas adjacent to the buildings. The Site is zoned commercial/industrial and is currently vacant at the capped area. The former COSCO Building is currently occupied by a textile retailer.

The properties adjoining the Site and, in the neighborhood surrounding the Site, primarily include industrial, commercial, and residential properties. The properties immediately south of the Site include commercial and residential properties; the properties immediately north of the Site include commercial/industrial properties; the properties immediately east of the Site include residential properties and other vacant treed lots.

2.2.2 Geology

The area surrounding the Site is underlain by glacial sediments (including glacial till, glacial outwash and glaciolacustrine deposits) that overlie red shale, mudstone, sandstone and conglomerates of the Brunswick Formation. Various phases of investigation at the site have identified unconsolidated overburden that consists of sand and gravel fill that is underlain by native silty clay, sand and gravel, and glacial till to a depth of approximately 40 feet below grade. Bedrock underlying the site includes sandstone and conglomerate. A geologic cross-section of the Site is shown on Figure 2-1.

2.2.3 Hydrogeology

The unconsolidated overburden is generally saturated between 10 feet and 15 feet below grade with groundwater movement generally toward the southeast. Within the bedrock, groundwater movement is generally toward the northeast. A downward vertical hydraulic gradient has been documented between the unconsolidated overburden and the bedrock.

A groundwater contour map for the overburden and bedrock zones are shown in **Figure 2-2** and **Figure 2-3**. Groundwater monitoring well details and elevation data is provided in **Table 2-1** and **Table 2-2**.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site.

In 1978, the Rockland County Department of Health (RCDOH) identified tetrachloroethene (PCE), trichloroethene (TCE), Dichloroethene (DCE), and 1,1,1-trichloroethane (1,1,1-TCA) in the well field operated by the Spring Valley Water Company (Aztech, 2020). The COSCO Site and CPC facility were identified as potential sources for the contamination at the former Spring Valley Well Field Site (ID No. 3-44-018). The results of a survey performed by Spring Valley Water Company in 1979 found that the CPC facility was pumping approximately 20 to 30 gallons per minute (gpm) of TCE and PCE contaminated non-contact cooling water into Reach B Diversion. In addition, The COSCO facility was using TCE as part of a vapor degreasing process and discharging the rinse water into Reach B Diversion. In 1980, Reach B Diversion was diverted away from the former Spring Valley Well Field Site into the West Branch of the Pascack Brook. After re-configuring the discharge for Reach B Diversion, the former waterway was sampled at multiple locations for volatile organic compounds (VOCs) in soil, sediment, and surface water. In addition, semi-volatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs) were identified in the Tailings Dump Area (Aztech, 2016).

From 1987 to 1990, a Remedial Investigation (RI)/Feasibility Study (FS) was performed for the Site by GHR Engineering Associates, Inc. The objective of the RI/FS was to evaluate potential source areas for Site-related constituents of concern (COCs), PCE and its associated degradation products TCE, DCE, and vinyl chloride (VC).

As documented in the RI Report, the former soil source area was located north of the COSCO facility and extends east-west from the east side of bedrock monitoring well GP-4D to east of overburden recovery well RW-1S (Aztech, 2020). The northern extent of source area soil was located south of the Conrail track line that extends east-west north of the COSCO facility. The

approximate impacted area of soil was 140-feet long by 40-feet wide. The maximum historical concentrations of PCE, TCE, and DCE in source area soils were 1.9 parts per million (ppm), 13 ppm, and 2.6 ppm, respectively. Cyanide, cadmium, lead, and zinc were detected in source area soils with maximum concentrations of 28 ppm, 4.2 ppm, 1,140 ppm and 4,120 ppm, respectively. Concentrations of other inorganic constituents detected in source area soils were within background values.

Site-related COCs were not detected in soils within the Tailings Dump Area during the RI. However, several SVOCs including polycyclic aromatic hydrocarbons (PAHs) were detected. The maximum concentrations of PAHs detected were approximately 90 ppm. In addition, pesticides 4,4-DDT and gamma chlordane, and PCBs were detected in one soil sample from the Tailings Dump Area. Inorganic constituents cyanide and cadmium were also detected in the Tailings Dump Area (similar to source area soils).

Sediment samples collected from the former waterway drainage channel (Reach B Diversion) had detected concentrations of PCE, TCE, and DCE with a maximum total VOC concentration of 38.7 ppm in a sediment sample collected from the DPW property (north of the soil source area).

Site-related COCs were detected in overburden groundwater at a maximum total concentration of 24,861 parts per billion (ppb) and in bedrock groundwater at a maximum total concentration of 15,437 ppb.

Following the RI, an FS was performed to identify, screen, and evaluate potential remedial alternatives and a Record of Decision (ROD) was issued for the Site in March 1990. The ROD detailed selected remedies to address contamination at the COSCO Site and CPC facility, which included:

- Source area groundwater extraction and treatment by ultraviolet (UV) chemical oxidation and polishing;
- Source area soil and sediment soil vapor extraction (SVE); and,
- Capping of the Tailings Dump Area to prevent erosion and disturbance.

Pursuant to the results of the RI and a petition from the Spring Valley Water Company to delist the Site, the Site boundaries were redefined, the COSCO Site and CPC facility were listed under the New York State Inactive Hazardous Waste Disposal Site Remedial Program, and the former Spring Valley Well Field Site was delisted in December 1990.

Two post-ROD groundwater studies were conducted to evaluate groundwater flow in the bedrock aquifer. The first study was performed in the summer of 1990 by COSCO and Sara Lee Corporation[1]. The second study, a supplemental RI, was performed in 1992 by COSCO, Sara Lee, and the Spring Valley Water Company. In March of 1996, COSCO and Sara Lee settled with NYSDEC to contribute past and future costs to the Site for remediation.

A pre-design investigation (PDI) was performed in 1997 and 1998 by Camp Dresser and McKee on behalf of NYSDEC to fill identified data gaps and evaluate the appropriateness of the remedial action recommended in the 1990 ROD. Field investigations performed during the PDI included:

[1] Sara Lee Corporation previously owned certain assets of the COSCO Site (NYSDEC, 1999).

- Soil and groundwater sampling;
- Aquifer pump testing; and,
- Vapor extraction pilot testing.

Six soil borings were completed in the source area. The soil borings were advanced from eight to twenty feet below grade, depending on location at the Site. Soil samples were collected at four-foot intervals. Fifteen soil samples were collected during the soil boring program. Total VOC concentrations detected in soil ranged from non-detect to 0.726 ppm (approximately one-quarter of the maximum concentration of total VOCs in soil reported during the RI). The soil boring program also identified the presence of low permeability soils in the source area, interbedded with more permeable soils.

The former drainage channel area (Reach B Diversion) could not be sampled during the PDI as the channel had been filled in and a communications tower had been constructed in the area following completion of the 1990 RI. As a result, five soil borings were advanced adjacent to the communications tower. Soil samples were collected at three of the five boring locations and a groundwater sample was collected at one boring location. The detected concentrations of VOCs in soil samples ranged from 0.0012 to 0.0099 ppm. The total VOC concentration detected in the groundwater sample was 1,270 ppb. These results suggested that the total VOC concentrations in overburden groundwater were still elevated near the former drainage channel, and that the total VOC concentration in soil was low.

As part of the PDI, two overburden monitoring wells (GW-1S and GW-4S) and four bedrock monitoring wells (GW-2D, GW-3D, GP-4D, and GW-5D) were installed at the Site and groundwater samples were collected for VOC analysis to compare to previous results. Groundwater sample results collected from the six monitoring wells indicated that VOC concentrations in both the overburden and bedrock had decreased since the RI.

In addition, during the PDI it was noted that an asphalt cap was installed over most of the Tailings Dump Area. This asphalt cap satisfied the capping requirement presented in the 1990 ROD.

Remedial actions were initiated at the Site beginning in the late 1990's when the Tailings Dump Area was capped with asphalt. In November 2003, the groundwater extraction and treatment (GWE&T) system was placed into operation (Aztech, 2020) and consists of two overburden recovery wells (RW-1S and RW-8S) and one bedrock recovery well (RW-3D). Recovery wells RW-1S and RW-3D are repurposed monitoring wells, formerly GW-1S and GW-3D. The wells were installed as part of the PDI in December 1997 by American Auger and Ditching, of Constantia, New York.

The 1990 ROD was amended in August 1999 (1999 ROD amendment) and is provided in **Appendix B**. The changes to the 1990 ROD were based on the results of the 1997-1998 PDI which concluded relatively low-level VOC concentrations remained in the soil and sediments at the Site and therefore the effectiveness of the recommended SVE would be limited. In addition, the soil samples collected adjacent to the communications tower constructed near the former drainage channel had VOC detections below NYSDEC Soil Clean-up Objectives. As a result, NYSDEC selected the following for the 1999 ROD amendment:

- No further action for source area soils and sediments;
- Extraction of contaminated overburden and bedrock groundwater in the source area and treatment by chemical oxidation and polishing technologies;
- Completion/repair of the existing asphalt cap over the Tailings Dump Area; and,
- Long-term groundwater monitoring to evaluate the effectiveness of both the groundwater extraction and the Tailings Dump Area.

The GWE&T system initially included treatment of extracted groundwater via UV light and peroxide oxidation. Operational issues resulted in a system shutdown within the first two years of operation. The GWE&T system design was re-evaluated to maximize treatment efficiency, minimize cost, and to continue to meet the goals of the 1999 ROD amendment. The GWE&T system redesign was completed in December 2011, replacing the UV light and peroxide oxidation treatment with an air stripper.

Since 2011, extracted groundwater is conveyed via underground piping from the recovery wells to the treatment system shed and is contained in a 1,500-gallon polyethylene batch tank prior to treatment. The extracted groundwater passes through two bag filter units, connected in parallel, prior to treatment in a ShallowTray® model 2341-P air stripper. The air stripper comprises four stripper trays and a sump tank. The air stripper is also equipped with sight tub and alarm switches and gauges connected to a programmable logic controller (PLC) to monitor the operation of the treatment system. Treated groundwater is discharged to Reach B Diversion via underground piping. Reach B Diversion ultimately discharges into Pascack Brook.

Currently only bedrock recovery well RW-3D is actively recovering groundwater. Overburden recovery wells RW-1S and RW-8S have been offline since the fall of 2015.

2.3.1 Soil Vapor Intrusion Evaluations

Two soil vapor intrusion (SVI) evaluations were conducted for the Site – one on-Site and the other off-site. The on-Site SVI evaluation was conducted by Environmental Resources Management, Inc. in January 2006. Six overburden groundwater samples and six soil vapor samples were collected and analyzed for VOCs in the area north of the COSCO facility building and along the Conrail railroad line and right-of-way. Two of the six groundwater samples had detections of Site-related COCs at concentrations less than 100 ppb. Site-related COCs were also detected in soil vapor samples.

Based on the results of the 2006 on-Site SVI evaluation, an off-Site supplemental SVI evaluation was performed to evaluate the residential and commercial area east of the Site. The off-Site SVI evaluation was performed by AECOM from December 2008 through March 2009. The off-Site supplemental SVI evaluation included collection of sub-slab soil gas samples with co-located indoor air samples at residential and commercial properties east of the Site on Commerce Street. The results of the off-Site supplemental SVI evaluation identified concentrations of PCE and TCE in the sub-slab sample collected at 47 Commerce Street in excess of the New York State Department of Health (NYSDOH) soil vapor/indoor air guideline values listed in Matrix A and Matrix B (NYSDOH, 2017). The analytical results for the other properties included in the off-Site supplemental SVI evaluation (35 Commerce Street, 37 Commerce Street, 39 Commerce Street, 41 Commerce Street, 43 Commerce Street, and 45 Commerce Street) had elevated VOC reporting limits, resulting in non-detection of VOCs.

In February 2010, an additional round of SVI sampling was performed to compare to the initial off-Site supplemental SVI results. The results of the additional round of off-Site supplemental SVI sampling indicated that concentrations of PCE and TCE were still present in the sub-slab soil vapor at 47 Commerce Street and Site-related COCs were not detected at the six other properties. Based on the detected concentrations of PCE and TCE in sub-slab soil vapor at 47 Commerce Street, a sub-slab depressurization system (SSDS) was installed to mitigate the sub-slab vapor intrusion to the property. The SSDS at 47 Commerce Street continues to operate with maintenance and inspection activities being performed by HDR Engineering, Inc. of Mahwah, New Jersey.

As recommended by NYSDEC and NYSDOH, a final round of off-Site SVI sampling was performed at 41 Commerce Street, 43 Commerce Street, and 45 Commerce Street in March 2012. The results of the final round of off-Site SVI sampling indicated that no further action or mitigation was warranted. SVI sampling was also proposed for 39 Commerce Street, however, the property owner did not grant access.

2.4 Remedial Action Objectives

The Remedial Action Goals for the Site as listed in the ROD dated August 2, 1999 are as follows:

- Reduce, control or eliminate to the extent practicable the contamination present within the soils/waste on Site.
- Eliminate the potential for direct human contact with the contaminated soils in the tailings dump.
- Prevent, to the extent possible, migration of contaminants in the soils/waste to the groundwater.
- Provide attainment of standards, criteria and guidelines (SCGs) for groundwater quality for the overburden and bedrock aquifers.

2.5 Remaining Contamination

COCs above SCGs remain in groundwater at the Site. Detected constituents in groundwater from the recent July 2020 and March 2021 semi-annual sampling events that were detected above the New York State Class GA Standards are shown on **Figure 2-4** and **Figure 2-5**.

As shown on **Figure 2-4**, Site-related COCs in overburden monitoring wells MW-18 and GW-4S and overburden recovery well RW-8S. Total 1,2-DCE was detected at an estimated concentration of 7.1 ppb[2] in MW-18. VC was also detected at an estimated concentration of 3.3 ppb, above the Class GA Standard of 2 ppb. TCE was detected at overburden monitoring well GW-4S at a concentration of 5.1 ppb, slightly above the Class GA Standard of 5 ppb. Total 1,2-DCE and TCE were detected at concentrations of 10 ppb and 9.5 ppb, respectively, at overburden recovery well RW-8S, which are above the Class GA Standard of 5 ppb for both constituents. The remaining Site-related COCs detected in overburden monitoring and recovery wells were below their Class GA Standards. As shown on **Figure 2-5**, in RW-3D, PCE was detected at a concentration of 130 ppb, TCE was detected at a concentration of 120 ppb, and total 1,2-DCE was detected at a concentration of 63 ppb, each above the Class GA Standards for these constituents of 5 ppb.

As shown on **Figure 2-4**, Site-related COCs in overburden monitoring wells MW-18 and GW-4S and overburden recovery wells RW-1S and RW-8S were detected above the Class GA Standards.

[2] For the purposes of this report, the individual Class GA Standard of 5 ppb is used for cis-1,2-dichloroethene and trans-1,2-dichloroethene.

Total 1,2-DCE was detected at an estimated concentration of 8.4 ppb in MW-18. VC was detected at a concentration of 8.6 ppb. Both concentrations are above the Class GA Standards of 5 ppb and 2 ppb, respectively. TCE was detected at a concentration of 5.8 ppb in GW-4S, slightly above the Class GA Standard of 5 ppb. TCE was also detected at concentrations of 12 ppb and 5.3 ppb in RW-1S and RW-8S, above the Class GA Standard of 5 ppb. Consistent with the July 2020 semi-annual sampling event, Site-related COCs were detected above their Class GA Standards in bedrock recovery well RW-3D. As shown on **Figure 2-5**, PCE was detected at a concentration of 260 ppb, TCE was detected at a concentration of 240 ppb, and total 1,2-DCE was detected at a concentration of 180 ppb.

3. INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC project manager.

3.2 Institutional Controls

A series of ICs is required by the August 1999 ROD amendment to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the site to commercial/industrial uses only. Adherence to these ICs on the Site will be required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. A figure showing the IC boundaries will be included in the Environmental Easement. These ICs are:

- Compliance with the SMP by the owner and remedial party (the remedial party for the purpose of the SMP is the NYSDEC);
- All Engineering Controls (ECs), discussed in greater detail below, must be operated or maintained as specified in the SMP;
- All ECs at the Site must be inspected at a frequency and manner defined in the SMP;
- Environmental monitoring for public health must be performed as defined in the SMP; and,
- Data and information pertinent to management of the Site must be reported at the frequency and in a manner defined in the SMP.

ICs, and Site restrictions, may not be discontinued without amendment to the SMP and approval from the NYSDEC. The following Site restrictions apply:

- The Site may only be used for commercial/industrial use provided that long-term ECs and ICs included in the SMP are employed;

- The Site may not be used for a higher level of use, such as unrestricted or restricted-residential use, without additional remediation and amendment of the SMP, as approved by the NYSDEC;
- Future activities conducted at the Site that disturb in-situ source soil and/or fill material that could contain potential Site-related COCs must be conducted in accordance with the SMP;
- The use of groundwater underlying the property is prohibited;
- Vegetable gardens and farming on the property are prohibited; and,
- A written statement certifying: 1). The ECs and/or ICs employed at the Site are unchanged from the previous certification or that any changes to the ECs and/or ICs were approved by the NYSDEC; and, 2). ECs and/or ICs have not been impaired to protect public health and the environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access the Site at any time in order to evaluate the continued maintenance of any and all ECs and/or ICs. The certification shall be submitted annually (or at an alternate time period acceptable to NYSDEC) and, will be made by an expert that the NYSDEC finds acceptable.

The Site is managed under the New York State Inactive Hazardous Waste Disposal Site Remedial Program administered by NYSDEC and is listed by the NYSDEC as a Class 4 Inactive Hazardous Waste Disposal Site (ID No. 3-44-035). Class 4 sites are hazardous waste sites that have been properly closed but, require continued O&M of remedial systems and/or continued site monitoring.

3.3 Engineering Controls

The ECs at the Site consist of the asphalt cap installed over the Tailings Dump Area, a security perimeter fence, the SSDS installed off-Site at 47 Commerce Street, the GWE&T system, and the overburden and bedrock monitoring well network. **Figure 1-2** shows the location of the ECs for the Site.

3.3.1 Asphalt Cap

The asphalt cap installed over the Tailings Dump Area during the PDI prevents exposure to remaining impacted soil/solid wastes in the Tailings Dump Area. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in **Section 4.0** of this SMP.

Any future intrusive work that will penetrate the asphalt cap will be performed in accordance with an Excavation Work Plan (EWP) that will be prepared prior to commencing the intrusive work. The EWP will outline the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in the Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the Site. Any disturbance of the Site's cover system must be overseen by a qualified environmental professional as defined in 6 NYCRR Part 375, a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

3.3.2 Security Perimeter Fence

A security perimeter fence was installed around the Tailings Dump Area and the monitoring well network at the Site to limit access.

3.3.3 Sub-Slab Depressurization System

An SSDS was installed by NYSDEC at a nearby off-Site residence (47 Commerce Street) to minimize exposure to elevated concentrations of VOCs in sub-slab/indoor air at the property and to mitigate future VOC exposure to the public. The SSDS consists of one centrally located system suction point (SSP) that induces air flow through a RadonAway™ model RP-145 fan. The RP-145 fan is mounted on the southwestern exterior of the property. Continued operation of the SSDS is a component of the overall remedial program for the Site.

The SSDS is managed under a separate state-wide maintenance contract through the NYSDEC and therefore specific inspection/maintenance procedures and operational information is not included as part of this SMP.

3.3.4 Groundwater Extraction and Treatment System

The GWE&T system at the Site consists of two overburden recovery wells, one bedrock recovery well, and four-tray air stripper. Groundwater extracted from the subsurface is conveyed via underground piping to a remedial structure that houses the GWE&T system and controls. The remedial structure consists of an oversized corrugated steel shipping container that is placed upon a concrete slab. On either end of the structure a rollup door allows for the larger system components to be brought in and out easily. A standard size door with functioning lock is located on the side. The structure is insulated and has painted sheet metal floors and walls covered with polyester resin composite panels.

The remedial structure is serviced by a public electric supply provided by Orange and Rockland Utilities as well as cellular telecommunication services provided by Verizon Wireless. The electrical distribution includes high and low-voltage electrical panels. The interior of the remedial structure is heated via individual electric heaters and includes a settling tank, shallow tray air stripper unit (with blower, transfer and discharge pumps), as well as system sensors, meters and controls. Security lighting illuminates the exterior of the remedial structure during nighttime hours. The remedial design for the groundwater extraction and treatment system was completed in 2000, followed by implementation of the selected remedy (groundwater extraction with treatment using ultra-violet (UV)/peroxide oxidation) in November of 2003.

Operational issues (including a need for a full-time remedial system operator, safety concerns associated with special materials handling, operational costs, etc.) resulted in the system being shut down within two (2) years. NYSDEC subsequently evaluated the groundwater treatment system to develop manageable operational procedures and still remain within the intent of the ROD. The groundwater treatment system was changed to an air stripper in January 2012. Currently only bedrock recovery well RW-3D is actively recovering groundwater. Treated groundwater is discharged to Reach B Diversion via underground piping. Reach B Diversion ultimately discharges into Pascack Brook.

Procedures for operating and maintaining the GWE&T system are documented in the Operation and Maintenance Plan (**Section 4.0** of this SMP). As-built drawings, signed and sealed by a PE who is licensed and registered in New York State, are included in **Appendix C** – Labella Site Operations and Maintenance Manual.

3.3.5 Overburden and Bedrock Monitoring Well Network

The Site includes eight groundwater monitoring and/or recovery wells. Five wells (GW-4S, MW-3, MW-18, RW-1S, and RW-8S) are completed within the overburden and three wells (DW-1, GP-4D, and RW-3D) are completed within the bedrock.

3.3.6 Criteria for Completion of Remediations/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. Unless waived by the NYSDEC, confirmation samples of applicable environmental media are required before terminating any remedial actions at the site. Confirmation samples require Category B deliverables and a Data Usability Summary Report (DUSR).

As discussed below, the NYSDEC may approve termination of a groundwater monitoring program. When a remedial party receives this approval, the remedial party will decommission all site-related monitoring, injection and recovery wells as per the NYSDEC CP-43 policy.

The remedial party will also conduct any needed site restoration activities, such as asphalt patching and decommissioning treatment system equipment. In addition, the remedial party will conduct any necessary restoration of vegetation coverage, trees and wetlands, and will comply with NYSDEC and United States Army Corps of Engineers regulations and guidance. Also, the remedial party will ensure that no ongoing erosion is occurring on the site.

3.3.6.1 Cover (or Cap)

The composite cover system is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.3.6.2 Sub-Slab Depressurization (SSD) System

The active SSD system will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH project managers. If monitoring data indicates that the SSD system may no longer be required, a proposal to discontinue the SSD system will be submitted by the remedial party to the NYSDEC and NYSDOH project managers.

3.3.6.3 Groundwater Extraction and Treatment (GWE&T) System

The GWE&T system will not be discontinued unless prior written approval is granted by the NYSDEC project manager. In the event that monitoring data indicates that the GWE&T system may no longer be required, a proposal to discontinue the system, including the results of an impact study, will be submitted by the remedial party. Conditions that may warrant discontinuing the GWE&T system include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards or the site SCGs as appropriate, (2) have become asymptotic to a low level over an extended period of time as accepted by the NYSDEC; or (3) the NYSDEC has determined that the GWE&T system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC project manager.

3.3.6.4 Monitoring Wells Associated with Monitored Natural Attenuation

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC project manager in consultation with NYSDOH project manager, until residual groundwater concentrations are found to be consistently below ambient water quality standards, the site SCGs, or have become asymptotic at an acceptable level over an extended period. In the event that monitoring data indicates that monitoring for natural attenuation may no longer be required, a proposal to discontinue the monitoring will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC project manager. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional source removal, treatment and/or control measures will be evaluated.

4. MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan for the Site.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance (SCGs), particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and
- Annual inspection and periodic certification.

Reporting requirements are provided in **Section 7.0** of this SMP.

The monitoring and sampling programs and schedule for the COSCO Site are summarized below in **Table 4-1**.

Table 4-1: Monitoring and Sampling Schedule

Monitoring Element	Frequency	Sampling Requirement	Analysis
Site-Wide Inspection – Including Soil Cover System and Fencing – Tailings Dump Area	Annually	Site-Wide	Visual Inspection
GWE&T System	Monthly	Combined Influent, Post Bag Filters, System Effluent	VOCs by Method 624
Groundwater	Semi-Annually	RW-1S, RW-8S, RW-3D, GW-4S, GW-4D, MW-18, DW-1, MW-3	VOCs by Method 624
SSDS	Inspection and maintenance of the SSDS is managed by the NYSDEC.		

4.2 Site-Wide Inspection

Site-wide inspections will be performed annually. These periodic inspections must be conducted when the ground surface is visible (i.e., no snow cover). The annual Site-Wide inspection includes evaluation of the current condition of the asphalt cap, site security fencing at the Tailings Dump Area including assessing the presence of vegetative growth and inspection of the perimeter fence for breaks in the linkage or loose poles. The annual inspection also includes evaluation of the current monitoring and recovery well network.

Site-wide inspections will be performed by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC project manager. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in **Appendix D** – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- Whether stormwater management systems, such as basins and outfalls, are working as designed;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the Site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless

of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as defined in 6 NYCCR Part 375. Written confirmation must be provided to the NYSDEC project manager within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Treatment System Monitoring

4.3.1 GWE&T System

Monitoring of the GWE&T system combined influent, post bag filters, system effluent streams for the full list of VOCs by Method 624 will be performed on a monthly basis, as identified in **Table 4-1**. Samples obtained from the GWE&T System will be collected directly into pre-preserved sampling containers via the sampling ports located inside of the GWE&T system building. Samples will immediately be placed on ice in a cooler and transported under chain of custody to the analytical laboratory for analysis.

The monitoring of remedial systems must be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the GWE&T system has been reported or an emergency occurs that is deemed likely to affect the operation of the system.

The remedial party will properly dispose of all wastes generated by the remedial system at off-site disposal facilities according to local, state and federal laws and regulations. Wastes will be tested before disposal to comply with the permit conditions of the disposal facility. Waste generated at this site includes spent bag filters from the GWE&T System.

4.3.2 SSDS

The SSDS is managed under a separate state-wide maintenance contract through the NYSDEC and therefore specific inspection/maintenance procedures and operational information is not included as part of this SMP.

4.4 Post-Remediation Media Monitoring and Sampling

4.4.1 Groundwater Sampling

Groundwater monitoring will be performed at eight locations, RW-1S, RW-8S, RW-3D, GW-4S, GW-4D, MW-18, DW-1, and MW-3, on a semi-annual basis to assess the performance of the remedy. Groundwater samples will be analyzed for the full list of VOCs by USEPA Method 624[1] by Pace Analytical of Longmeadow, Massachusetts. Well construction details are provided on **Table 2-1** and in **Appendix E.**

Groundwater monitoring events will include the collection of depth to groundwater measurements using an electronic water level meter. Groundwater sampling will be conducted after three well volumes of groundwater have been purged using dedicated disposable bailers to ensure to collection of representative groundwater samples. Groundwater samples will be collected in pre-preserved laboratory supplied sampling containers. Groundwater samples obtained from the active groundwater extraction wells will be collected directly into the sampling containers via the sampling ports located inside of the GWE&T system building. Field quality assurance/quality control (QA/QC) samples consist of one blind field duplicate, one matrix spike (MS), one matrix spike duplicate (MSD), and trip blanks for each day of sample collection. In addition, an equipment blank sample will be collected per event from the submersible pump. Samples will immediately be placed on ice in a cooler and transported under chain of custody to the analytical laboratory for analysis.

If biofouling or silt accumulation occurs in the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance. The NYSDEC project manager will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC project manager. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC project manager.

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

All sampling activities will be recorded in a field book and associated sampling log as provided in **Appendix D** - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network.

5. OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the Site to operate and maintain the GWE&T system;
- Will be updated periodically to reflect changes in Site conditions or the manner in which the GWE&T system is operated and maintained.

Further detail regarding the Operation and Maintenance of the GWE&T is provided in **Appendix C** – Labella Site Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, is to be maintained at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 GWE&T System Performance Criteria

Samples from the with the GWE&T system are analyzed for the full list of VOCs via analytical method 624. Concentrations of the Site-related VOCs (TCE, PCE, DCE and VC) in the system effluent samples will be compared to the Effluent Limitations established by NYSDEC – Division of Water for the site. The effluent limitations are listed below in **Table 5-1** and in the State Pollutant Discharge Elimination System Permit (SPDES) provided in **Appendix F.**

Table 5-1 GWE&T System Effluent Limitations

Parameter	Effluent Limitation
Flow (GPM)	18-45
pH (range)	6.5-8.5
Vinyl Chloride (ppb)	10
1,1 Dichloroethene (ppb)	10
1,2 Dichloroethene (Total) (ppb)	10
Trichloroethene (ppb)	10
Tetrachloroethene (ppb)	6
Aluminum (ppb)	4,000
Arsenic (Total) (ppb)	1,800
Arsenic (Dissolved)	900
Barium (ppb)	4,000
Iron (ppb)	1,800
Copper (Total) (ppb)	75
Copper (Dissolved)	50
Lead (Total) (ppb)	100
Lead (Dissolved)	24
Manganese (ppb)	2,000
Vanadium (ppb)	84
Zinc (Total) (ppb)	600
Zinc (Dissolved) (ppb)	400

Notes:
GPM = Gallons per Minute
Total metals concentration via analysis of an acidified, unfiltered sample
Dissolved metals concentration via filtration using a 0.45-micron particulate filter prior to acidification.
Effluent Limitations established by NYSDEC – Division of Water

5.3 Operation and Maintenance of the GWE&T System

5.3.1 System Startup and Testing

Startup and testing of the GWE&T system after a system failure should be conducted as recommended in **Appendix C** – Labella Site Operation and Maintenance Manual Prior to conducting with a manual system restart, careful attention should be paid to determine the cause of the system shutdown. If the system shutdown is unknown and cannot be determined, each component of the GWE&T System should be carefully inspected prior to system startup. Manufacturer's recommendations can be found for each system component in their respective manuals (see **Appendix C** – Labella Site Operation and Maintenance Manual).

5.3.2 Routine System Operation and Maintenance

Routine system operation includes daily systems reports generated by the Programmable Logic Controller that are transmitted via e-mail to the office of the standby remedial contractor. Additionally, bi-weekly inspection and maintenance Site visits are conducted, and system influent/effluent sampling is conducted monthly. Items found in need of attention via either the daily e-mails or visual inspection during the biweekly Site visits shall be addressed as soon as

reasonably possible. Typical routine maintenance items that are performed during Site visits are replacing bag filters, inspection and cleaning of the air stripper and replacement of system components such as gauges and valves. A complete list of components to be checked is provided in the Inspection Checklist which is provided in **Appendix D**.

System components found to be working below their typical performance capabilities should be reported to the Site's NYSDEC Project Manager for further evaluation and troubleshooting. Procedures for routine system operation and maintenance site visits are discussed in detail in **Appendix C** – Labella Site Operation and Maintenance Manual of this SMP. These procedures should be referenced during any system failure or malfunction.

5.3.3 Non-Routine Operation and Maintenance

Non-routine maintenance activities include various tasks that should be conducted on an annual basis at a minimum. This includes annual inspection, maintenance, and replacement as needed of various system components such as well pumps, transfer pumps, the air stripper components (trays, sump, blower etc.), system controls, remedial building, etc. Equipment is replaced as needed. Procedures for non-routine equipment maintenance are discussed in detail in **Appendix C** – Labella Site Operation and Maintenance Manual of this SMP.

5.3.4 System Monitoring Devices and Alarms

The GWE&T system is equipped with a PLC that provides a daily report (via e-mail) that summarizes various system inputs/outputs such as flow rates, pressures, amperage loads etc. These system e-mails are reviewed to verify that the system is operating properly. When appropriate, non-routine Site maintenance visits will be scheduled in order to address issues that need attention. System maintenance and/or repairs will be conducted as specified in **Appendix C** – Labella Site Operation and Maintenance Manual of this SMP. Operational problems will be noted in the subsequent quarterly letter report for system operation and will be noted in the Periodic Review Report to be prepared for that reporting period.

5.3.5 Fire Safety

The remedial party will conduct an annual facility walk with the local fire chief and/or fire suppression team. The Site walk will allow for the addition of the facility to any local preplanning efforts. The NYSDEC project manager will be provided with the local fire chief's/fire suppression team's recommendations as soon as they become available. Following review, the NYSDEC project manager may direct the remedial party to implement the recommendations and/or revise the SMP.

6. PERIODIC ASSESMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding. This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding.

According the Federal Emergency Management Agency (FEMA) flood plain mapping tool the Site is within a "Zone A" special flood hazard area. The Site may be susceptible to flooding during severe weather events. The GWE&T System requires municipal electricity to run and therefore would be susceptible to power outages during severe weather events.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including Site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the Site during Site management, and as reported in the Periodic Review Report (PRR).

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the NYSDEC project manager feels appropriate, e.g., during significant maintenance events or in conjunction with storm recovery activities.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of reagents and consumables. Spent materials will be sent for recycling, as appropriate.

6.2.3 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site, use of consumables in relation to visiting the Site in order to conduct system checks and/or collect samples, and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

6.2.5 Metrics and Reporting

A green remediation metric tracking for is included in **Appendix D** – Site Management Forms, and will be used to aggregate information on energy usage, solid waste generation, transportation and shipping, water usage and land use and ecosystems will be recorded as applicable to facilitate and document consistent implementation of green remediation during Site management and to identify corresponding benefits. Metrics expected to be applicable to this Site include Section I. energy use and Section III. transportation distances.

6.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC project manager or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a Site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the Site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7. REPORTING REQUIREMENTS

7.1 Site Management Reports

All Site management inspection, maintenance and monitoring events will be recorded on the appropriate Site management forms provided in **Appendix D**. These forms are subject to NYSDEC revision. All Site management inspection, maintenance, and monitoring events will be conducted by a qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of **Table 7-1** and summarized in the Periodic Review Report. The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.

Table 7-1: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency
Quarterly System Monitoring Report	Quarterly
Groundwater Monitoring Report	Semi-Annually[3]
Site Wide Inspection (Including Tailings Dump Area Cover)	Annually
Periodic Review Report	Annually

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

[3] The second semi-annual Groundwater Monitoring Report is incorporated into the Periodic Review Report.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the to the NYSDEC project manager annually, or at another frequency as may be required by the NYSDEC project manager. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site . The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections, fire inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables and figures

will include a presentation of past data as part of an evaluation of contaminant concentration trends, including but not limited to:

  - Trend monitoring graphs that present groundwater contaminant levels from before the start of the remedy implementation to the most current sampling data;
  - Trend monitoring graphs depicting system influent analytical data on a per event and cumulative basis;
  - O&M data summary tables;
  - A current plume map for sites with remaining groundwater contamination; and
  - A groundwater elevation contour map for each gauging event.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.
- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP), ROD or Decision Document;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
  - An evaluation of trends in contaminant levels in the affected media to determine if the remedy continues to be effective in achieving remedial goals as specified by the RAWP, ROD or Decision Document; and
  - The overall performance and effectiveness of the remedy.

- A performance summary for all treatment systems at the site during the calendar year, including information such as:
  - The number of days the system operated for the reporting period;
  - The average, high, and low flows per day;
  - The contaminant mass removed and the cost per pound of mass removed during the certification period and during the life of the treatment system;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;
  - Trends in equipment failure;
  - A summary of the performance, effluent and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation. Recommendations must address how receptors would be impacted. Recommendations can include:
    - Proposals to address efficiency and costs such as: instituting remote operation, system changes to decrease maintenance costs and downtime, and system changes to decrease energy use; and

- Proposals to modify or shut down a treatment system due to remediation completion, system performance or changed conditions. System shutdowns are addressed in Section 6.4 of DER-10.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice and registered in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the Site, I certify that all of the following statements are true:*

- *The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any Site management plan for this control;*
- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the Site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative] (and if the site consists of multiple properties): *[I have been authorized and designated by all site owners/remedial parties to sign this certification] for the Site."*

"I certify that the New York State Education Department has granted a Certificate of Authorization to provide Professional Engineering services to the firm that prepared this Periodic Review Report."

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work

will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

7.4 Remedial Site Optimization Report

If an RSO is to be performed (see **Section 6.3**), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

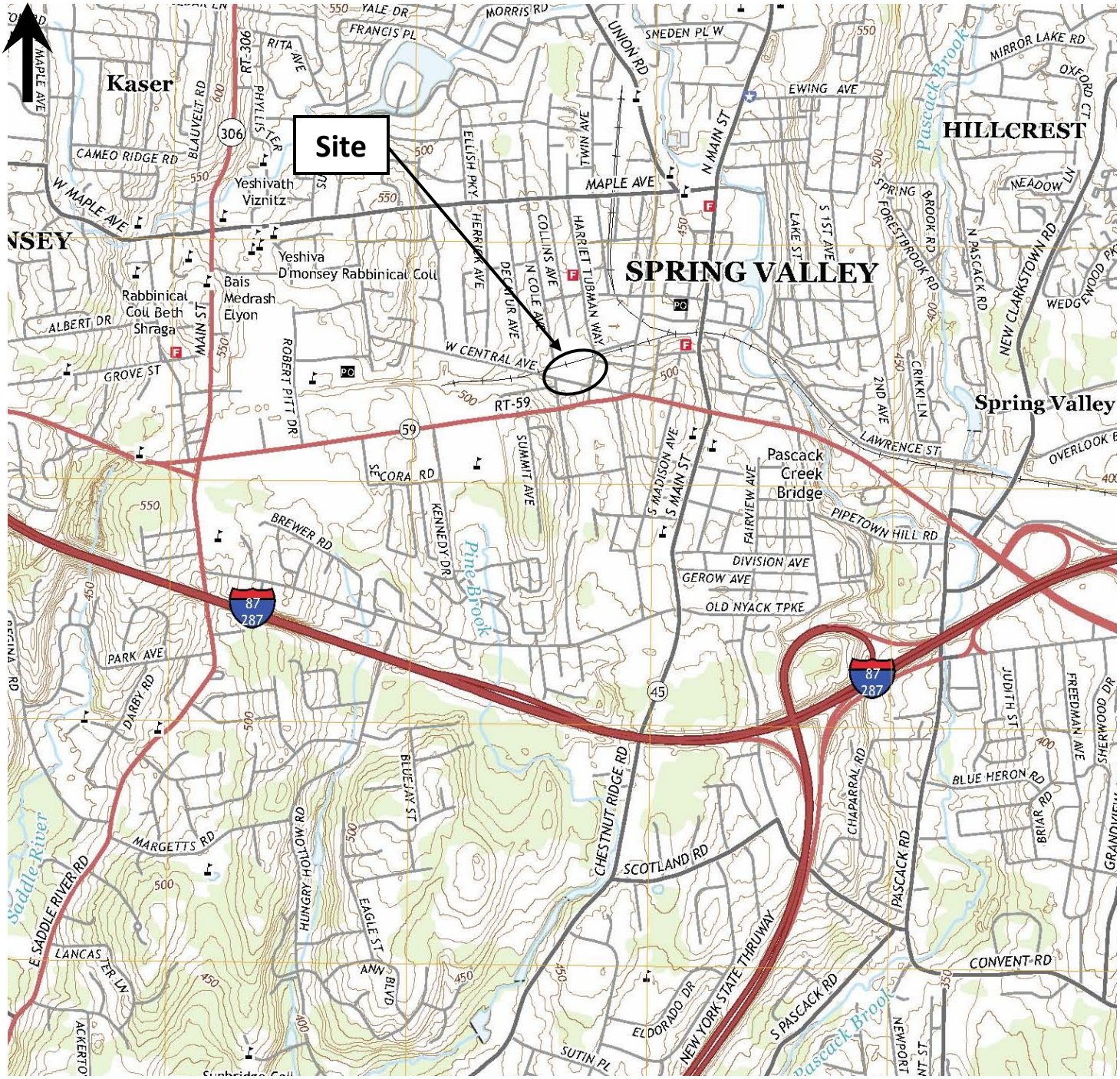
8. REFERENCES

Aztech Environmental Technologies, 2016. *Site Management Plan Volume I COSCO*, Spring Valley, Rockland County, New York. NYSDEC Site No.:3-44-035. Prepared for the New York State Department of Environmental Conservation. January 21, 2016.

Aztech Environmental Technologies, 2020. *Periodic Review Report COSCO*, Spring Valley, Rockland County, New York. Covering the Time Period from April 4, 2019 through April 4, 2020. NYSDEC Site No.:3-44-035. Prepared for the New York State Department of Environmental Conservation. May 1, 2020.

FIGURES

N



Scale 1:24,000

Adapted From: USGS Topographic Quadrangle Map, Park Ridge, New Jersey.

Modified From: Aztech Environmental Technologies, 2020.

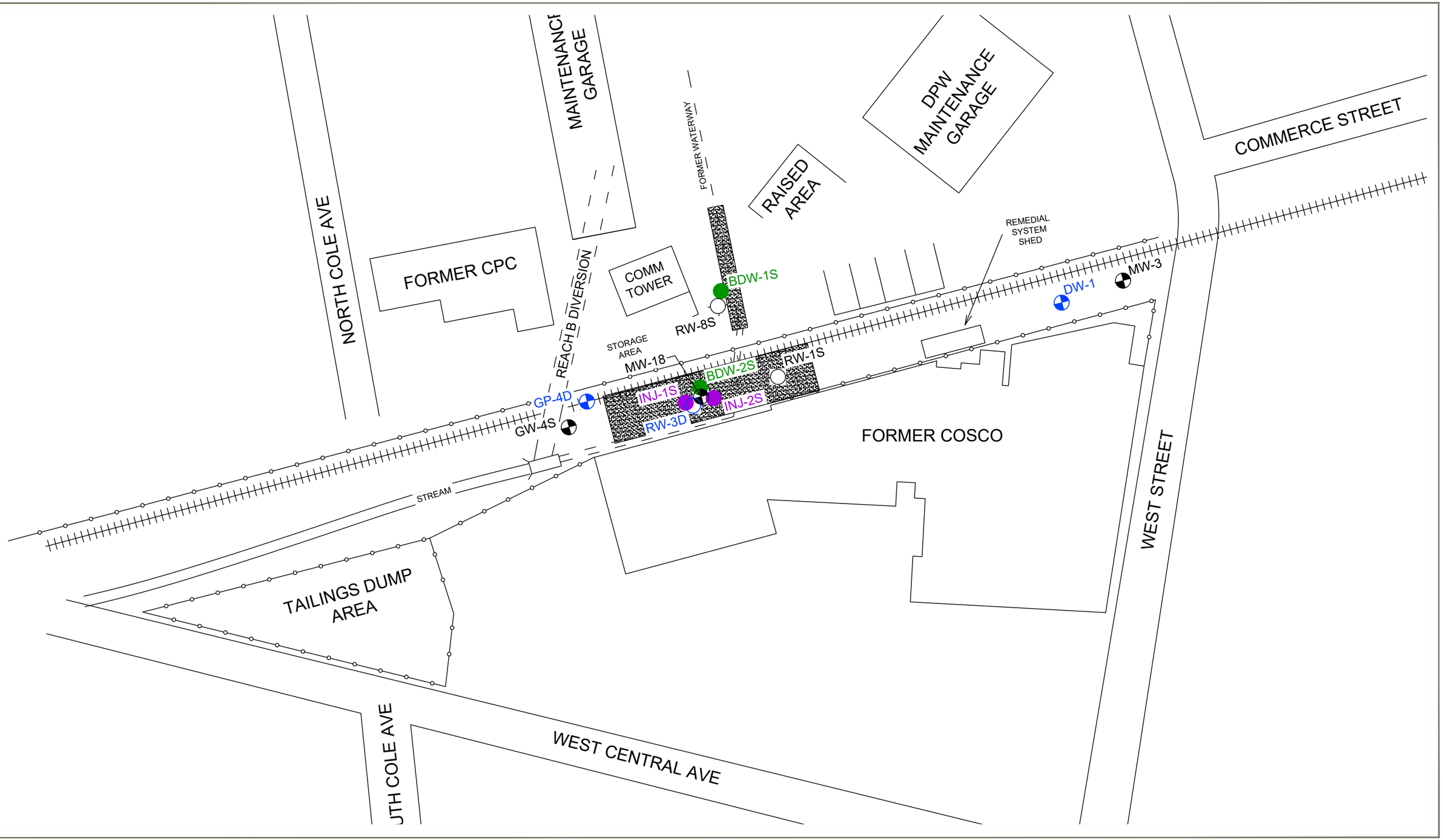
NYSDEC COSCO SITE
15 West Street
Spring Valley, New York

NYSDEC Site ID No. 3-44-035

FIGURE 1-1

Site Location Map

RAMBOLL



LEGEND:

- BEDROCK OBSERVATION WELL
- BEDROCK INJECTION WELL
- OVERBURDEN MONITORING WELL
- OVERBURDEN GROUNDWATER RECOVERY WELL
- BEDROCK MONITORING WELL
- BEDROCK RECOVERY WELL
- RAILROAD TRACK
- FENCE LINE
- SOURCE AREA

0 60
SCALE IN FEET

NOTE:

1. EXISTING DEEP BEDROCK PUMPING WELL RW-3D WILL BE USED AS A DEEP BEDROCK INJECTION WELL DURING THE REMEDIAL SYSTEM OPTIMIZATION.

SITE LAYOUT MAP

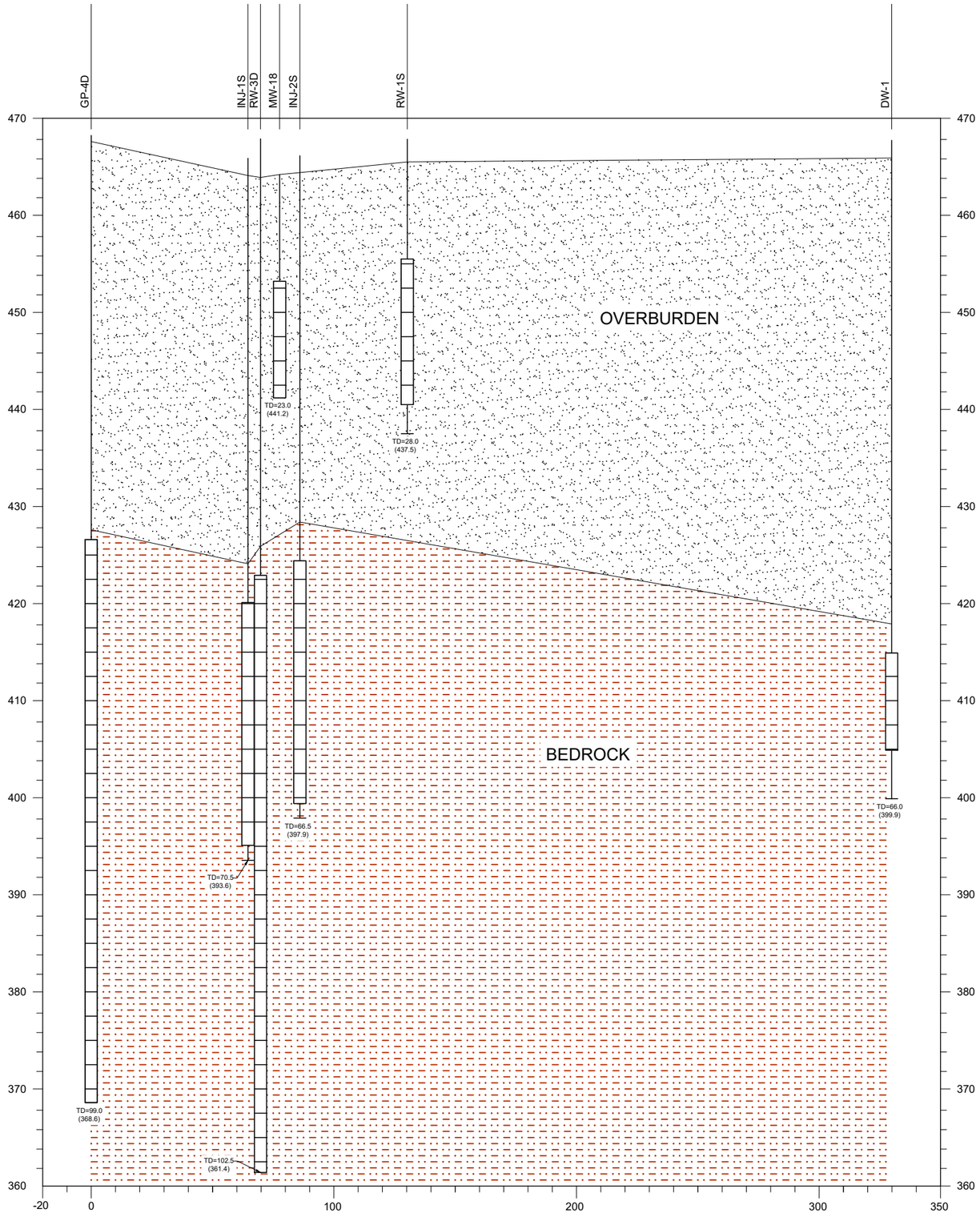
NYSDEC COSCO
SPRING VALLEY, NEW YORK
AUGUST 2022

FIGURE 1-2

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

\\ramsyrfile01\Projects\Nys-Dec.10653\75217.Cosco-75217\Docs\DWG\Well Map & Cross Section_080822.dwg
DESIGNER: LOMBARJJ
DATED: 8/11/2022
PROJECT: 75217



50 0 50

HORIZONTAL SCALE IN FEET

12.5 0 12.5

VERTICAL SCALE IN FEET

GEOLOGIC CROSS SECTION

NYSDEC COSCO
SPRING VALLEY, NEW YORK
AUGUST 2022

FIGURE 2-1

RAMBOLL AMERICAS ENGINEERING SOLUTIONS, INC.

RAMBOLL

PROJECT: 75217 DATED: 8/11/2022 DESIGNER: LOMBARJJ

\\syracusesvr\projects\Nys-Dec.10653\75217.Cosco-75217\Docs\DWG

North Cole Ave

Former CPC

Maint. Garage

Reach B Diversion

Former Waterway

Comm. Tower

Raised Area

DPW Maintenance Garage

Commerce Street

Remedial System Shed

Storage Area

87.75

(87.76)

RW-8S

88.00

(87.65)

MW-3

DW-1

GP-4D

(87.78)

RW-1S

RW-3D

MW-18

(87.83)

GW-4S

(88.22)

87.75

88.00

Stream

Former COSCO

Tailings Dump Area

West Street

South Cole Ave

West Central Ave

LEGEND:

- Overburden Monitoring Well
- Overburden Groundwater Recovery Well
- Bedrock Monitoring Well
- Bedrock Recovery Well
- Groundwater Contour
- (87.76) Groundwater Elevation - March 2021
- Railroad Track
- Fence line

0 15 30 60

Approximate Scale 1" ~ 60'

RAMBOLL

NYSDEC COSCO

SPRING VALLEY, NEW YORK

OVERBURDEN GROUNDWATER ELEVATION CONTOUR MAP – MARCH 2021

FILE NO. 75217

DATE APRIL 2021

2-2

\\syracusesvr\projects\Nys-Dec.10653\75217.Cosco-75217\Docs\DWG

North Cole Ave

Maint. Garage

Former Waterway

DPW Maintenance Garage

Raised Area

Commerce Street

Former CPC

Reach B Diversion

Comm. Tower

RW-8S

Remedial System Shed

MW-3

DW-1
(74.32)

Storage Area

70

80

GP-4D
(89.49)

GW-4S

RW-3D
(51.59)

MW-18

RW-1S

60

Stream

Former COSCO

West Street

Tailings Dump Area

South Cole Ave

West Central Ave

LEGEND:

- Overburden Monitoring Well
- Overburden Groundwater Recovery Well
- Bedrock Monitoring Well
- Bedrock Recovery Well
- Groundwater Contour
- (74.32) Groundwater Elevation - March 2021
- Railroad Track
- Fence line

0 15 30 60

Approximate Scale 1" ~ 60'

RAMBOLL

NYSDEC COSCO

SPRING VALLEY, NEW YORK

BEDROCK GROUNDWATER ELEVATION CONTOUR MAP – MARCH 2021

FILE NO. 75217

DATE APRIL 2021

2-3

\\syracusesvr\projects\Nys-Dec.10653\75217.Cosco-75217\Docs\DWG

Cole Ave

Former CPC

Maint Gar

Former Waterway

DPW Maintenance Garage

Raised Area

Commerce Street

Reach B Diversion

Comm. Tower

RW-8S

Storage Area

Remedial System Shed

MW-3

DW-1

RW-1S

GP-4D

RW-3D

MW-18

GW-4S

Stream

Former COSCO

Tailings Dump Area

West Central Ave

West Street

Ave

GP-4D		
	7/29/2020	3/8/2021
1,2-Dichloroethene, Total	2.0 U	10 U
Tetrachloroethene	1.0 U	5.0 U
Trichloroethene	1.0 U	5.0 U
Vinyl chloride	1.0 U	5.0 U

RW-3D		
	7/28/2020	3/9/2021
1,2-Dichloroethene, Total	**63**	**180**
Tetrachloroethene	**130**	**260**
Trichloroethene	**120**	**240**
Vinyl chloride	10 U	25 U

DW-1		
	7/28/2020	3/8/2021
1,2-Dichloroethene, Total	10 U	10 U
Tetrachloroethene	3.0 J	0.58 J
Trichloroethene	2.3 J	5.0 U
Vinyl chloride	5.0 U	5.0 U

LEGEND:

- Overburden Monitoring Well
- Overburden Groundwater Recovery Well
- Bedrock Monitoring Well
- Bedrock Recovery Well
- Railroad Track
- Fence line

0 15 30 60

Approximate Scale 1" ~ 60'

Notes:

1) Results are reported in micrograms per liter (µg/L).
2) NYSDEC designates New York State Department of Environmental Conservation.
3) TOGS designates Technical and Operational Guidance Series.
4) New York State Department of Environmental Conservation, Technical and Operational Guidance Series (1.1.1), Class GA Standards and Guidance Values, Revised June 1998.
5) To be conservative, the individual Class GA Standard is used for cis-1,2-dichloroethene and trans-1,2-dichloroethene.
6) U indicates that the compound was not detected at or above the practical quantitation limit shown.
7) J indicates that the compound was detected at an estimated concentration.
8) Values that are bold indicate exceedance of criteria.

	NYSDEC TOGs (1.1.1), Class GA Standards and Guidance Values
1,2-Dichloroethene, Total	5
Tetrachloroethene	5
Trichloroethene	5
Vinyl chloride	2

RAMBOLL

NYSDEC COSCO
SPRING VALLEY, NEW YORK

SUMMARY OF BEDROCK GROUNDWATER ANALYTICAL RESULTS IN 2020/2021

FILE NO. 75217

DATE APRIL 2021

2-4

\\syracusesvr\projects\Nys-Dec.10653\75217.Cosco-75217\Docs\DWG

Former CPC

Former COSCO

DPW Maintenance Garage

Comm. Tower

Storage Area

Tailings Dump Area

Reach B Diversion

Waterway

Stream

Remedial System Shed

Cole Ave

West Central Ave

West St

Street

RW-8S

MW-3

DW-1

GP-4D

RW-3D

MW-18

RW-1S

GW-4S

GW-4S	7/29/2020	3/8/2021
1,2-Dichloroethene, Total	2.0 U	10 U
Tetrachloroethene	1.0 U	5.0 U
Trichloroethene	**5.1**	**5.8**
Vinyl chloride	1.0 U	5.0 U

RW-8S	7/29/2020	3/10/2021
1,2-Dichloroethene, Total	**10**	10 U
Tetrachloroethene	0.84 J	0.45 J
Trichloroethene	**9.5**	**5.3**
Vinyl chloride	1.8	5.0 U

MW-3	7/29/2020	3/10/2021
1,2-Dichloroethene, Total	10 U	20 U
Tetrachloroethene	5.0 U	10 U
Trichloroethene	5.0 U	10 U
Vinyl chloride	5.0 U	10 U

MW-18	7/28/2020	3/9/2021
1,2-Dichloroethene, Total	**7.1 J**	**8.4 J**
Tetrachloroethene	0.64 J	0.58 J
Trichloroethene	1.5 J	1.3 J
Vinyl chloride	**3.3 J**	**8.6**

RW-1S	7/28/2020	3/9/2021
1,2-Dichloroethene, Total	10 U	10 U
Tetrachloroethene	5.0 U	3.4 J
Trichloroethene	2.3 J	**12**
Vinyl chloride	5.0 U	5.0 U

Notes:

1) Results are reported in micrograms per liter (µg/L).
2) NYSDEC designates New York State Department of Environmental Conservation.
3) TOGS designates Technical and Operational Guidance Series.
4) New York State Department of Environmental Conservation, Technical and Operational Guidance Series (1.1.1), Class GA Standards and Guidance Values, Revised June 1998.
5) To be conservative, the individual Class GA Standard is used for cis-1,2-dichloroethene and trans-1,2-dichloroethene.
6) U indicates that the compound was not detected at or above the practical quantitation limit shown.
7) J indicates that the compound was detected at an estimated concentration.
8) Values that are bold indicate exceedance of criteria.

	NYSDEC TOGs (1.1.1), Class GA Standards and Guidance Values
1,2-Dichloroethene, Total	5
Tetrachloroethene	5
Trichloroethene	5
Vinyl chloride	2

LEGEND:

- Overburden Monitoring Well
- Overburden Groundwater Recovery Well
- Bedrock Monitoring Well
- Bedrock Recovery Well
- Railroad Track
- Fence line

0 15 30 60

Approximate Scale 1" ~ 60'

RAMBOLL

NYSDEC COSCO
SPRING VALLEY, NEW YORK

SUMMARY OF OVERBURDEN GROUNDWATER ANALYTICAL RESULTS IN 2020/2021

FILE NO. 75217

DATE APRIL 2021

2-5

TABLES

Table 2-1
Overburden and Bedrock Monitoring Well Summary
NYSDEC COSCO Site
Spring Valley, New York

Well	Geologic Unit	Measuring Point Elevation (NAVD 88)	Well Diameter (inches)	Total Depth of Well (ft bmp)	Screen Interval (ft bg)
MW-3	Overburden	465.66	2.0	16.75	?-16.8
MW-18	Overburden	464.15	2.0	23.00	11.0-23.0
GW-4S	Overburden	468.41	2.0	25.00	10.0-25.0
RW-1S	Overburden	467.80	4.0	28.00	10.0-25.0
RW-8S	Overburden	464.69	4.0	25.00	10.0-25.0
DW-1	Bedrock	467.55	4.0	66.00	51.0-61.0[a]
GP-4D	Bedrock	467.83	2.0	99.00	41.0-99.0
RW-3D	Bedrock	467.88	4.0	102.50	41.0-102.5
BDW-1S	Bedrock	464.98	4.0	76.12	50.5-75.5
BDW-2S	Bedrock	465.81	4.0	69.14	42.0-67.0
INJ-1S	Bedrock	465.42	4.0	70.54	44.0-69.0
INJ-2S	Bedrock	465.54	4.0	66.50	40.0-65.0

Notes:

1. "NYSDEC" designates New York State Department of Environmental Conservation.
2. "NAVD 88" designates elevations are reported in North American Vertical Datum 1988, expressed in feet.
3. "ft bmp" designates feet below measuring point.
4. "ft bg" designates feet below grade.
5. "[a]" designates five-foot sump present from 61.0-66.0 feet below grade.
6. RW-1S and RW-8S are inactive overburden recovery wells.
   RW-3D is an active bedrock recovery well.

Table 2-2
Summary of Water Level Measurements and Groundwater Elevations
NYSDEC COSCO Site
Spring Valley, New York

Well	Geologic Unit	Measuring Point Elevation (NAVD 88)	July 2020		March 2021	
			Depth to Water (ft bmp)	Water Level Elevation (NAVD 88)	Depth to Water (ft bmp)	Water Level Elevation (NAVD 88)
MW-3	Overburden	465.66	11.82	453.84	10.99	454.67
MW-18	Overburden	464.15	12.68	451.47	11.49	452.66
GW-4S	Overburden	468.41	14.90	453.51	13.27	455.14
RW-1S	Overburden	467.80	14.90	452.90	13.22	454.58
RW-8S	Overburden	464.69	11.59	453.10	9.98	454.71
DW-1	Bedrock	467.55	25.45	442.10	25.80	441.75
GP-4D	Bedrock	467.83	14.61	453.22	11.52	456.31
RW-3D	Bedrock	467.88	59.58	408.30	48.95	418.93

Notes:

1. "NYSDEC" designates New York State Department of Environmental Conservation.
2. "NAVD 88" designates elevations are reported in North American Vertical Datum 1988, expressed in feet.
3. "ft bmp" designates feet below measuring point.

APPENDICES

APPENDIX A
SITE CONTACTS

SITE CONTACTS

Site Owner
West Central Associates, L.P.

NYSDEC DER Project Manager
Robert Strang, E.I.T. 518-402-8642 robert.strang@dec.ny.gov

NYSDEC DER Project Manager's Supervisor
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NYSDEC Site Control
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NYSDOH Project Manager
Stephen Lawrence 518-402-7860 beei@health.ny.gov

Remedial Party
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Qualified Environmental Professional
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Ramboll

Environmental Project Manager
Paul D'Annibale, P.G. 518-724-7256 paul.dannibale@ramboll.com
Ramboll

APPENDIX B
RECORD OF DECISION

Department of Environmental Conservation

Division of Environmental Remediation

Record of Decision Amendment

COSCO/CPC Site

Spring Valley, Rockland County

Site Number 3-44-035

August 1999

New York State Department of Environmental Conservation

GEORGE E. PATAKI, *Governor* JOHN P. CAHILL, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION AMENDMENT

COSCO/CPC Inactive Hazardous Waste Disposal Site
Spring Valley, Rockland County, New York
Site No. 3-44-035

Statement of Purpose and Basis

The Record of Decision (ROD) Amendment presents the amended remedial action for the COSCO/CPC inactive hazardous waste disposal site which was chosen in accordance with the New York State Environmental Conservation Law (ECL). The remedial program selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based upon the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the COSCO/CPC Inactive Hazardous Waste Disposal Site and upon public input to the Proposed ROD Amendment presented by the NYSDEC. A bibliography of the documents included as a part of the Administrative Record is included in Appendix B of the ROD Amendment.

Assessment of the Site

Trichloroethylene (TCE) in a vapor degreasing process and rinse water from the plating operation were discharged into a surface water drainage stream, contaminating the soils and groundwater in the vicinity of the site. These contaminants have impacted the Spring Valley Water Supply Company wells downgradient of the site. These wells are treated to remove this contamination. Actual or threatened release of hazardous waste constituents from this site if not addressed by implementing the response action selected in this ROD Amendment, presents a current or potential significant threat to public health and the environment.

Description of Selected Remedy

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS) and additional investigations performed during the remedial design for the COSCO/CPC site and the criteria identified for evaluation of alternatives, the NYSDEC has selected no further action on the source area soils and sediments rather than the implementation of soil vapor extraction (SVE) treatment called for in the 1990 ROD. The components of the amended remedy are as follows:

- Extraction of contaminated overburden and bedrock groundwater in the source area and treatment by chemical oxidation and polishing technologies.
- Completion/repair of the existing asphalt cap over the tailings dump area.
- Long-term groundwater monitoring to evaluate the effectiveness of both the groundwater extraction and the tailings dump cap.

New York State Department of Health Acceptance

The New York State Department of Health concurs with the amended remedy selected for this site as being protective of human health.

Declaration

The amended remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

August 2, 1999
Date

Michael J. O'Toole, Jr., Director
Division of Environmental Remediation

TABLE OF CONTENTS

1.0 INTRODUCTION

On March 29, 1990, the New York State Department of Environmental Conservation signed a Record of Decision (ROD) which selected the remedy to cleanup the COSCO/CPC Class 2 Site on the Registry of Inactive Hazardous Waste Disposal Sites. Trichloroethylene (TCE) from a vapor degreasing process and rinse water from the plating operation were discharged into a surface water drainage stream, contaminating the soils and groundwater in the vicinity of the site. These contaminants have impacted the Spring Valley Water Supply Company wells downgradient of the site. These wells are treated to remove this contamination. One element of the 1990 ROD called for soil vapor extraction (SVE) of contaminated soils and sediments in the source area with carbon treatment of the contaminants. In 1997, as part of the remedial design program for this remedy, additional soil data were collected in the source area, and in January of 1998, a vapor extraction pilot study was performed. This additional testing indicated that the conditions for vapor extraction at this site were not ideal due to the presence of low permeability soils and relatively low quantity of contamination remaining in the soils. The existing contaminant levels were found to be below the current NYSDEC soil cleanup objectives. In addition, the drainage channel containing contaminated sediments has been backfilled and a communications tower has been constructed in that area. Based on the current information, the Department is proposing no further action on the source area soils and sediments rather than the implementation of SVE.

Since the change from SVE to no further action for the source area soils/sediments represents a fundamental change in a portion of the remedy, the Department is amending the 1990 ROD. The Department, with NYS Department of Health concurrence, has determined that the amended remedy is protective of human health and the environment.

Other components of the remedy selected in the 1990 ROD are not being changed. These components include the extraction of contaminated overburden and bedrock groundwater in the source area with treatment using chemical oxidation and polishing technologies, capping of the tailings dump area (partially complete) and a long-term groundwater monitoring program to monitor the effectiveness of the groundwater extraction and cap. Implementing these provisions of the amended remedy will eliminate the significant threat to human health and the environment.

2.0 SITE LOCATION AND DESCRIPTION

The COSCO/CPC site is located in the Village of Spring Valley, Rockland County, New York as shown on Figures 1 and 2. The site is the location of the former Consolidated Stamp Company (COSCO) facility, located at 15 West Street, and the former Continental Plastic Company (CPC) facility, located at 2 North Cole Avenue, about 200 feet northwest of the former COSCO facility. The COSCO property is triangular shaped and is bordered to the east by West Street, to the south by Central Avenue and to the north by an inactive Conrail line and right of way. Various industrial/commercial facilities are located on the north side of the right of way including the former CPC facility, a relatively new communications tower, and an active Spring Valley Department of Public Works maintenance facility.

A drainage way, known as the Reach B Diversion, runs between the facilities. The drainage way originates to the southwest of the industries and continues in a northeast direction and discharges into the West Branch of Pascack Brook located east of the site. The Spring Valley Well Field is located about three-thousand feet to the northeast of the site. In addition, a COSCO's tailing disposal area is located on the west side of the property which is currently being used for vehicle storage.

Based on subsurface studies conducted at the site, the overburden materials consist of a layer of fill material of sands and gravel below which lies glacially derived materials consisting of a silty clay zone, a glacial outwash of sands and gravel, followed by a glacial till unit. The bedrock in the area is about 40 feet below grade and is part of the Brunswick Formation consisting primarily of red shales and mudstones. The RI indicated that the groundwater flow in the overburden aquifer at the site was to the southeast and that a downward gradient exists between the overburden and bedrock aquifers. Regional flow in the bedrock in the study area is not certain but appears to be to the northeast.

3.0 SITE HISTORY

The COSCO/CPC site was identified during the course of a State-funded RI/FS for the former Spring Valley Well Field Site (Site No. 3-44-018). The RI/FS, performed during 1987 to 1990 by GHR Engineering Associates, Inc., investigated suspected sources of contamination to the well field. Contamination in the well field was first discovered in 1978. Based on a 1979 survey of local industries conducted by the Spring Valley Water Company, CPC was pumping 20-30 gallons per minute of trichloroethene (TCE) and tetrachloroethene (PCE) contaminated non-contact cooling water into a surface water drainage stream (Reach B) and COSCO was using TCE in a vapor degreasing process and discharging rinse water from the plating operation into the same receiving stream. In 1980, Reach B was diverted, as shown on Figure 2, which diverted flow away from the Spring Valley Well Field. Reach B was sampled at various locations during the Spring Valley Well Field RI which found volatile organic compound (VOC) contamination in the original waterway between the COSCO/CPC facilities. In addition, the RI identified VOCs in the soils and groundwater in the vicinity of the COSCO and CPC facilities, as well as semi-volatile organic compounds (SVOCs) in the tailing dump area where solid waste from COSCO had reportedly been discharged.

Based on the results of the remedial investigation, a feasibility study (FS) was performed to identify, screen and evaluate potential remedial alternatives and resulted in the issuance of the ROD for the Spring Valley Well Field site in March 1990. That document identified the selected remedy to address the contamination at the COSCO/CPC properties which consisted of the following elements:

- Source area groundwater extraction and treatment by UV chemical oxidation and polishing;
- Source area soil and sediment soil vapor extraction; and
- Capping of the tailing dump area to prevent erosion and disturbance.

In December 1990, pursuant to the findings of the RI and a petition from the Spring Valley Water Company to delist the site, the site boundaries were redefined, the COSCO/CPC site was listed in the NYS Registry of Inactive Hazardous Waste Disposal Sites, and the Spring Valley Well Field site was deleted.

After the issuance of the 1990 ROD, two post-ROD groundwater studies were conducted in an attempt to generate sufficient data to determine the groundwater flow patterns in the bedrock aquifer. The first was a supplemental remedial investigation conducted during the summer of 1990 by COSCO and the Sara Lee Corporation (which also owned certain assets in the property). The second was a focused supplemental remedial investigation conducted in 1992 by COSCO, Sara Lee and the Spring Valley Water Company, which included an extensive pump test of the area between the site and the well field. After several years of negotiations for implementation of the remedy, in March of 1996 COSCO and Sara Lee settled with the Department for $2.5 million to help defray past and future State costs. In 1997, pre-design investigations began.

4.0 NATURE AND EXTENT OF SITE CONTAMINATION

As described in the original ROD and other documents, many soil, groundwater, and sediment samples were collected at the Site to characterize the nature and extent of contamination. The primary contaminants of concern in the groundwater and soils are VOCs consisting of TCE, PCE, 1,2 dichloroethene (DCE) and vinyl chloride. In addition, SVOCs, pesticides and polychlorinated biphenyls (PCBs) are present in the tailings area. A summary of the extent of contamination is provided below and a summary of analytical data is provided in Table 1.

4.1 Summary of the Remedial Investigation

The 1990 RI report identified contamination in groundwater, soils and sediments in the source area and in soils in the tailings dump. Source area soils were found to be contaminated with VOCs up to a total concentration of 2.27 parts per million (ppm). The soil contamination was identified in an area adjacent to the COSCO building extending to the north side of the railroad tracks, as shown on Figure 3, with a volume estimated at 3000 cubic yards. An on-site overburden monitoring well, MW-18, located in the source area, contained total VOCs up to 24,861 parts per billion (ppb). The nearest bedrock well to the site was MW-17B. This well, since destroyed, contained total VOCs up to 15,437 ppb. This well was believed to be down gradient of the source area. In addition, samples from 1987 identified up to 38.7 ppm of DCE, TCE and PCE in the sediments of the drainage channel located on the DPW property, north of the soil source area.

The tailings area is west of the soil source area and is in the shape of a triangle approximately 18,750 square feet in size as shown on Figure 2. VOCs were not detected in this area during the RI, however, SVOCs were detected, mostly poly-nuclear aromatic hydrocarbons (PAHs), to a total concentration of approximately 90 ppm. This concentration is below the NYSDEC soil cleanup objective of 500 ppm total SVOCs, however, four individual SVOCs were detected above the cleanup objectives. In addition, the pesticides 4,4-DDT and gamma-chlordane were detected at two sample locations at relatively low levels and PCBs were detected in one sample at 5.3 ppm.

4.2 Summary of New Information

Pre-design field investigations began in 1997 to fill data gaps and to confirm that the recommended remedial action in the 1990 ROD is still appropriate based upon existing site conditions. The field investigations performed included:

- Soil and groundwater sampling;
- Aquifer pump testing; and
- Vapor extraction pilot testing.

The 1997 investigation included installation and sampling of six geoprobe borings from the source area with maximum sampling depths of eight to twenty feet, depending on the location. Samples were collected at four foot soil intervals for a total of fifteen samples. Total VOC concentrations in these samples ranged from non-detect to 0.726 ppm. This data indicates that total VOC concentrations in soils have dropped to below one-quarter of the 1988 levels. In addition, the subsurface soil investigation confirmed the presence of very low permeability soils in the source area, intermixed with more permeable layers.

During the 1997 investigation, the former drainage channel on the Department of Public Works property was found to have been filled in and a communications tower was constructed in that area. Therefore, it was not possible to resample sediments from the channel directly. However, in December 1998, an attempt was made to locate the previously contaminated portion of the channel by the installation and sampling of geoprobe borings adjacent to the communications tower. Geoprobes were installed and screened for VOCs at five locations; soils were analyzed for VOCs at three of these locations and groundwater was analyzed at one location. Concentrations in the soil samples were relatively low, ranging from 0.0012 ppm to 0.0099 ppm. However, a sample of the overburden groundwater from one of the geoprobes identified total VOC levels at 1,270 ppb. This data indicates that VOC contamination is still present in the area where the former drainage channel was located, but primarily present in the groundwater.

Two overburden and four bedrock monitoring wells were also installed in the source area as part of the pre-design investigation. Groundwater samples were collected and analyzed from those wells and from the only pre-existing on-site well, MW-18, as well as from several geoprobe points. Levels of total VOCs have diminished in the overburden groundwater since 1988 as MW-18 contained only 118 ppb total VOCs compared to 24,861 ppb in 1988. The remaining overburden groundwater data ranged from non-detect to 1,162 ppb total VOCs. Levels of total VOCs in the bedrock aquifer have also diminished since 1988 as GW-5D, located near former well MW-17B, contained only 2,208 ppb total VOCs compared to 24,861 ppb from MW-17B in 1988. The data from the remaining bedrock wells, GW-2D, GW-3D, GW-4D, shown on Figure 3, contained total VOCs at 59 ppb, 3,110 ppb, and non-detect, respectively.

Another site change was noted during the 1997 field investigation; asphalt was found to have been placed over much of the tailings dump area by the property owner and this area is now being used as a parking area. As this cover material satisfies the capping component of the ROD, activities in this area will be limited to repairing the existing asphalt as required and installing additional asphalt in areas where none currently exists.

4.3 Summary of Human Exposure Pathways

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Section 8 of the RI Report.

An exposure pathway is how an individual may come into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

The potential human exposure pathways at the COSCO/CPC site are as follows:

1. ingestion, inhalation and dermal contact with contaminated groundwater.

2. dermal contact with or ingestion of contaminated soils in the tailings dump.

4.4 Summary of Environmental Exposure Pathways

No current pathways for environmental exposure have been identified for this site. In 1980,the Village diverted the Reach B waterway through a drainage culvert around the contaminated area. The data collected in the RI/FS indicates that the contamination present in the source area is not currently migrating via this rerouted waterway. In addition, the West Branch of Pascack Brook is located approximately 2000 feet

southeast of the site, which is outside of the range of detectable levels of contaminants in the aquifer.

5.0 SUMMARY OF REMEDIAL GOALS

Goals for the cleanup of the Site were established in the original ROD. The goals selected for this site are as follows:

1. Reduce, control or eliminate to the extent practicable the contamination present within the soils/waste on site.

2. Eliminate the potential for direct human contact with the contaminated soils in the tailings dump.

3. Prevent, to the extent possible, migration of contaminants in the soils/waste to groundwater.

4. Provide attainment of standards, criteria and guidelines (SCGs) for groundwater quality for the overburden and bedrock aquifers.

6.0 EVALUATION OF THE AMENDED REMEDY

6.1 Description of Original ROD and Amended ROD

Original ROD Remedy

The remedy selected in the 1990 ROD included the extraction of contaminated overburden and bedrock groundwater in the source area and soil vapor extraction of the soils and sediments in the source area. Treatment of groundwater would be achieved using chemical oxidation and polishing technologies, due to the presence of vinyl chloride in the groundwater, and the treated water would be returned to the aquifer. For cost purposes it was assumed that one overburden and one bedrock extraction well would be required. The treatment of contaminants from the SVE system would be with granular activated carbon. The RI/FS estimated the volume of the soils to be treated as approximately 3000 cubic yards. In addition, approximately 42 cubic yards of contaminated sediments from the exposed portion of the former drainage channel would be excavated and treated by SVE along with the source area soils. After the completion of the SVE treatment, topsoil and a vegetative cover would be installed over the source area.

This remedy also included capping of the contaminated soils/waste in the tailings dump area. The cap would consist of low permeability soil, topsoil and a vegetative cover. A long-term groundwater monitoring program would be implemented to monitor the effectiveness of the groundwater extraction and the tailings dump cap. In addition, access to the source area would be restricted by fencing.

The ROD also called for the extraction and treatment of groundwater at the Spring Valley water supply wells, however, this element has been addressed separately by the Spring Valley Water Company.

Amended ROD Remedy

The fundamental change to the 1990 ROD involves no further action for the source area soils and sediments rather than SVE treatment. This change is based on the results of the 1997-1998 pre-design study, which identified relatively low levels of contaminants remaining in the soils and sediments and determined that the effectiveness of SVE on these materials is limited. In addition, the former drainage way was filled in during recent construction activities and is now the location of a communications tower. Recent samples in the vicinity of the former drainage way did not identify VOCs in soils/sediments above cleanup objectives.

Because the contaminant levels in soils and sediments meet the NYSDEC soil cleanup objectives found in the Division of Environmental Remediation's Technical, Administrative and Guidance Memorandum (TAGM) 4046, fencing the source area to restrict access will no longer be required. The other elements of the original ROD will remain essentially the same, but will contain some modifications as noted below.

The overburden and bedrock groundwater will be extracted and treated as specified in the 1990 ROD, however, the treated groundwater will be discharged to surface water rather than being recharged back to the aquifer, as this discharge option is more cost effective. In addition, the area of overburden groundwater extraction and treatment will be expanded to address contaminated groundwater in the vicinity of the buried drainage way. Long-term monitoring will be implemented to evaluate the effectiveness of groundwater extraction as per the 1990 ROD. Another modification is the result of a change that occurred at the site since the 1990 ROD. The tailings dump area has largely been capped with asphalt by the property owner and is being used as a vehicle storage area. As this cover satisfies the capping component of the ROD by eliminating human contact with and migration of contaminants, activities in this area will be limited to repairing the existing asphalt as required and installing additional asphalt in areas where none currently exists.

6.2 Evaluation of Original ROD and Amended ROD

The criterion used to compare the remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each criterion, a brief description is provided. A detailed discussion of the evaluation criteria and comparative analysis is contained in the 1990 Feasibility Study.

The first two evaluation criteria are called threshold criteria and must be satisfied in order for an alternative to be considered for selection.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet applicable environmental laws, regulations, standards, and guidance. The primary SCGs for this site are the NYSDEC soil cleanup objectives found in the Division of Environmental Remediation's TAGM 4046 and the NYS groundwater quality standards promulgated in regulation 6 NYCRR Part 703.

The amended remedy will meet SCGs for the source area soils and sediments through no further action as contaminants are currently below the TAGM values. The amended remedy will achieve groundwater SCGs over the long term, similar to the original remedy, through groundwater extraction and treatment. As with the original remedy, the amended remedy will meet SCGs in the tailings dump area through capping.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective. It incorporates several of the criteria listed below with an emphasis on achieving the remediation goals described above.

The amended remedy will be protective of human health and the environment equal to the original remedy. Concentrations of contaminants in the source area soils and sediments are currently below the NYSDEC remedial goals specified in DER's TAGM 4046, which are considered to be protective of human health and protective to groundwater quality. The original remedy would not be any more effective since residual levels of contaminants would still remain in the soils after treatment and these levels would be comparable to the current levels. The amended remedy will have equal protection as the original remedy for groundwater and the tailings dump since the remedial elements are essentially the same.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during construction and operation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared with the other alternatives.

Potential for short-term impacts for the amended remedy are slightly less than the original remedy since there will be no construction and operation activities associated with the source area soils and sediments. The other elements of the amended remedy are identical to the original remedy and will pose relatively low short term risks. The overall time to implement the amended remedy is the same as the original remedy and is driven by the groundwater remediation, which will operate for several years.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of alternatives after implementation of the response actions. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

The long term effectiveness of the amended remedy will be identical to the original remedy since the concentrations of contaminants remaining on-site after remediation is complete will be similar. After the groundwater remediation is complete, use of the source area portion of the site will be unrestricted. However, since wastes will remain capped in the tailings dump area, the cap will have to be maintained with continued restrictions on the use of this area.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Similar to the original remedy, the amended remedy will reduce the toxicity, mobility and volume of contaminants by groundwater extraction and treatment. Contaminants in the source area soils and sediments have been reduced since the 1990 ROD by natural attenuation and dispersion. Because of the reduction in concentrations of contaminants in the source area, the SVE element of the original remedy would have contributed little to the further reduction in the residual levels of contamination. In the tailings dump area, the mobility of contaminants will be reduced equally to the original remedy through repair and maintenance of the current asphalt cap present in this area.

6. Implementability. The technical and administrative feasibility of implementing each alternative is evaluated. Technically, this includes the difficulties associated with the construction, the reliability of the technology, and the ability to monitor the effectiveness of the remedy. Administratively, the availability of the necessary personnel and equipment is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

Both remedies would be relatively easy to implement as they involve common technologies. However, SVE would not be very effective for this site, due to the relatively low levels of contamination currently present in the source area soils and relatively low permeability of these soils. The amended remedy will require long-term operation and maintenance and groundwater monitoring similar to the original remedy.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives

have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision.

The estimated costs for the original and amended remedy are presented in Table 2. The cost for the design and implementation of the original remedy was re-estimated during the pre-design to have a present worth of $2,067,153 which is lower than the 1990 ROD estimate of $2,880,673. The total present worth for the amended remedy is estimated at $1,852,153. The reduction in cost of the amended remedy results from the deduction of costs for SVE. The estimates of present worth are conservative since they are based on extraction and treatment of groundwater for thirty years; it is likely that remedial objectives will be achieved in a shorter time frame.

8. Community Acceptance. Concerns of the community regarding the pre-design reports and the Proposed ROD Amendment have been evaluated. The "Responsiveness Summary" included as Appendix A presents the public comments received and the Department's response to the concerns raised. In general, the public comments received were supportive of the selected remedy. Several comments were received, however, concerning the current state of contamination in the buried portion of the former drainage channel which had not been sampled since the channel was filled in. To address these concerns, in December of 1998, the NYSDEC collected samples in the vicinity of the buried channel in an attempt to locate and sample potentially contaminated sediments. The results of this task are summarized in Section 4.2, above. Based on this data, the groundwater extraction and treatment system will be expanded to address groundwater contamination in the vicinity of the buried channel.

7.0 SUMMARY OF THE AMENDED REMEDY

Based upon the results of the RI/FS, pre-design investigations, and the evaluation presented in Section 6, the NYSDEC is amending the Record of Decision (ROD) for the COSCO/CPC Site. The changes consists of no further action on the soil/sediment source area rather than SVE treatment. The amended remedy is considered to provide equal protection of human health and the environment as the original remedy, is as effective in the long-term, will achieve SCGs as quickly and is more cost effective.

The estimated present worth cost to carry out the amended remedy is $1,852,153. The estimated present worth to complete the original remedy is $2,067,153. The cost to construct the amended remedy is estimated to be $484,000 and the estimated average annual operation and maintenance cost for thirty years is $89,000.

The elements of the amended remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program.

2. Extraction of contaminated overburden and bedrock groundwater in the source area and treatment by chemical oxidation and polishing technologies.

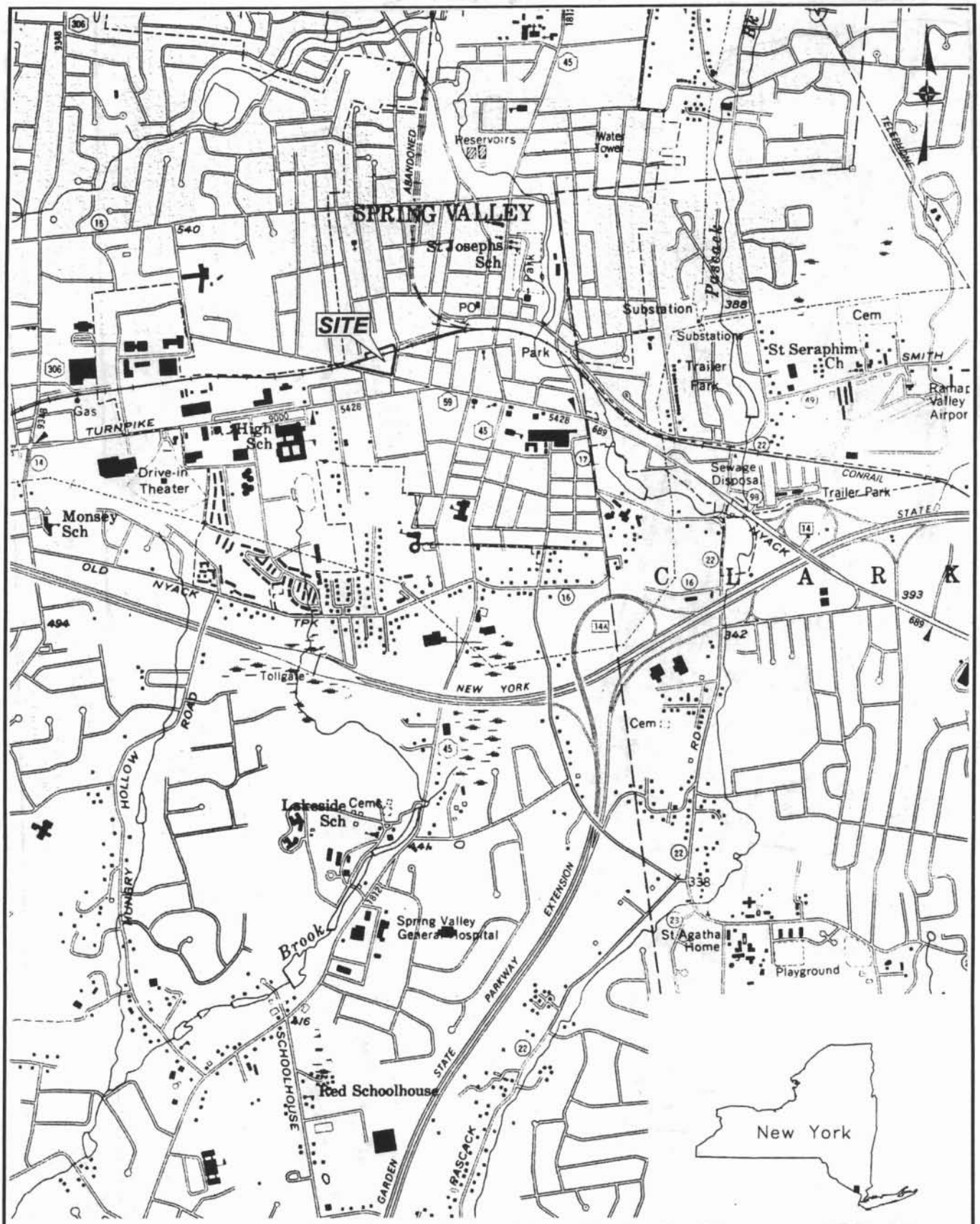
3. Completion/repair of the existing asphalt cap over the tailings dump area.

4. Long-term groundwater monitoring to evaluate the effectiveness of both the groundwater extraction and the tailings dump cap.

8.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the pre-design investigation process, a number of Citizen Participation (CP) activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

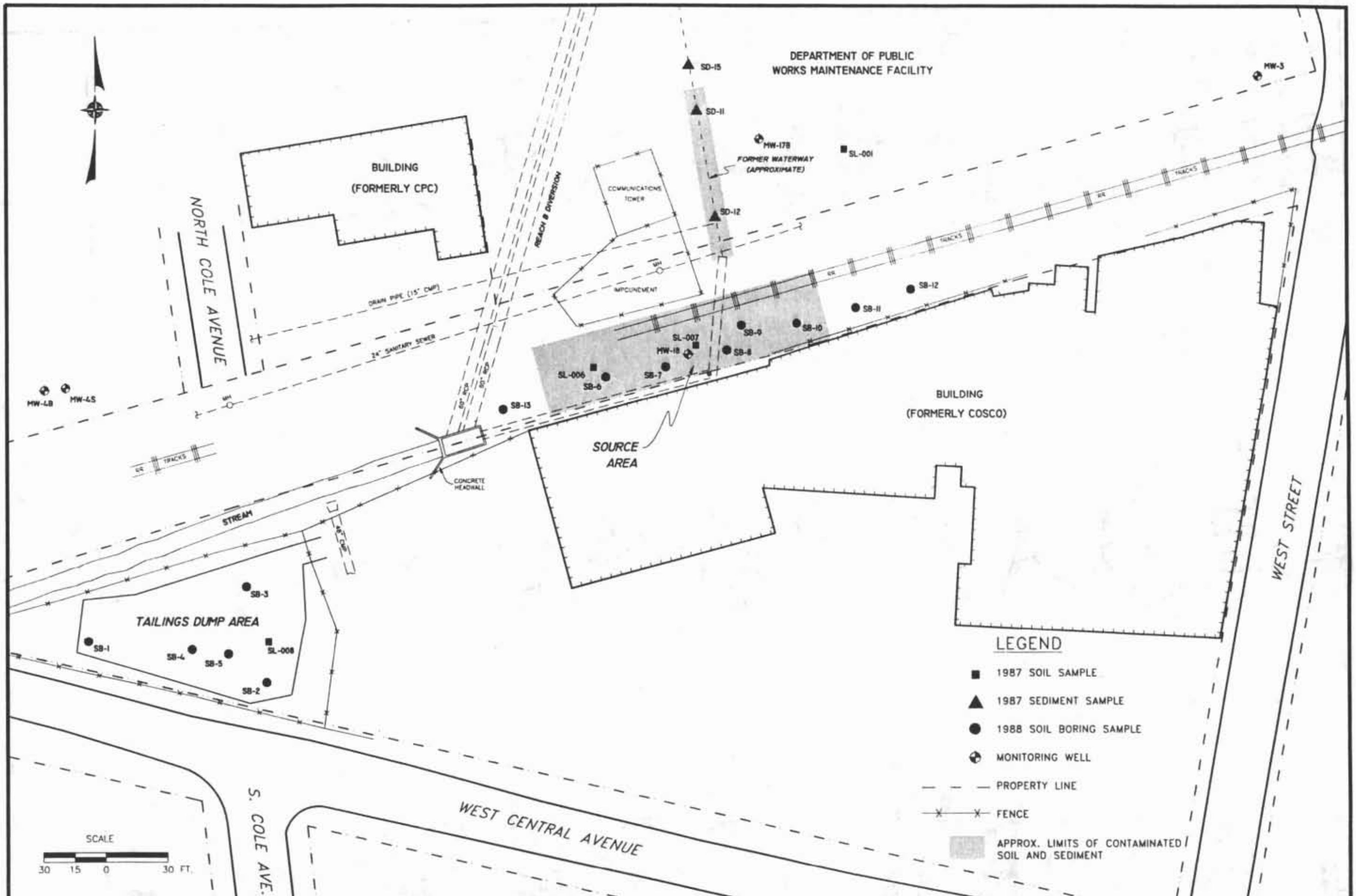
- Documents in the local repository for documents pertaining to the site were updated.
- The site mailing list, which included nearby property owners, local political officials, local media and other interested parties, was updated.
- A fact sheet providing notice of the public meeting for the Proposed ROD Amendment and summary of the pre-design investigation was distributed to the site mailing list.
- A public meeting was held at the Spring Valley Village Hall on November 17, 1998 presenting the Proposed ROD Amendment and current site status.
- A public comment period for the Proposed ROD Amendment was set from November 3, 1998 to December 3, 1998.
- A Responsiveness Summary was prepared in January 1999 to address the comments received during the public comment period for the Proposed ROD Amendment, and is included as an appendix to this ROD Amendment.



COSCO/CPC SITE
SPRING VALLEY, ROCKLAND COUNTY, NEW YORK

SITE LOCATION

FIGURE 1



COSCO/CPC SITE
SPRING VALLEY, ROCKLAND COUNTY, NEW YORK

SITE FEATURES AND RI SAMPLING LOCATIONS

FIGURE 2

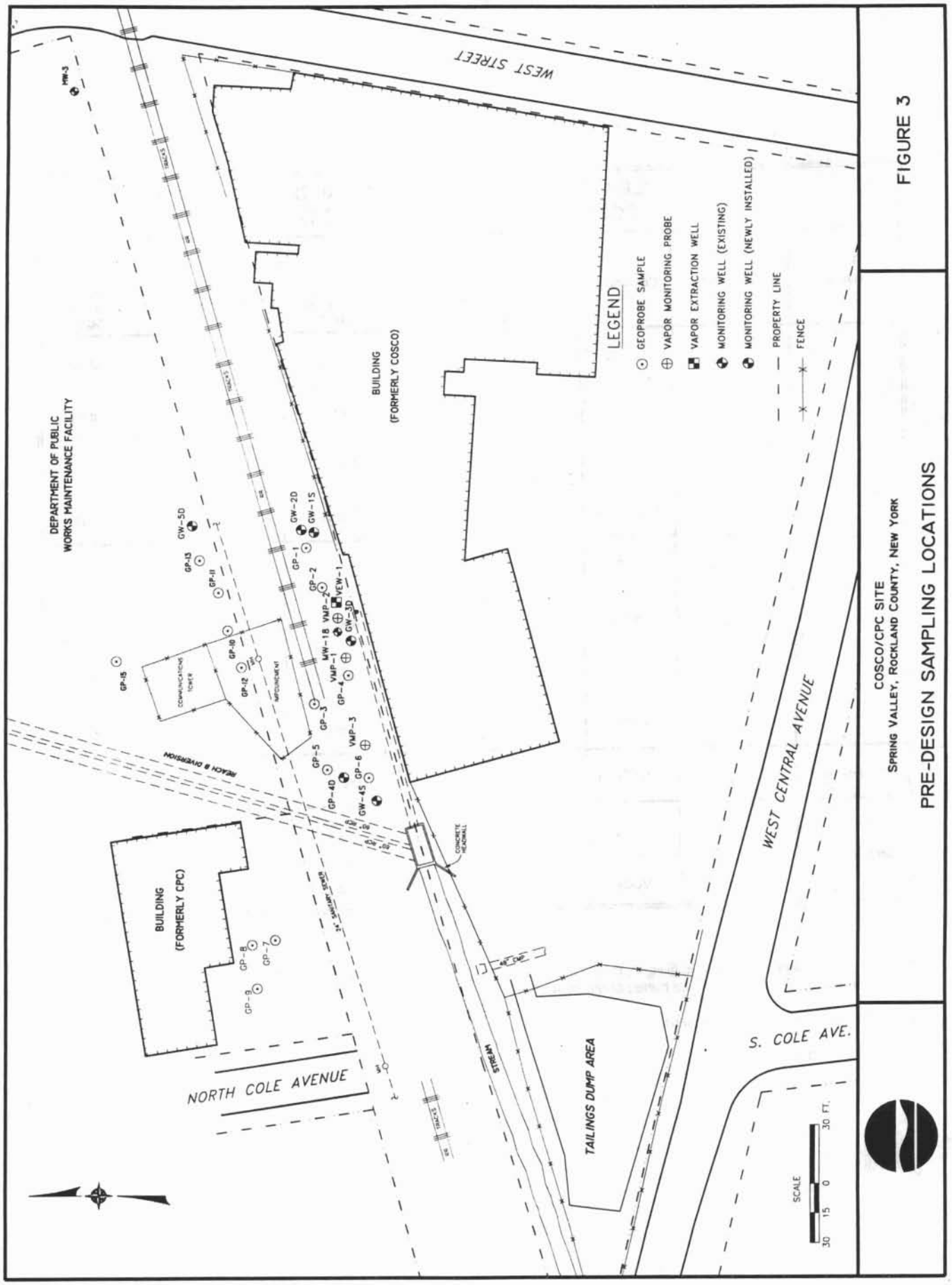


FIGURE 3
PRE-DESIGN SAMPLING LOCATIONS
COSCO/CPC SITE
SPRING VALLEY, ROCKLAND COUNTY, NEW YORK
LEGEND
GEOPROBE SAMPLE
VAPOR MONITORING PROBE
VAPOR EXTRACTION WELL
MONITORING WELL (EXISTING)
MONITORING WELL (NEWLY INSTALLED)
PROPERTY LINE
FENCE
WEST STREET
WEST CENTRAL AVENUE
S. COLE AVE.
NORTH COLE AVENUE
BUILDING (FORMERLY COSCO)
BUILDING (FORMERLY CPC)
DEPARTMENT OF PUBLIC WORKS MAINTENANCE FACILITY
TAILINGS DUMP AREA
STREAM
REACH B DIVERSION
CONCRETE HEADWALL
SCALE
30 15 0 30 FT.

TABLE 1: SUMMARY OF ANALYTICAL DATA
COSCO/CPC Site, Site No. 3-44-035

Media	Location	Compound	SCG (ppm)	Previous Data		Pre-design Data	
				Concentration Range (ppm)	Frequency of Exceeding SCG	Concentration Range (ppm)	Frequency of Exceeding SCG
Soil	Source Area	1,2-DCE	0.3	ND to 1.2	1 of 10	ND to 0.19	0 of 13
		TCE	0.7	ND to 4.8	2 of 10	ND to 0.22	0 of 13
		PCE	1.4	ND to 0.53	0 of 10	ND to 0.04	0 of 13
		Total VOCs	10	ND to 5.56	0 of 10	ND to 0.726	0 of 13
	Tailings Dump	VOCs	10	ND	0 of 6	NA	NA
		SVOCs	500	ND to 89.4	0 of 6	NA	NA
		Pesticides	10	ND to 0.29	0 of 6	NA	NA
		PCBs	10	ND to 5.3	0 of 6	NA	NA
Sediments	Former Reach B	VOCs	1	0.004 to 38.7	2 of 4	0.0012 to 0.0099 [1]	0 of 3 [1]
Groundwater	Overburden	VOCs	0.005	24.9	1 of 1	ND to 1.16	8 of 23
	Bedrock	VOCs	0.005	15.4	1 of 1	ND to 3.11	3 of 4

Notes:

1. The former drainage way was filled in, therefore, the pre-design data for the former Reach B represent subsurface samples of soils/sediments in vicinity of the buried drainage way.
2. NA = not available (not sampled).
3. ND = non-detected

TABLE 2: COST SUMMARIES FOR THE ORIGINAL AND AMENDED REMEDY
COSCO/CPC Site, Site No. 3-44-035

Action	Original Remedy[1]			Amended Remedy		
	Capital Costs	Annual O&M	Total Present Worth[2]	Capital Costs	Annual O&M	Total Present Worth[2]
Source Area Groundwater Treatment	$449,000	$87,000	$1,786,408	$449,000	$87,000	$1,786,408
Source Area Soils/Sediment Treatment	$215,000	$0[3]	$215,000	$0	$0	$0
Tailings Dump	$35,000	$2,000	$65,745	$35,000	$2,000	$65,745
Totals:	$699,000	$89,000	$2,067,153	$484,000	$89,000	$1,852,153

Notes:

1. All cost estimates are from the Draft Pre-design Program Report, CDM, October 1998 and represent re-estimates based on current site conditions and pre-design data.
2. Total present worth is based on a 5% rate for thirty years.
3. O&M costs of $53,000 are included in the construction capital cost since treatment duration is estimated to be less than one year.

Appendix A

Responsiveness Summary

RESPONSIVENESS SUMMARY

COSCO/CPC Site
Proposed ROD Amendment
Spring Valley (V), Rockland County
Site No. 3-44-035

A Proposed ROD Amendment for the COSCO/CPC site, was prepared by the New York State Department of Environmental Conservation (NYSDEC) and issued to the local document repository on November 3, 1998. The amendment outlined modifications to the remedial measure previously selected for the remediation of the contaminated groundwater, soil and sediment at the COSCO/CPC site. The amended remedy eliminates the remediation of source area soil and sediments since current contaminant levels in these media are currently below NYSDEC's soil cleanup objectives.

The release of the Proposed ROD Amendment was announced via a notice to the mailing list, informing the public of the Amendment's availability.

A public meeting was held on November 17, 1998 which included a presentation of the predesign investigation as well as a discussion of the proposed amendment. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed amendment. These comments have become part of the Administrative Record for this site. No written comments were received. The public comment period for the PRAP ended on December 3, 1998.

This Responsiveness Summary responds to all questions and comments raised at the November 17, 1998 public meeting. The following are the comments received at the public meeting, with the NYSDEC's responses:

1.) **Comment:** When was the drainage channel covered? I do not recall the channel being covered over between 1989 and the present. I believe the Reach B diversion pipe was covered over in 1992. But the drainage channel was filled in prior to 1989. Please clarify the dates shown on the map (Figure 2 of the Proposed ROD Amendment).

Response: We have no specific record of when the drainage channel was covered over. However, surface water and sediment samples were collected from the drainage channel in September 1987 and the communications tower was constructed in 1992. Therefore, the channel was covered sometime between 1987 and 1992. The sampling dates on Figure 2 of the Record of Decision Amendment are accurate.

2.) **Comment:** Who owns the parcel of land north of the rail road tracks?

Response: The property is owned by the Village of Spring Valley and is the location of the Department of Public Works maintenance facility.

3.) **Comment:** I own a house on the corner of Commerce Street and West Street and am concerned whether rain water could drain down onto my property from the site. The former drainage

way is on my property line.

Response: In general, a surface water pathway for VOCs to migrate off site does not exist for this site, since the VOC contamination is present in subsurface soils and the former drainage stream is now buried. In addition, the levels of VOC contamination in the source area soils are currently below soil cleanup guidelines and do not present an exposure concern.

4.) **Comment:** Was any contamination removed from the tailings dump area before it was capped or are the contaminants still present there ? Are they mobile ?

Response: Soil/debris piles containing volatile organic compounds were identified in the tailings dump in 1979 as part of the Hackensack Water Company investigation. These were removed some time after that since they were not present during the NYSDEC's Remedial Investigation, which started in 1987, and in which no VOCs were detected. However, other compounds including semi-volatile organic compounds, PCBs and pesticides are still present in the tailings dump area soils. These compounds have relatively low mobility, therefore, off site migration is not be expected to occur. However, any chance of migration is further reduced by the asphalt cap which will be maintained over this area.

5.) **Comment:** Can any of the compounds on site cause any changes in the ground or groundwater that would make them more toxic?

Response: In general, the compounds present on this site degrade to simpler, less toxic compounds. However, the VOCs in the groundwater (TCE and PCE) are degrading to vinyl chloride, which is considered more hazardous than the original compounds. Although these chemicals are considered hazardous, they are not harmful to the public or animals unless there is a completed exposure route. At this time, there are no completed exposure routes, no way for people to come into contact or ingest these chemicals. The groundwater extraction system will be designed to remove these contaminants from the source area, thereby preventing any future offsite migration.

6.) **Comment:** Where is the groundwater extraction well going to be installed?

Response: Two extraction wells have already been installed in the rail road right-of-way during the pre-design investigations in 1997. They consist of one overburden and one bedrock extraction well (GW-1S and GW-3D) as shown on Figure 3 of the ROD. An additional overburden extraction well will be installed just north of the right-of-way.

7.) **Comment:** What are the withdrawal rates expected to be from the two extraction wells and where will it be discharged to?

Response: The overburden extraction well will be designed to extract approximately 3.5 gallons per minute and the bedrock well approximately 15 gallons per minute. The bedrock extraction rate can be increased, if necessary, and the treatment system will be designed for a total maximum flow of 45 gallons per minute. After treatment, the water will be discharged to the surface drainage channel (Reach B) adjacent to the site which discharges into Pascack Brook.

8.) **Comment:** What were the levels of contamination found in the RI from the former drainage stream

sediments and were samples collected further downstream in the reach? Were any soil samples taken from these areas or just from the stream?

Response: Twenty-five sediment samples were collected from the drainage stream in September of 1987 during the initial investigation performed as part of the Spring Valley Well Field RI. These samples were distributed along the drainage stream from locations just upstream of the COSCO/CPC site extending to the well field, 3000 feet downstream of the site. The highest VOC detections were at two locations, SD-11 and SD-12, located just downstream of the former COSCO/CPC outfalls, with total VOC levels of 38.7 ppm and 33.7 ppm, respectively. VOC levels in the sediments rapidly decreased beyond these two locations with most samples at either trace levels or below the detection limit of 0.002 ppm.

Twenty-five soil samples were also collected in September of 1987. Several were collected adjacent to the drainage stream. The only detections above the detection limit were SL-06 and SL-07, located in the right-of-way between the COSCO and CPC facilities with total VOCs at 4.56 ppm and 0.46 ppm, respectively.

Over one hundred soil gas samples were also collected in 1987. Most of the samples were collected adjacent to the drainage stream. The locations of all of the samples described above are shown on Plan 1 of Appendix B of the RI Report for the Spring Valley Well Field Site, dated February 1989.

9.) **Comment:** Did the NYSDEC take any samples during the predesign sampling at depth from the contaminated area next to the COSCO building? Did they notice if the materials were of similar type of soils found during the RI?

Response: Yes. Six geoprobe borings were collected from within the source area and vicinity. This consisted of sampling the subsurface soils in 4 foot intervals to a depth of at least sixteen feet. The materials found were similar to those encountered during the RI which consisted of several feet of fill followed by either sands and gravel or a silt/clay unit depending on the location.

10.) **Comment:** Were any non-aqueous phase liquids (NAPLs) found in the soils or in any of the wells?

Response: No NAPLs were identified during the predesign investigation.

11.) **Comment:** With respect to the stream samples, were there any environmental studies done to assess the effects on wildlife?

Response: No environmental impact studies were performed during the remedial investigation. Given the relatively low levels of VOC remaining in soils and the fact that the previously contaminated portion of the stream is now buried, environmental impacts on this site are considered to be minimal.

12.) **Comment:** According to the newspaper article today, it indicates that the NYSDEC does not want to clean up the site; what is the reason? Why won't the entire remedy be done?

Response: The newspaper had several inaccurate statements. It inferred that the NYSDEC is not performing the soil remediation so it can refund money to the polluters. This is not the

case. The NYSDEC has received $2.5 million in settlement costs from the potentially responsible parties to help pay for the site remediation. Regardless of the final actual cost of the remediation none of this money will be refunded to those parties. As explained in the Record of Decision, the NYSDEC is not going to implement the soil remediation because the remaining levels of VOCs in the soils are below current remedial cleanup objectives. However, the more costly groundwater remediation will still be performed.

13.) **Comment:** A.) When it rained the former drainage reach flooded in the area around the communications tower. Were soil samples collected near the tower to see if the ground there was still contaminated? Contaminants sat there since this area flooded.

B.) Also the line overflowed over toward our house on Congress Street and flooded out the lot on West Street. Has any testing been done around our lot, which is at the end of the line of flooding? Vegetation does not grow on this lot.

Response: A.) Based on this comment and the uncertainties regarding the current state of the buried drainage reach, in December 1998 the NYSDEC collected additional subsurface soil samples using a geoprobe in the vicinity of the communications tower and former drainage reach. The sample locations are shown on Figure 3 of the Record of Decision. VOCs were detected in the soils, but at relatively low concentrations, 0.0012 to 0.0099 parts per million (ppm) total VOCs, compared to the current cleanup objective of 1 ppm. However, the groundwater in this area was found to contain approximately 1.27 ppm of total VOCs which is high relative to the groundwater standard of 0.005 ppm. Because of the presence or residual contamination in the groundwater, an additional overburden extraction well will be installed in this area as part of the site-wide groundwater extraction and treatment remediation.

B.) During the RI samples were collected from sediments and surface water along the drainage reach from the point of the discharges from COSCO and CPC and extending downstream to the Spring Valley Well Field. These samples only identified significant concentrations of VOCs in the sediments directly adjacent to the COSCO and CPC facilities (samples 011 and 012). Sediments downstream contained only trace amounts of VOCs or were non-detect. VOCs in the surface water samples were dissolved in the water downstream of the CPC discharge and, therefore, would tend to migrate into the groundwater. Soil gas samples were collected along the drainage reach including the area west of West Street and along the western boundary of the Department of Public Works parcel. Significant quantities of VOCs were not detected in any of these samples. Based on these results significant contamination in soils/sediments was limited to on-site areas and the stream sediments immediately adjacent to the site. However, even these levels have been reduced over time by natural degradation mechanisms and migration into the groundwater.

14.) **Comment:** Are any remaining contaminants dangerous? The article I read indicated that TCE is dangerous to animals and harms the liver and can cause cancer.

Response: The VOCs disposed on site, such as TCE, can be harmful to humans and animals if the person or animal is exposed to high enough amounts of the chemical under some conditions of exposure. These conditions include the duration, frequency, and route of contact with the chemical. This is unlikely at the COSCO/CPC site since levels of VOCs

currently present in the on-site soils are below levels which result in health effects if contact with the soils occurred. In addition, in order to be exposed to the compounds one would have to have contact with the on-site soils through soil excavation or similar activity. However, VOC levels in the groundwater at the site are above public drinking water standards and could result in health effects if significant quantities of the water was ingested under certain conditions of exposure. Therefore, to further protect the Spring Valley Water Supply Wells located downgradient of the site, the contaminated groundwater at the site will be extracted and treated to remove the contamination. The Well Field is equipped with a treatment system to remove any VOC contamination present in the groundwater extracted there prior to distribution.

15.) **Comment:** How many samples, if any, were collected from the DOPW property?

Response: During the RI, four samples were collected from sediments in the former drainage way on that property, one soil sample was collected to the west of the drainage way and four soil gas samples were collected. During the second phase predesign investigation, five geoprobe soil samples were collected and screened (see response to comment 13a, above). From these, three soil samples were analyzed and one groundwater sample was analyzed. In addition, a bedrock monitoring well was installed on the property and sampled during the predesign investigation.

16.) **Comment:** Is it the nature of these contaminants to float on water or do they sink?

Response: PCE, TCE and 1,2 DCE sink as they are all denser than water.

17.) **Comment:** Since the contaminants were discharged to the drainage stream, wouldn't it be reasonable to take a core sample next to the tower now since a significant amount of contaminants could still be there since the discharge was there?

Response: This has now been done, see response to comment 13a, above.

18.) **Comment:** If contamination was in this part of the stream, why was the tower put there?

Response: The tower was constructed without the NYSDEC's knowledge. Unfortunately, there was some misunderstanding by the Village regarding the NYSDEC's plan to remediate contaminated sediments from the portion of the drainage way now covered by the tower. Although the sediments beneath the tower can not be remediated, they no longer pose any threat since there are no possible exposures to them.

Appendix B

Administrative Record

ADMINISTRATIVE RECORD

COSCO/CPC Site ROD Amendment
Site No. 3-44-035

1. Proposed ROD Amendment, COSCO/CPC Site, Spring Valley (V), Rockland County, New York, Site No. 3-44-035, NYSDEC, October 1998.

2. Final Work Plan - Remedial Design, COSCO/CPC Site, Spring Valley, Rockland County, New York, Site No. 3-44-035, CDM, May 1997.

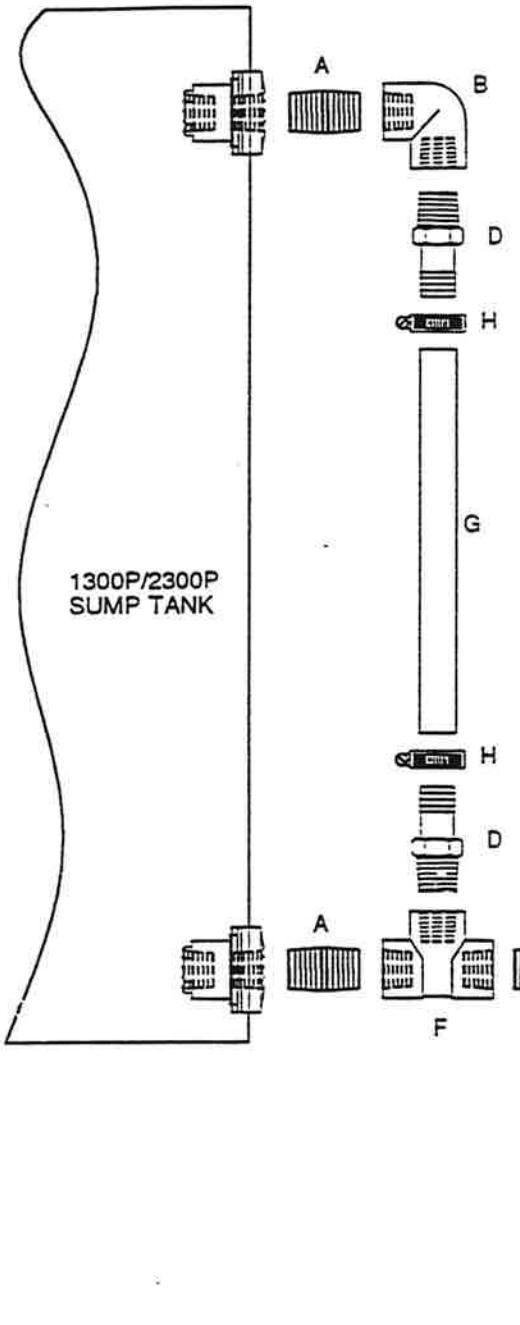
3. Final Predesign Program Report - Remedial Design, COSCO/CPC Site, Spring Valley, Rockland County, New York, Site No. 3-44-035, CDM, October 1998.

4. Letter Report: Geoporobe Investigation of Drainage Ditch, COSCO/CPC Site, Spring Valley, Rockland County, New York, Site No. 3-44-035, CDM, March 1999.

APPENDIX C
LABELLA SITE OPERATIONS AND MAINTENCE MANUAL

APPENDIX J-1

AIR STRIPPER (S-101)



PARTS LIST

SUBASSEMBLY 200-140-00006

A	3	500-140-02980 Nipple,.5xClose,TxT,Brass
B	1	500-140-02510 Elbow 90, .5Fx.5F, brass
C	1	500-140-02520 Elbow Street 90, .5Fx.5M, brass
D	2	500-140-02890 Hose Barb .5Mx.5M , brass
E	1	500-140-02740 Valve Ball .5Fx.5F, brass
F	1	500-140-02630 Tee,.5Fx.5Fx.5F,TxTxT,Brass
G	15.5"	500-200-00150 Hose,1/2"IDx5/8"OD,Polyurethane
H	2	500-140-00030 Clamp, Hose, 5/16-7/8", sst

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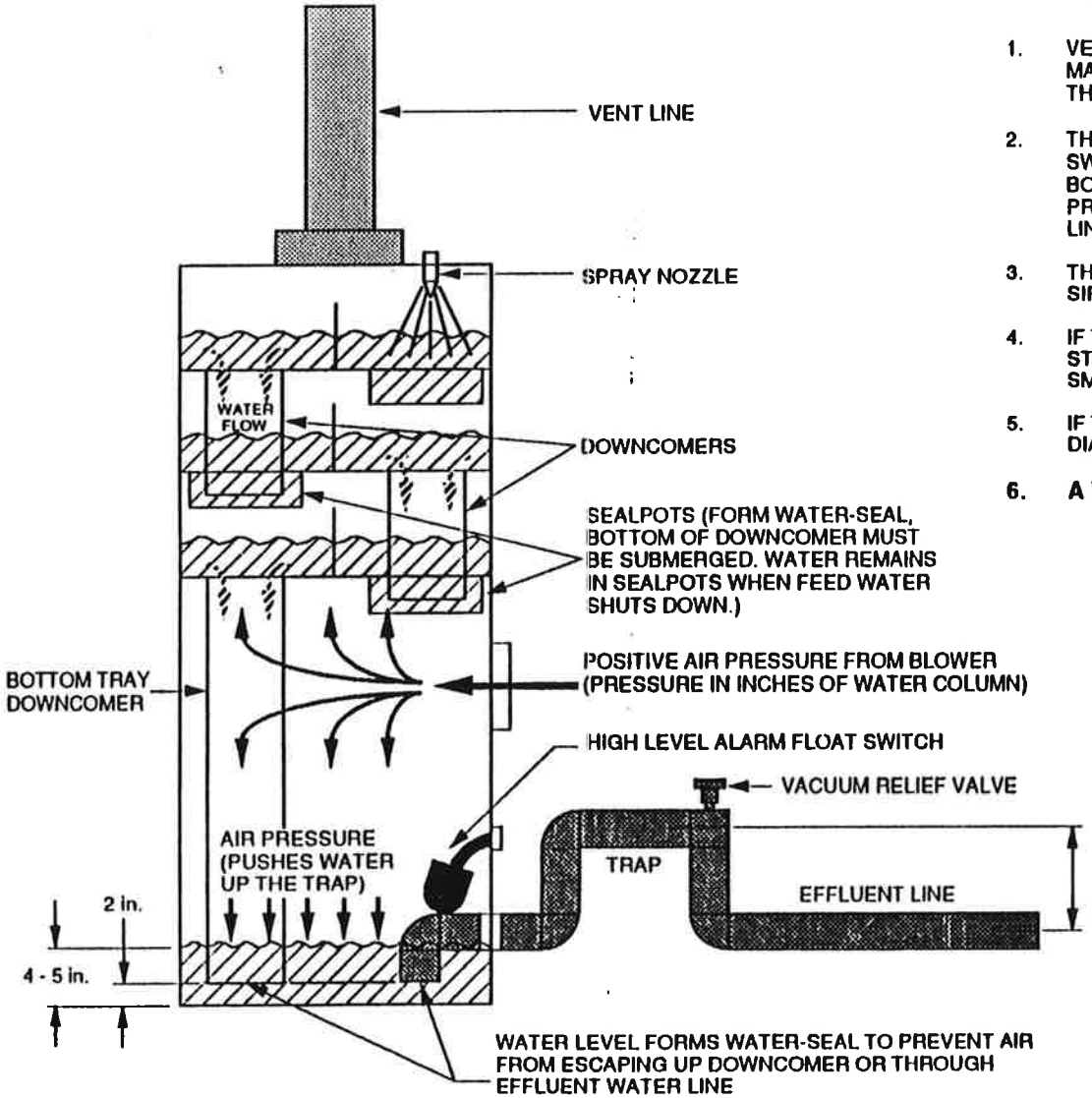
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE

SITE TUBE ASSEMBLY
1300P & 2300P

SIZE	DWG NO.	SHEET	REV
A	200-140-00006	1 OF 1	Ø

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC	9-16-96



SIDE VIEW

DO NOT USE THIS TRAP WHEN PUMPING OUT OF ShallowTray OR WITH INDUCED DRAFT SYSTEMS

GRAVITY DISCHARGE TRAP SET-UP (SEE NOTE 6)

1. VERTICAL TRAP HEIGHT SHOULD BE SET SO THAT THE SYSTEM MAINTAINS A SUMP TANK WATER LEVEL OF 4-5 INCHES (FROM THE BOTTOM OF THE SUMP TANK) DURING NORMAL OPERATION.
2. THE 4-5 INCH WATER LEVEL ALLOWS THE HIGH LEVEL ALARM SWITCH TO RESET AND ALSO FORMS A WATER SEAL AROUND THE BOTTOM TRAY DOWNCOMER AND THE EFFLUENT WATER LINE. THIS PREVENTS AIR FROM ESCAPING THROUGH THE EFFLUENT WATER LINE AND BOTTOM TRAY DOWNCOMER.
3. THE VACUUM RELIEF VALVE PREVENTS THE WATER FROM SIPHONING OUT THE EFFLUENT WATER LINE.
4. IF THE SUMP TANK WATER IS DEEPER THAN 4-5 INCHES WHEN THE STRIPPER IS IN OPERATION, THEN EITHER THE LINE SIZE IS TOO SMALL OR THERE IS SOME TYPE OF RESTRICTION IN THE LINE.
5. IF THE EFFLUENT LINE BECOMES FOULED, IT WILL REDUCE THE DIAMETER OF THE LINE AND CAUSE THE WATER LEVEL TO RISE.
6. **A TRAP IS NOT NEEDED IF THERE IS A DISCHARGE PUMP.**

FOR REFERENCE ONLY !

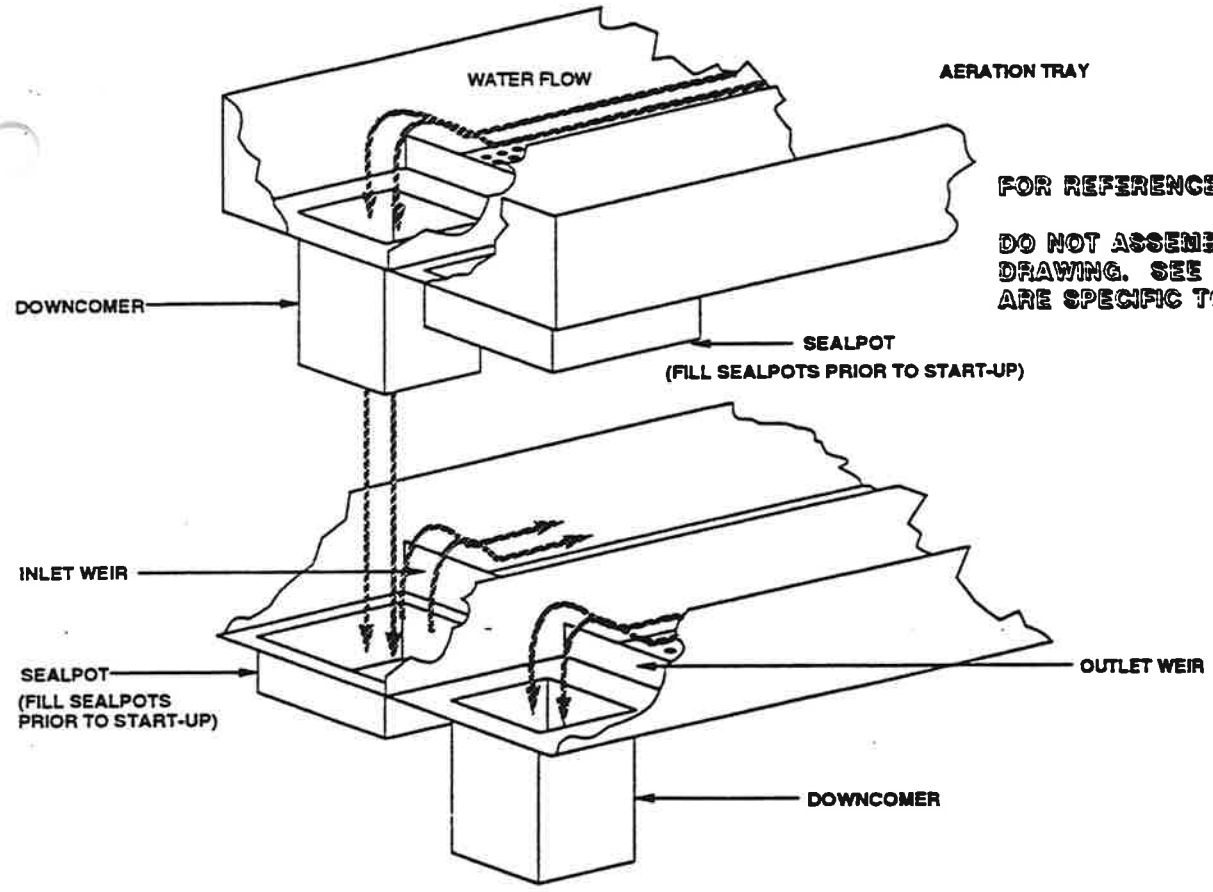
DO NOT ASSEMBLE PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

SET HEIGHT OF INVERTED U-TRAP TO MAINTAIN 4-5 in. WATER LEVEL IN SUMP TANK DURING STRIPPER OPERATION

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NH 03784
(603) 298-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED ± 1 In.	DRAWING NAME: GRAVITY DISCHARGE TRAP HEIGHT		
	DRAWING #: 900-140-00001		
DRAWN: MS	CUSTOMER:		
DATE: 11/8/93	SCALE:	SIZE: A	SHEET : OF :

SEALPOT FUNCTION - WATER SEAL

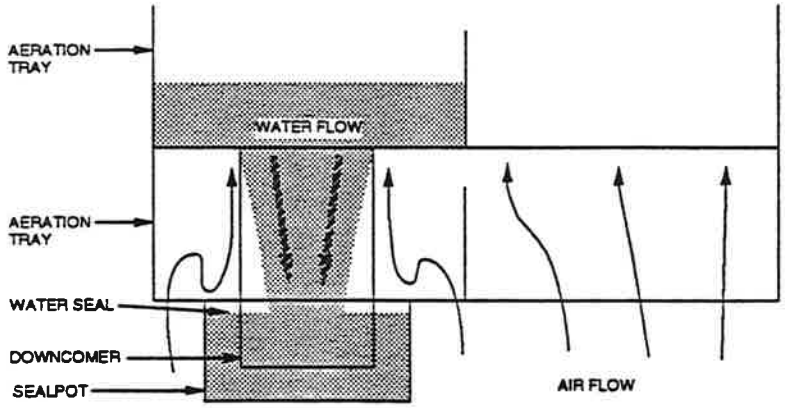


FOR REFERENCE ONLY !

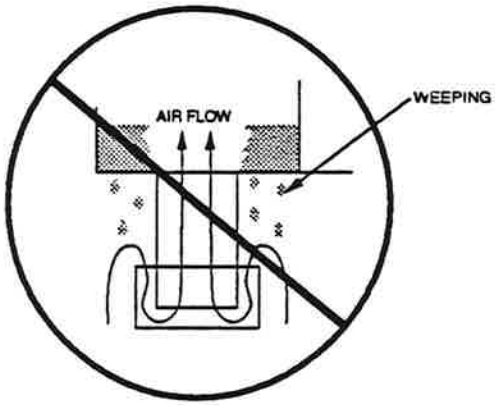
DO NOT ASSEMBLE PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

CAUTION!

SEALPOT MUST BE FILLED WITH WATER TO CREATE WATER SEAL.



FILLED SEALPOT



UNFILLED SEALPOT

1. EACH AERATION TRAY CONTAINS A SEALPOT. ALL SEALPOTS MUST BE FILLED WITH WATER TO FORM A WATER SEAL AROUND THE DOWNCOMERS.
2. IF SEALPOTS ARE NOT FILLED, AIR WILL TRAVEL UP THE DOWNCOMER AND PREVENT WATER FROM FLOWING DOWN THEM. THIS WILL CAUSE THE WATER TO WEEP THROUGH THE 3/16" AERATION HOLES ON THE BOTTOM OF EACH TRAY, RESULTING IN POOR REMOVAL EFFICIENCY.

   THE SUMP TANK WATER LEVEL ACTS AS A WATER SEAL FOR THE BOTTOM TRAY DOWNCOMER. MAINTAIN AT LEAST 3" OF WATER IN THE SUMP TANK AT ALL TIMES.
3. SEALPOTS CAN BE FILLED MANUALLY, OR BY FOLLOWING THE PROCEDURES LISTED IN THE OPERATION AND MAINTENANCE MANUAL.

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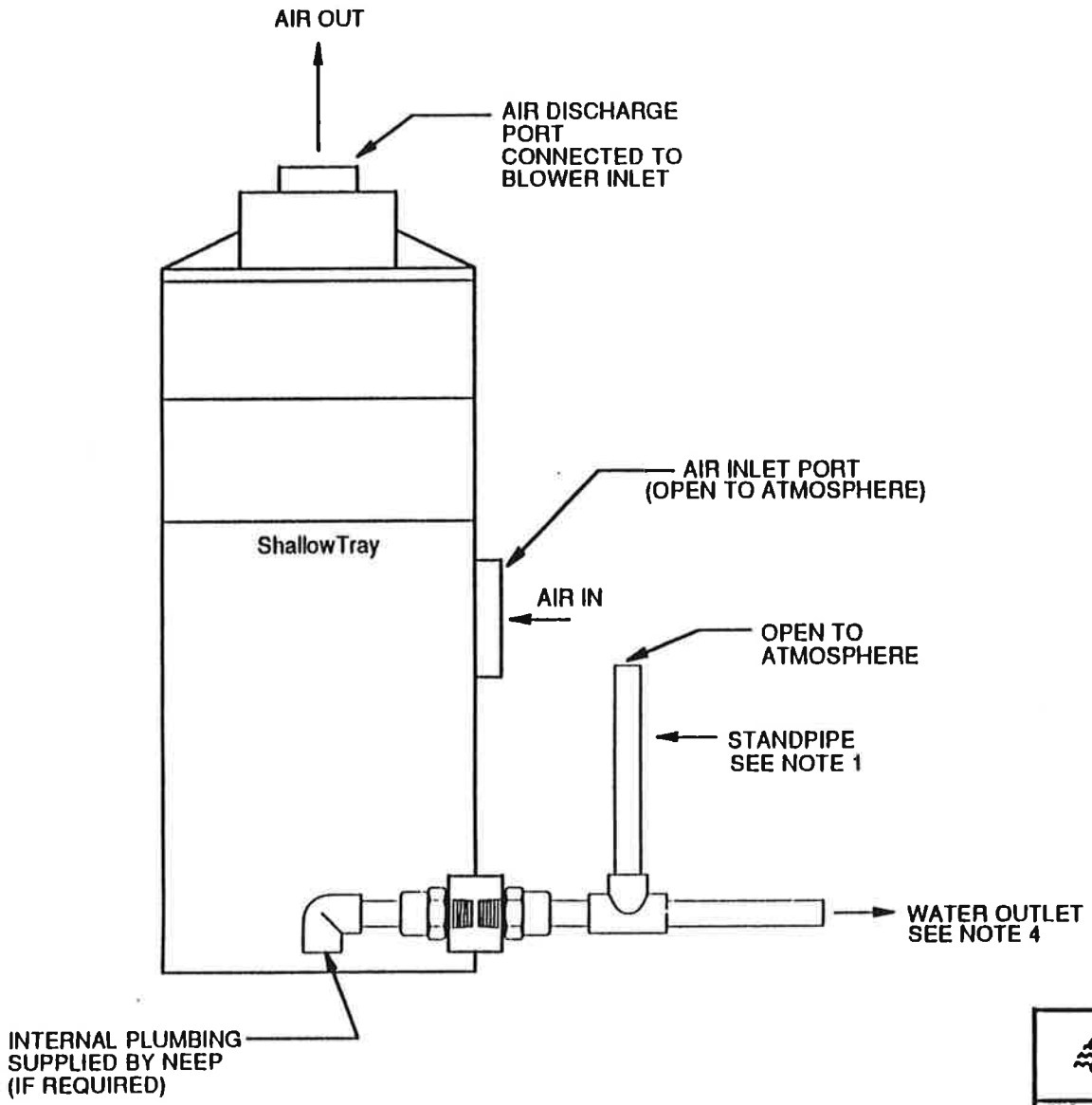
TOLERANCES UNLESS OTHERWISE SPECIFIED ± 1 in.	DRAWING NAME: SEALPOTS		
	DRAWING #: 900-160-00061		
DRAWN: MS DATE: 11/19/92	CUSTOMER:		
REV: A 3/9/94	SCALE:	SIZE: A	SHEET: OF:



NOTES

1. HEIGHT TO TOP OF STANDPIPE SHOULD BE 1" HIGHER THAN LOWEST POINT ON AIR INLET PORT.
2. DO NOT USE THIS SETUP IF PUMPING OUT OF ShallowTray.
3. DISHARGE PIPING SHALL BE GREATER THAN OR SAME SIZE AS WATER DISCHARGE PORT.
4. PIPING RUN MUST PITCH AWAY FROM STRIPPER.

DRAWING FOR REFERENCE ONLY DO NOT ASSEMBLY PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE

RECOMMENDED GRAVITY DISCHARGE SETUP FOR INDUCED DRAFT SYSTEMS

SIZE	DWG NO	SHEET	REV
A	900-140-00003	1 OF 1	Ø
SCALE NONE	DO NOT SCALE DRAWING	DRAWN RC	DATE 7-7-95

TYPICAL VENT LINE INSTALLATION

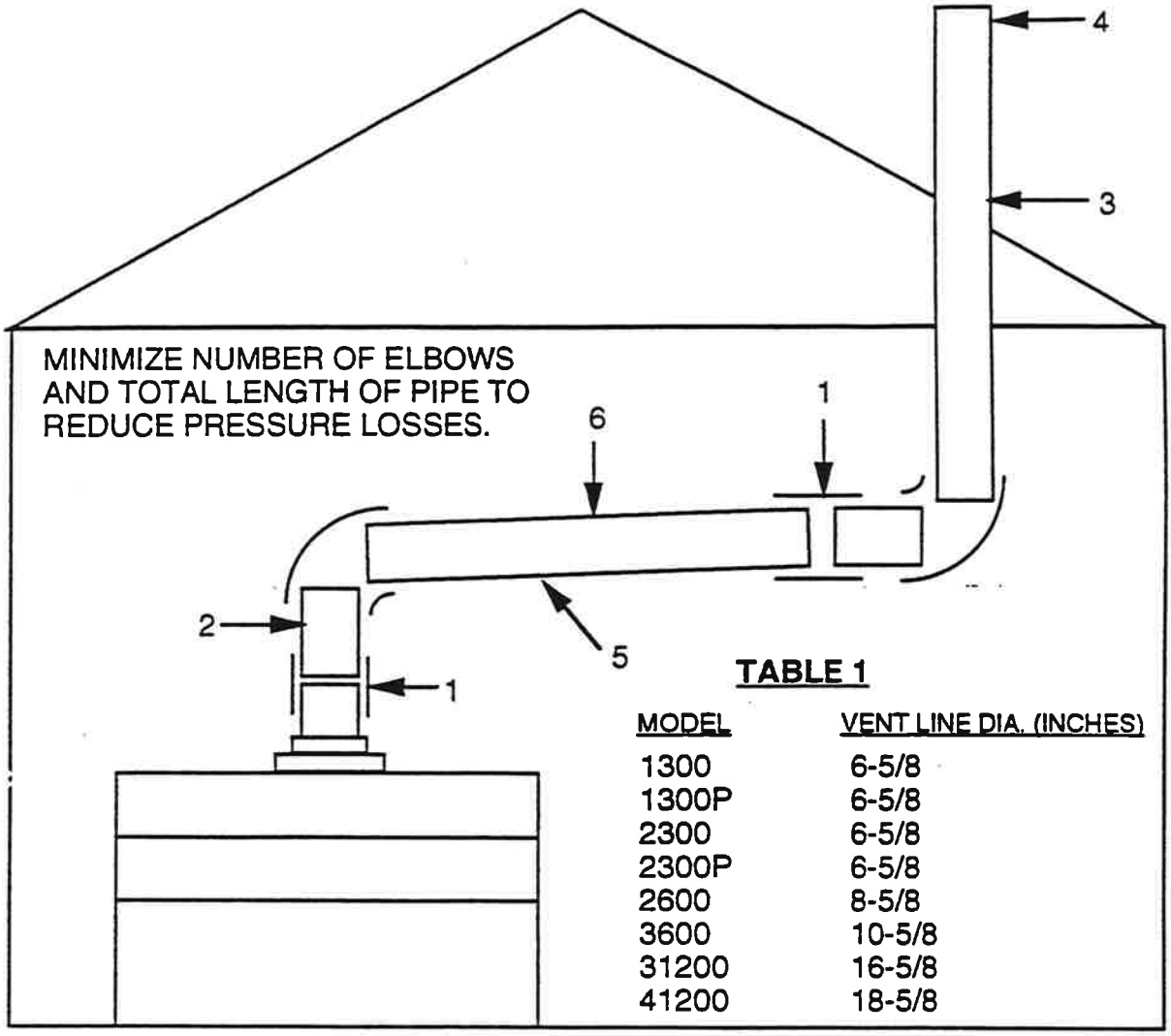


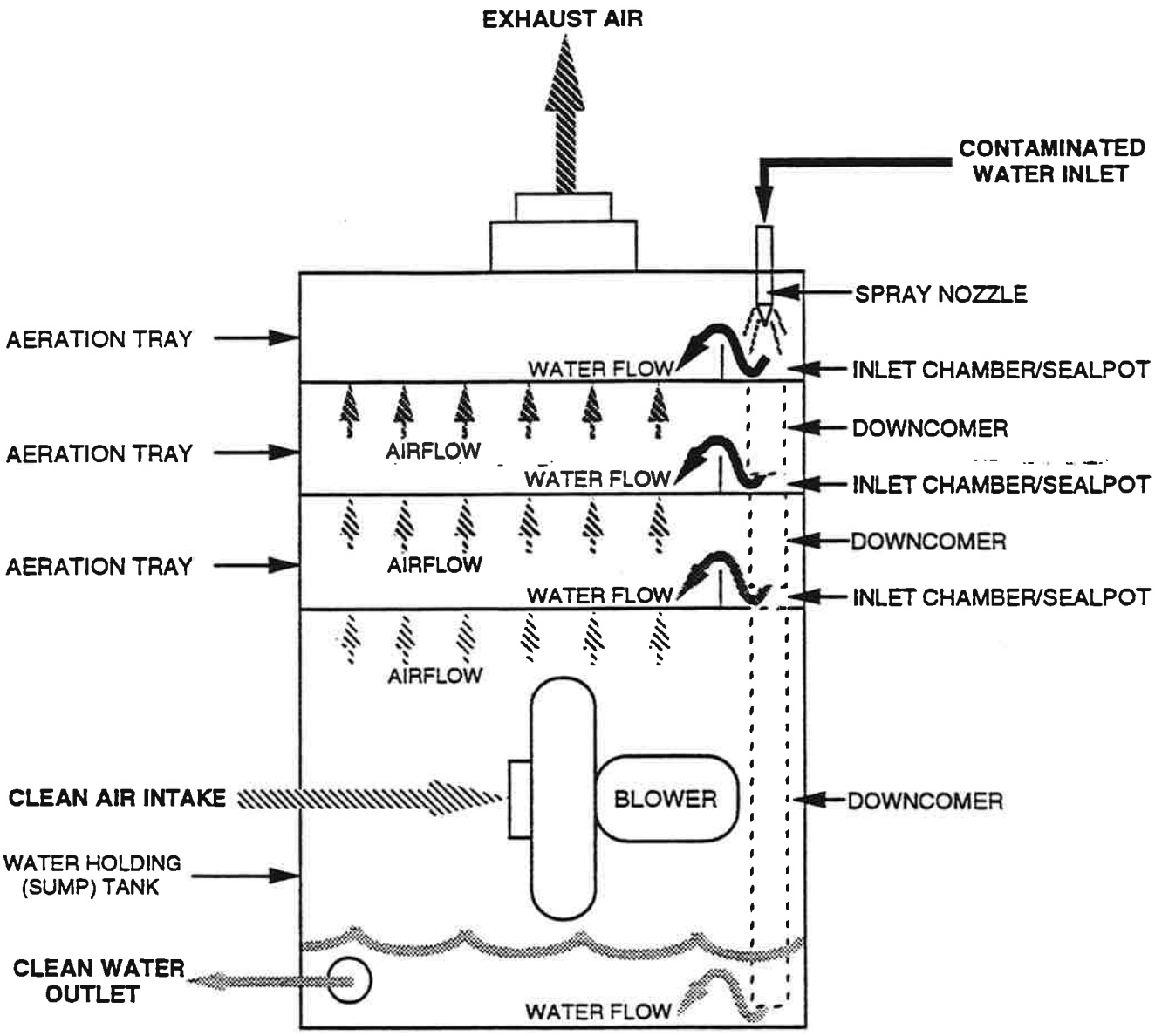
TABLE 1

MODEL	VENT LINE DIA. (INCHES)
1300	6-5/8
1300P	6-5/8
2300	6-5/8
2300P	6-5/8
2600	8-5/8
3600	10-5/8
31200	16-5/8
41200	18-5/8

NOTES:

1. RUBBER COUPLING WITH STAINLESS STEEL RING CLAMPS.
2. VENT LINE PIPE DIAMETER MUST BE EQUAL TO OR GREATER THAN THE AIR EXHAUST VENT DIAMETER ON THE AIR STRIPPER COVER.
3. FIRMLY SUPPORT PIPE AT ROOF PENETRATION.
4. FOR INTERMITTENT OPERATION, INSTALL WIRE MESH OF 1/4" (OR LARGER). FOR DRINKING WATER SUPPLY, INSTALL ELBOW WITH WIRE MESH.
5. ALLOW CLEARANCE FOR REMOVING SECTION OF VENT LINE FOR EASY ACCESS TO AERATION TRAYS.
6. PITCH VENT LINE TOWARD SHALLOW TRAY UNIT.
7. USE PIPING THAT HAS ADEQUATE STRENGTH (PRESSURE OR VACUUM) SPECIFICATIONS, AND THAT IS OF SUITABLE MATERIAL.

AERATION PROCESS, COUNTER-CURRENT AIR AND WATER FLOW



FOR REFERENCE ONLY !

DO NOT ASSEMBLE PER THIS DRAWING. SEE DRAWINGS THAT ARE SPECIFIC TO THIS UNIT.

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WEST LEBANON, NH 03784
(603) 298-7061

TOLERANCES UNLESS OTHERWISE SPECIFIED ±1 in.	DRAWING NAME: AERATION PROCESS		
	DRAWING #: 900-200-00003		
DRAWN: MS DATE: 1/11/93	CUSTOMER:		
REV: A 3/9/94	SCALE:	SIZE: A	SHEET : OF:

Troubleshooting Guide for Poor Removal

WATER ISSUES

1. What is the water flow rate through the stripper?

2. Is there foam in the air stripper caused by surfactants, greases, fats , etc.?

3. What else is in the water besides the contaminates in question?

4. Are there occasional slugs of free product that could contaminate the sump of the air stripper?

5. Does the sump tank have at least 4 inches of water at all times?

6. Are the seal pots on each tray full of water?

7. Are the samples being taken, stored, and tested per approved methods?

AIR ISSUES

1. What is the air flow rate through the stripper?
   - How is it measured?
   - How does it compare with the shop tests?

2. Is there water blowing out the exhaust stack?

3. Is there air blowing out the water discharge piping?

4. What is the design of the air intake and exhaust?
   - Is there any constriction of the flow of air?

14. is there any way contaminated air can get into the blower intake?

MECHANICAL AND OTHER ISSUES

1. Is the blower spinning in the correct direction? i.e.Top of blower wheel spinning towards blower outlet. (The blower will blow air even if running backwards.)

2. Is the system level?

3. When system shuts down, does blower continue to run for 5 minutes after influent water stops?

4. Have there been any power outages that would cause untreated water to fall into the sump?

5. Are trays properly stacked so that the downcomers are in seal pots?

FOULING ISSUES

1. Is there any scaling or fouling on the trays? The holes in the trays should be 3/16 of an inch in diameter.

2. What is the sump tank pressure reading? Has it changed over time?

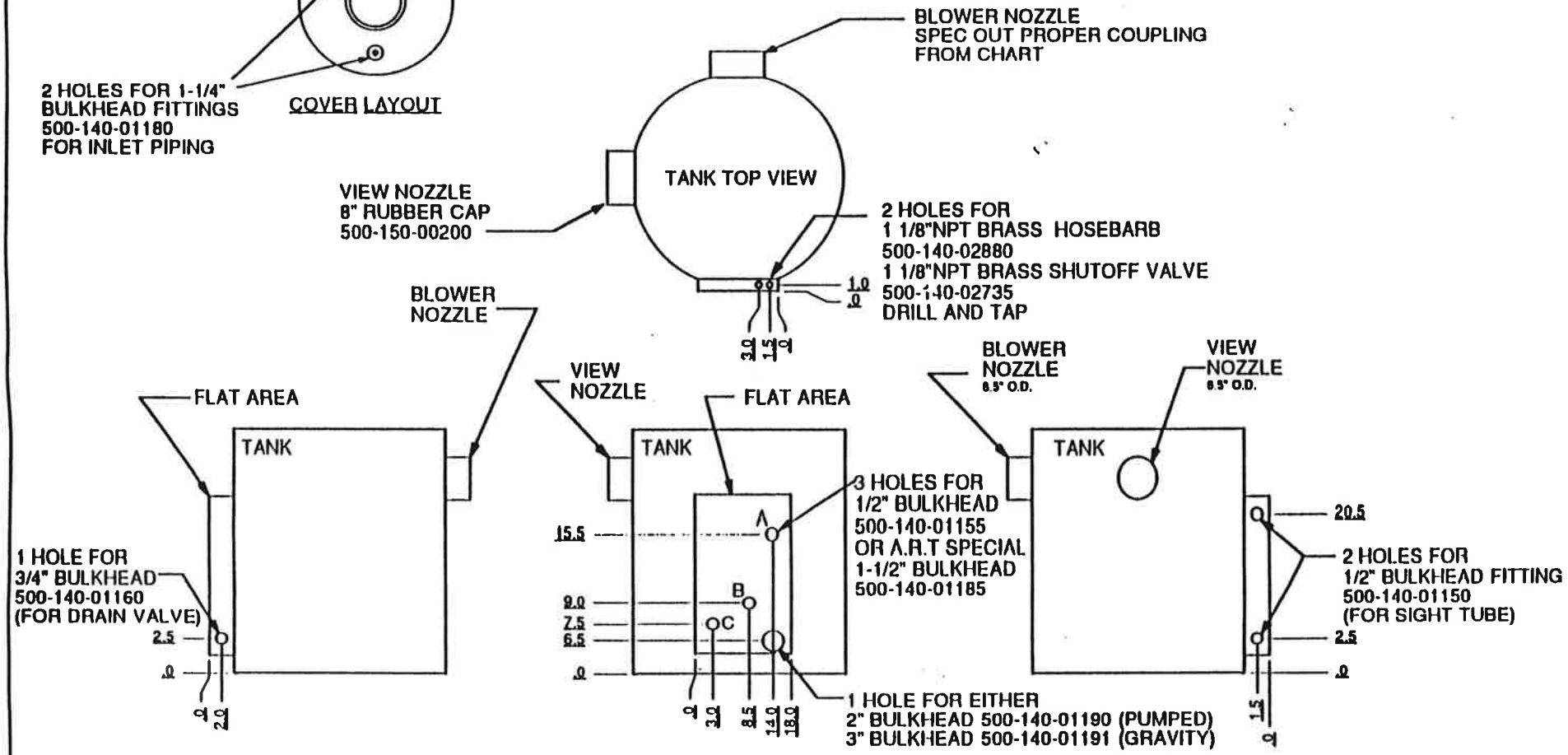
DATE	REV.	ENG.	DESCRIPTION
5-5-04	A	RC	NOTATION FOR OUTLET BULKHEAD SIZE

14" ROUND DEMISTER
500-160-00035
8"X6" RUBBER COUPLING
500-150-00150

Ø 8.5"

2 HOLES FOR 1-1/4"
BULKHEAD FITTINGS
500-140-01180
FOR INLET PIPING

COVER LAYOUT



BULKHEAD SELECTION - FLOAT SWITCH LOCATION					
CHECK ALL THAT APPLY					
√	A	√	B	√	C
✓	SWITCH N.C.		SWITCH N.C.		SWITCH N.C.
	SWITCH N.O.		SWITCH N.O.	✓	SWITCH N.O.
	1/2" PLUG	✓	1/2" PLUG		1/2" PLUG
	1-1/2" PLUG		1-1/2" PLUG		1-1/2" PLUG
	EXP MODEL - MOUNT CORD FITTINGS INSIDE				
✓	TEFC MODEL - MOUNT CORD FITTINGS OUTSIDE				

HOLE SELECTION CHART	
FITTING SIZE/TYPE	HOLE SIZE
1/8" NPT FITTING	11/32" DRILL
1/2" BULKHEAD	1-3/8" HOLESAW
3/4" BULKHEAD	1-3/4" HOLESAW
1-1/4" BULKHEAD	2-3/8" HOLESAW
1-1/2" BULKHEAD	2-1/2" HOLESAW
2" BULKHEAD	3-1/2" HOLESAW
3" BULKHEAD	4-1/2" HOLESAW

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17 TECHNOLOGY DRIVE
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TOLERANCES UNLESS OTHERWISE SPECIFIED: ± .030 in.

DRAWING NAME: 2300P COUPLING LAYOUT

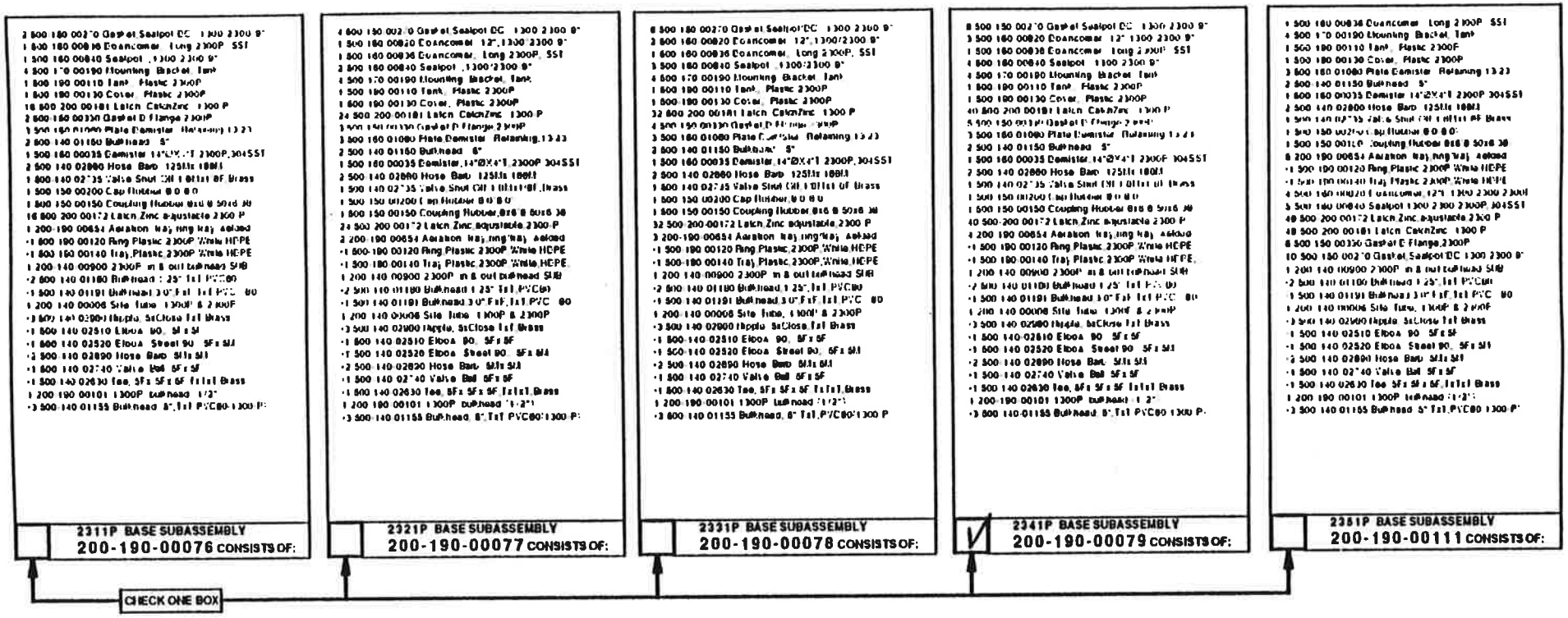
DRAWN: RC

DRAWING #: 900-190-00020

DATE: 3-2[illegible]

SCALE: NONE | SIZE: A | SHEET 1 OF 1

DO NOT SCALE DRAWING



2311P BASE SUBASSEMBLY
200-190-00076 CONSISTS OF:

2321P BASE SUBASSEMBLY
200-190-00077 CONSISTS OF:

2331P BASE SUBASSEMBLY
200-190-00078 CONSISTS OF:

2341P BASE SUBASSEMBLY
200-190-00079 CONSISTS OF:

2351P BASE SUBASSEMBLY
200-190-00111 CONSISTS OF:

CHECK ONE BOX

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(603)-298-7061 FAX(603)-298-7063

TOLERANCES UNLESS OTHERWISE STATED ± .XX in.

DRAWING NAME
2300P SUBASSEMBLY PARTS LIST
SHALLOWTRAY TANK LABEL

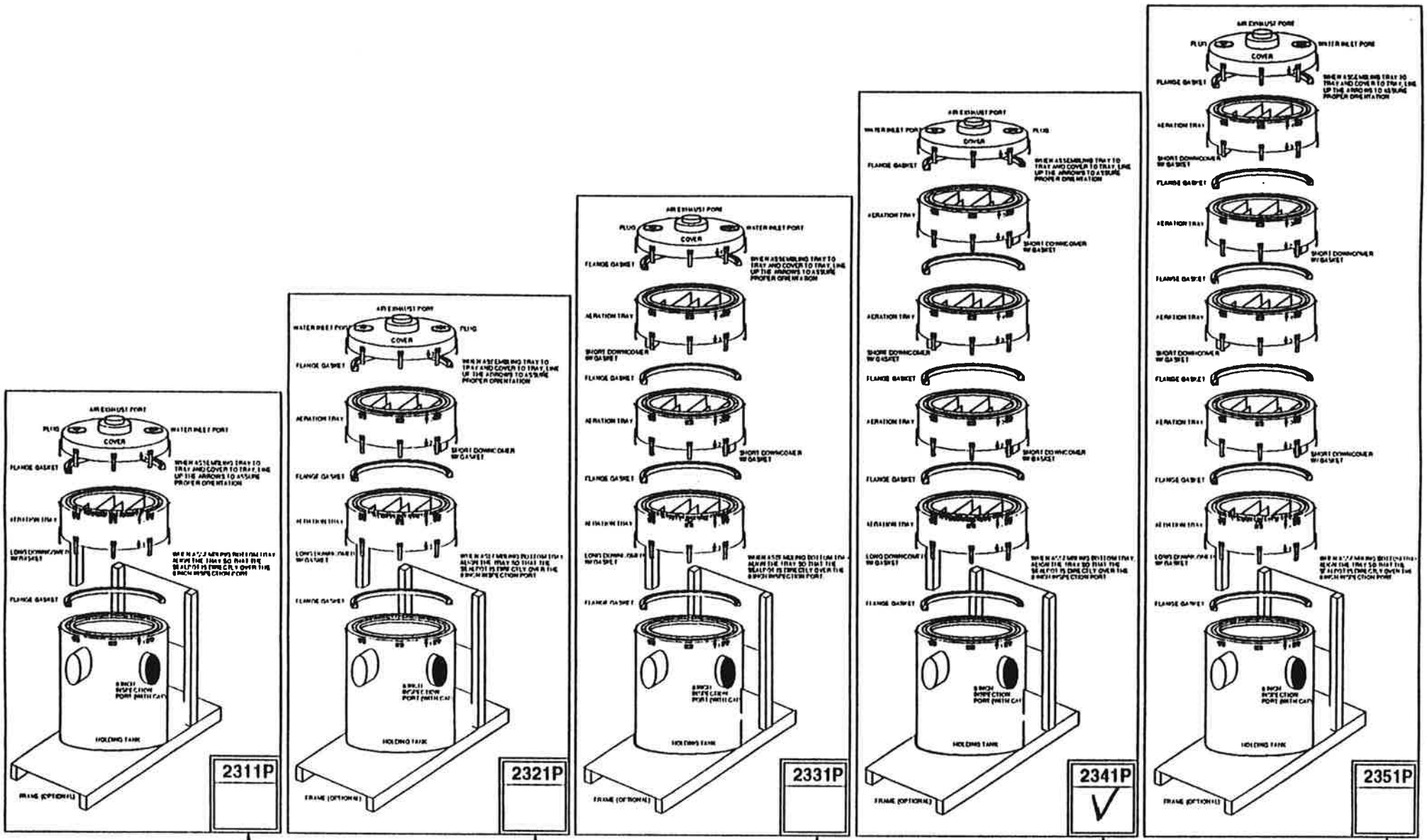
DRAWN: SAC

DRAWING #: 000-190-00036-D

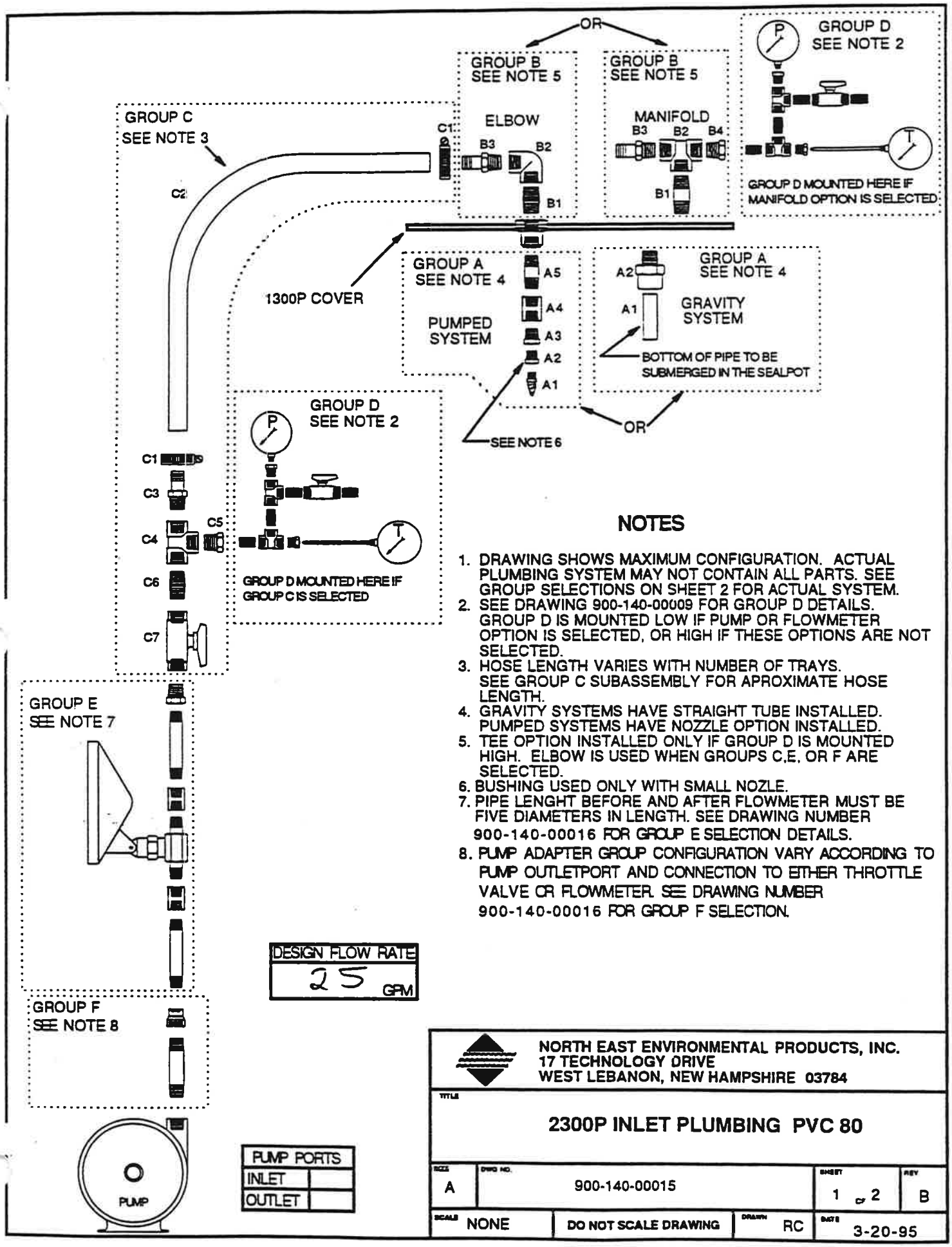
DATE: 10-18-96

SCALE: NONE | SIZE: A | SHEET 1 OF 1

DO NOT SCALE DRAWING



DRAWING NAME:	2300P BASE SUBASSEMBLY
DRAWING #:	900-190-00041-A
CUSTOMER:	



NOTES

1. DRAWING SHOWS MAXIMUM CONFIGURATION. ACTUAL PLUMBING SYSTEM MAY NOT CONTAIN ALL PARTS. SEE GROUP SELECTIONS ON SHEET 2 FOR ACTUAL SYSTEM.
2. SEE DRAWING 900-140-00009 FOR GROUP D DETAILS. GROUP D IS MOUNTED LOW IF PUMP OR FLOWMETER OPTION IS SELECTED, OR HIGH IF THESE OPTIONS ARE NOT SELECTED.
3. HOSE LENGTH VARIES WITH NUMBER OF TRAYS. SEE GROUP C SUBASSEMBLY FOR APROXIMATE HOSE LENGTH.
4. GRAVITY SYSTEMS HAVE STRAIGHT TUBE INSTALLED. PUMPED SYSTEMS HAVE NOZZLE OPTION INSTALLED.
5. TEE OPTION INSTALLED ONLY IF GROUP D IS MOUNTED HIGH. ELBOW IS USED WHEN GROUPS C,E, OR F ARE SELECTED.
6. BUSHING USED ONLY WITH SMALL NOZLE.
7. PIPE LENGHT BEFORE AND AFTER FLOWMETER MUST BE FIVE DIAMETERS IN LENGTH. SEE DRAWING NUMBER 900-140-00016 FOR GROUP E SELECTION DETAILS.
8. PUMP ADAPTER GROUP CONFIGURATION VARY ACCORDING TO PUMP OUTLETPORT AND CONNECTION TO EITHER THROTTLE VALVE OR FLOWMETER. SEE DRAWING NUMBER 900-140-00016 FOR GROUP F SELECTION.

DESIGN FLOW RATE
25 GPM

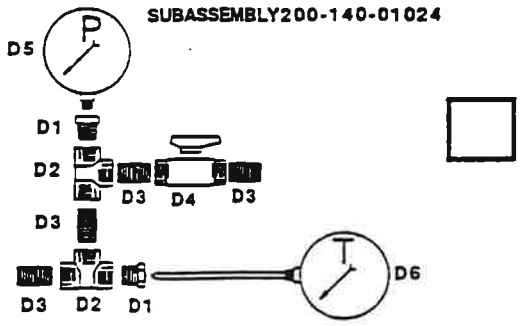
NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE: 2300P INLET PLUMBING PVC 80

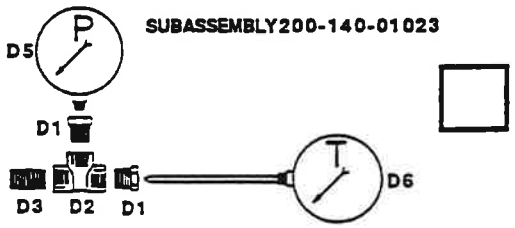
SIZE	DWG NO.	SHEET	REV
A	900-140-00015	1 OF 2	B

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC	3-20-95

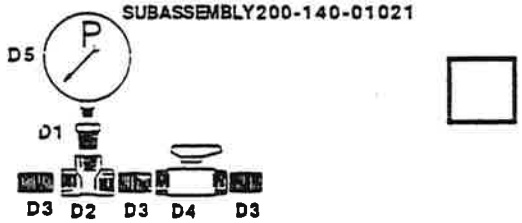
SAMPLE PORT, PRESSURE GAUGE, TEMPERATURE GAUGE



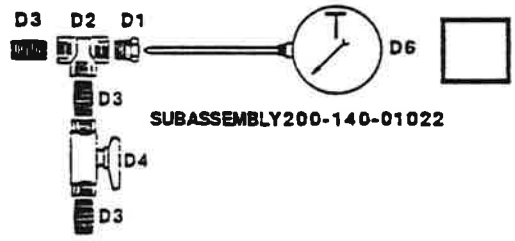
PRESSURE GAUGE, TEMPERATURE GAUGE



SAMPLE PORT, PRESSURE GAUGE



SAMPLE PORT, TEMPERATURE GAUGE

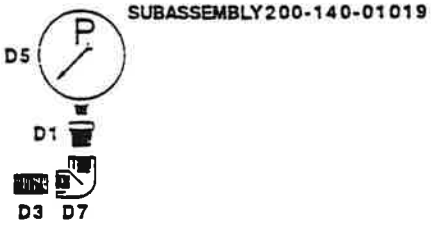


GROUP D PARTS LIST

D1 500-140-00250 Bushing,.5Mx.25F,TxT,PVC80
D2 500-140-00940 Tee,.5",T,PVC80
D3 500-140-01380 Nipple,.5xClose,T,PVC80
D4 500-140-01300 Valve,Ball,.5,T,PVC80
D5 500-130-00150 Gauge,Water Pressure, 0-60PSI
D6 500-130-00190 Gauge,WaterTemp,(0-140),4.0"
D7 500-140-00795 Elbow,90,.5Fx.5F,TxT,PVC 80
D8 500-140-00690 Coupling,.5Fx.5F,TxT,PVC8 0
D9 500-140-02000 Plug, .5M, T, PVC 40

SAMPLE PORT

PRESSURE GAUGE



TEMPERATURE GAUGE

GROUP D

INLET PLUMBING	
GRAVITY DISCHARGE	

SELECT ONE

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE
GROUP D PLUMBING CONFIGURATIONS
SAMPLE PORT, TEMPERATURE GAUGE, PRESSURE GAUGE

SIZE	DWG NO.	SHEET	REV
A	900-140-00009	1 OF 1	A

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC	5-1-96

PLUMBING SYSTEM SELECTION

SELECT ONE FROM EACH GROUP

GROUP A

☐ **200-140-01131 NOZZLE(1 TO 10 GPM)**
A1 1 500-140-00160 Nozzle,10.0gpm@15psi,.375,Bras
A2 1 500-140-00260 Bushing,.5Mx.375F,TxT,PVC80
A3 1 500-140-00360 Bushing,1.25Mx.5F,TxT,PVC 80
A4 1 500-140-00730 Coupling,1.25Fx1.25F,TxT,PVC80
A5 1 500-140-01480 Nipple,1.25x2.0L,TxT,PVC 80

☐ **200-140-01132 NOZZLE(11 TO 19GPM)**
A1 1 500-140-00180 Nozzle,19.7gpm@15psi,.5,Brass
A3 1 500-140-00360 Bushing,1.25Mx.5F,TxT,PVC 80
A4 1 500-140-00730 Coupling,1.25Fx1.25F,TxT,PVC80
A5 1 500-140-01480 Nipple,1.25x2.0L,TxT,PVC 80

☐ **200-140-01133 NOZZLE(20 TO 25GPM)**
A1 1 500-140-00190 Nozzle,25.5gpm@15psi,.75,Brass
A3 1 500-140-00380 Bushing,1.25Mx.75F,TxT,PVC80
A4 1 500-140-00730 Coupling,1.25Fx1.25F,TxT,PVC80
A5 1 500-140-01480 Nipple,1.25x2.0L,TxT,PVC 80

☑ **200-140-01134 NOZZLE(26 TO 50GPM)**
A1 1 500-140-00210 Nozzle,57.0gpm@15psi,1.0,Brass
A3 1 500-140-00420 Bushing,1.25Mx1.0F,TxT,PVC80
A4 1 500-140-00730 Coupling,1.25Fx1.25F,TxT,PVC80
A5 1 500-140-01480 Nipple,1.25x2.0L,TxT,PVC 80

☐ **200-140-01135 TUBE (GRAVITY FEED TO 50GPM)**
A1 4" 500-140-01670 Pipe,1.25",PVC80
A2 1 500-140-01100 Adapter,1.25Mx1.25F,TxS,PVC

GROUP B

☐ **200-140-01136 ELBOW**
B1 1 500-140-03100 Nipple,1.25xClose,TxT,Brass
B2 1 500-140-02580 Elbow,90,1.25Fx1.25F,TxT,Brass
B3 1 500-140-02926 Hose Barb,1.25Mx1.25M,TxB,Bras

☐ **200-140-01137 MANIFOLD TEE**
B1 1 500-140-03120 Nipple,1.25x2.5L,TxT,Brass
B2 1 500-140-02650 Tee,1.25Fx1.25Fx1.25F,TxTxT,Br
B3 1 500-140-02926 Hose Barb,1.25Mx1.25M,TxB,Bras
B4 1 500-140-00360 Bushing,1.25Mx.5F,TxT,PVC 80

GROUP C

☐ **200-140-01138 VALVE & EXTENDER - 1 TRAY**
C1 2 500-140-00045 Clamp,Hose,1-5/16-2-1/4
C2 5' 500-140-03841 Hose,Pure Water,1.25"
C3 1 500-140-02926 Hose Barb,1.25Mx1.25M,TxB,Bras
C4 1 500-140-02650 Tee,1.25Fx1.25Fx1.25F,TxTxT,Br
C5 1 500-140-00360 Bushing,1.25Mx.5F,TxT,PVC 80
C6 1 500-140-03100 Nipple,1.25xClose,TxT,Brass
C7 1 500-140-02770 Valve,Ball,1.25Fx1.25F,TxT,Bra

☐ **200-140-01139 VALVE & EXTENDER - 2 TRAY**
C1 2 500-140-00045 Clamp,Hose,1-5/16-2-1/4
C2 6' 500-140-03841 Hose,Pure Water,1.25"
C3 1 500-140-02926 Hose Barb,1.25Mx1.25M,TxB,Bras
C4 1 500-140-02650 Tee,1.25Fx1.25Fx1.25F,TxTxT,Br
C5 1 500-140-00360 Bushing,1.25Mx.5F,TxT,PVC 80
C6 1 500-140-03100 Nipple,1.25xClose,TxT,Brass
C7 1 500-140-02770 Valve,Ball,1.25Fx1.25F,TxT,Bra

☐ **200-140-01140 VALVE & EXTENDER - 3 TRAY**
C1 2 500-140-00045 Clamp,Hose,1-5/16-2-1/4
C2 7' 500-140-03841 Hose,Pure Water,1.25"
C3 1 500-140-02926 Hose Barb,1.25Mx1.25M,TxB,Bras
C4 1 500-140-02650 Tee,1.25Fx1.25Fx1.25F,TxTxT,Br
C5 1 500-140-00360 Bushing,1.25Mx.5F,TxT,PVC 80
C6 1 500-140-03100 Nipple,1.25xClose,TxT,Brass
C7 1 500-140-02770 Valve,Ball,1.25Fx1.25F,TxT,Bra

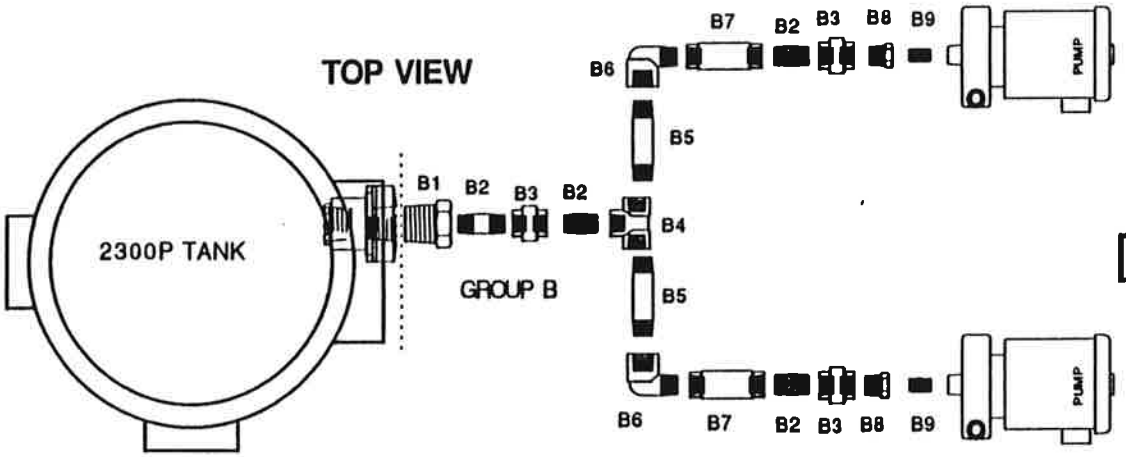
☐ **200-140-01141 VALVE & EXTENDER - 4 TRAY**
C1 2 500-140-00045 Clamp,Hose,1-5/16-2-1/4
C2 8' 500-140-03841 Hose,Pure Water,1.25"
C3 1 500-140-02926 Hose Barb,1.25Mx1.25M,TxB,Bras
C4 1 500-140-02650 Tee,1.25Fx1.25Fx1.25F,TxTxT,Br
C5 1 500-140-00360 Bushing,1.25Mx.5F,TxT,PVC 80
C6 1 500-140-03100 Nipple,1.25xClose,TxT,Brass
C7 1 500-140-02770 Valve,Ball,1.25Fx1.25F,TxT,Bra

NOTE: SEE DRAWING № 900-140-00009 FOR GROUP D SELECTION
SEE DRAWING № 900-140-00016 FOR GROUP E & F SELECTION

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE: 2300P INLET PLUMBING PVC 80			
SIZE: A	DWG NO: 900-140-00015	SHEET: 2 of 2	REV: B
SCALE: NONE	DO NOT SCALE DRAWING	DRAWN: RC	DATE: 3-20-95

TOP VIEW



GROUP A

[X] **200-140-01123 INTERNAL SUCTION ELBOW**

A1 1 500-140-01130 Adapter,3.0Mx3.0F,TxS, PVC 80
A2 3.5" 500-140-01700 Pipe,3.0",PVC 80
A3 1 500-140-00890 Elbow,90,3.0Fx3.0F,SxS,PVC 80

GROUP B

B1 1 500-140-02340 Bushing,3.0Mx2.0F,TxT,Brass
B2 4 500-140-03210 Nipple,2.0xClose,TxT,Brass
B3 3 500-140-02710 Union,2.0Fx2.0F,TxT,Brass
B4 1 500-140-02655 Tee,2.0Fx2.0Fx2.0F,TxTxT,Brass
B5 2 500-140-03251 Nipple,2.0x6.0L,TxT,Brass
B6 2 500-140-02615 Elbow,Street 90,2.0Fx2.0M,TxT,Brass
B7 ~~2 500-140-02860 Valve,Check,2.0Fx2.0F,TxT,Brass~~
B8 2 500-140-02330 Bushing,2.0Mx1.25F,TxT,Brass
B9 2 500-140-03100 Nipple,1.25xClose,TxT,Brass

B7 = ball valve 2" [X]

GROUP C

[ ] **200-140-01148 THROTTLE VALVE 1"**

C1 2 500-140-03060 Nipple,1.0xClose,TxT,Brass
C2 1 500-140-02780 Valve,Ball,1.0Fx1.0F,TxT,Brass
C3 1 500-140-02640 Tee,1.0Fx1.0Fx1.0F,TxTxT,Brass
C4 1 500-140-02240 Bushing,1.0Mx.5F,TxT,Brass

Group C By Customer

SIDE VIEW

(TYPICAL OF BOTH PUMPS)

DESIGN FLOW RATE	
25	GPM

PUMP PORTS	
INLET	1 1/4
OUTLET	1

NOTE: SEE DRAWING Nº 900-140-00009 FOR GROUP D SELECTION

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE

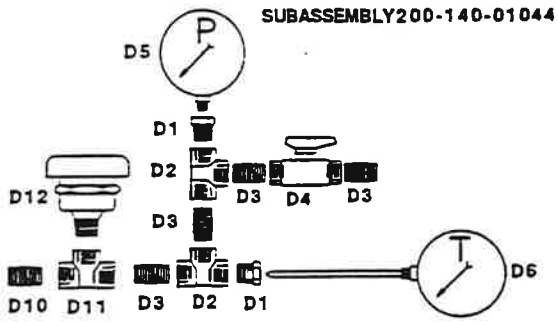
2300P OUTLET PLUMBING (PUMPED) PVC 80

SIZE	DWG NO.	SHEET	REV
A	2341P-5128	1 of 1	A

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	SAC	2-11-98

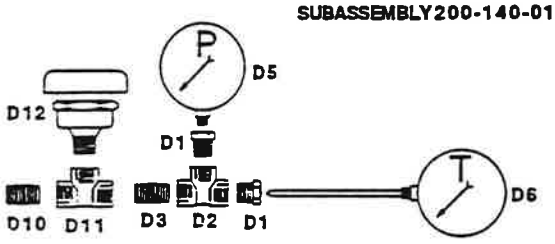
SAMPLE PORT, PRESSURE GAUGE, TEMPERATURE GAUGE

SUBASSEMBLY200-140-01044



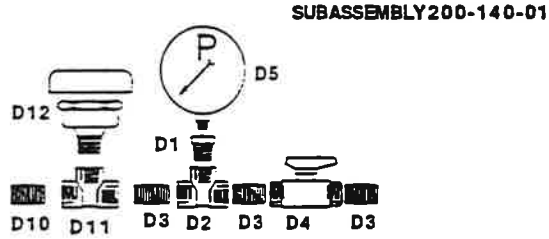
PRESSURE GAUGE, TEMPERATURE GAUGE

SUBASSEMBLY200-140-01043

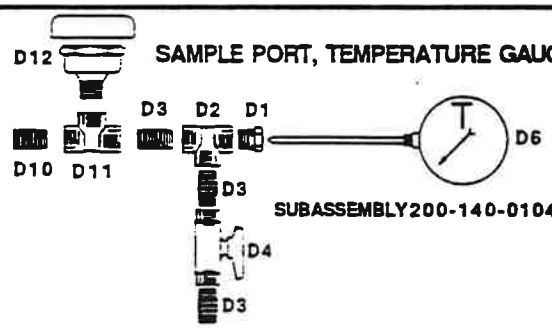


SAMPLE PORT, PRESSURE GAUGE

SUBASSEMBLY200-140-01041



SAMPLE PORT, TEMPERATURE GAUGE



SUBASSEMBLY200-140-01042

GROUP D PARTS LIST

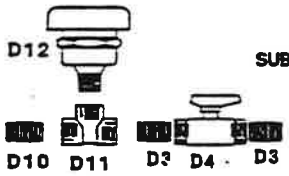
D1	500-140-00250	Bushing,.5Mx.25F,TxT,PVC80
D2	500-140-00940	Tee,.5",T,PVC80
D3	500-140-01380	Nipple,.5xClose,T,PVC80
D4	500-140-01300	Valve,Ball,.5,T,PVC80
D5	500-130-00150	Gauge, Water Pressure, 0-60PSI
D6	500-130-00190	Gauge,Water Temp,(0-140),4.0"
D7	500-140-00795	Elbow,90,.5Fx.5F,TxT, PVC 80
D8	500-140-00690	Coupling,.5Fx.5F,TxT,PVC 80
D9	500-140-02000	Plug, .5M, T, PVC 40
D10	500-140-02980	Nipple,.5xClose,TxT,Brass
D11	500-140-02630	Tee,.5Fx.5Fx.5F,TxTxT,Brass
D12	500-140-00060	Valve,Vacuum Relief 1/2"

NO OPTIONS

SUBASSEMBLY200-140-01037

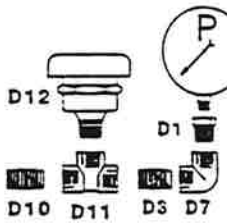
ship loose [X]

SAMPLE PORT



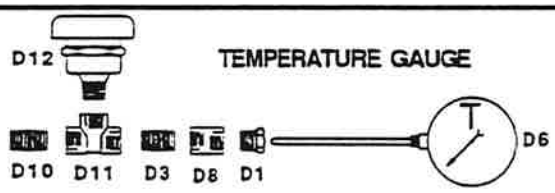
SUBASSEMBLY200-140-01038

PRESSURE GAUGE



SUBASSEMBLY200-140-01039

TEMPERATURE GAUGE



SUBASSEMBLY200-140-01040

GROUP D

PUMPED DISCHARGE

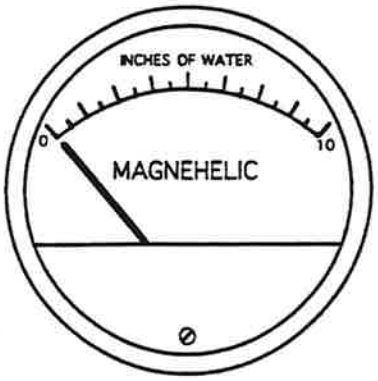
NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE: GROUP D PLUMBING CONFIGURATIONS
SAMPLE PORT, TEMPERATURE GAUGE, PRESSURE GAUGE

SIZE	DWG NO.	SHEET	REV
A	900-140-00008	1 OF 1	Ø

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC	5-1-96

AIR PRESSURE GAGE

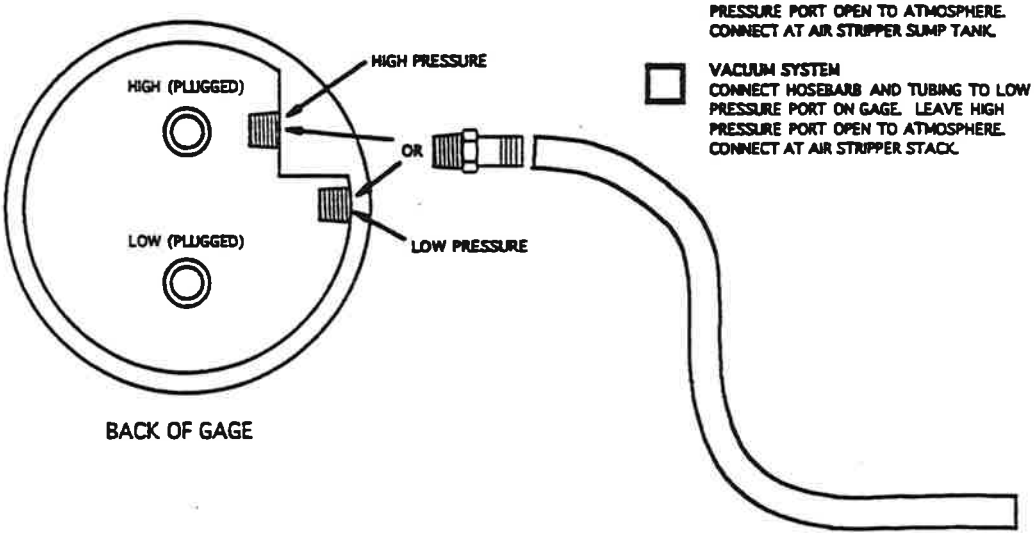


NOTES

1 PRESSURE LINE SHUT-OFF VALVE SHOULD BE CLOSED UNTIL A READING IS NEEDED. THIS WILL PREVENT CONDENSATION FROM BUILDING UP AND FLOODING THE GAGE.

☐ PRESSURE SYSTEM
CONNECT HOSEBARB AND TUBING TO HIGH PRESSURE PORT ON GAGE. LEAVE LOW PRESSURE PORT OPEN TO ATMOSPHERE. CONNECT AT AIR STRIPPER SUMP TANK.

☐ VACUUM SYSTEM
CONNECT HOSEBARB AND TUBING TO LOW PRESSURE PORT ON GAGE. LEAVE HIGH PRESSURE PORT OPEN TO ATMOSPHERE. CONNECT AT AIR STRIPPER STACK.



BACK OF GAGE

☐ 200-130-00209 Air pressure gauge SUB 0-5"wc
•1 500-130-00035 Gauge,Air Pressure,0-5"WC
•4' 500-200-00145 Tubing Air3/16IDx5/16OD

☐ 200-130-00210 Air pressure gauge SUB 0-10"wc
•1 500-130-00040 Gauge Air Pressure, 0-10"WC
•4' 500-200-00145 Tubing Air3/16IDx5/16OD

☐ 200-130-00211 Air pressure gauge SUB 0-15"wc
•1 500-130-00050 Gauge Air Pressure0-15"WC
•4' 500-200-00145 Tubing Air3/16IDx5/16OD

☐ 200-130-0021? Air pressure gauge SUB 0-20"wc
•1 500-130-000?0 Gauge Air Pressure0-20"WC
•4' 500-200-00•45 Tubing Air3/16IDx5/16OD

☒ 200-130-00213 Air pressure gauge SUB 0-30"wc
•1 500-130-00065 Gauge Air Pressure 0-30"
•4' 500-200-00145 Tubing Air3/16IDx5/16OD

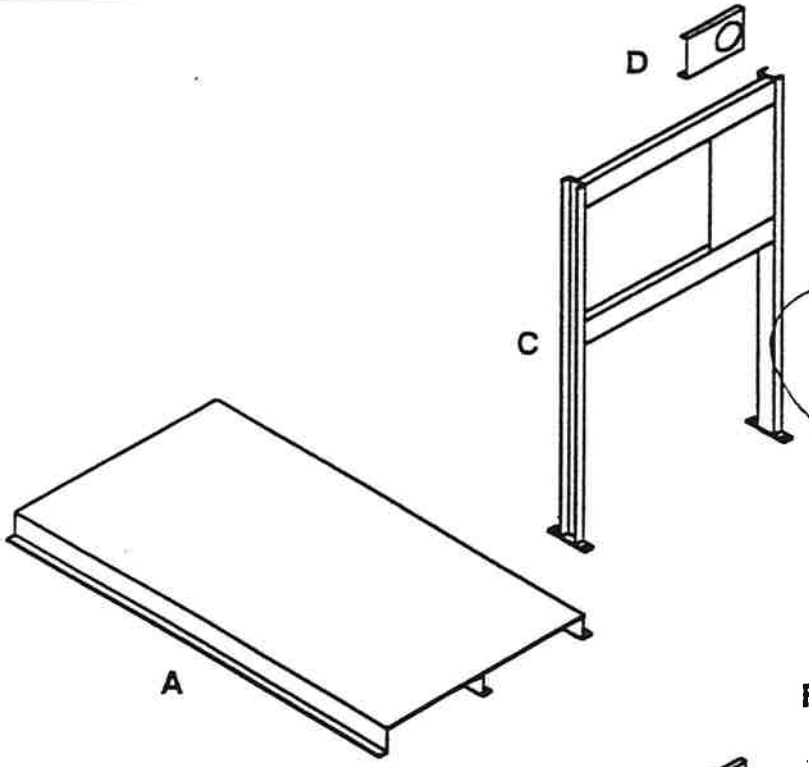
☐ 200-130-00214 Air pressure gauge SUB 0-40"wc
•1 500-130-00066 Gauge, Air Pressure,0-40"WC
•4' 500-200-00145 Tubing Air3/16IDx5/16OD

☐ 200-130-00215 Air pressure gauge SUB 0-60"wc
•1 500-130-00068 Gauge,Air Pressure,0-60"wc
•4' 500-200-00145 Hose,3/16id x 5/16od,Tygon,clr

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

AIR PRESSURE GAGE

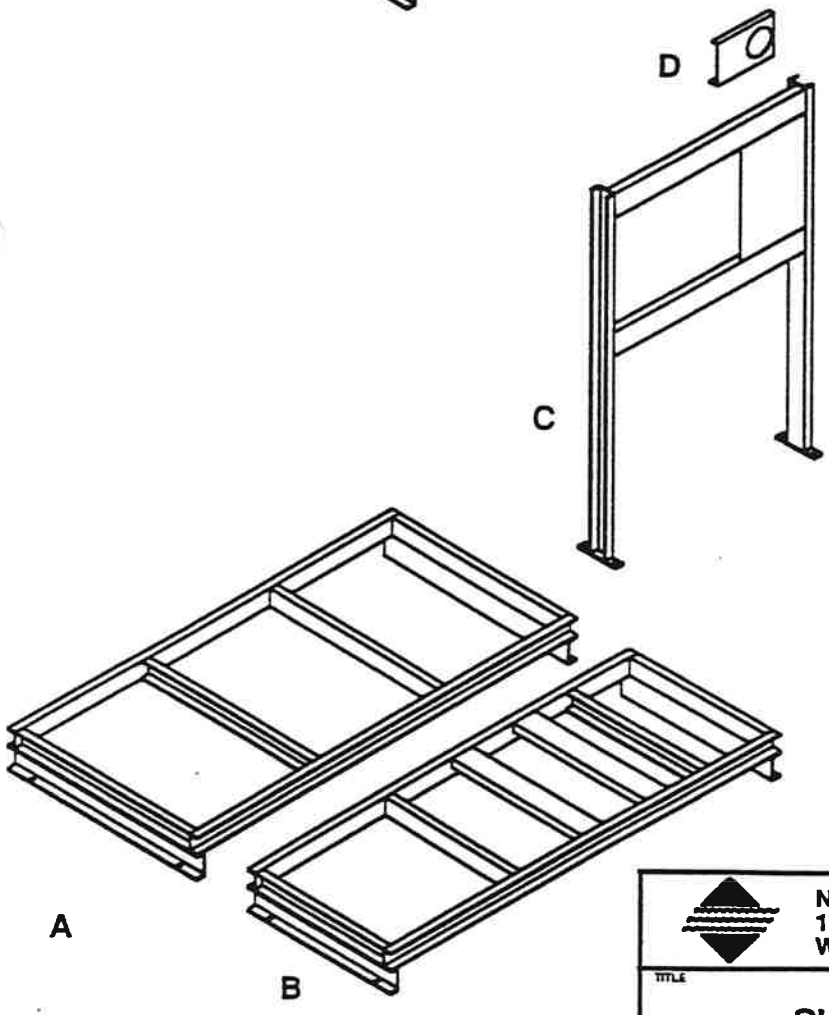
A	900-130-00012	1 - 1	Ø
NONE	DO NOT SCALE DRAWING	RC	10-31-94



FRAMES FOR PLASTIC SYSTEMS

200-170-00041 Frame Assembly, 1300P Steel
A 1 500-170-00332 Frame,Steel,1300P
C 1 500-170-00045 Frame, control panel
D 1 500-170-00047 Instrument bracket

200-170-00042 Frame assembly, 2300P steel
A 1 500-170-00330 Frame,Steel,2300P
C 1 500-170-00045 Frame, control panel
D 1 500-170-00047 Instrument bracket



FRAMES FOR STAINLESS SYSTEMS

200-170-00030 Frame assembly, 1300
A 1 500-170-00021 Frame Tank. Steel. 1300
B 1 500-170-00031 Frame, Blower, Steel, 1300/2300
C 1 500-170-00045 Frame, control panel
D 1 500-170-00047 Instrument bracket

200-170-00031 Frame assembly, 2300
A 1 500-170-00041 Frame, Holding Tank, Steel, 2300
B 1 500-170-00031 Frame, Blower, Steel, 1300/2300
C 1 500-170-00045 Frame, control panel
D 1 500-170-00047 Instrument bracket

200-170-00032 Frame assembly, 2600
A 1 500-170-00051 Frame, Holding Tank,Steel 2600
B 1 500-170-00061 Frame, Blower, Steel 2600/3600
C 1 500-170-00045 Frame, control panel
D 1 500-170-00047 Instrument bracket

200-170-00033 Frame assembly, 3600
A 1 500-170-00071 Frame, Tank. Steel, 3600
B 1 500-170-00061 Frame, Blower, Steel 2600/3600
C 1 500-170-00045 Frame, control panel
D 1 500-170-00047 Instrument bracket

200-170-00034 Frame assembly 31200
A 1 500-170-00080 Frame, Tank. Steel, 31200
B 1 500-170-00091 Frame, Blower, Steel, 31200
C 1 500-170-00045 Frame, control panel
D 1 500-170-00047 Instrument bracket

200-170-00035 Frame assembly, 41200
A 1 500-170-00100 Frame,Tank,Steel 41200
B 1 500-170-00096 Frame, Blower, Steel, 41200
C 1 500-170-00045 Frame, control panel
D 1 500-170-00047 Instrument bracket

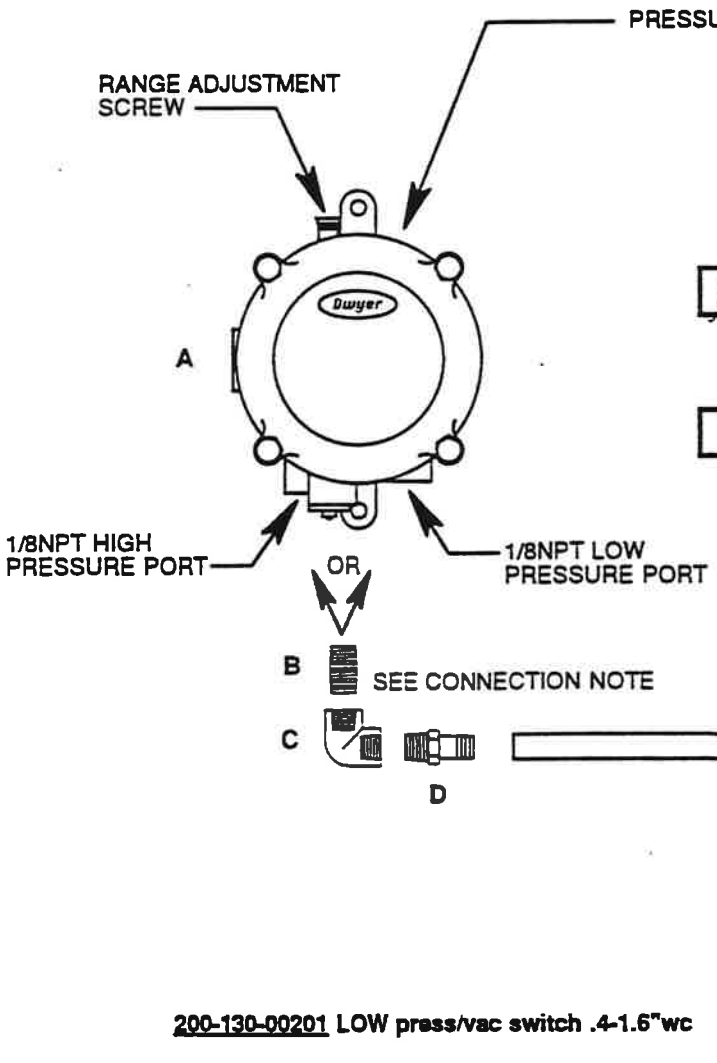
NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE: **SHALLOW TRAY FRAME OPTION**

SIZE	DWG NO.	SHEET	REV
A	900-170-00020	1 OF 1	Ø

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC	11/4/96

LOW AIR PRESSURE/VACUUM SWITCH



CONNECTION NOTE

☑ **LOW AIR PRESSURE SYSTEM**
CONNECT FITTINGS TO HIGH PESSURE PORT OF PRESSURE DIFFERENTIAL SWITCH, LEAVE LOW PRESSURE PORT OPEN. STRIPPER CONNECTION ON SUMP TANK

☐ **LOW VACUUM SYSTEM**
CONNECT FITTINGS TO LOW PESSURE PORT OF PRESSURE DIFFERENTIAL SWITCH, LEAVE HIGH PRESSURE PORT OPEN. STRIPPER CONNECTION ON STACK

200-130-00201 LOW press/vac switch .4-1.6"wc

A 500-130-00070 Switch Air Pressure, .4-1.6" WC
B 500-140-02960 Nipple,.125xClose,TxT,Brass
C 500-140-02490 Elbow,90,.125Fx.125F,TxT,Brass
E 500-200-00145 Hose,3/16id x 5/16od,Tygon,cle

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
17 TECHNOLOGY DRIVE
WEST LEBANON, NEW HAMPSHIRE 03784

TITLE: LOW AIR PRESSURE/VACUUM SWITCH

SIZE	DWG NO.	SHEET	REV
A	900-130-00011	1 OF 1	Ø

SCALE		DRAWN	DATE
NONE	DO NOT SCALE DRAWING	RC/MS	9-22-94


East
Environmental Pro cts, Inc

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

ShallowTray Aeration System

North East Environmental Products Inc.

Serial # 2341P-07-5128

TABLE OF CONTENTS

Special Cautions!

Prior to start-up:

- ***Connect the Interlock Switches.***
  Connect the High Water Level Interlock, the Low Air Pressure/Vacuum Interlock, and the High Air Pressure/Vacuum Interlock (if required).

  It is important that a qualified, licensed electrician perform these installations.

- ***Fill the Sump Tank and Aeration Tray Inlet Chambers.***

  Fill the sump tank to a depth of at least 5 inches (12.7cm), and fill the seal pots on each tray. Use clean water only.

  Please see Equipment Set-up in the Operating Instructions section of this manual.

North East Environmental Products, Inc.
17 Technology Drive
West Lebanon, NH 03784
603-298-7061 Fax: 603-298-7063

Section 1: Components List

ShallowTray® Low Profile Air Stripper Specification Sheet - Polyethylene Systems

ShallowTray Serial #: 2341P-07-5128 Customer: J. Hall Ship date: 4/6/98

Engineered By: Scott Cook Order Date: 2/19/98 DCS FEB 27 1998

Design Review: Engineering Scott 2/27/98 Sales

Additional Treatment Equipment

VaporMate Serial #: Neozone Serial #: EconoPump Serial #:

I. Special Components / Requirements / Information / Comments

Two discharge pumps in parallel

1AI50534

Group C outlet by customer

ball valves on pump inlet

II Design Criteria

Design Water Flow Rate: 25 gpm

Maximum Water Flow Rate: 30 gpm, which is considered a ✓ Low Water Flow Design, or ___ a High Water Flow Design, and is based on the blower model selection.

Weir Height: 2" Inlet, 2" Outlet

Equipment Power Requirements: 3 ø, 208 volts, 60 Hz

INSTALL ALL EQUIPMENT PER APPLICABLE NATIONAL AND LOCAL CODES.
CUSTOMER TO PROTECT EXPLOSION-PROOF MOTORS FROM RAIN.

III. Basic System Components

CAUTION: MAXIMUM PRESSURE OR VACUUM ACROSS PLASTIC SYSTEM = 22" WC

✓ Sump Tank, Cover, Rings — Linear low density polyethylene

4 Aeration Trays (quantity) — High density polyethylene

✓ Latches — Zinc-plated steel

✓ Main Blower (with inlet screen and damper) — American Fan Model # AF15-1120-7

Minimum Required Blower Performance: 300 cfm @ 18 "wc

5 hp, 3 ø, 208 volts, 3450 rpm

60 Hz, ✓ TEFC or ___ EXP

7 "Blower Inlet Size, 8 "Blower Outlet Size

Blower P/N 315

Coupling P/N 160

Riser P/N

✓ Blower on Inlet (Pressure system)

___ Blower on Outlet (Vacuum system)

___ Blowers on In & Out (Combo system)

Main Blower Sized For:
18 "wc required for ShallowTray Air Stripper
0 "wc additional available for airstream equipment

✓ Demister Pad — Koch style 4310, 4" thick, 304 ss

✓ Spray Nozzle — Hollow cone, 90° pattern, sized for 15 psi, brass

✓ Sight Tube — Brass, Nalgene tubing

✓ Aeration Tray Gaskets — Medium density neoprene sponge rubber

✓ Inlet Piping Connection — Schedule 80 PVC, Brass

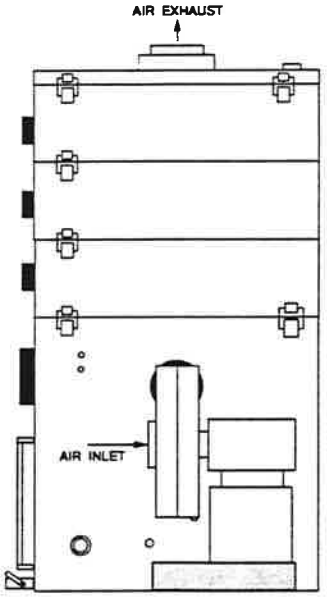
✓ Blower and Vent Line Connections — Flexible rubber couplings

IV. Optional Equipment

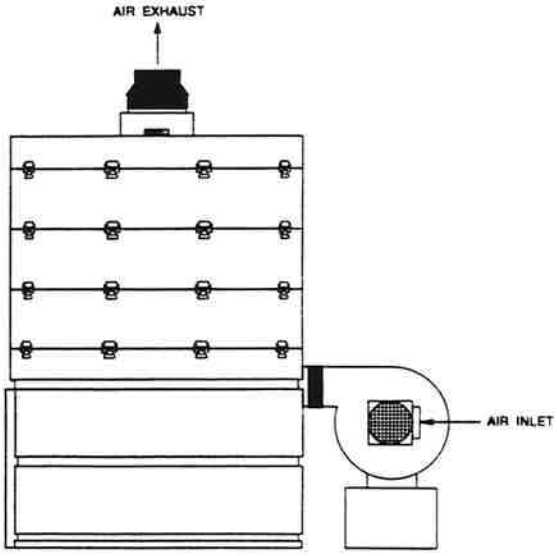
✓ Frame	Solid steel deck, angle runners, painted.
✓ Air Pressure Gauge (0 - 30 "wc)	Dwyer Magnehelic 2000 series
___ Gravity Discharge Riser	PVC 80 Piping, with vacuum relief valve
___ Additional Blower (with inlet screen and damper)	_____ Fan Model #_____
Required Performance	_____cfm @ _____" wc Blower P/N_____
	_____hp, ____Ø, _____volts, _____rpm, _____ Hz, ____TEFC or ____EXP
	____"Blower Inlet Size, ____"Blower Outlet Size
___ Feed Pump	_____ Pump Model #_____
Required Performance	_____ gpm @ _____' TDH Feed Pump P/N_____
	_____hp, ____Ø, _____volts, _____rpm, _____ Hz, ____TEFC or ____EXP
	Port Sizes: _____ inch inlet, _____ inch outlet. Impellor Size _____ inches
✓ Discharge Pump (TWO)	Goulds Pump Model # 3642
Required Performance	25 gpm @ 20 ' TDH Discharge Pump P/N 110-00903
	1/2 hp, 3 Ø, 208 volts, 3500 rpm, 60 Hz, ✓ TEFC or ___EXP
	Port Sizes: 1 1/4 inch inlet, 1 inch outlet. Impellor Size 3 3/16 inches
___ Main Disconnect Switch	Integral with electrical enclosure, rotary style
___ Control Panel	Motor starters, system alarm interlock circuit, operator switches, alarm light, NEMA _____ Enclosure, _____ Amps, _____Ø, _____Volts, _____Hz, _____ wire and ground
___ Control Panel w/ Pump Level Control	Motor starters, system alarm interlock circuit, pump level control circuit, operator switches, alarm light, NEMA _____ Enclosure, _____ Amps, _____Ø, _____Volts, _____Hz, _____ wire and ground
___ PurgePanel ™	NEMA 7 Main Disconnect switch, NEMA 4 enclosure, air pressure gauge, Low air pressure switch, Blower (100 cfm @ 2" w.c.)
___ Autodialer	Sensaphone 4100
___ Control Circuit Transformer	_____:120vac
___ Intrinsically-Safe Relay	_____ Pepperl+Fuchs, WE77/Ex2-UL repeater relay Dual Channel, SPDT relay output _____ Warrick 27A1E0 latching relay Single Channel, SPDT relay output
___ Intermittent Operation	Blower time-delay circuit added to panel design. Blower shuts off 5 minutes after inlet water flow stops.
___ Auto Operation	# of wells _____
___ Well Probes	Warrick, series 3Y, 80' cord
___ Blower Start/Stop Switch	Local blower switch mounted near blower
___ Power Lapse Indicator	Black-out / Brown-out indicating light, switch and circuit added to panel design
___ Individual Alarm Light	Light and relay circuit added to panel design
___ Strobe Alarm Light	___Red, ___ Blue, Federal Signal, NEMA 4, UL listed
___ Alarm Horn	Federal Signal
✓ Low Air ✓ Press. ___Vacuum Switch	Dwyer 1950-1, preset at 1.6" wc (range=0.3"wc to1.6" wc), Explosion-proof
___ High Air ___Press. ___Vacuum Switch	Dwyer 1950, _____"wc to _____"wc, Explosion-proof
___ Low Water Level Alarm Float Switch	Mechanical, SJ Electro, (qty)____N.O., (qty)____N.C.
✓ High Water Level Alarm Float Switch	Mechanical, SJ Electro, (qty)____N.O., (qty) 1 N.C.
✓ Discharge Pump Float Switch	Mechanical, SJ Electro, (qty) 1 N.O., (qty)____N.C.
___ Water Flow Meter	Halliburton, MCII digital readout
___ Air Flow Meter	Dwyer 2000-0 meter, single-point insertion pitot tube, mounting kit
✓ Water Press. Gauge, ___inlet, 2 outlet	Dial gauge, liquid-filled shipped loose BWD 3/5/98
___ Water Temp. Gauge, ___inlet, ___outlet	Dial gauge
___ Line Sampling Port, ___inlet, ___outlet	Schedule 80 PVC
___ Air Blower Silencer	Clevaflex, CSA series
___ Washer Wand	Nozzle, Elbow, 1/4" steel pipe

Section 2: ShallowTray System

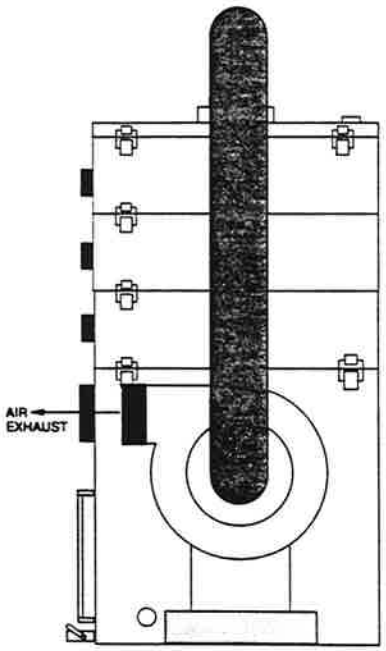
The ShallowTray Basic System



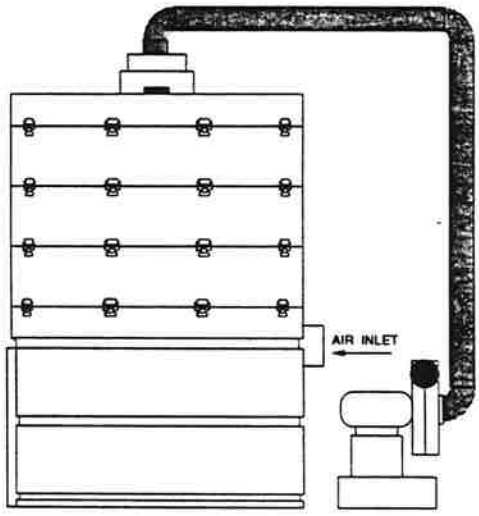
1. 2331 STAINLESS PRESSURE SYSTEM (FORCED DRAFT)



2. 2331 LLDPE PRESSURE SYSTEM (FORCED DRAFT)



3. 2331 STAINLESS VACUUM SYSTEM (INDUCED DRAFT)



4. 2331 LLDPE VACUUM SYSTEM (INDUCED DRAFT)

High Water Level Float Alarm Switch

The high water level float alarm switch is one of the alarm interlocks that must be properly connected, by a licensed electrician, prior to the system's initial start-up. Please see *Special Cautions* at the beginning of Operating Instructions section for more information. The purpose of the high water level float alarm switch is to prevent water from flooding the system. It does this by shutting off the incoming contaminated water once clean water has reached a designated level in the sump tank. The high water level float switch will send an alarm signal when it rises approximately 3½ inches (8.8cm) above the coupling it is installed in.

Line Sampling Ports

The line sampling ports provide a quick and easy way to take water samples of both incoming contaminated water and outgoing clean water. The sampling ports are the typically ½" (1.2cm) ball valves located on both the inlet and outlet piping.

When taking a water sample, open the valve and let the water flow for at least 1 minute prior to bottling the sample. This purges the sample port of any stagnant water.

When purging the sample ports be sure to capture the water and properly dispose of it. When starting the unit for the first time double check that the valves on the sample ports are closed.

Low Air Pressure/Vacuum Alarm Switch

The low air pressure/vacuum alarm switch monitors the blower for continuous water treatment. This switch is one of the alarm interlocks that must be properly connected by a licensed electrician prior to the system's initial start-up. Please see *Special Cautions* at the beginning of Operating Instructions section for more information.

Should the blower fail, the low air pressure switch should be wired to shut off all incoming water. Using tubing, connect the switch to the hose barb on the tank (pressure system) or in the cover exhaust pipe (vacuum system).

Pressure system – The air hose is connected from the sump tank ⅛" (3.2mm) hose barb (without valve) to the "high" pressure port on the switch using the provided hose barb. The "low" pressure port must be open to the atmosphere. The switch measures the differential pressure between the sump tank and the atmosphere.

Vacuum system – The air hose is connected from the exhaust piping ⅛" (3.2mm) hose barb to the "low" pressure port on the switch using the provided hose barb. The "high" pressure port must be open to the atmosphere.The switch measures the differential pressure between the top tray and the atmosphere.

Periodically inspect the air hose for water build-up which will affect the switch's operation. The tubing must remain open at all times.

Basic System Components

Component manufacturer information sheets ("cutsheets") are included in the Components Information Section (Section 7) at the back of this manual.

Blower

The blowers on the ShallowTray low profile air stripper units are typically type B spark resistant with a cast aluminum wheel, direct drive @ 3450 rpm with motor options of Totally Enclosed Fan Cooled (TEFC) or Explosion Proof (EXP). Each blower is selected by our engineering staff to exceed the minimum cubic feet per minute (CFM) air flow requirements at the nominal working pressure (inches of W.C.) of each system. It is critical that the blower damper be opened wide enough to provide the unit with the designated minimum fresh air flow.

It is also critical that water does not enter the blower housing while the blower is in operation; this will damage your blower and void the warranty. The high water level alarm switch prevents this from happening. Make sure it is installed properly.

The motor horse power is selected to provide a reasonable operating range. However, there is potential for the blower motor to overload if it is not working against a pressure drop. Therefore, the blower must be protected with a thermal overload switch. Also, the blower damper should be set so that the blower produces at least the minimum air flow requirement (see table below), and does not exceed the nameplate amperage limit of the motor.

Damper

There is a damper plate on the intake side of the blower, and is used to make air flow rate (CFM) adjustments to your system. Open the damper to increase air flow rate, and close the damper to decrease air flow rate. Note that air pressure may vary as the air flow rate is changed.

To get the most accurate air flow measurement, we recommend installing an air flow meter in the air piping.

If this is not possible, then an estimated air flow can be obtained by measuring the stripper pressure or vacuum. For initial start-up, simply adjust the damper until the air pressure is at least the minimum required for your system. (Refer to the pressure gauge description for minimum pressure readings).

The table below gives the minimum, recommended, and maximum required air flow rates for each ShallowTray series.

ShallowTray Model	Requirements Air Flow Minimum	Recommended	Maximum
1300 & 1300P	150 cfm (254.9m³/hr)	195	225
2300 & 2300P	300 cfm (509.8m³/hr)	390	450
2600	600 cfm (1019.6m³/hr)	780	900
3600	900 cfm (1529.4m³/hr)	1170	1800
31200	1800 cfm (3058.8m³/hr)	2340	3600
41200	2400 cfm (4078.4m³/hr)	3120	4800

Beware when making damper adjustments after initial start-up. Fouling may occur in the system which may reduce the air flow rate, and may increase the air pressure reading

Demister

A wire mesh demisting pad is installed beneath the air exhaust port, located on the top cover of the unit. The purpose of the demisting pad is to remove water droplets that would have blown through the vent line. It is possible, though unlikely, that the demisting pad may become plugged or fouled. If this occurs the demisting pad is easily removed for cleaning. Disconnect the vent line, take off the top cover, and remove the retaining plates on the bottom side of the cover. The demisting pad can be cleaned with a pressure washer, or replaced with a new one.

Gasket

A black nitrile or neoprene (2300P) sponge gasket is used to form an airtight/watertight seal around the sump tank and aeration trays. If there are any problems with the gaskets, please contact North East Environmental Products. A replacement gasket can be glued to the sealing flange using an industrial neoprene contact adhesive. We recommend using Rubatex adhesive # R-27780. Please contact North East Environmental Products prior to making any gasket repairs or adjustments.

Sight Tube

The sight tube provides a means of easily viewing the water level in the sump tank. Make sure the valve to the sight tube is open during stripper operation.

Spray Nozzle

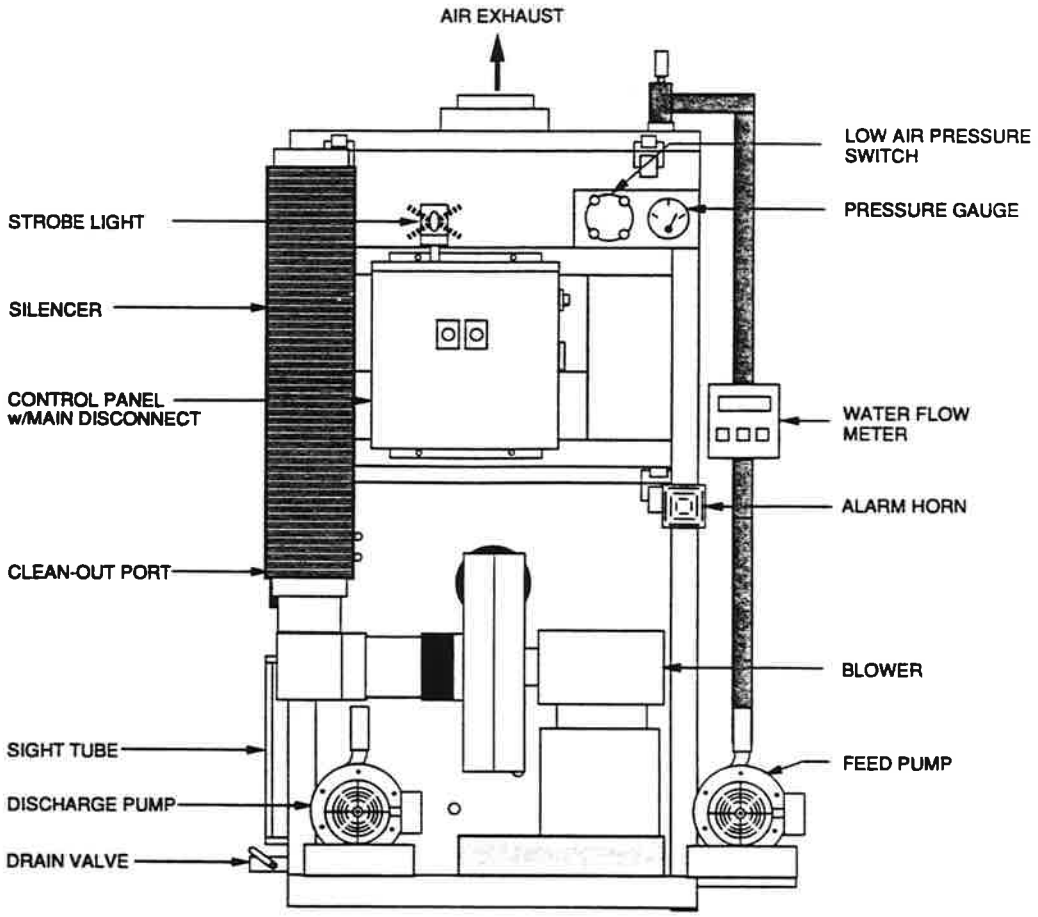
A spray nozzle is installed in all units except those with a gravity feed option. The nozzle directs the contaminated water to the first inlet chamber and begins the volatilization process. The nozzle is rated for 15 psi at the system's maximum water flow rate.

It is recommended that a strainer be installed somewhere in the inlet process water line, especially during initial start-up, to prevent sediment from plugging the nozzle.

If the nozzle becomes plugged, it is easily removed by first removing the top cover and then unscrewing the nozzle from the inlet piping. Clean it with a wire brush or a pipe cleaner. If the nozzle causes too much back pressure or becomes plugged too often, it can be removed without any serious effects to the system's performance. Units that have a gravity feed system should not use a spray nozzle – it causes too much back pressure. In these cases, the inlet piping should extend below the water level of the inlet chamber to provide a water seal for the inlet pipe.

Note: System performance is tested at NEEP lab without a nozzle, and warranty is valid whether a nozzle is installed or not.

ShallowTray System Options



2331 STAINLESS PRESSURE SYSTEM WITH OPTIONS

*NOT ALL OPTION SHOWN

SHALLOWTRAY OPTIONS

ShallowTray System Options

ShallowTray low profile air strippers are custom built to meet site and project specifications. Please refer to the components list insert (Section 1) to see which options were selected for your system. Component manufactured information cutsheets are included in Section 7 of this manual.

Air Blower Silencer

The air blower silencer reduces the dynamic noise level of the blower. The size of the silencer and the type of connection used to mount are dictated by the size of the blower, and whether the silencer is mounted horizontally or vertically. Silencers should be supported to avoid over-stressing the connections, and should be secured if exposed to high wind loads.

Air Flow Meter

The air flow meter measures the amount of air flowing through the system. It consists of a pitot tube mounted in the air line, and a differential pressure gauge. The measured velocity pressure is then converted to an air flow rate. The pitot tube must be located at least 8½ pipe diameters of straight pipe from the cover exhaust nozzle or elbow, and at least 1½ diameters of straight pipe from the end of the pipe or any elbow. The best pitot tube location is before the stripper because the air is less humid and the hose is less likely to fill with condensate.

The air flow meter typically gives readings in inches of water column (W.C.), which is then converted to feet per minute (FPM) using the provided chart. You then multiply the feet per minute by the interior cross sectional area (square feet) of the vent line. This gives cubic feet per minute (CFM). As stated in the damper section, the air flow meter in conjunction with the pressure gauge provides the most accurate damper adjustments, especially after initial start-up.

The table below lists the minimum, recommended, and maximum flows for each stripper model, and the minimum exhaust pipe diameters. Note that the airflow must be at least the minimum for proper stripping efficiency.

Stripper Model	Minimum	Required Air Flow Recommended	Max.	Recommended Exhaust Pipe Diameter
1300	150 cfm (254.9m³/hr)	195 cfm (331.3m³/hr)	300 cfm (509.8m³/hr)	6 in.(15.2cm)
2300	300 cfm (509.8m³/hr)	390 cfm (662.5m³/hr)	600 cfm (1019.6m³/hr)	6 in.(15.2cm)
2600	600 cfm (1019.6m³/hr)	780 cfm (1325m³/hr)	1200 cfm (2039.2m³/hr)	8 in.(20.4cm)
3600	900 cfm (1529.4m³/hr)	170 cfm (288.8m³/hr)	1800 cfm (3058.8m³/hr)	10 in.(25.4cm)
31200	1800 cfm (3058.8m³/hr)	2340 cfm (3974.9m³/hr)	3600 cfm (6117.6m³/hr)	6 in.(15.2cm)
41200	2400 cfm (4078.4m³/hr)	3210 cfm (5452.8m³/hr)	4800 cfm (8156.8m³/hr)	8 in.(20.4cm)

Note: Low airflow is the most common reason for poor removal efficiencies. Thus, an airflow meter is highly recommended to ensure adequate air flow.

Air Pressure Gauge

The air pressure gauge reads the pressure differential in inches of water column (W.C.) between the point of highest pressure in the air stripper and the atmosphere. The gauge is connected to the system via an air hose that attaches to a pressure port on the system. Instructions to properly connect the gauge for the two types of systems are as follows:

Pressure System – Using tubing, connect the "High" pressure port on the gauge to the ⅛" (3.2mm) shutoff valve/hose barb located on the air stripper sump tank. The matching "Low" pressure port is to be open to the atmosphere. Highest pressure is in the sump tank.

Vacuum System – Using tubing, connect the "Low" pressure port on the gauge to the hose barb located on the exhaust vent line of the air stripper. The matching "High" pressure port is to be open to the atmosphere. Highest vacuum is in the cover air exhaust pipe.

Note: There are two sets of pressure ports on the gauge. One set should be used to measure the differential pressure, and the other set must be plugged.

At initial start-up, the pressure gauge can be used to make proper blower damper adjustments. Adjustments should be made according to the following nominal air pressure/vacuum table:

	Nominal Air Pressure/Vacuum	
Number of trays	**Low Water Flow System**	**High Water Flow System**
1 tray system	4 - 6 inches W.C. (10.2 - 15.2cm)	7 - 10 inches W.C. (17.8 - 25.4cm)
2 tray system	7 - 10 inches W.C. (17.8 - 25.4cm)	11 - 14 inches W.C. (27.9 - 35.6cm)
3 tray system	11 - 14 inches W.C. (27.9 - 35.6cm)	16 - 18 inches W.C. (40.8 - 45.8cm)
4 tray system	16 - 18 inches W.C. (40.8 - 45.8cm)	20 - 22 inches W.C. (50.8 - 55.8cm)
5 tray system	20 - 22 inches W.C. (50.8 - 55.8cm)	24 - 26 inches W.C. (60.8 - 66cm)

Note: The nominal pressures or vacuums shown are for the air stripper only, and do not include additional air stream equipment pressure requirements. Fouling may occur in the system, which may increase the nominal air pressure reading, and may decrease the air flow rate.

Control Panel

The control panel serves two basic functions required for the safe operation of the system. The first is to provide the required electrical safety components for each motor (blowers and pumps) per NEC standards. These components consist of fuses, motor starters, and overload relays.

The second function is to provide the required process control and alarm components. The alarm circuit monitors the low air pressure switch and the high water level alarm switch. If either of these alarms occur, then the alarm contacts will shut off the incoming water source (feed or well pumps) if the appropriate connections have been made. Other alarm options are also available.

Control Panel Intrinsically Safe Components

ShallowTray low profile air stripper systems that operate in or near potentially explosive concentrations of vapors may require intrinsically safe (IS) signals to all electrical components housed in non-explosion proof enclosures. The IS signal is not capable of creating a spark or a temperature rise great enough to ignite any concentration of any NEC classified explosive vapor. Typical components that need IS signals are the float switches and well probes. Determination of when IS signals are required is generally the responsibility of the groundwater remediation engineer who is placing the order for a system.

Digital Water Flow Indicator

The digital water flow indicator, typically installed in the water feed piping to the stripper, reads the rate of flow (gpm) and the totalized flow (gallons). The flow meter is selected to exceed the maximum flow of your system while providing a wide working range. The digital face plate is battery operated and intrinsically safe (Halliburton brand). The only moving meter component is the turbine rotor, which spins around a shaft axially to the flow of water.

It is possible to plug the turbine rotor with particles and sediment. An ⅛" (3.2mm) screen filter should be installed somewhere in the incoming process water line prior to the meter. If the meter becomes plugged it can be disassembled and cleaned. Please disassemble per the manufacturer's instructions, if necessary.

Feed and Discharge Pumps

The pumps on each system have been selected by our engineering staff to meet the appropriate flow and pressure requirements. The pumps are typically cast iron and bronze, with either EXP or TEFC motors. The pumps are not self-priming. Prior to initial start-up, the pumps must be primed by filling the pump impeller housing with clean water. Throttle valves are installed on the discharge lines. If the pump is running wide open and it is not pumping against the required head, the pump may cavitate. This is the nature of centrifugal pumps; they must be throttled back if they are not pumping against the required head. Also, the valve should be throttled back until the motor draws less than the nameplate current rating.

If the pump is wired by someone other than North East Environmental Products, please **double check the rotation**. A pump rotating in the wrong direction could cause the pump impeller to spin off, causing serious damage to the pump.

Systems using pumps should have the flow rates tuned so that the discharge flow rate is faster than the inlet flow rate. This will prevent possible blower flooding.

High Water Level Float Alarm Switch

The high water level float alarm switch is one of the alarm interlocks that must be properly connected, by a licensed electrician, prior to the system's initial start-up. Please see *Special Cautions* at the beginning of Operating Instructions section for more information. The purpose of the high water level float alarm switch is to prevent water from flooding the system. It does this by shutting off the incoming contaminated water once clean water has reached a designated level in the sump tank. The high water level float switch will send an alarm signal when it rises approximately 3 1/2 inches (8.8cm) above the coupling it is installed in.

Line Sampling Ports

The line sampling ports provide a quick and easy way to take water samples of both incoming contaminated water and outgoing clean water. The sampling ports are the typically 1/2" (1.2cm) ball valves located on both the inlet and outlet piping.

When taking a water sample, open the valve and let the water flow for at least 1 minute prior to bottling the sample. This purges the sample port of any stagnant water.

When purging the sample ports be sure to capture the water and properly dispose of it. When starting the unit for the first time double check that the valves on the sample ports are closed.

Low Air Pressure/Vacuum Alarm Switch

The low air pressure/vacuum alarm switch monitors the blower for continuous water treatment. This switch is one of the alarm interlocks that must be properly connected by a licensed electrician prior to the system's initial start-up. Please see *Special Cautions* at the beginning of Operating Instructions section for more information.

Should the blower fail, the low air pressure switch should be wired to shut off all incoming water. Using tubing, connect the switch to the hose barb on the tank (pressure system) or in the cover exhaust pipe (vacuum system).

Pressure system – The air hose is connected from the sump tank 1/8" (3.2mm) hose barb (without valve) to the "high" pressure port on the switch using the provided hose barb. The "low" pressure port must be open to the atmosphere. The switch measures the differential pressure between the sump tank and the atmosphere.

Vacuum system – The air hose is connected from the exhaust piping 1/8" (3.2mm) hose barb to the "low" pressure port on the switch using the provided hose barb. The "high" pressure port must be open to the atmosphere.The switch measures the differential pressure between the top tray and the atmosphere.

Periodically inspect the air hose for water build-up which will affect the switch's operation. The tubing must remain open at all times.

Test the switch at initial start-up by removing the air hose from the hose barb on the sump tank or exhaust pipe once the system is in full operation. This should set the system into an alarm condition and shut off the incoming contaminated water.

High Air Pressure/Vacuum Alarm Switch

The high air pressure/vacuum alarm switch prevents the system from exceeding its highest rated pressure/vacuum value. If the blower has the ability to produce pressure/vacuum higher than 32 inches (81.6cm) W.C. for stainless units or 22 inches (55.8cm) W.C. for plastic units then it should have a high pressure/vacuum alarm switch. Be sure to check that the setpoint for alarm shutdown is at the proper setting for the system.

Main Disconnect Switch

The main disconnect switch removes power from the ShallowTray low profile air stripper. A disconnect is required by the National Electric Code (NEC) and must be installed. North East Environmental Product's panels typically contain a disconnect integral with the control panel to remove power but may also use disconnects external to the control panel depending on the situation. Make sure a qualified licensed electrician installs the power line, into the disconnect switch. Be sure to ground the switch back to the main service.

Water Temperature Gauge

Water temperature gauges can be installed on both the inlet and outlet piping. Water is an important variable for predicting the system's removal efficiency.

Water Pressure Gauge

Water pressure gauges can be installed on both the inlet and outlet water piping. Excessively high readings could signal that something in the piping system is plugged. Large pressure fluctuations could be a sign that the water flow rate is varying.

Recommended relubrication intervals-general guide only.

H.P. Range	Standard Duty 8 Hr./Day	Severe Duty 24 Hr./Day Dirty-Dusty	Extreme Duty Very Dirty High Ambients
1 ½-7 ½	5 Yrs.	3 Yrs.	9 Mos.
10-40	3 Yrs.	1 Yrs.	4 Mos.
50-150	1 Yrs.	9 Mos.	4 Mos.

These ball bearing greases or their equivalents are satisfactory for ambients from -15°F.
For Motors:

Mobilplex EP#1—Socony Mobil Oil Company
Alvania Grease #2 —Shell Oil Company
Andox B Grease—Esso Standard Oil Company
Prestige #42 Grease—Sun Oil Company

V-BELT DRIVE MAINTENANCE

If belts squeal at start-up, they are too loose and should be tightened. Periodically, check belt and sheave wear, alignment, and tension. When belts show wear, replace all belts at once with a new matched set of belts. New belts will not work properly in conjunction with used belts due to difference in length. Belts and sheaves should be clean and free from grease. After installing new belts, check tension midway between sheaves. Belts should deflect about 1/64" per inch of span length with approx. 20 lb. force. Allow unit to run for 4-6 hours, then it will be necessary to re-tighten belts again because new belts tend to stretch initially.

SECTION IV

PROBLEM TROUBLESHOOTING

In the event that trouble is experienced in the field, listed below are the most common fan difficulties. These points should be checked in order to prevent needless delay and expense of factory service.

1. CAPACITY OR PRESSURE RATING
   - A. Total resistance of system higher than anticipated.
   - B. Speed too low.
   - C. Dampers or variable inlet vanes not properly adjusted.
   - D. Poor fan inlet or outlet conditions.
   - E. Air leaks in system.
   - F. Damaged wheel.
   - G. Incorrect direction of rotation.
   - H. Wheel mounted backwards on shaft.

2. VIBRATION & NOISE
   - A. Misalignment of bearings, couplings, wheel, or V-belt drive.
   - B. Unstable foundation, fan bolted to uneven foundation, not shimmed or grouted.
   - C. Foreign material in fan causing unbalance.
   - D. Worn bearings.
   - E. Damaged wheel or motor.
   - F. Broken or loose bolts and set screws.
   - G. Bent shaft.

ARRANGEMENT 8 BLOWER MOUNTING PROCEDURE

1. Motor and coupling should be mounted with blower resting on level, flat surface, but not bolted to surface.
2. After blower is situated in its final mounting location, feeler gauges should be used between blower mounting feet and mounting surface at each bolt hole location to determine thickness of shims required. Since the blower base is a weldment it will be warped to some degree. If it is not shimmed to the foundation properly when bolted down, a bind in the frame will result. This may cause a bent shaft, coupling, motor and/or bearing misalignment resulting in high vibration levels and premature failure of drive components.
3. After shimming is done, each frame mounting bolt should be finger snugged. Then going from bolt to bolt, progressively tighten each one with a torque wrench until the proper torque value is achieved for the size foundation bolt being used.
4. After the unit is completely tightened down to foundation, coupling alignment should be rechecked. If coupling is now misaligned, loosen foundation bolts and recheck coupling alignment. If after loosening foundation bolts, coupling is aligned, then a bind was introduced in the bolt-down procedure. It will then be necessary to reshim so that the bind is no longer present.
5. Once the unit is tightened down to foundation and coupling alignment is maintained, replace guards and check duct work, etc. Unit is now ready for start-up.
6. Jog motor to make sure unit is rotating in proper direction. If so, bring up to speed and check amperage to motor to make sure enough static pressure is present in system to prevent motor from overloading.
7. Vibration levels should be checked and if they are above 1.0 MIL @ 3600 RPM or 1.5 MILS @ 1800 RPM, a qualified balancing technician should trim balance the unit to achieve these levels.

SECTION II

BEFORE START-UP

1. Fasteners - all foundation bolts, wheel hub set screws, wheel locking bolts and bearing locking collars must be tight.
2. Bearings - check bearing alignment and make certain they are properly lubricated.
3. Fan Wheel - turn over rotating assembly by hand to see that it runs free and does not bind or strike fan housing. If wheel strikes housing the wheel may have to be moved on the shaft or the bearing pillow blocks moved and reshimmed.
4. Motor - check electrical wiring to motor. The current characteristics of the supply line must agree with the motor nameplate rating. Motor should be wired and fused in accordance with the National Electric Code and local codes.
5. V-belt drive must be in alignment with belts at proper tension.
6. Duct Connections (if required) from fan to duct work must not be distorted. Ducts should never be supported by the fan. Expansion joints between duct connections should be used where expansion is likely to occur or where fan is mounted on vibration isolators. All duct joints should be sealed to prevent air leaks. All debris should be removed from duct work and fan.

START UP

1. "Jog" the motor to check for proper wheel rotation. The motor should be started in accordance with the manufacturer's recommendations. Arrows on fan indicate the proper direction of rotation and air flow.

2. Fan may now be brought up to speed. Watch for anything unusual such as vibration, overheating of bearings and motor, etc. Check fan speed on V-belt driven units and adjust motor sheave (on adjustable drives) to give desired RPM.

3. Check motor amperage against nameplate amperage to make sure motor is not overloading.

START-UP OF HIGH TEMPERATURE CONSTRUCTION FANS AND BLOWERS

In addition to normal start-up procedure described above, certain measures must be taken against thermal expansion deformation.

1. Fan or blower should be brought to speed between 50°F and 120°F. It may be necessary to throttle back air entering fan or blower and slowly bleeding in heated air to accomplish this. (Note: if motor horsepower is sized for high temperature operating condition and not cold start-up, throttling inlet air will be mandatory to prevent motor overloading. It is recommended motor amperage be monitored during this procedure.)

2. The maximum rate of temperature rise allowable is 15°F per minute.

3. The reverse situation of fan or blower shut-off also applies. That is the temperature must be lowered slowly before turning fan or blower off to prevent damage.

SECTION III

GENERAL MAINTENANCE

1. A definite time schedule for inspecting all rotating parts and accessories should be established. The frequency of inspection depends on the severity of operation and the locality. Inspections might be weekly at first in order to set up the schedule.

2. Alignment - shaft must not be cocked in the bearings. Misalignment can cause overheating, wear to dust seals, bearing failure an unbalance.

3. Hardware - check tightness of all bolts and set screws.

4. Lubrication - check fan and motor bearings and add lubricant if necessary. Be careful not to overgrease as this can damage bearing seals .

5. Air flow - make sure there are no obstructions to air flow in outlet or inlet duct work.

6. Bearings on high speed fans tend to run hot. Therefore, do not replace a bearing because it feels hot to the touch. Place a pyrometer or contact thermometer against the pillow block and check the temperature.

   Ball pillow blocks can have total running temperatures of 165°F (74°C) before the cause of overheating be investigated.

7. Wheel - inspect wheel blades for accumulation of dust and dirt. Clean thoroughly with stream of water jet, compressed air or a wire brush. This will help prevent unbalanced condition. If blades are aluminum, be careful not to damage them. Cover the bearings so water won't enter the pillow block. The wheel should be centered to prevent the blades from striking the housing. Make sure wheel is rotating in proper direction. Never run the fan at a higher speed than it was designed for unless you check with American Fan first.

FAN BEARING MAINTENANCE

For most applications, a lithium base grease conforming to a NLGI grade 2 consistency should be used. This type of grease inhibits rust, is water resistant, and has a temperature range of -30°F to 200°F with intermittent highs of 250°F.

Because oil lubricated bearings are usually used on high-speed or high temperature applications, refer to American Fan for the type of oil you should use in your particular application.

When greasing bearings it is important not to overgrease. This is especially true if the bearings are equipped with extended grease lines and the bearings are not visible. In this case, more bearing failures occur due to overgreasing than undergreasing. It is best to give the bearing just one "shot" of grease periodically, when the bearings are not visible. When the bearings are visible, pump in grease until a small bead of grease forms around the bearing seals. It is very important that fan bearing greasing take place while the fan is operating. Caution should be taken while working on and near rotating equipment to avoid personal injury.

When oiling oil-lubricated bearings, oil should be poured into cup at top of bearing until it reaches the overflow point at the lower oil cup.

MOTOR MAINTENANCE

Lubricate motor bearings to the manufacturer's recommendations. Lubrication recommendations are printed on tags attached to the motor. Should these tags be missing, the following will apply:

A. Fractional Horsepower Sleeve Bearing Motors:

Under normal operation at ordinary temperatures and clean surroundings, these motors will operate for three years without relubrication. Then lubricate annually with electric motor oil or SAE 10 oil. Under continuous operation at higher temperatures (but not to exceed 104°F ambient) relubricate annually.

B. Fractional Horsepower Ball Bearing Motors:

Under normal conditions, ball bearing motors will operate for five years without relubrication. Under continuous operation at higher temperatures (but not to exceed 104°F ambient) relubricate after one year. To relubricate where motors are not equipped with pressure fittings, disassemble motor and clean the bearings thoroughly. Repack each bearing one-third full with ball bearing grease.

C. Integral Horsepower Ball Bearing Motors:

Motors having pipe plugs or grease fittings should be relubricated while warm and at stand-still. Replace one pipe plug on each end shield with grease fitting. Remove other plug for grease relief. On low pressure, grease, run and lubricate until new grease appears at grease relief. Allow motor to run for ten minutes to expel excess grease. Replace pipe plugs. Motors not having pipe plugs or grease fittings can be relubricated by removing end shields, cleaning grease cavity and refilling three-fourths of circumference of cavity.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

Recommended
SAFETY PRACTICES

For Users and Installers of Industrial and Commercial Fans
AMCA Publication 410-96

FOREWORD

i. This publication has been prepared by the Air Movement Division of the Air Movement and Control Association, Inc. (AMCA). The information contained in this publication has been derived from many sources. The suggestions made necessarily should be general in their meaning and cannot be applied literally to all specific situations or conditions.

ii. ***The safe installation and operation of fans is the responsibility of the system designer, installer, maintainer, and user.*** From the initial system design through the life of the equipment, safety should be a foremost consideration. Some areas which require some special attention include system design, layout and construction, fan performance specifications, foundation and installation details, storage procedures, start-up and commissioning procedures, operation, maintenance, and repair. Specific safety requirements are mandated by federal, state, and local codes. *Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans* is published by AMCA for assistance. System designers, installers, maintainers, and users should consult and properly comply with all applicable codes and guidelines.

iii. The safety recommendations contained herein are intended to assist designers, installers, maintainers, or other users of air moving devices in the safe operation and use of the devices mentioned. These recommendations do not represent the only methods, procedures, or devices appropriate for the situations discussed. Caution should be used at all times when working in or around moving parts.

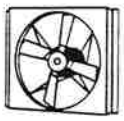
iv. AMCA disclaims any and all warranties, expressed or implied, regarding the products sold by the manufacturer with which this booklet has been provided. Further, AMCA recommends that competent personnel be consulted in deciding what is the preferred or recommended safety procedure in a particular instance where the guidelines contained in this booklet are unclear or in any way incomplete.

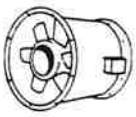
v. AMCA has offered the information within this booklet to assist in the safe operation, maintenance, and use of the products sold by members of AMCA. In so doing, AMCA does not assume any legal duties of the designer or manufacturer to instruct or warn about their product. AMCA expressly disclaims liability for any injury or damage arising out of the operation or use of the product or the guidelines contained herein.

vi. These recommended safety practices were adopted by the AMCA membership on April 28, 1996.

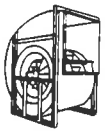

Power Roof Ventilator


Wall Exhauster


Propeller Fan


Axial Fan

1. INTRODUCTION


Centrifugal Fan


Upblast Roof Exhauster

1.1 Fans and other air moving devices are made in a wide variety of types, sizes, and arrangements. This publication addresses the proper use and installation of industrial and commercial fans. It is not intended to address residential and consumer fans.

1.2 Various "size" factors are important when assessing potential for injury; some factors are: diameter of impeller (wheel, rotor, propeller), rotational inertia, voltage, and current.

1.3 This guide is intended to assist in the safe installation of air moving equipment and to warn operating and maintenance personnel of the commonly recognized hazards associated with this equipment.

1.4 ***Handling and installation should always be performed only by experienced and trained personnel who are aware of the hazards associated with rotating equipment. Failure to comply with these practices may result in death or serious bodily injury.*** In addition to following the manufacturer's installation instructions, care should be taken to ensure compliance with specific safety requirements mandated by federal, state, and local codes. Industry safety standards and practices published by AMCA and by other recognized agencies and associations should be consulted and followed where applicable.

2. PERSONNEL SAFETY ACCESSORIES

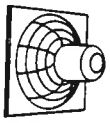
2.1 GENERAL

2.1.1 Protective devices are incorporated as standard construction on some types of fans but on many fans, these devices are offered as optional accessories. This is done because the need for the devices and the design required will frequently depend upon the type of system, fan location, and operating procedures being employed. Proper protective safety devices; company safety standards; specific safety requirements mandated by federal, state, and local codes; and industry safety standards and practices published by AMCA and by other recognized agencies and associations should be determined by the user, who should specify and obtain the appropriate devices from the fan manufacturer or others, and should not allow operation of the equipment without them. Examples of available devices include the following:

2.2 FAN GUARDS

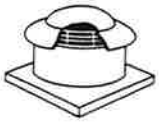
2.2.1 All fans have moving parts which require guarding in the same way as other moving machinery. Fans located less than seven (7) feet above the floor require special consideration. Specific safety requirements should comply with mandated federal, state, and local codes; and industry safety standards and practices published by AMCA and by other recognized agencies and associations should be followed.

2.2.2 Roof-mounted fans and other fans which are not generally accessible may not require safety guards which might otherwise be appropriate. Where accessibility to these fans is occasional or infrequent, the expense of permanent guarding may be reduced through the use of lockout switches and suitable warnings. In such cases, maintenance personnel should engage the lockout switch before undertaking any maintenance or repairs. As is the case with other machinery involving moving parts, common sense and caution will preserve personal safety.



Industrial Type Guard For Propeller Fan

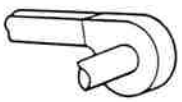
Maximum Safety Guard for Propeller Fan



Screen on Roof Ventilator

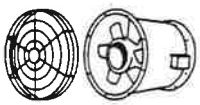
2.3 INLET AND OUTLET GUARDS

2.3.1 Axial and centrifugal fans are often connected directly to ductwork which will prevent contact with the internal moving parts; when an exposed inlet or outlet represents a hazard, a suitable guard should be installed.



Centrifugal Fan Protected by Ductwork

Inlet or Outlet Guard on Centrifugal Fan



Guard for Axial Fan With Non-Ducted Inlet or Outlet

2.4 DRIVE GUARDS

2.4.1 Fans may be driven directly from the motor shaft or through a belt drive. Where the bearing assembly, rotating shaft, sheaves, or belts are exposed, a suitable guard may need to be provided. Some example guards are shown below.

rive Coupling uard

Heat Slinger Guard (Shaft and bearing guard omitted for clarity)

Shaft and Bearing Guard

2.4.2 Drive guards may be required for tubular centrifugal or axial fans to cover the exposed drive sheave and belts outside the fan housing.

Drive Guard - Axial Fan

2.4.3 A typical centrifugal fan drive guard may vary with the arrangement. Safety guards should be used when drive systems are accessible to personnel. In restricted areas, omission of the back cover may be acceptable.

Drive Guard - Centrifugal Fan

2.4.4 Dampers and their linkage may operate suddenly without warning at high speeds. Dampers and their linkage contain pinch points which should be identified and guarded.

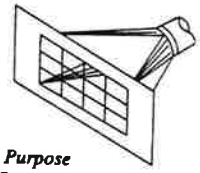
3. HIDDEN DANGERS

3.1 GENERAL

3.1.1 In addition to the obvious hazards associated with the moving parts of rotating machinery, fans present additional potential hazards that are not so obvious and should be considered by the system designer and user for safe operation.

3.2 SUCTION AND AIR PRESSURE

3.2.1 Fans operate by creating suction and air pressure which can be hazardous. Solid objects can be drawn into a fan's inlet and then become dangerous projectiles when they are exhausted through the fan's outlet. ***Solid objects can also cause fan failure or impeller failure due to imbalance or damage to the impeller blades.*** Personnel in close proximity to a fan inlet can be overcome by the suction, and drawn into the fan.



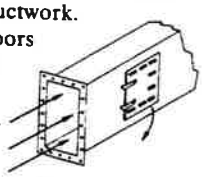
Special Purpose Intake Screen

3.2.2 Whenever there is a possibility that solid objects can be drawn into a remote intake, the intake should be guarded at all times. Before a guard is removed, the fan should be disconnected and the power supply locked out.

3.2.3 Where fans are installed over an occupied area, safety guards should be provided to prevent dropped objects from entering this area during installation and maintenance.

3.2.4 Access doors to a fan or duct system should never be opened while the fan is operating or coasting to a stop. On the downstream (or pressure) side of the system, releasing the door with the system in operation may result in an explosive opening. On the upstream (or suction) side, the inflow may be sufficient to draw in tools, clothing, and other materials. The power supply should always be locked out prior to accessing a fan or ductwork.

3.2.5 Fan design sometimes requires access doors to be supplied with internal components such as a plug to fill a hole in the fan casing. These doors can often be heavy and difficult to handle. Care should be exercised when opening, removing, and installing these components.



Bolted Access Door in Duct

3.3 WINDMILLING

3.3.1 Even when the power supply is locked out, fans may cause injury or damage if the impeller is subject to "windmilling" which is the turning of the impeller and drive components due to a draft in the system. To guard against this hazard, the impeller should be secured to physically restrict rotational movement.

3.4 TEMPERATURE

3.4.1 Many fans, fan motors, and fan components run at temperatures that could burn someone who comes in contact with the hot areas, including discharged or leaking gases. If this potential hazard is present, steps should be taken so that personnel working near the fan are aware of the danger and can exercise caution.

3.5 FAN NOISE AND ENVIRONMENT

3.5.1 Some fans can generate sound that could be hazardous to exposed personnel. Sound pressure can be measured in the field, but obtaining accurate data is difficult. The environment in which the fan operates can impact the ability to obtain accurate fan sound readings. Consult the manufacturer for fan sound data. It is the responsibility of the system designer, installer, user, and maintainer to comply with specific safety requirements mandated by federal, state, and local codes; and to follow industry safety standards and practices published by AMCA and by other recognized agencies and associations, regarding personnel safety from exposure to fan noise associated with use and exposure to the equipment.

Hearing Protection

3.6 STROBOSCOPIC EFFECT

3.6.1 The stroboscopic effect of certain lights in combination with certain fan speeds may cause a rotating assembly to appear stopped. In these cases, irregular markings can be placed on the moving parts to prevent this type of effect. Personnel should be warned that the fan may be in motion even if it appears not to be.

3.7 SPECIAL PURPOSE FANS AND SYSTEMS

3.7.1 The hidden dangers associated with Special Purpose Fans used in special systems are covered in Section 6.

4. POWER ISOLATION

4.1 Every fan should be installed with a suitable device allowing it to be completely disconnected or isolated from the power supply.

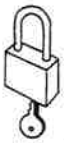
4.2 Many fans are started by remote switches or push-buttons,

by interlocks with other equipment, or by automatic controls. Before performing any maintenance, inspection, or other activity which will require removal of guards, ductwork, access doors, etc., or exposure of moving parts, the fan power supply should be locked out and the fan tagged out of service.

4.3 In some installations other equipment, such as gas burners, may be interlocked with the fan so that disconnecting the fan will automatically shut off the burner or other device. Maintenance on systems of this type should be performed only under the supervision of competent engineering personnel and in accordance with applicable codes and standards.

Remote Switch

Disconnect Switch



Lock Carried by Maintenance Personnel

4.4 In cases where the fan is power driven by a source other than an electric motor, appropriate provisions should be made for the isolation or disengagement of the power supply.

5. START-UP CHECK LIST

5.1 GENERAL

5.1.1 Before putting any fan into initial operation, the manufacturer's instructions should be followed. Transportation, handling, and installation can cause fasteners to loosen, and cause misalignment of fan components. Carefully follow this check list when commissioning equipment.

5.1.2 Lock out the primary and all secondary power sources.

5.1.3 A complete inspection should be made of all of the ductwork and the interior of the fan. Make certain there is no foreign material which can be drawn into or blown through the fan or ductwork. Appropriate protective measures and safety practices should be observed when entering or working within these areas. These measures might include the use of goggles, respirators, or other personal protective devices.

5.1.4 Make sure the foundation or mounting arrangement and the duct connections are adequately designed and installed per drawings and in accordance with recognized acceptable engineering practices and with the fan manufacturer's recommendations.

5.1.5 Check and tighten all bolts, fasteners, and set screws as necessary.

5.1.6 Check the fan assembly and bearings for proper grounding to prevent static electricity discharge.

5.1.7 Ensure power and drive components such as motor starter, variable frequency drive, or hydraulic power unit are properly sized, matched, and connected to the fan.

5.1.8 Check bearings for recommended lubricant and lubrication amount.

5.1.9 Spin the rotating assembly to determine whether it rotates freely, without hitting anything, and is not grossly out of balance.

5.1.10 Inspect impeller for proper rotation for the fan design.

5.1.11 Check alignment of drives and all other components.

5.1.12 Check the belt drive for proper sheave selection and installation and make sure the sheaves are not reversed (excessive speeds could develop).

5.1.13 Check for recommended belt tension.

5.1.14 Properly secure all safety guards.

5.1.15 Assure that all appropriate warnings have been put in place.

5.1.16 Secure all access doors to the fan and ductwork.

5.1.17 Momentarily energize the fan to check the direction of rotation. Listen as the fan coasts to a stop for any unusual noise, identify the source, and take corrective action as necessary.

5.1.18 Switch on the electrical supply and allow the fan to reach full speed. Check carefully for:

(1) Excessive vibration
(2) Unusual noise
(3) Proper belt alignment
(4) Proper lubrication
(5) Proper amperage, voltage, or power values.
(6) If any problem is indicated, SWITCH OFF IMMEDIATELY.
(7) Lock out the power supply. Secure the fan impeller if there is a potential for windmilling. Check carefully for the cause of the trouble, correct as necessary, and repeat check list procedure.

5.2 Even if the fan appears to be operating satisfactorily, shut down after a brief period, lock out the power supply, and recheck items 5.1.5 through 5.1.17 as the initial start-up may have loosened the bolts, fasteners, and set screws.

5.3 The fan may now be put into operation, but during the first eight hours of running, it should be closely observed and checked for excessive vibration and noise. At this time checks should also be made of motor input current and motor and bearing temperatures to ensure that they do not exceed manufacturer's recommendations.

5.4 After eight hours of operation, the fan should be shut down and the power locked out. Check list items 5.1.5 through 5.1.17 should be inspected and adjusted, if necessary.

5.5 After twenty-four (24) hours of satisfactory operation, the fan should be shut down (locked out) and the drive belt tension should be readjusted to recommended tension.

5.6 After commissioning and start-up, the fan should be operated and maintained in accordance with the manufacturer's and component manufacturer's recommendations. Some basic guidelines for WARNING SIGNS and ROUTINE MAINTENANCE are included in Sections 7 and 8 of this publication. These sections are meant as a supplement to other publications and are not intended to replace the manufacturer's instructions.

6. SPECIAL PURPOSE FANS

6.1 Most fans are designed to handle clean air at standard temperatures between 32°F and 120°F. These fans should not be placed in systems or used for other than their design intended use. *Special Purpose Fans* are designed for use in systems that may include extreme temperatures, explosive, toxic, or special gases, material handling, corrosive environments, or other special hazards which should be carefully considered. Specific safety requirements should comply with mandated federal, state, and local codes; and industry safety standards and practices published by AMCA and by other recognized agencies and associations should be followed.

6.2 Where the system will handle explosive or flammable materials (i.e., dust, fumes, vapors or gases), fans of spark-resistant construction should be used.

6.3 Fans connected by ductwork or other piping may contain gases other than air which are hazardous. In these cases, procedures should be established to prevent exposure of personnel working on or near the fan, and by maintenance personnel who may need to enter the fan. Appropriate personal protective equipment as determined by the material safety data sheet, and system operators should be utilized. Appropriate environmental protective measures should also be taken.

6.4 Fan inlet boxes, housings, ductwork, and other system components which are large enough to permit entry should be considered confined spaces. System areas may also serve as low points where heavy gases, liquids, or other substances may accumulate and present explosive, fire, health, or suffocation hazards. Appropriate protective measures and safety practices should be observed when entering or working within these areas.

6.5 Material-handling fans are specially designed to allow the fan to handle a specific type of material without excessive accumulation of material on the fan impeller. Fans handling corrosive gases or erosive materials should be checked periodically. If loss of material is evident, the fan should be shut down, power supply locked out, and tagged out of service. The manufacturer or other qualified personnel should be consulted to determine if the fan is

within safety limits for operation. To ensure satisfactory operation it is essential to observe the manufacturer's limitations concerning the type of material to be handled by the fan.

6.6 Fan ratings and maximum speed limits are typically based on the use of air at 70°F. At temperatures above the normal range (specified by the manufacturer), a reduction should be made in the maximum speed limit. Information on this reduction and on other precautions to be taken for high temperature applications should be obtained from the fan manufacturer. Personnel working near high temperature fans should be aware that coming in contact with the fan's housing, ductwork, or handled gases could result in serious burns. Where the danger of burns is not apparent, appropriate warnings should be posted. Appropriate protective apparel should be worn whenever working in close contact with heated housings or ductwork.

6.7 Corrosive contaminants can be formed when moisture combines with an active airborne chemical. Fans subjected to corrosive contaminants will corrode; however, suitable protective coatings or material, if used in the fan construction, can delay corrosion. Protected fans should be regularly inspected to ensure that the protection remains effective. Personnel working in environments with airborne chemicals may require personal protective apparel equipment.

6.8 Where liquid can accumulate within the fan, provide for the installation of adequately sized drains.

6.9 In those applications where there is a potential for chemical build-up (such as grease, creosote, etc.), periodic cleaning and proper drainage are necessary to avoid a fire hazard.

7. WARNING SIGNS

7.1 GENERAL

7.1.1 A change in the operating characteristics of a fan may indicate the need for maintenance. Sudden changes may indicate severe problems or dangerous conditions developing. Investigate any changes in the operational characteristics or unusual symptoms of operation. Refer to AMCA Publication 202, *Troubleshooting*, for a more detailed explanation of investigating procedures. Consult your manufacturer or other qualified consultant with questions concerning changes observed.

7.2 EXCESSIVE VIBRATION

7.2.1 Operational vibration levels are one of the best indicators of the condition of the blower. Careful observation and monitoring of vibration levels can detect a minor problem in the early stages of development when correction is less costly and easier. Recommended maximum vibration levels should be obtained from the equipment manufacturer.

7.2.2 If excessive vibration is observed, stop the fan and lock it out until the cause is corrected. Check for material build-up on the impeller. Generally this will show up as material flaking off the fan impeller and causing an imbalance which may lead to catastrophic failure of the fan or its components. Excessive vibration can also be caused by looseness in the drive train, loose fasteners, misalignment or impeller damage. Contact the fan manufacturer or other qualified consultant to determine the maximum vibration level if it is not included in maintenance instructions.

7.3 NOISE

7.3.1 Changes to the sound level may indicate maintenance is needed. Some unusual noises often heard include: bearing noise indicating the bearings need lubricant or replacement; scraping or rubbing noise indicating the rotating parts are hitting the stationary housing; squealing indicating the belt drive needs tensioning; repeated pulsating pitch of the blower indicating operation of the blower at low airflow. If any of these noises or any other unusual noises develop, their cause should be determined and corrective action taken as necessary.

7.4 HIGH MOTOR TEMPERATURES

7.4.1 Check that cooling air to the motor has not been diverted or blocked by dirty guards or similar obstacles. Check the input amperage. An increase in amperage may indicate that some major change has occurred in the system.

7.5 HIGH BEARING TEMPERATURES

7.5.1 This condition is usually caused by improper lubrication; this can be either "over," "under," or "unsuitable" lubrication. In every case, if the cause of the trouble is not easily seen, experienced personnel should examine the equipment before it is put back in operation.

7.6 POOR PERFORMANCE

7.6.1 Too much flow or pressure or too little flow or pressure is often a symptom of a change in the operating system. A fan will typically operate at the same performance in a static system. Some typical causes include: operating of the fan backwards after maintenance procedures; filters dirty or not in place; change or blockage in the ductwork; change in speed of the fan (switching the sheaves); loss or failure of the impeller. All of these causes and many others will affect the flow and pressure produced by the fan.

8. ROUTINE MAINTENANCE

8.1 A preventive maintenance program is an important aspect of an effective safety program. Consult your manufacturer or other qualified consultant with questions concerning changes observed during periodic inspections and routine maintenance.

8.2 The fan manufacturer's operating and maintenance recommendations, as well as the components manufacturer's instructions (such as motor, bearing, drives, etc.) should be strictly followed.

8.3 *Maintenance should always be performed by experienced and trained personnel who are aware of the hazards associated with rotating equipment.* Do not attempt any maintenance on a fan unless the fan power supply has been locked out and tagged out and the impeller has been secured.

8.4 When performing maintenance functions which include disassembly of the fan, careful consideration should be given to the size, weight, center of gravity, and lifting means of the fan components. It should also be noted that the outboard bearing on some fans such as arrangements 1, 8, 9, and 10 is often cap-loaded. Removal of the securing means may result in a sudden change in impeller position.

8.5 Historical data is often the best indicator for determining the operational condition of the fan. Maintenance logs which include relubrication, vibration levels, temperature levels, power requirements, inspections, and other pertinent records should be maintained and consulted as necessary when assessing the condition of the fan.

8.6 Under normal circumstances, handling clean air, the system should require cleaning only once a year. However, the fan and system should be checked at regular intervals to detect any unusual accumulation.

8.7 The fan impeller should be specially checked for build-up of material or dirt which may cause an imbalance with resulting undue wear on bearings and belt drives. A regular maintenance program should be established as needed to prevent material build-up.

8.8 Periodic inspection of the rotating assembly should be made to detect any indication of weakening of the rotor because of corrosion, erosion, or metal fatigue. Where signs of deterioration are found, lock out and tag out the impeller until the unit has been inspected and approved by a qualified consultant.

BALDOR
MOTORS AND DRIVES

INSTALLATION - MAINTENANCE INSTRUCTIONS

The safety of personnel depends upon following these instructions:

RECEIVING:

Inspect machine before accepting shipment for any damage in transit. Shaft should turn by hand without any rubs. Any damage from transit should be reported to the carrier immediately.

INSTALLATION

Qualified or trained personnel should install the machine. Electrical rotating equipment can result in property damage, serious injury, or death, when improperly installed. Equipment should be installed in accordance with the National Electrical Code, local codes and with NEMA MG2, Safety Standards for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators.

WARNING: Observe the following for safety.

1. When eyebolts are provided, they are intended **only** for lifting the motor and its included motor accessories. Eyebolt must be fully tightened.
2. The machine **must** be grounded in accordance with the National Electrical Code and any local code.
3. Permanently guard machine against accidental contact of body parts or clothing with moving parts.
4. Shaft key must be secured before starting motor.
5. The machine should match the line voltage, line frequency, and the equipment load.
6. Applications for motor-mounted brake should have proper safeguards provided for personnel in case of possible brake failure.
7. Remove all power services and allow machine to reach standstill prior to servicing.
8. On single phase motors discharge start and/or run capacitors prior to servicing.
9. Do not by-pass or render inoperative safeguard or protective devices.

MOTOR ENCLOSURE

Open drip proof motors are intended for use in clean, dry locations with access to an adequate supply of cooling air. In addition, there should be protection from or avoidance of flammable or combustible materials in the area of open-type motors as they can eject flame and/or molten metal in the event of an insulation failure. **Totally enclosed motors** are intended for use where moisture, dirt, and/or corrosive materials are present in indoor or outdoor locations. **Explosion-proof motors**, as indicated by the Underwriters Laboratories, Inc. label, are required for hazardous locations in accordance with the National Electrical Code.

MOUNTING

Foot mounted machines should be mounted to a rigid foundation to prevent excessive vibration. Shims may be required if foundation is uneven.

Flange mounted machines should be properly seated and aligned. **NOTE:** If improper direction of rotation is detrimental to the load, check rotation prior to connecting the motor to the load.

For V-belt drive, mount the sheave (pulley) close to the motor housing, however, allow clearance for end to end movement of shaft. Do not overtighten belts as this may cause premature bearing failure and/or shaft breakage.

WIRING

Connect the machine in accordance with furnished connection diagram. The wiring, fusing, and grounding must be in accordance to the National Electrical Code and any local codes.

When the machine is connected to the load for proper direction of rotation and ted, it should start quickly and run smoothly. If this is not the case, immediately shut motor off. Investigate the cause. The cause could be; low voltage, the motor is misconnec d, or the load is too great, etc.

It is recommended that the motor current be checked after it has been operating a rt time and compared against nameplate current.

LUBRICATION

This is a ball bearing motor. The bearings have been given initial lubrication a he factory. Motors without regreasing capability are factory lubricated for normal bearing life.

RELUBRICATION INTERVALS (MOTORS HAVING REGREASING CAPABILITY)

New motors having been in storage for over a year should be relubricated b he procedure noted below. The following relubrication intervals are suggested as a de for long operating life.

NEMA/ (IEC) FRAME SIZE	RATED SPEED-RPM			
	3600	1800	1200	900
Up to 210 incl. (132)	5500 hrs.	12000 hrs.	18000 hrs.	22000 s.
Over 210 to 280 incl. (180)	3600 hrs.	9500 hrs.	15000 hrs.	18000 hrs.
Over 280 to 360 incl. (225)	*2200 hrs.	7400 hrs.	12000 hrs.	1 rs.
Over 360 to 5000 incl. (300)	*2200 hrs.	3500 hrs.	7400 hrs.	1 s.

* Bearings in 360 through 5000 frame, 2 pole motors are either 6313 or 6314 bea gs Stated relubrication interval reflects this selection. If roller bearings are used, the te relubrication interval is to be divided by 2.

LUBRICANT

Baldor motors are pre-greased, normally with Chevron SRI #2. Equivalent and compatibl greases are Texaco Polyrex #2, Shell Dolium R, Amoco Rykon Premium #2.

PROCEDURE

Clean grease fitting (or area around grease hole, if equipped with slotted greas screws). If motor is equipped with a purge plug, remove for greasing and replac ft at least 20 minutes of operation following greasing. Motors can be relubricated th while stopped (at less than 80°F) or running.

Apply grease gun to fitting (or grease hole). OVERGREASING, EITHER IN QUA IT OR SPEED OF INJECTION, CAN CAUSE PREMATURE BEARING FAILURE. Apply th recommended quantity of grease gradually, taking at least 1 minute to do so.

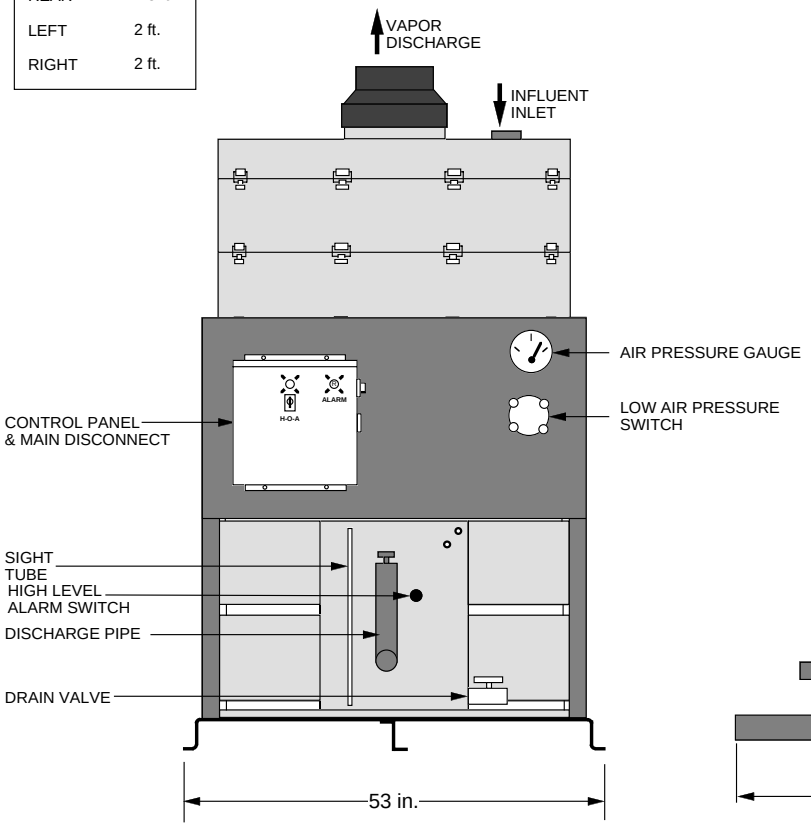
CAUTION: 1. Keep grease clean.
2. Mixing of dissimilar greases is not recommended.

Frame Size NEMA (IEC)	Weight of Grease to add oz (Grams)	Volume of gr se to be ed	
		in3	oo
Up to 210 incl. (132)	0.30 (8.4)	0.6	)
Over 210 to 280 incl. (180)	0.61 (17.4)	1.2	3.9
Over 280 to 360 incl. (225)	0.81 (23.1)	1.5	5.2
Over 360 to 5000 incl. (300)	2.12 (60.0)	4.1	4

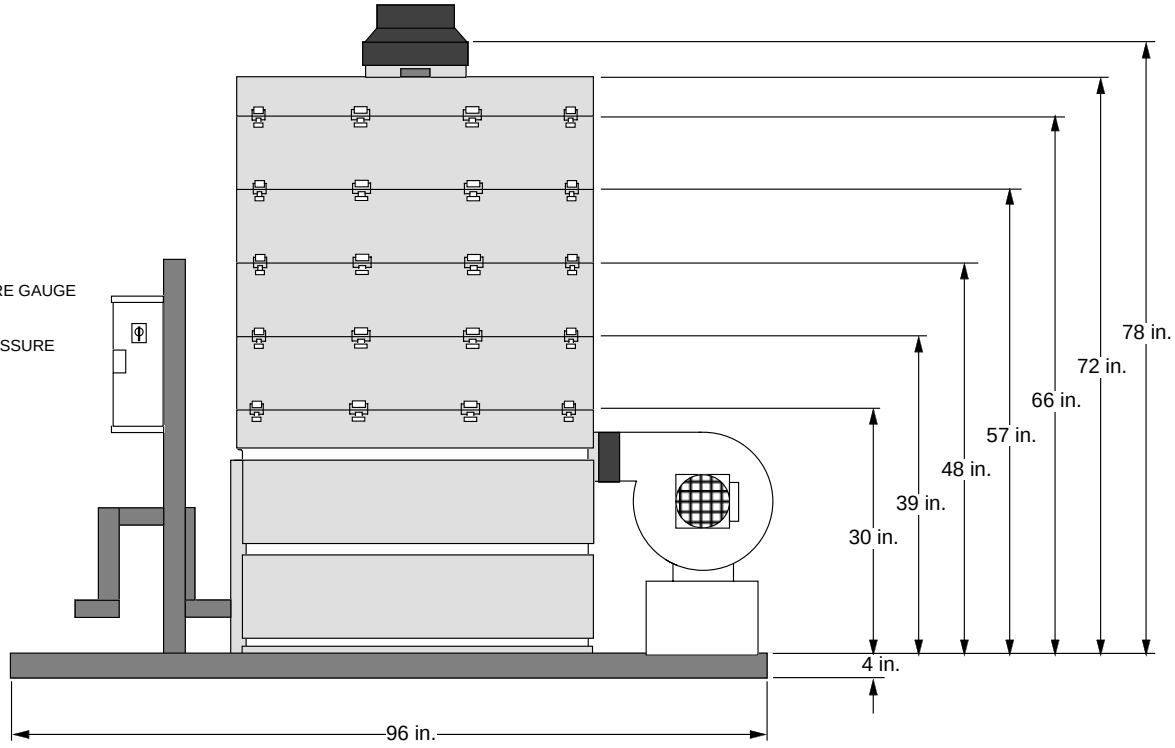
MINIMUM CLEARANCE

FRONT	1.5 ft.
TOP	12 in.
REAR	1.5 ft.
LEFT	2 ft.
RIGHT	2 ft.

FRONT



RIGHT SIDE



BASIC SYSTEM

- ✓ SUMP TANK
- ✓ STRIPPER TRAYS
- ✓ BLOWER
- ✓ MIST ELIMINATOR
- ✓ PIPING
- ✓ SPRAY NOZZLE
- ✓ WATER LEVEL SIGHT TUBE
- ✓ GASKETS
- ✓ LATCHES

OPTIONAL ITEMS

- ✓ SKID & STANCHION
- ✓ AIR PRESSURE GAUGE
- ✓ GRAVITY DISCHARGE PIPING
- ___ DISCHARGE PUMP
- ___ FEED PUMP
- ___ ADDITIONAL BLOWER
- ___ EXPLOSION-PROOF MOTOR(S)
- ___ LOCAL DISCONNECT NEMA 7
- ✓ CONTROL PANEL
- ✓ MAIN DISCONNECT SWITCH
- ___ I.S. COMPONENTS/REMOTE MOUNT
- ✓ INTERMITTENT OPERATION
- ___ STROBE LIGHT
- ___ ALARM HORN
- ___ POWER LAPSE INDICATOR
- ✓ AIR PRESSURE ALARM SWITCH(ES)
- ✓ HIGH WATER LEVEL ALARM SWITCH
- ___ DISCHARGE PUMP LEVEL SWITCH
- ___ WATER PRESSURE GAUGE(S)
- ___ DIGITAL WATER FLOW INDICATOR
- ___ AIR FLOW METER
- ___ TEMPERATURE GAUGE(S)
- ___ LINE SAMPLING PORT(S)
- ___ AIR BLOWER SILENCER
- ___ WASHER WAND
- ___ AUTO DIALER

NOTE: THIS DRAWING IS REPRESENTATIVE OF A STANDARD SHALLOWTRAY CONFIGURATION, AND IS NOT INTENDED FOR ENGINEERING DESIGN OR LAYOUT. ACTUAL ARRANGEMENT AND DIMENSIONS MAY VARY DEPENDING ON BLOWER SELECTION OR OTHER ACCESSORIES. PLEASE CONTACT NEEP FOR DETAILED DESIGN INFORMATION.

POWER: 3Ø, 460 Volts, 3 WIRE + GROUND, 60 Hz
*CONSULT N.E.E.P. FOR AMPACITIES AND OTHER VOLTAGE OPTIONS

STRIPPER CONSTRUCTION:

ROTATIONALLY MOLDED (43"Ø)
LOW DENSITY POLYETHYLENE (LDPE)

CONNECTION INFORMATION

ITEM	SIZE
GRAVITY DISCHARGE	3"Ø SOCKET, PVC80
DISCHARGE PUMP	1 1/4"Ø FNPT
WATER INLET	1-1/4"Ø FNPT
AIR EXHAUST NOZZLE	8"Ø STUB W/8"x6" CPLG

NORTH EAST ENVIRONMENTAL PRODUCTS, INC.
7 COMMERCE AVENUE
WEST LEBANON, NEW HAMPSHIRE 03784
PHONE: 603-298-7061 FAX: 603-298-7063
www.neepsystems.com

TOLERANCES UNLESS OTHERWISE SPECIFIED: ± 1 INCH

DRAWING NAME: **ShallowTray® Model 2341-P**

DRAWING #: **Proposal #Typical**

DRAWN: ***DCS***

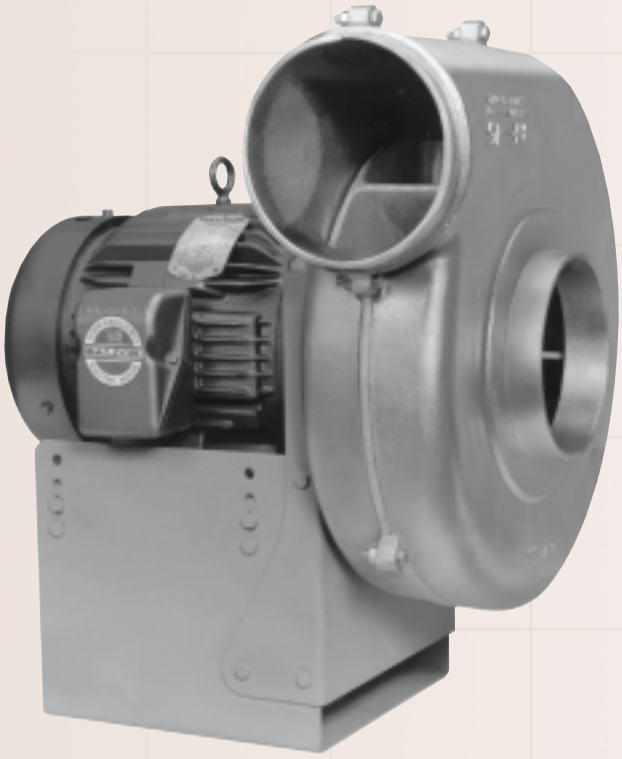
CUSTOMER: **NEEPSYSTEMS.com**

DATE: **09/04/02**

SCALE: NTS | SIZE: A | SHEET : 1 OF : 1

Bulletin AF-0302

AMERICAN FAN COMPANY®
&
WOODS
U.S.A. DIVISION



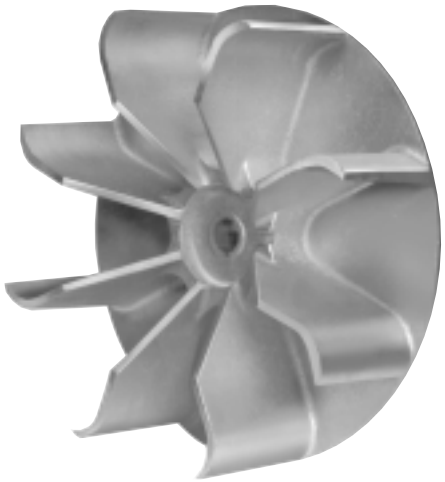
REG. NO. AQC-19201
ISO 9001
AMERICAN FAN CO.

AFCASTALUMINUM PRESSURE BLOWERS

WHEEL TYPES

Radial Wheel (Code R)

Cast aluminum radial open design for air and light material applications. Also available in welded steel construction.



Backward Curve Wheel (Code B)

Cast aluminum backward curve blade tip design for clean air applications where lower noise level is a consideration.

Forward Curve Wheel (Code F)

Fabricated aluminum forward curve with cast iron hub design for clean air applications. Has highest performance at a given speed making it ideal for 50 Hz applications where space is a problem.

CONTENTS

FAN CODES

AF-12-R13446-7

- 12 — Fan Size
- R — Wheel Type
  - ***R*** = Radial
  - ***B*** = Backward Curve
  - ***F*** = Forward Curve
- 13446 — Wheel Size Code
- 7 — Inlet Diameter

TESTING

All fan/wheel/inlet combinations shown in this catalog have each been thoroughly air and sound performance tested at the American Fan Company Test Laboratory.

Air testing was performed per AMCA 210-85 figure 7, installation type B (free inlet, ducted outlet). Sound testing was performed per AMCA 300-85, installation type B. Fans in this catalog **are not** licensed to bear the AMCA certified ratings seal.

MOTOR SPEEDS

USED FOR DIRECT DRIVE SELECTIONS

BHP Range	60 Hz RPM	50 Hz RPM
up to 2.00	3450	2875
2.01-5.00	3500	2875
5.01 & higher	3515	2900

FEATURES

Model AF features a rugged, lightweight and rustproof cast aluminum housing making it ideal for demanding industrial applications. Model AF is available in direct or belt drive with a variety of accessories to meet your requirements.

Capacity selections are available up to 4000 CFM and pressure selections up to 20" SP w.g.

- Split housing for maintenance ease
- Even O.D. pipe sizes on inlet and outlet
- Non-sparking cast aluminum housing
- Assortment of wheel sizes to pin-point your performance requirement
- Reliability
- Wheel both statically and dynamically balanced
- Rustproof
- Low initial cost
- Available in arrangements 1,2,4,8 and 9

APPLICATIONS

- Rubber processing
- Food processing
- Chemical processing
- Fume control
- Dust control
- Combustion air for incinerators, ovens, furnaces, kilns and dryers
- Paper and printing machinery
- Cooling electronic equipment, motors, generators and transformers
- Textile machinery
- Light materials conveying
- Woodworking machinery
- Forced drying

OPTIONS

- Inlet flange
- Outlet flange
- Housing drain
- Cast Iron housing
- Fabricated steel wheel
- Shaft seal
- Sound attenuator
- Inlet filter
- Corrosive resistant coatings
- Inlet and/or outlet guard
- Fabricated stainless wheel and housing
- Full or half cut-off
- Heat slinger
- Drive guard system

Inlet Venturi
(shown with inlet guard)

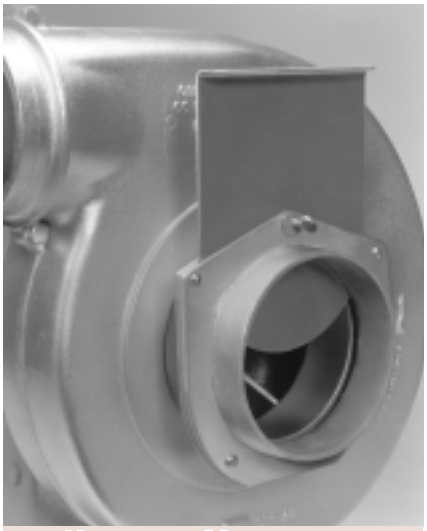
Spun steel venturi provides efficient smooth airflow into fan inlet on non inlet-ducted applications.

Inlet Guard
(shown welded to inlet venturi)

1" square wire cloth is welded to large end of inlet venturi providing OSHA type guarding with minimal airflow restriction.

Inlet Filter

Oil wetted, crimped steel wire mesh media provides 94% filtration efficiency of particulate of 10 micron or larger. Filters are cleanable and reusable.

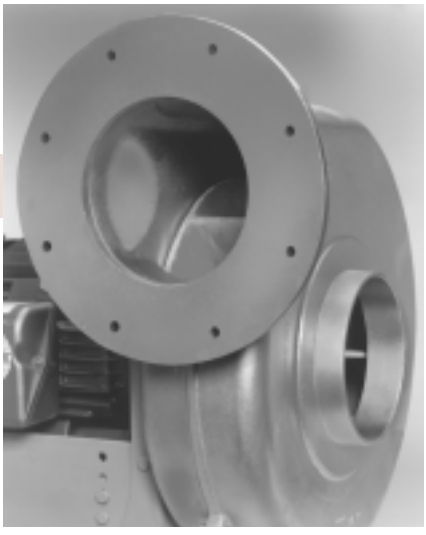


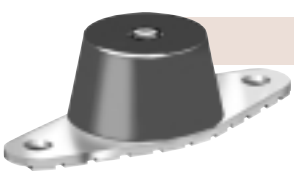
Full Cut-off Damper
(shown mounted to fan inlet)

Cast aluminum housing with steel gate allows manual adjustment of CFM. Thumbscrew locks gate in place. Can be mounted on inlet or outlet.

Flanges
(outlet flange shown)

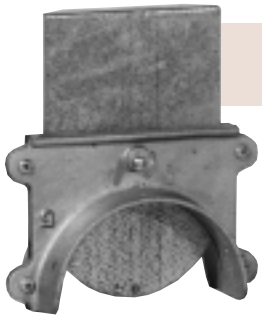
Cast aluminum flange matches ANSI flange bolt patterns. Available with either ANSI mounting hole diameters or 7⁄16" diameter (standard).





Vibration Isolators

Neoprene isolators with molded-in steel mounting plate and threaded top mounting hole. Provides ¼" static deflection.

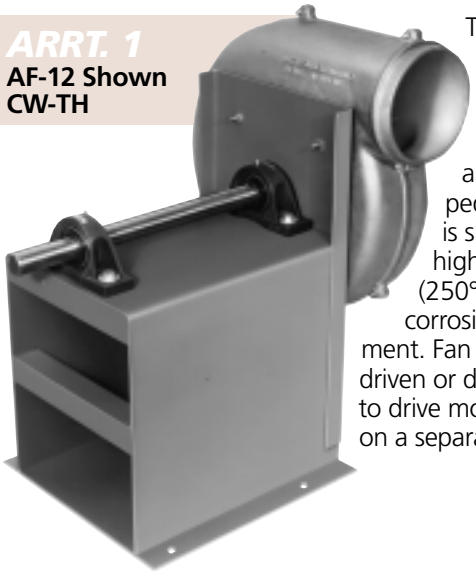


Half Cut-off Dampers

Similar to full cut-offs except half cut-offs are saddle mounted to ductwork on inlet or outlet.

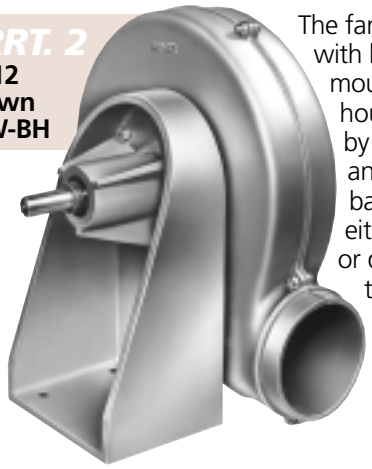
ARRANGEMENTS

ARRT. 1
AF-12 Shown CW-TH



The fan wheel is overhung with both bearings mounted on a common pedestal. ARRT. 1 is suitable for high temperature (250°F max.) and/or corrosive environment. Fan can be belt driven or directly coupled to drive motor mounted on a separate base.

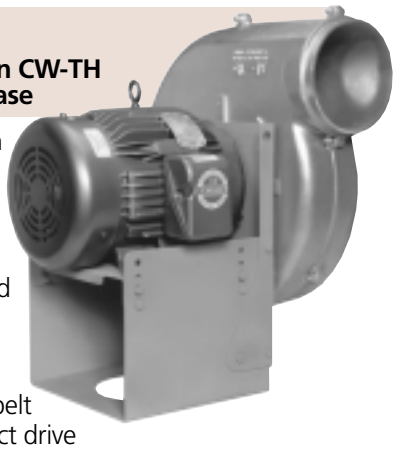
ARRT. 2
AF-12 Shown CCW-BH



The fan wheel is overhung with both bearings mounted in a cast iron housing supported by the fan housing and a cast aluminum base. Unit can be either belt driven or direct coupled to an independently supported motor.

ARRT. 4
AF-9 Shown CW-TH with cast alum. base

ARRT. 4
AF-15 Shown CW-TH with steel base

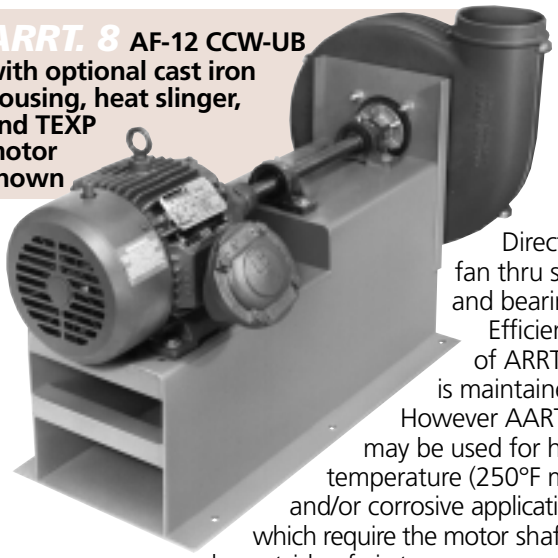


Direct drive fan with wheel mounted directly on motor shaft. Unit is designed for standard temperature applications only. With no belt losses, the direct drive fan operates at a higher efficiency.

ARRT. 4
FLANGE MOUNT AF-9 Shown CW-FM

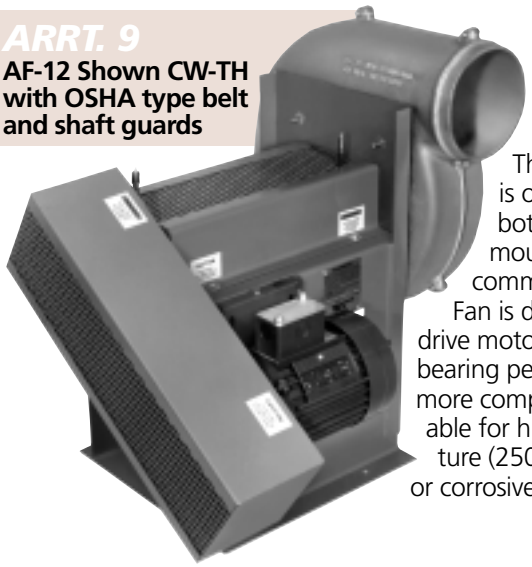
Direct drive fan with wheel mounted directly on motor shaft. Unit is designed to be supported by the outlet flange.

ARRT. 8
AF-12 CCW-UB with optional cast iron housing, heat slinger, and TEXP motor shown



Direct drive fan thru shaft and bearings. Efficiency of ARRT. 4 is maintained. However AART. 8 may be used for high temperature (250°F max.) and/or corrosive applications which require the motor shaft to be outside of airstream.

ARRT. 9
AF-12 Shown CW-TH with OSHA type belt and shaft guards



The fan wheel is overhung with both bearings mounted on a common pedestal. Fan is driven with drive motor mounted on bearing pedestal for a more compact unit suitable for high temperature (250°F max.) and/or corrosive environment.

Radial Wheels 3600 RPM 60 Hz

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
1.0" SP							
209	.196	8-R07025-3	83	1	28	3	4
248	.246	8-R08113-3	84	3	24	3	4
251	.265	8-R08125-3	83	5	21	3	4
271	.220	8-R07025-4	83	2	31	4	4
320	.292	8-R08113-4	83	4	25	4	4
369	.338	8-R08125-4	84	6	23	4	4
1.5" SP							
186	.192	8-R07025-3	83	1	43	3	4
229	.238	8-R08113-3	84	3	35	3	4
234	.261	8-R08125-3	83	5	32	3	4
241	.206	8-R07025-4	83	2	46	4	4
294	.280	8-R08113-4	83	4	37	4	4
342	.330	8-R08125-4	84	6	35	4	4
424	.506	9-R09026-4	85	7	27	4	4
465	.517	9-R09026-5	88	8	28	5	4
477	.706	9-R10413-4	86	11	22	4	4
488	.691	9-R09626-4	88	9	23	4	4
529	.760	9-R10413-5	88	12	23	5	4
541	.758	9-R09626-5	90	10	24	5	4
570	.876	9-R10527-4	91	13	20	4	4
626	.952	9-R10527-5	92	14	20	5	4
795	1.337	10-R10527-6	92	15	20	6	5
2.0" SP							
161	.185	8-R07025-3	83	1	57	3	4
206	.190	8-R07025-4	83	2	61	4	4
218	.255	8-R08125-3	83	5	43	3	4
265	.264	8-R08113-4	83	4	50	4	4
309	.319	8-R08125-4	84	6	46	4	4
402	.482	9-R09026-4	85	7	36	4	4
433	.663	9-R10413-4	86	11	29	4	4
439	.492	9-R09026-5	86	8	37	5	4
467	.669	9-R09626-4	88	9	30	4	4
507	.741	9-R10413-5	88	12	30	5	4
517	.728	9-R09626-5	89	10	32	5	4
549	.848	9-R10527-4	91	13	26	4	4
606	.926	9-R10527-5	90	14	26	5	4
761	1.300	10-R10527-6	89	15	27	6	5
793	1.464	10-R11027-6	90	16	25	6	5
797	1.801	10-R12213-6	91	18	21	6	5
877	1.781	10-R11527-6	90	17	22	6	5
1219	2.536	12-R11527-7	92	20	21	7	6
2.5" SP							
125	.169	8-R07025-3	83	1	71	3	4
158	.169	8-R07025-4	83	2	76	4	4
174	.209	8-R08113-3	82	3	59	3	4
201	.249	8-R08125-3	83	5	53	3	4
231	.246	8-R08113-4	82	4	62	4	4
275	.302	8-R08125-4	84	6	58	4	4
378	.454	9-R09026-4	85	7	45	4	4
412	.468	9-R09026-5	86	8	46	5	4
443	.644	9-R09626-4	86	9	38	4	4
482	.715	9-R10413-5	86	12	38	5	4
492	.699	9-R09626-5	89	10	40	5	4
527	.820	9-R10527-4	90	13	33	4	4
583	.897	9-R10527-5	89	14	32	5	4
723	1.267	10-R10527-6	89	15	33	6	5
764	1.404	10-R11027-6	90	16	31	6	5
771	1.759	10-R12213-6	90	18	26	6	5
849	1.735	10-R11527-6	90	17	27	6	5
946	2.264	10-R12227-6	94	19	23	6	5
1173	2.456	12-R11527-7	91	20	26	7	6
1309	3.101	12-R12327-7	91	21	23	7	6
1444	3.715	12-R13032-7	96	22	21	7	6
3.0" SP							
78	.145	8-R07025-3	82	1	85	3	4
90	.143	8-R07025-4	83	2	92	4	4
138	.189	8-R08113-3	82	3	71	3	4
179	.241	8-R08125-3	83	5	64	3	4
183	.215	8-R08113-4	84	4	74	4	4
238	.279	8-R08125-4	84	6	69	4	4
354	.427	9-R09026-4	85	7	54	4	4
385	.446	9-R09026-5	87	8	55	5	4
421	.620	9-R09626-4	86	9	45	4	4
454	.685	9-R10413-5	86	12	46	5	4
465	.668	9-R09626-5	87	10	47	5	4
508	.793	9-R10527-4	89	13	39	4	4
558	.864	9-R10527-5	89	14	39	5	4
685	1.223	10-R10527-6	89	15	40	6	5
735	1.342	10-R11027-6	89	16	37	6	5
823	1.677	10-R11527-6	90	17	32	6	5
922	2.225	10-R12227-6	94	19	28	6	5
1128	2.372	12-R11527-7	91	20	31	7	6
1270	3.010	12-R12327-7	93	21	28	7	6
1405	3.618	12-R13032-7	95	22	25	7	6
1465	3.833	12-R14016-7	93	24	23	7	6
1578	4.137	12-R13722-7	95	23	23	7	6
1638	4.754	12-R14032-7	102	25	21	7	6
3.5" SP							
92	.164	8-R08113-3	82	3	82	3	4
114	.176	8-R08113-4	84	4	87	4	4
147	.226	8-R08125-3	83	5	75	3	4
195	.250	8-R08125-4	84	6	81	4	4
330	.400	9-R09026-4	85	7	63	4	4
359	.424	9-R09026-5	87	8	65	5	4
401	.599	9-R09626-4	86	9	53	4	4
423	.654	9-R10413-4	86	12	53	4	4
435	.637	9-R09626-5	87	10	55	5	4
487	.766	9-R10527-4	89	13	46	4	4
533	.830	9-R10527-5	89	14	45	5	4
647	1.169	10-R10527-6	89	15	47	6	5
705	1.283	10-R11027-6	89	16	43	6	5
797	1.610	10-R11527-6	90	17	38	6	5
900	2.175	10-R12227-6	93	19	32	6	5
1082	2.288	12-R11527-7	90	20	37	7	6
1232	2.920	12-R12327-7	92	21	33	7	6
1367	3.518	12-R13032-7	94	22	30	7	6
1437	3.756	12-R14016-7	93	24	27	7	6
1542	4.045	12-R13722-7	94	23	27	7	6
1600	4.659	12-R14032-7	102	25	25	7	6
4.0" SP							
89	.192	8-R08125-3	84	5	85	3	4
133	.207	8-R08125-4	83	6	92	4	4
302	.371	9-R09026-4	83	7	72	4	4
327	.399	9-R09026-5	87	8	74	5	4
348	.593	9-R10413-4	86	11	58	4	4
381	.578	9-R09626-4	86	9	61	4	4
405	.604	9-R09626-5	87	10	63	5	4
463	.736	9-R10527-4	88	13	52	4	4
508	.797	9-R10527-5	88	14	52	5	4
609	1.104	10-R10527-6	88	15	53	6	5
675	1.228	10-R11027-6	88	16	50	6	5
771	1.548	10-R11527-6	89	17	43	6	5
879	2.122	10-R12227-6	93	19	37	6	5
1032	2.206	12-R11527-7	90	20	42	7	6
1192	2.830	12-R12327-7	91	21	37	7	6
1327	3.417	12-R13032-7	93	22	34	7	6
1407	3.677	12-R14016-7	93	24	31	7	6
1504	3.949	12-R13722-7	94	23	31	7	6
1566	4.575	12-R14032-7	101	25	28	7	6
4.5" SP							
34	.155	8-R08125-3	83	5	96	3	4
268	.339	9-R09026-4	83	7	81	4	4
283	.359	9-R09026-5	87	8	83	5	4
317	.563	9-R10413-4	85	11	65	4	4
344	.592	9-R10413-5	86	12	69	5	4
358	.553	9-R09626-4	86	9	68	4	4
377	.574	9-R09626-5	87	10	71	5	4
436	.704	9-R10527-4	87	13	59	4	4
483	.763	9-R10527-5	88	14	58	5	4
4.5" SP *(continued)*							
570	1.011	10-R10527-6	88	15	60	6	5
643	1.176	10-R11027-6	88	16	56	6	5
743	1.489	10-R11527-6	89	17	49	6	5
857	2.069	10-R12227-6	92	19	41	6	5
982	2.125	12-R11527-7	89	20	47	7	6
1149	2.739	12-R12327-7	91	21	42	7	6
1288	3.315	12-R13032-7	93	22	38	7	6
1376	3.597	12-R14016-7	92	24	35	7	6
1465	3.833	12-R13722-7	93	23	35	7	6
1537	4.502	12-R14032-7	101	25	32	7	6
5.0" SP							
204	.293	9-R09026-4	83	7	91	4	4
222	.307	9-R09026-5	86	8	92	5	4
277	.529	9-R10413-4	85	11	72	4	4
292	.552	9-R10413-5	86	12	76	5	4
325	.515	9-R09626-4	86	9	76	4	4
344	.539	9-R09626-5	87	10	79	5	4
410	.673	9-R10527-4	87	13	65	4	4
457	.728	9-R10527-5	86	14	65	5	4
534	.940	10-R10527-6	88	15	67	6	5
611	1.128	10-R11027-6	88	16	62	6	5
715	1.435	10-R11527-6	88	17	54	6	5
834	2.014	10-R12227-6	92	19	46	6	5
934	2.043	12-R11527-7	89	20	52	7	6
1100	2.648	12-R12327-7	90	21	47	7	6
1247	3.211	12-R13032-7	92	22	42	7	6
1341	3.509	12-R14016-7	92	24	39	7	6
1425	3.712	12-R13722-7	93	23	39	7	6
1506	4.426	12-R14032-7	100	25	35	7	6
5.5" SP							
217	.489	9-R10413-4	85	11	79	4	4
280	.468	9-R09626-4	86	9	83	4	4
294	.488	9-R09626-5	87	10	87	5	4
387	.646	9-R10527-4	87	13	72	4	4
430	.694	9-R10527-5	86	14	71	5	4
507	.926	10-R10527-6	88	15	73	6	5
579	1.090	10-R11027-6	87	16	68	6	5
686	1.386	10-R11527-6	88	17	60	6	5
809	1.959	10-R12227-6	92	19	50	6	5
891	1.966	12-R11527-7	88	20	58	7	6
1052	2.555	12-R12327-7	89	21	51	7	6
1205	3.106	12-R13032-7	92	22	47	7	6
1303	3.416	12-R14016-7	92	24	43	7	6
1383	3.592	12-R13722-7	91	23	43	7	6
1475	4.346	12-R14032-7	100	25	39	7	6
6.0" SP							
147	.435	9-R10413-4	85	11	87	4	4
154	.440	9-R10413-5	86	12	91	5	4
201	.391	9-R09626-4	86	9	91	4	4
221	.412	9-R09626-5	86	10	95	5	4
360	.616	9-R10527-4	87	13	78	4	4
399	.656	9-R10527-5	86	14	78	5	4
476	.897	10-R10527-6	88	15	80	6	5
545	1.054	10-R11027-6	87	16	74	6	5
563	1.355	10-R12213-6	88	18	63	6	5
655	1.342	10-R11527-6	88	17	65	6	5
784	1.902	10-R12227-6	91	19	55	6	5
846	1.886	12-R11527-7	88	20	63	7	6
1005	2.461	12-R12327-7	89	21	56	7	6
1163	3.001	12-R13032-7	90	22	51	7	6
1264	3.321	12-R14016-7	91	24	47	7	6
1339	3.474	12-R13722-7	92	23	46	7	6
1442	4.262	12-R14032-7	99	25	42	7	6
6.5" SP							
147	.435	9-R10413-4	85	11	94	4	4
323	.575	9-R10527-4	86	13	85	4	4
357	.608	9-R10527-5	86	14	84	5	4
430	.810	10-R10527-6	88	15	87	6	5
510	.998	10-R11027-6	87	16	81	6	5
511	1.219	10-R12213-6	88	18	68	6	5
624	1.318	10-R11527-6	88	17	70	6	5

Radial Wheels 3600 RPM 60 Hz

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
6.5" SP *(continued)*							
756	1.844	10-R12227-6	91	19	60	6	5
798	1.803	12-R11527-7	88	20	68	7	6
964	2.365	12-R12327-7	88	21	60	7	6
1119	2.894	12-R13032-7	90	22	55	7	6
1222	3.224	12-R14016-7	91	24	51	7	6
1293	3.357	12-R13722-7	92	23	50	7	6
1408	4.174	12-R14032-7	98	25	46	7	6
1782	5.014	15-R13446-7	91	26	48	7	8
1863	5.339	15-R13446-8	91	27	50	8	8
1999	5.572	15-R13446-10	91	28	50	10	8
7.0" SP							
263	.511	9-R10527-4	86	13	91	4	4
297	.545	9-R10527-5	86	14	91	5	4
356	.657	10-R10527-6	88	15	93	6	5
469	.924	10-R11027-6	87	16	87	6	5
591	1.286	10-R11527-6	87	17	76	6	5
727	1.784	10-R12227-6	91	19	64	6	5
748	1.718	12-R11527-7	88	20	73	7	6
922	2.268	12-R12327-7	88	21	65	7	6
1073	2.784	12-R13032-7	90	22	59	7	6
1177	3.123	12-R14016-7	91	24	55	7	6
1244	3.243	12-R13722-7	91	23	54	7	6
1373	4.080	12-R14032-7	98	25	49	7	6
1711	4.833	15-R13446-7	90	26	51	7	8
1798	5.147	15-R13446-8	91	27	53	8	8
1812	5.224	15-R14133-7	91	29	50	7	8
1923	5.356	15-R13446-10	90	28	54	10	8
1963	5.723	15-R14133-8	91	30	51	8	8
2034	5.960	15-R14133-10	91	31	53	10	8
7.5" SP							
182	.430	9-R10527-4	86	13	98	4	4
217	.465	9-R10527-5	86	14	97	5	4
404	.820	10-R11027-6	87	16	93	6	5
554	1.234	10-R11527-6	87	17	81	6	5
694	1.721	10-R12227-6	90	19	69	6	5
695	1.631	12-R11527-7	88	20	79	7	6
878	2.170	12-R12327-7	88	21	70	7	6
1024	2.672	12-R13032-7	90	22	64	7	6
1129	3.019	12-R14016-7	90	24	59	7	6
1193	3.131	12-R13722-7	91	23	58	7	6
1335	3.981	12-R14032-7	98	25	53	7	6
1639	4.642	15-R13446-7	90	26	55	7	8
1736	4.946	15-R13446-8	90	27	57	8	8
1755	5.036	15-R14133-7	91	29	53	7	8
1848	5.140	15-R13446-10	90	28	58	10	8
1893	5.497	15-R14133-8	91	30	55	8	8
1946	5.646	15-R14133-10	91	31	57	10	8
8.0" SP							
273	.865	10-R12213-6	88	18	84	6	5
512	1.160	10-R11527-6	87	17	87	6	5
634	1.533	12-R11527-7	88	20	84	7	6
658	1.655	10-R12227-6	89	19	73	6	5
830	2.070	12-R12327-7	88	21	74	7	6
978	2.562	12-R13032-7	89	22	68	7	6
1076	2.911	12-R14016-7	90	24	63	7	6
1138	3.030	12-R13722-7	90	23	62	7	6
1295	3.874	12-R14032-7	98	25	57	7	6
1575	4.432	15-R13446-7	90	26	59	7	8
1675	4.737	15-R13446-8	90	27	61	8	8
1696	4.845	15-R14133-7	91	29	57	7	8
1769	4.914	15-R13446-10	90	28	62	10	8
1820	5.266	15-R14133-8	91	30	59	8	8
1858	5.340	15-R14133-10	91	31	61	10	8
1921	6.959	15-R15234-7	93	32	47	7	8
2166	7.969	15-R15234-8	94	33	48	8	8
2285	8.181	15-R15234-10	94	34	51	10	8
8.5" SP							
207	.753	10-R12213-6	88	18	89	6	5
450	1.032	10-R11527-6	87	17	92	6	5
563	1.419	12-R11527-7	87	20	78	7	6
622	1.593	10-R12227-6	89	19	78	6	5
8.5" SP *(continued)*							
778	1.982	12-R12327-7	88	21	79	7	6
940	2.456	12-R13032-7	89	22	72	7	6
1071	2.801	12-R14016-7	90	24	66	7	6
1078	2.932	12-R13722-7	90	23	66	7	6
1253	3.760	12-R14032-7	97	25	60	7	6
1508	4.216	15-R13446-7	91	26	62	7	8
1610	4.522	15-R13446-8	90	27	65	8	8
1635	4.650	15-R14133-7	92	29	60	7	8
1686	4.677	15-R13446-10	90	28	66	10	8
1743	5.030	15-R14133-8	91	30	62	8	8
1768	5.042	15-R14133-10	91	31	65	10	8
1858	6.694	15-R15234-7	93	32	49	7	8
2013	7.771	15-R16422-7	93	38	49	7	8
2092	7.675	15-R15234-8	94	33	51	8	8
2164	8.423	15-R16422-8	94	39	51	8	8
2209	7.865	15-R15234-10	93	34	54	10	8
2274	8.594	15-R16422-10	94	40	51	10	8
9.0" SP							
151	.679	10-R12213-6	88	18	95	6	5
351	.826	10-R11527-6	86	17	97	6	5
470	1.269	12-R11527-7	87	20	94	7	6
589	1.544	10-R12227-6	88	19	83	6	5
721	1.887	12-R12327-7	88	21	84	7	6
906	2.354	12-R13032-7	88	22	76	7	6
952	2.676	12-R14016-7	89	24	70	7	6
1078	2.932	12-R13722-7	90	23	70	7	6
1203	3.623	12-R14032-7	96	25	64	7	6
1437	3.995	15-R13446-7	92	26	66	7	8
1540	4.299	15-R13446-8	91	27	69	8	8
1570	4.450	15-R14133-7	92	29	64	7	8
1598	4.427	15-R13446-10	90	28	70	10	8
1663	4.787	15-R14133-8	91	30	66	8	8
1677	4.753	15-R14133-10	91	31	68	10	8
1796	6.421	15-R15234-7	93	32	52	7	8
1960	7.565	15-R16422-7	93	38	52	7	8
2021	7.335	15-R15234-8	93	33	54	8	8
2084	7.922	15-R15550-7	93	35	50	7	8
2122	8.204	15-R16422-8	94	39	54	8	8
2137	7.548	15-R15234-10	93	34	57	10	8
2227	8.386	15-R16422-10	94	40	54	10	8
2324	8.893	15-R15550-8	96	36	52	8	8
2516	8.911	15-R15550-10	96	37	52	10	8
9.5" SP							
549	1.476	10-R12227-6	88	19	87	6	5
655	1.777	12-R12327-7	88	21	88	7	6
868	2.248	12-R13032-7	88	22	81	7	6
878	2.516	12-R14016-7	89	24	74	7	6
955	2.648	12-R13722-7	89	23	74	7	6
1149	3.471	12-R14032-7	95	25	67	7	6
1359	3.769	15-R13446-7	93	26	70	7	8
1462	4.065	15-R13446-8	91	27	73	8	8
1500	4.245	15-R14133-7	93	29	68	7	8
1502	4.137	15-R13446-10	90	28	74	10	8
1577	4.535	15-R14133-8	91	30	70	8	8
1594	4.490	15-R14133-10	91	31	73	10	8
1733	6.148	15-R15234-7	93	32	55	7	8
1905	7.352	15-R16422-7	92	38	55	7	8
1950	6.982	15-R15234-8	93	33	57	8	8
2037	7.704	15-R15550-7	93	35	52	7	8
2062	7.226	15-R15234-10	94	34	61	10	8
2078	7.980	15-R16422-8	93	39	56	8	8
2176	8.167	15-R16422-10	94	40	57	10	8
2271	8.622	15-R15550-8	96	36	55	8	8
2447	8.702	15-R15550-10	96	37	55	10	8
10.0" SP							
488	1.316	10-R12227-6	88	19	92	6	5
575	1.640	12-R12327-7	87	21	93	7	6
10.0" SP *(continued)*							
795	2.335	12-R14016-7	89	24	78	7	6
824	2.138	12-R13032-7	88	22	85	7	6
887	2.483	12-R13722-7	88	23	77	7	6
1098	3.329	12-R14032-7	94	25	71	7	6
1265	3.540	15-R13446-7	94	26	73	7	8
1357	3.806	15-R13446-8	91	27	76	8	8
1397	3.831	15-R13446-10	90	28	78	10	8
1424	4.046	15-R14133-7	93	29	71	7	8
1485	4.274	15-R14133-8	91	30	73	8	8
1508	4.231	15-R14133-10	91	31	76	10	8
1667	5.874	15-R15234-7	93	32	58	7	8
1849	7.130	15-R16422-7	92	38	58	7	8
1875	6.630	15-R15234-8	93	33	60	8	8
1983	6.899	15-R15234-10	94	34	64	10	8
1989	7.484	15-R15550-7	93	35	55	7	8
2030	7.748	15-R16422-8	93	39	59	8	8
2119	7.932	15-R16422-10	93	40	60	10	8
2216	8.347	15-R15550-8	95	36	58	8	8
2276	9.279	15-R16550-7	95	41	50	7	8
2377	8.484	15-R15550-10	95	37	58	10	8
2572	10.454	15-R16550-8	96	42	50	8	8
2800	10.845	15-R16550-10	98	43	50	10	8
11.0" SP							
679	1.885	12-R13032-7	87	22	93	7	6
718	2.143	12-R13722-7	88	23	85	7	6
1015	3.089	12-R14032-7	92	25	78	7	6
1041	3.036	15-R13446-7	96	26	81	7	8
1110	3.206	15-R13446-8	92	27	84	8	8
1148	3.189	15-R13446-10	90	28	85	10	8
1248	3.608	15-R14133-7	95	29	78	7	8
1282	3.719	15-R14133-8	91	30	80	8	8
1315	3.713	15-R14133-10	91	31	84	10	8
1533	5.343	15-R15234-7	93	32	64	7	8
1714	5.930	15-R15234-8	93	33	66	8	8
1736	6.663	15-R16422-7	92	38	64	7	8
1809	6.222	15-R15234-10	94	34	70	10	8
1886	7.043	15-R15550-7	92	35	61	7	8
1905	7.243	15-R16422-8	94	39	65	8	8
1918	7.218	15-R16422-10	93	40	66	10	8
2096	7.781	15-R15550-8	95	36	63	8	8
2203	8.988	15-R16550-7	94	41	55	7	8
2226	8.016	15-R15550-10	94	37	63	10	8
2483	9.918	15-R16550-8	96	42	56	8	8
2656	10.312	15-R16550-10	98	43	55	10	8
12.0" SP							
371	1.495	12-R14016-7	88	24	94	7	6
531	1.731	12-R13722-7	88	23	93	7	6
785	2.434	15-R13446-7	93	26	88	7	8
787	2.474	15-R13446-10	88	28	93	10	8
821	2.459	15-R13446-8	89	27	92	8	8
919	2.832	12-R14032-7	90	25	85	7	6
1025	3.052	15-R14133-7	96	29	85	7	8
1051	3.133	15-R14133-8	90	30	88	8	8
1084	3.246	15-R14133-10	92	31	91	10	8
1398	4.844	15-R15234-7	94	32	70	7	8
1531	5.280	15-R15234-8	93	33	72	8	8
1584	5.440	15-R15234-10	95	34	77	10	8
1605	6.145	15-R16422-7	92	38	70	7	8
1704	6.467	15-R16422-10	93	40	72	10	8
1759	6.680	15-R16422-8	95	39	71	8	8
1771	6.603	15-R15550-7	92	35	66	7	8
1945	7.164	15-R15550-8	95	36	69	8	8
2057	7.471	15-R15550-10	95	37	69	10	8
2123	8.735	15-R16550-7	94	41	60	7	8
2321	9.413	15-R16550-8	95	42	61	8	8
2506	9.861	15-R16550-10	97	43	60	10	8
13.0" SP							
615	2.042	15-R14133-7	91	29	92	7	8
688	2.268	15-R14133-8	89	30	95	8	8
779	2.520	12-R14032-7	90	25	92	7	6
1236	4.293	15-R15234-7	94	32	76	7	8
1318	4.586	15-R15234-8	93	33	78	8	8
1339	4.677	15-R15234-10	95	34	83	10	8

Radial Wheels 3600 RPM 60 Hz

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
13.0" SP *(continued)*							
1426	5.464	15-R16422-7	92	38	76	7	8
1487	5.698	15-R16422-10	93	40	78	10	8
1545	5.917	15-R16422-8	96	39	77	8	8
1771	6.603	15-R15550-7	92	35	72	7	8
1779	6.524	15-R15550-8	95	36	75	8	8
1873	6.883	15-R15550-10	96	37	75	10	8
2035	8.445	15-R16550-7	94	41	65	7	8
2173	8.927	15-R16550-8	94	42	66	8	8
2360	9.419	15-R16550-10	96	43	66	10	8
14.0" SP							
541	1.905	12-R14032-7	92	25	99	7	6
984	3.556	15-R15234-7	93	32	82	7	8
1040	3.777	15-R15234-8	92	33	84	8	8
1089	4.003	15-R15234-10	93	34	89	10	8
1178	4.602	15-R16422-7	92	38	81	7	8
1225	4.842	15-R16422-10	94	40	84	10	8
1233	4.909	15-R16422-8	97	39	83	8	8
1473	5.608	15-R15550-7	91	35	77	7	8
1586	5.859	15-R15550-8	95	36	81	8	8
1678	6.255	15-R15550-10	96	37	81	10	8
1934	8.093	15-R16550-7	93	41	70	7	8
2060	8.503	15-R16550-8	93	42	71	8	8
2223	9.009	15-R16550-10	94	43	71	10	8
15.0" SP							
676	2.814	15-R15234-8	90	33	90	8	8
687	2.750	15-R15234-7	91	32	87	7	8
731	3.169	15-R15234-10	90	34	96	10	8
817	3.583	15-R16422-7	91	38	87	7	8
836	3.773	15-R16422-8	94	39	89	8	8
855	3.770	15-R16422-10	91	40	90	10	8
1257	5.608	15-R15550-7	91	35	83	7	8
1364	5.136	15-R15550-8	96	36	87	8	8
1457	5.547	15-R15550-10	97	37	86	10	8
1808	7.605	15-R16550-7	93	41	75	7	8
1936	8.050	15-R16550-8	92	42	76	8	8
2074	8.547	15-R16550-10	93	43	76	10	8
16.0" SP							
319	2.035	15-R15234-8	88	33	96	8	8
421	2.106	15-R15234-7	88	32	93	7	8
462	2.500	15-R16422-7	89	38	93	7	8
523	2.791	15-R16422-8	90	39	95	8	8
526	3.114	15-R16422-10	89	40	96	10	8
16.0" SP *(continued)*							
1029	4.273	15-R15550-7	90	35	88	7	8
1122	4.352	15-R15550-8	94	36	92	8	8
1187	4.667	15-R15550-10	97	37	92	10	8
1666	7.077	15-R165550-7	93	41	80	7	8
1796	7.549	15-R165550-8	92	42	81	8	8
1909	8.005	15-R165550-10	93	43	81	10	8
17.0" SP							
148	1.658	15-R15234-7	87	32	99	7	8
154	1.737	15-R16422-7	88	38	99	7	8
807	3.613	15-R15550-10	95	37	98	10	8
1504	6.526	15-R16550-7	91	41	85	7	8
1612	6.957	15-R16550-8	92	42	86	8	8
1719	7.338	15-R16550-10	92	43	86	10	8
18.0" SP							
1307	5.868	15-R16550-7	96	41	90	7	8
1396	6.232	15-R16550-8	96	42	91	8	8
1497	6.566	15-R16550-10	92	43	91	10	8
19.0" SP							
1029	4.869	15-R16550-7	100	41	95	7	8
1132	5.266	15-R16550-8	100	42	96	8	8
1219	5.601	15-R16550-10	92	43	96	10	8

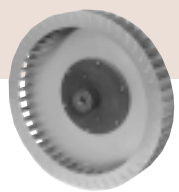
Backward Curve 3600 RPM 60 Hz

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
1.0"SP							
184	.174	8-B07025-3	85	72	30	3	4
219	.226	8-B08125-3	86	74	22	3	4
225	.170	8-B07025-4	84	73	33	4	4
289	.285	8-B08125-4	84	75	24	4	4
1.5"SP							
161	.167	8-B07025-3	85	72	45	3	4
198	.163	8-B07025-4	84	73	49	4	4
202	.221	8-B08125-3	86	74	33	3	4
264	.273	8-B08125-4	84	75	36	4	4
368	.311	9-B08725-4	85	76	28	4	4
383	.319	9-B08725-5	85	77	29	5	4
449	.487	9-B10127-4	86	78	22	4	4
494	.517	9-B10127-5	86	79	23	5	4
571	.836	10-B10127-6	87	80	24	6	5
687	1.151	10-B10727-6	89	81	20	6	5
2.0"SP							
130	.158	8-B07025-3	84	72	60	3	4
161	.150	8-B07025-4	84	73	65	4	4
187	.216	8-B08125-3	86	74	44	3	4
238	.258	8-B08125-4	84	75	48	4	4
344	.299	9-B08725-4	85	76	37	4	4
358	.305	9-B08725-5	85	77	39	5	4
425	.468	9-B10127-4	86	78	29	4	4
469	.500	9-B10127-5	86	79	31	5	4
542	.809	10-B10127-6	86	80	32	6	5
659	1.116	10-B10727-6	88	81	27	6	5
2.5"SP							
97	.145	8-B07025-3	85	72	75	3	4
112	.134	8-B07025-4	84	73	81	4	4
163	.207	8-B08125-3	86	74	55	3	4
209	.242	8-B08125-4	84	75	61	4	4
319	.285	9-B08725-4	85	76	46	4	4
333	.290	9-B08725-5	85	77	49	5	4
2.5" SP *(continued)*							
400	.447	9-B10127-4	86	78	36	4	4
444	.484	9-B10127-5	86	79	39	5	4
514	.799	10-B10127-6	86	80	41	6	5
632	1.092	10-B10727-6	88	81	34	6	5
1085	2.190	12-B13031-7	91	82	24	7	6
3.0"SP							
36	.114	8-B07025-4	84	73	98	4	4
46	.120	8-B07025-3	85	72	90	3	4
133	.194	8-B08125-3	85	74	66	3	4
171	.220	8-B08125-4	84	75	73	4	4
293	.269	9-B08725-4	85	76	56	4	4
306	.273	9-B08725-5	85	77	59	5	4
373	.425	9-B10127-4	86	78	44	4	4
417	.466	9-B10127-5	86	79	46	5	4
484	.782	10-B10127-6	86	80	49	6	5
605	1.067	10-B10727-6	88	81	41	6	5
1050	2.136	12-B13031-7	91	82	28	7	6
1262	2.962	12-B14132-7	94	83	23	7	6
3.5"SP							
99	.180	8-B08125-3	85	74	77	3	4
120	.193	8-B08125-4	84	75	85	4	4
266	.251	9-B08725-4	85	76	65	4	4
277	.256	9-B08725-5	85	77	68	5	4
345	.401	9-B10127-4	86	78	51	4	4
382	.440	9-B10127-5	86	79	54	5	4
449	.754	10-B10127-6	86	80	57	6	5
576	1.038	10-B10727-6	87	81	47	6	5
1014	2.081	12-B13031-7	90	82	33	7	6
1231	2.901	12-B14132-7	94	83	27	7	6
4.0"SP							
42	.160	8-B08125-4	83	75	97	4	4
52	.158	8-B08125-3	85	74	88	3	4
232	.229	9-B08725-4	85	76	74	4	4
238	.233	9-B08725-5	85	77	78	5	4
318	.379	9-B10127-4	86	78	58	4	4
351	.411	9-B10127-5	86	79	62	5	4
402	.698	10-B10127-6	86	80	65	6	5
545	1.004	10-B10727-6	87	81	54	6	5
979	2.027	12-B13031-7	90	82	38	7	6
1201	2.851	12-B14132-7	93	83	31	7	6
4.5"SP							
164	.189	9-B08725-4	85	76	84	4	4
174	.193	9-B08725-5	85	77	88	5	4
292	.356	9-B10127-4	86	78	65	4	4
326	.380	9-B10127-5	86	79	70	5	4
362	.643	10-B10127-6	83	80	73	6	5
511	.964	10-B10727-6	86	81	61	6	5
945	1.974	12-B13031-7	90	82	42	7	6
1171	2.805	12-B14132-7	93	83	35	7	6
5.0"SP							
85	.147	9-B08725-5	86	77	98	5	4
89	.150	9-B08725-4	85	76	93	4	4
254	.322	9-B10127-4	86	78	73	4	4
294	.348	9-B10127-5	86	79	77	5	4
326	.596	10-B10127-6	84	80	81	6	5
471	.912	10-B10727-6	84	81	68	6	5
912	1.921	12-B13031-7	89	82	47	7	6
1140	2.756	12-B14132-7	92	83	39	7	6
5.5"SP							
203	.279	9-B10127-4	86	78	80	4	4
226	.314	9-B10127-5	86	79	85	5	4
271	.530	10-B10127-6	83	80	89	6	5
437	.872	10-B10727-6	84	81	74	6	5

Backward Curve 3600 RPM 60 Hz

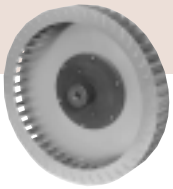
CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
5.5" SP *(continued)*							
879	1.869	12-B13031-7	89	82	52	7	6
1110	2.706	12-B14132-7	92	83	43	7	6
6.0"SP							
155	.247	9-B10127-4	86	78	87	4	4
168	.274	9-B10127-4	86	79	93	4	4
172	.435	10-B10127-6	83	80	97	6	5
403	.836	10-B10727-6	84	81	81	6	5
847	1.817	12-B13031-7	88	82	57	7	6
1079	2.653	12-B14132-7	91	83	47	7	6
6.5"SP							
63	.204	9-B10127-4	86	78	95	4	4
352	.747	10-B10727-6	84	81	88	6	5
817	1.769	12-B13031-7	88	82	61	7	6
1047	2.597	12-B14132-7	91	83	50	7	6
1394	3.023	15-B14132-10	86	86	53	10	8
7.0"SP							
270	.633	10-B10727-6	84	81	95	6	5
789	1.722	12-B13031-7	88	82	66	7	6
1015	2.539	12-B14132-7	90	83	54	7	6
1308	2.850	15-B14132-7	87	84	51	7	8
1320	2.915	15-B14132-10	86	86	57	10	8
1338	2.900	15-B14132-8	86	85	53	8	8
7.5"SP							
757	1.670	12-B13031-7	88	82	71	7	6
983	2.479	12-B14132-7	90	83	58	7	6
1247	2.812	15-B14132-10	85	86	61	10	8
1253	2.763	15-B14132-7	87	84	54	7	8
1272	2.790	15-B14132-8	85	85	57	8	8
1831	4.992	15-B15247-10	91	89	52	10	8
8.0"SP							
720	1.612	12-B13031-7	88	82	76	7	6
950	2.416	12-B14132-7	90	83	62	7	6
1186	2.726	15-B14132-10	87	86	65	10	8
1195	2.671	15-B14132-7	87	84	58	7	8
1204	2.683	15-B14132-8	85	85	61	8	8
1598	4.480	15-B15247-7	90	87	50	7	8
1674	4.795	15-B15247-8	91	88	52	8	8
1761	4.844	15-B15247-10	91	89	55	10	8
8.5"SP							
673	1.542	12-B13031-7	88	82	80	7	6
919	2.356	12-B14132-7	90	83	66	7	6
1128	2.644	15-B14132-10	87	86	69	10	8
1134	2.574	15-B14132-7	87	84	62	7	8
1138	2.610	15-B14132-8	85	85	64	8	8
1550	4.347	15-B15247-7	89	87	54	7	8
1620	4.632	15-B15247-8	90	88	56	8	8
1699	4.705	15-B15247-10	90	89	58	10	8
9.0"SP							
617	1.457	12-B13031-7	88	82	85	7	6
886	2.290	12-B14132-7	89	83	70	7	6
1064	2.558	15-B14132-10	87	86	73	10	8
1067	2.466	15-B14132-7	84	84	65	7	8
1069	2.526	15-B14132-8	85	85	68	8	8
1499	4.202	15-B15247-7	89	87	57	7	8
1569	4.453	15-B15247-8	90	88	59	8	8
1634	4.557	15-B15247-10	90	89	62	10	8
9.5"SP							
536	1.330	12-B13031-7	88	82	90	7	6
850	2.213	12-B14132-7	89	83	73	7	6
994	2.467	15-B14132-10	87	86	77	10	8
995	2.351	15-B14132-7	84	84	69	7	8
995	2.428	15-B14132-8	84	85	72	8	8
1439	4.013	15-B15247-7	89	87	60	7	8
1515	4.269	15-B15247-8	89	88	62	8	8
1566	4.397	15-B15247-10	89	89	65	10	8
2244	7.781	15-B16550-10	94	95	51	10	8
10.0"SP							
437	1.189	12-B13031-7	88	82	94	7	6
810	2.109	12-B14132-7	89	83	78	7	6
913	2.367	15-B14132-10	87	86	81	10	8
916	2.315	15-B14132-8	84	85	76	8	8
917	2.226	15-B14132-7	84	84	72	7	8
1374	3.810	15-B15247-7	88	87	63	7	8
1457	4.081	15-B15247-8	89	88	65	8	8
1493	4.224	15-B15247-10	89	89	69	10	8
1896	6.861	15-B16550-7	95	93	51	7	8
2094	7.476	15-B16550-8	94	94	52	8	8
2193	7.620	15-B16550-10	93	95	54	10	8
11.0"SP							
674	2.106	15-B14132-10	86	86	90	10	8
713	1.871	12-B14132-7	89	83	85	7	6
726	1.925	15-B14132-7	84	84	80	7	8
741	2.011	15-B14132-8	84	85	83	8	8
1229	3.398	15-B15247-7	88	87	69	7	8
1320	3.678	15-B15247-8	88	88	72	8	8
1324	3.769	15-B15247-10	88	89	76	10	8
1821	6.603	15-B16550-7	96	93	56	7	8
1992	7.169	15-B16550-8	93	94	57	8	8
2086	7.303	15-B16550-10	93	95	59	10	8
12.0"SP							
293	1.649	15-B14132-10	86	86	98	10	8
12.0" SP *(continued)*							
483	1.503	15-B14132-7	84	84	87	7	8
484	1.554	15-B14132-8	84	85	91	8	8
561	1.609	12-B14132-7	89	83	93	7	6
1045	2.969	15-B15247-7	87	87	76	7	8
1112	3.185	15-B15247-8	87	88	79	8	8
1119	3.248	15-B15247-10	87	89	83	10	8
1738	6.303	15-B16550-7	97	93	61	7	8
1890	6.819	15-B16550-8	93	94	62	8	8
1973	6.992	15-B16550-10	92	95	64	10	8
13.0"SP							
165	1.100	15-B14132-8	84	85	98	8	8
251	1.139	15-B14132-7	84	84	94	7	8
828	2.504	15-B15247-7	87	87	82	7	8
829	2.610	15-B15247-10	87	89	89	10	8
863	2.647	15-B15247-8	87	88	85	8	8
1641	5.934	15-B16550-7	97	93	66	7	8
1779	6.439	15-B16550-8	92	94	68	8	8
1850	6.647	15-B16550-10	91	95	70	10	8
14.0"SP							
509	2.157	15-B15247-10	87	89	96	10	8
568	1.975	15-B15247-7	87	87	88	7	8
570	2.036	15-B15247-8	87	88	92	8	8
1532	5.543	15-B16550-7	98	93	71	7	8
1655	6.025	15-B16550-8	92	94	73	8	8
1710	6.251	15-B16550-10	91	95	75	10	8
15.0"SP							
225	1.353	15-B15247-8	87	88	98	8	8
306	1.440	15-B15247-7	87	87	94	7	8
1396	5.114	15-B16550-7	98	93	76	7	8
1490	5.503	15-B16550-8	90	94	78	8	8
1537	5.755	15-B16550-10	90	95	81	10	8
16.0"SP							
1213	4.608	15-B16550-7	95	93	81	7	8
1296	4.910	15-B16550-8	92	94	83	8	8
1341	5.189	15-B16550-10	90	95	86	10	8
17.0"SP							
1003	4.026	15-B16550-7	95	93	86	7	8
1071	4.267	15-B16550-8	95	94	88	8	8
1111	4.506	15-B16550-10	89	95	91	10	8
18.0"SP							
751	3.321	15-B16550-7	93	93	91	7	8
789	3.489	15-B16550-8	97	94	93	8	8
801	3.631	15-B16550-10	89	95	97	10	8
19.0"SP							
312	2.170	15-B16550-8	88	94	99	8	8
409	2.388	15-B16550-7	94	93	96	7	8

Forward Curve 3600 RPM 60 Hz



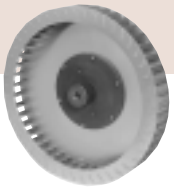
CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
1.0" SP							
376	.417	8-F07620-3	83	47	20	3	4
592	.884	8-F07620-4	83	48	20	4	4
1.5" SP							
359	.408	8-F07620-3	83	47	30	3	4
565	.846	8-F07620-4	83	48	30	4	4
2.0" SP							
339	.397	8-F07620-3	82	47	40	3	4
537	.803	8-F07620-4	82	48	40	4	4
2.0" SP *(continued)*							
762	1.873	9-F10020-4	88	49	23	4	4
894	2.293	9-F10020-5	86	50	23	5	4
2.5" SP							
315	.382	8-F07620-3	82	47	50	3	4
503	.746	8-F07620-4	82	48	50	4	4
743	1.809	9-F10020-4	87	49	29	4	4

Forward Curve 3600 RPM 60 Hz



CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
2.5" SP *(continued)*							
872	2.231	9-F10020-5	85	50	29	5	4
1253	4.281	10-F10020-6	90	51	27	6	5
1299	4.659	10-F10520-6	90	52	24	6	5
3.0" SP							
288	.363	8-F07620-3	84	47	60	3	4
468	.686	8-F07620-4	82	48	60	4	4
722	1.747	9-F10020-4	87	49	35	4	4
849	2.165	9-F10020-5	85	50	35	5	4
1225	4.145	10-F10020-6	90	51	32	6	5
1273	4.555	10-F10520-6	90	52	29	6	5
3.5" SP							
255	.336	8-F07620-3	83	47	70	3	4
428	.623	8-F07620-4	82	48	70	4	4
699	1.687	9-F10020-4	87	49	41	4	4
826	2.091	9-F10020-5	85	50	41	5	4
1197	4.006	10-F10020-6	90	51	37	6	5
1247	4.446	10-F10520-6	90	52	34	6	5
2240	10.199	12-F12220-7	93	53	25	7	6
2372	10.814	12-F12224-7	95	54	23	7	6
4.0" SP							
216	.297	8-F07620-3	83	47	80	3	4
384	.554	8-F07620-4	82	48	80	4	4
674	1.628	9-F10020-4	86	49	47	4	4
802	2.015	9-F10020-5	85	50	46	5	4
1167	3.863	10-F10020-6	89	51	43	6	5
1220	4.332	10-F10520-6	90	52	38	6	5
2205	10.043	12-F12220-7	93	53	28	7	6
2342	10.653	12-F12224-7	95	54	26	7	6
2413	12.256	12-F13420-7	96	55	24	7	6
4.5" SP							
343	.486	8-F07620-4	83	48	90	4	4
648	1.570	9-F10020-4	86	49	53	4	4
776	1.937	9-F10020-5	85	50	52	5	4
1139	3.711	10-F10020-6	89	51	48	6	5
1195	4.210	10-F10520-6	90	52	43	6	5
2169	9.880	12-F12220-7	93	53	32	7	6
2312	10.489	12-F12224-7	94	54	30	7	6
2385	12.116	12-F13420-7	95	55	27	7	6
2505	12.802	12-F13430-7	97	56	26	7	6
5.0" SP							
619	1.521	9-F10020-4	86	49	61	4	4
749	1.857	9-F10020-5	86	50	58	5	4
1113	3.547	10-F10020-6	89	51	53	6	5
1174	4.078	10-F10520-6	89	52	48	6	5
2132	9.712	12-F12220-7	92	53	35	7	6
2280	10.321	12-F12224-7	94	54	33	7	6
2357	11.975	12-F13420-7	95	55	30	7	6
2468	12.588	12-F13430-7	96	56	28	7	6
5.5"SP							
589	1.465	9-F10020-4	85	49	64	4	4
719	1.774	9-F10020-5	85	50	64	5	4
1087	3.381	10-F10020-6	89	51	59	6	5
1152	3.944	10-F10520-6	89	52	53	6	5
2095	9.538	12-F12220-7	93	53	39	7	6
2248	10.149	12-F12224-7	94	54	36	7	6
2328	11.832	12-F13420-7	95	55	33	7	6
2432	12.376	12-F13430-7	96	56	31	7	6
6.0" SP							
557	1.394	9-F10020-4	85	49	70	4	4
687	1.687	9-F10020-5	85	50	70	5	4
1058	3.214	10-F10020-6	88	51	64	6	5
1129	3.806	10-F10520-6	89	52	58	6	5
2058	9.352	12-F12220-7	92	53	42	7	6
2215	9.973	12-F12224-7	94	54	40	7	6
2299	11.687	12-F13420-7	95	55	36	7	6
2398	12.177	12-F13430-7	96	56	34	7	6
6.5" SP							
528	1.291	9-F10020-4	85	49	76	4	4
655	1.595	9-F10020-5	84	50	75	5	4
6.5" SP *(continued)*							
1027	3.045	10-F10020-6	88	51	70	6	5
1105	3.665	10-F10520-6	89	52	63	6	5
2021	9.155	12-F12220-7	92	53	46	7	6
2181	9.792	12-F12224-7	93	54	43	7	6
2270	11.540	12-F13420-7	95	55	39	7	6
2370	12.016	12-F13430-7	96	56	37	7	6
7.0" SP							
494	1.178	9-F10020-4	84	49	82	4	4
622	1.503	9-F10020-5	84	50	81	5	4
993	2.874	10-F10020-6	88	51	75	6	5
1078	3.520	10-F10520-6	88	52	67	6	5
1983	8.954	12-F12220-7	92	53	49	7	6
2146	9.599	12-F12224-7	93	54	46	7	6
2241	11.391	12-F13420-7	95	55	42	7	6
2341	11.852	12-F13430-7	95	56	40	7	6
7.5" SP							
452	1.054	9-F10020-4	84	49	88	4	4
585	1.397	9-F10020-5	84	50	87	5	4
956	2.700	10-F10020-6	87	51	80	6	5
1049	3.370	10-F10520-6	88	52	72	6	5
1944	8.747	12-F12220-7	92	53	53	7	6
2110	9.397	12-F12224-7	93	54	50	7	6
2211	11.242	12-F13420-7	95	55	45	7	6
2312	11.683	12-F13430-7	95	56	43	7	6
8.0"SP							
374	.891	9-F10020-4	84	49	93	4	4
537	1.269	9-F10020-5	86	50	93	5	4
914	2.521	10-F10020-6	87	51	86	6	5
1018	3.213	10-F10520-6	88	52	77	6	5
1904	8.534	12-F12220-7	91	53	56	7	6
2072	9.190	12-F12224-7	93	54	53	7	6
2187	11.133	12-F13420-7	95	55	47	7	6
2282	11.510	12-F13430-7	95	56	45	7	6
8.5"SP							
460	1.076	9-F10020-5	86	50	99	5	4
864	2.351	10-F10020-6	87	51	91	6	5
982	3.046	10-F10520-6	88	52	82	6	5
1863	8.316	12-F12220-7	91	53	60	7	6
2033	8.977	12-F12224-7	93	54	56	7	6
2162	11.018	12-F13420-7	95	55	50	7	6
2252	11.333	12-F13430-7	95	56	48	7	6
9.0"SP							
796	2.144	10-F10020-6	86	51	96	6	5
940	2.865	10-F10520-6	87	52	87	6	5
1821	8.092	12-F12220-7	91	53	63	7	6
1993	8.759	12-F12224-7	92	54	59	7	6
2136	10.899	12-F13420-7	95	55	53	7	6
2220	11.151	12-F13430-7	94	56	51	7	6
3517	19.938	15-F15020-10	95	59	50	10	8
3592	23.717	15-F15020-7	98	57	49	7	8
3996	25.498	15-F15020-8	98	58	48	8	8
9.5"SP							
883	2.640	10-F10520-6	86	52	91	6	5
1778	7.860	12-F12220-7	91	53	67	7	6
1951	8.534	12-F12224-7	92	54	63	7	6
2110	10.773	12-F13420-7	94	55	56	7	6
2188	10.963	12-F13430-7	94	56	54	7	6
3471	19.745	15-F15020-10	95	59	53	10	8
3549	23.389	15-F15020-7	98	57	51	7	8
3948	25.168	15-F15020-8	98	58	51	8	8
10.0"SP							
804	2.398	10-F10520-6	86	52	96	6	5
1734	7.621	12-F12220-7	91	53	70	7	6
10.0" SP *(continued)*							
1907	8.301	12-F12224-7	92	54	66	7	6
2082	10.641	12-F13420-7	94	55	59	7	6
2155	10.770	12-F13430-7	94	56	57	7	6
3424	19.544	15-F15020-10	95	59	56	10	8
3504	23.064	15-F15020-7	98	57	54	7	8
3892	24.813	15-F15020-8	98	58	54	8	8
11.0"SP							
1642	7.118	12-F12220-7	90	53	77	7	6
1814	7.809	12-F12224-7	91	54	73	7	6
2023	10.353	12-F13420-7	94	55	65	7	6
2085	10.364	12-F13430-7	94	56	62	7	6
3321	19.113	15-F15020-10	95	59	61	10	8
3411	22.404	15-F15020-7	98	57	60	7	8
3557	26.860	15-F16420-7	100	66	54	7	8
3762	23.272	15-F15030-7	99	60	53	7	8
3777	24.083	15-F15020-8	97	58	59	8	8
3934	27.232	15-F16420-10	97	68	52	10	8
4153	26.809	15-F15030-10	97	62	52	10	8
4386	29.113	15-F15030-8	99	61	51	8	8
12.0"SP							
1550	6.593	12-F12220-7	87	53	84	7	6
1709	7.271	12-F12224-7	90	54	79	7	6
2010	9.926	12-F13430-7	93	56	68	7	6
3188	18.612	15-F15020-10	95	59	67	10	8
3311	21.704	15-F15020-7	97	57	65	7	8
3467	26.239	15-F16420-7	100	66	59	7	8
3654	23.321	15-F15020-8	97	58	64	8	8
3654	22.457	15-F15030-7	98	60	58	7	8
3844	26.768	15-F16420-10	97	68	56	10	8
4028	29.673	15-F16420-8	99	67	57	8	8
4071	26.097	15-F15030-10	96	62	56	10	8
4264	28.246	15-F15030-8	99	61	55	8	8
13.0"SP							
1438	5.989	12-F12220-7	87	53	91	7	6
1588	6.670	12-F12224-7	89	54	86	7	6
1886	9.646	12-F13420-7	93	55	77	7	6
1928	9.449	12-F13430-7	93	56	74	7	6
3042	18.023	15-F15020-10	95	59	72	10	8
3204	20.953	15-F15020-7	97	57	70	7	8
3372	25.587	15-F16420-7	99	66	64	7	8
3524	22.532	15-F15020-8	97	58	70	8	8
3538	21.612	15-F15030-7	98	60	63	7	8
3738	26.257	15-F16420-10	97	68	61	10	8
3932	29.004	15-F16420-8	98	67	62	8	8
3980	25.373	15-F15030-10	96	62	61	10	8
4135	27.309	15-F15030-8	99	61	60	8	8
14.0"SP							
1220	5.022	12-F12220-7	87	53	98	7	6
1437	5.909	12-F12224-7	89	54	93	7	6
1801	9.186	12-F13420-7	93	55	83	7	6
1838	8.902	12-F13430-7	92	56	79	7	6
2882	17.322	15-F15020-10	95	59	78	10	8
3088	20.130	15-F15020-7	97	57	76	7	8
3271	24.897	15-F16420-7	99	66	68	7	8
3384	21.719	15-F15020-8	96	58	75	8	8
3409	20.719	15-F15030-7	97	60	68	7	8
3601	25.657	15-F16420-10	97	68	66	10	8
3814	28.277	15-F16420-8	98	67	67	8	8
3846	24.721	15-F15030-10	96	62	66	10	8
4000	26.272	15-F15030-8	98	61	64	8	8
15.0"SP							
1735	8.290	12-F13430-7	92	56	85	7	6
2711	16.475	15-F15020-10	94	59	84	10	8
2960	19.226	15-F15020-7	96	57	81	7	8
3163	24.163	15-F16420-7	99	66	73	7	8
3231	20.809	15-F15020-8	96	58	80	8	8
3271	19.794	15-F15030-7	97	60	73	7	8
3456	24.984	15-F16420-10	97	68	70	10	8
3688	27.506	15-F16420-8	98	67	71	8	8
3698	23.979	15-F15030-10	95	62	70	10	8
3855	25.183	15-F15030-8	98	61	69	8	8

Forward Curve 3600 RPM 60 Hz



CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
16.0"SP							
1525	7.560	12-F13420-7	88	55	95	7	6
1612	7.660	12-F13430-7	88	56	91	7	6
2507	15.418	15-F15020-10	90	59	89	10	8
2813	18.216	15-F15020-7	89	57	87	7	8
3045	23.370	15-F16420-7	99	66	78	7	8
3060	19.764	15-F15020-8	90	58	86	8	8
3122	18.828	15-F15030-7	96	60	78	7	8
3302	24.223	15-F16420-10	97	68	75	10	8
3545	23.103	15-F15030-10	95	62	75	10	8
3551	26.697	15-F16420-8	98	67	76	8	8
3697	24.028	15-F15030-8	97	61	74	8	8
17.0"SP							
1448	6.909	12-F13430-7	89	56	96	7	6
2240	13.987	15-F15020-10	90	59	95	10	8
2638	17.077	15-F15020-7	89	57	92	7	8
2862	18.511	15-F15020-8	90	58	91	8	8

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
17.0" SP *(continued)*							
2960	17.885	15-F15030-7	95	60	83	7	8
3394	22.053	15-F15030-10	94	62	80	10	8
3518	22.805	15-F15030-8	97	61	78	8	8
18.0"SP							
2405	15.557	15-F15020-7	90	57	98	7	8
2619	16.959	15-F15020-8	91	58	97	8	8
2776	16.825	15-F15030-7	95	60	87	7	8
2967	22.395	15-F16420-10	97	68	85	10	8
3232	24.825	15-F16420-8	97	67	86	8	8
3248	20.840	15-F15030-10	94	62	84	10	8
3315	21.452	15-F15030-8	96	61	83	8	8

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
19.0"SP							
2551	15.529	15-F15030-7	89	60	92	7	8
2594	20.544	15-F16420-7	97	66	93	7	8
2763	21.197	15-F16420-10	97	68	89	10	8
3078	19.480	15-F15030-10	91	62	89	10	8
3086	19.887	15-F15030-8	90	61	87	8	8
20.0"SP							
2235	13.682	15-F15030-7	90	60	97	7	8
2358	18.928	15-F16420-7	92	66	98	7	8
2507	19.736	15-F16420-10	94	68	94	10	8
2817	17.791	15-F15030-8	90	61	92	8	8
2866	17.864	15-F15030-10	91	62	94	10	8
21.0"SP							
2476	15.149	15-F15030-8	91	61	96	8	8
2547	20.277	15-F16420-8	94	67	100	8	8
2550	15.596	15-F15030-10	92	62	99	10	8

Radial Wheels 3000 RPM 50 Hz

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
.5"SP							
183	.114	8-R07025-3	78	96	20	3	4
239	.131	8-R07025-4	78	97	22	4	4
1.0" SP							
157	.111	8-R07025-3	78	96	41	3	4
193	.138	8-R08013-3	79	98	34	3	4
197	.151	8-R08025-3	78	100	31	3	4
204	.120	8-R07025-4	78	97	44	4	4
248	.163	8-R08013-4	80	99	36	4	4
288	.192	8-R08025-4	79	101	33	4	4
356	.294	9-R09026-4	80	102	26	4	4
390	.301	9-R09026-5	81	103	27	5	4
1.5" SP							
126	.105	8-R07025-3	78	96	61	3	4
160	.107	8-R07025-4	78	97	66	4	4
165	.129	8-R08013-3	79	98	51	3	4
177	.147	8-R08025-3	78	100	46	3	4
212	.150	8-R08013-4	79	99	54	4	4
249	.182	8-R08025-4	79	101	50	4	4
328	.274	9-R09026-4	80	102	39	4	4
359	.280	9-R09026-5	81	103	40	5	4
375	.393	9-R10413-4	81	106	31	4	4
383	.383	9-R09626-4	81	104	33	4	4
424	.416	9-R09626-5	82	105	34	5	4
451	.486	9-R10527-4	84	108	28	4	4
499	.531	9-R10527-5	83	109	28	5	4
624	.747	10-R10527-6	84	110	29	6	5
653	.836	10-R11026-6	86	111	27	6	5
2.0 " SP							
81	.089	8-R07025-3	78	96	82	3	4
91	.086	8-R07025-4	78	97	88	4	4
122	.112	8-R08013-3	79	98	68	3	4
154	.141	8-R08025-3	78	100	78	3	4
164	.130	8-R08013-4	79	99	71	4	4
206	.165	8-R08025-4	79	101	66	4	4
300	.251	9-R09026-4	80	102	52	4	4
326	.261	9-R09026-5	81	103	53	5	4
355	.362	9-R09626-4	80	104	44	4	4

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
2.0" SP *(continued)*							
384	.400	9-R10413-5	81	107	44	5	4
393	.391	9-R09626-5	82	105	46	5	4
427	.463	9-R10527-4	83	108	38	4	4
470	.505	9-R10527-5	83	109	37	5	4
578	.714	10-R10527-6	84	110	38	6	5
618	.785	10-R11026-6	85	111	36	6	5
691	.980	10-R11426-6	86	112	31	6	5
759	1.235	10-R12227-6	90	114	27	6	5
930	1.318	12-R11426-7	85	115	31	7	6
1045	1.672	12-R12227-7	89	116	28	7	6
1157	2.009	12-R13032-7	90	117	25	7	6
2.5 " SP							
67	.092	8-R08013-3	79	98	85	3	4
80	.097	8-R08013-4	79	99	89	4	4
114	.127	8-R08025-3	78	100	77	3	4
154	.141	8-R08025-4	79	101	83	4	4
270	.228	9-R09026-4	80	102	65	4	4
294	.243	9-R09026-5	82	103	67	5	4
331	.345	9-R09626-4	80	104	54	4	4
347	.375	9-R10413-5	81	107	55	5	4
357	.365	9-R09626-5	82	105	57	5	4
402	.440	9-R10527-4	81	108	47	4	4
440	.477	9-R10527-5	81	109	47	5	4
533	.669	10-R10527-6	83	110	48	6	5
582	.736	10-R11026-6	83	111	45	6	5
597	.982	10-R12213-6	84	113	38	6	5
660	.924	10-R11426-6	85	112	39	6	5
732	1.194	10-R12227-6	89	114	34	6	5
873	1.249	12-R11426-7	84	115	39	7	6
999	1.598	12-R12227-7	85	116	34	7	6
1109	1.927	12-R13032-7	88	117	31	7	6
1170	2.064	12-R14016-7	87	119	29	7	6
1254	2.220	12-R13722-7	88	118	29	7	6
1301	2.561	12-R14032-7	97	120	26	7	6

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
3.0 " SP							
45	.098	8-R08025-3	79	100	92	3	4
234	.203	9-R09026-4	80	102	78	4	4
251	.217	9-R09026-5	82	103	80	5	4
274	.332	9-R10413-4	80	106	62	4	4
301	.349	9-R10413-5	81	107	66	5	4
305	.325	9-R09626-4	80	104	65	4	4
323	.339	9-R09626-5	82	105	68	5	4
371	.414	9-R10527-4	82	108	56	4	4
410	.449	9-R10527-5	81	109	56	5	4
487	.604	10-R10527-6	83	110	58	6	5
546	.691	10-R11026-6	83	111	54	6	5
566	.951	10-R11213-6	84	113	45	6	5
628	.874	10-R11426-6	83	112	47	6	5
706	1.150	10-R12227-6	88	114	41	6	5
811	1.182	12-R11426-7	83	115	47	7	6
948	1.523	12-R12227-7	85	116	41	7	6
1061	1.843	12-R13032-7	87	117	38	7	6
1133	1.998	12-R14016-7	86	119	35	7	6
1207	2.132	12-R13722-7	87	118	34	7	6
1265	2.500	12-R14032-7	96	120	31	7	6
3.5 " SP							
164	.166	9-R09026-4	81	102	91	4	4
179	.175	9-R09026-5	81	103	93	5	4
227	.305	9-R10413-4	80	106	73	4	4
239	.317	9-R10413-5	81	107	77	5	4
268	.296	9-R09626-4	80	104	76	4	4
284	.310	9-R09626-5	81	105	80	5	4
340	.388	9-R10527-4	82	108	66	4	4
379	.420	9-R10527-5	81	109	65	5	4
443	.544	10-R10527-6	83	110	67	6	5
507	.651	10-R11026-6	82	111	63	6	5
529	.904	10-R12213-6	83	113	53	6	5
594	.828	10-R11426-6	83	112	55	6	5
678	1.105	10-R12227-6	88	114	48	6	5
753	1.116	12-R11426-7	83	115	54	7	6
889	1.448	12-R12227-7	84	116	48	7	6
1011	1.758	12-R13032-7	86	117	44	7	6
1090	1.926	12-R14016-7	86	119	41	7	6

Radial Wheels 3000 RPM 50 Hz

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
3.5" SP *(continued)*							
1158	2.032	12-R13722-7	87	118	40	7	6
1228	2.437	12-R14032-7	96	120	37	7	6
4.0 " SP							
152	.267	9-R10413-4	80	106	83	4	4
161	.272	9-R10413-5	81	107	88	5	4
205	.251	9-R09626-4	80	104	87	4	6
216	.262	9-R09626-5	81	105	91	5	4
311	.365	9-R10527-4	82	108	75	4	4
345	.391	9-R10527-5	81	109	75	5	4
409	.529	10-R10527-6	83	110	77	6	5
468	.621	10-R11026-6	82	111	71	6	5
486	.830	10-R12213-6	83	113	61	6	5
558	.788	10-R11426-6	82	112	62	6	5
647	1.059	10-R12227-6	87	114	54	6	5
700	1.052	12-R11426-7	82	115	62	7	6
831	1.371	12-R12227-7	83	116	55	7	6
960	1.672	12-R13032-7	85	117	50	7	6
1043	1.848	12-R14016-7	85	119	46	7	6
1105	1.935	12-R13722-7	86	118	46	7	6
1189	2.369	12-R14032-7	95	120	42	7	6
4.5 " SP							
26	.216	9-R10413-5	81	107	99	5	4
47	.223	9-R10413-4	80	106	94	4	4
271	.334	9-R10527-4	81	108	85	4	4
299	.353	9-R10527-5	84	109	81	5	4
361	.473	10-R10527-6	83	110	87	6	5
426	.579	10-R11026-6	82	111	80	6	5
428	.707	10-R12213-6	80	113	68	6	5
521	.763	10-R11426-6	82	112	70	6	5
613	1.011	10-R12227-6	84	114	61	6	5
642	.983	12-R11426-7	82	115	70	7	6
781	1.293	12-R12227-7	83	116	62	7	6
907	1.584	12-R13032-7	84	117	57	7	6
991	1.768	12-R14016-7	85	119	52	7	6
1049	1.839	12-R13722-7	82	118	52	7	6
1147	2.296	12-R14032-7	94	120	47	7	6
1444	2.746	15-R13446-7	85	121	47	7	8
1512	2.924	15-R13446-8	85	122	51	8	8
1531	2.965	15-R14032-7	85	124	47	7	8
1621	3.048	15-R13446-10	85	123	52	10	8
1655	3.255	15-R14032-8	86	125	49	8	8
1717	3.399	15-R14032-10	86	126	51	10	8
5.0 " SP							
195	.279	9-R10527-4	81	108	94	4	4
224	.299	9-R10527-5	81	109	93	5	4
262	.365	10-R10527-6	81	110	96	6	5
339	.643	10-R12213-6	80	113	76	6	5
374	.515	10-R11026-6	82	111	89	6	5
480	.734	10-R11426-6	82	112	78	6	5
575	.960	10-R12227-6	84	114	68	6	5
579	.913	12-R11426-7	82	115	78	7	6
728	1.212	12-R12227-7	82	116	69	7	6
848	1.492	12-R13032-7	84	117	63	7	6
935	1.684	12-R14016-7	84	119	52	7	6
988	1.746	12-R13722-7	85	118	57	7	6
1102	2.217	12-R14032-7	91	120	58	7	6
1357	2.592	15-R13446-7	84	121	54	7	8
1434	2.762	15-R13446-8	85	122	57	8	8
1450	2.810	15-R14032-7	85	124	53	7	8
1529	2.871	15-R13446-10	85	123	58	10	8
1566	3.069	15-R14032-8	85	125	54	8	8
1612	3.161	15-R14032-10	85	126	56	10	8
5.5 " SP							
231	.371	10-R11026-6	79	111	98	6	5
239	.516	10-R12213-6	82	113	83	6	5
433	.679	10-R11426-6	82	112	86	6	5
505	.832	12-R11426-7	82	115	86	7	6
531	.907	10-R12227-6	84	114	75	6	5
669	1.131	12-R12227-7	82	116	76	7	6
793	1.401	12-R13032-7	83	117	69	7	6
870	1.594	12-R14016-7	84	119	64	7	6
920	1.664	12-R13722-7	84	118	63	7	6
1054	2.129	12-R14032-7	91	120	58	7	6
1277	2.421	15-R13446-7	85	121	60	7	8
1360	2.590	15-R13446-8	84	122	62	8	8
1378	2.653	15-R14032-7	85	124	58	7	8
1433	2.685	15-R13446-10	85	123	63	10	8
1476	2.879	15-R14032-8	85	125	60	8	8
1504	2.909	15-R14032-10	85	126	62	10	8
1656	3.654	15-R15247-4-7	89	139	49	7	8
1761	3.762	15-R15247-4-8	91	140	51	8	8
1862	3.923	15-R15247-4-10	90	141	51	10	8
6.0 " SP							
356	.568	10-R11426-6	81	112	94	6	5
405	.724	12-R11426-7	82	115	93	7	6
490	.862	10-R12227-6	81	114	82	6	5
603	1.058	12-R12227-7	82	116	83	7	6
750	1.317	12-R13032-7	83	117	75	7	6
794	1.499	12-R14016-7	84	119	69	7	6
846	1.574	12-R13722-7	84	118	69	7	6
998	2.027	12-R14032-7	90	120	63	7	6
1193	2.241	15-R13446-7	85	121	65	7	8
1278	2.410	15-R13446-8	85	122	68	8	8
1301	2.491	15-R14032-7	86	124	63	7	8
1328	2.484	15-R13446-10	84	123	69	10	8
1380	2.683	15-R14032-8	85	125	65	8	8
1394	2.668	15-R14032-10	85	126	68	10	8
1486	3.591	15-R15134-7	87	127	52	7	8
1633	4.292	15-R16322-7	88	133	51	7	8
1704	4.277	15-R15134-8	88	128	52	8	8
1733	4.494	15-R15450-7	88	130	49	7	8
1764	4.653	15-R16322-8	88	134	52	8	8
1802	4.388	15-R15134-10	88	129	56	10	8
1852	4.754	15-R16322-10	89	135	53	10	8
1933	5.050	15-R15450-8	90	131	51	8	8
2096	5.046	15-R15450-10	91	132	51	10	8
6.5 " SP							
441	.805	10-R12227-6	80	114	88	6	5
522	.966	12-R12227-7	82	116	90	7	6
704	1.230	12-R13032-7	82	117	82	7	6
704	1.369	12-R14016-7	83	119	75	7	6
770	1.443	12-R13722-7	83	118	75	7	6
932	1.902	12-R14032-7	88	120	68	7	6
1098	2.055	15-R13446-7	86	121	71	7	8
1183	2.217	15-R13446-8	85	122	74	8	8
1211	2.248	15-R13446-10	84	123	75	10	8
1217	2.322	15-R14032-7	87	124	69	7	8
1276	2.475	15-R14032-8	85	125	70	8	8
1291	2.450	15-R14032-10	85	126	73	10	8
1409	3.367	15-R15134-7	87	127	56	7	8
1567	4.117	15-R16322-7	87	133	56	7	8
1619	3.985	15-R15134-8	88	128	57	8	8
1677	4.314	15-R15450-7	88	130	53	7	8
1710	4.469	15-R16322-8	88	134	57	8	8
1712	4.123	15-R15134-10	88	129	60	10	8
1791	4.574	15-R16322-10	88	135	58	10	8
1870	4.827	15-R15450-8	90	031	55	8	8
2014	4.875	15-R15450-10	90	132	55	10	8
7.0 " SP							
348	.647	10-R12227-6	83	114	95	6	5
405	.830	12-R12227-7	82	116	96	7	6
639	1.139	12-R13032-7	82	117	88	7	6
680	1.309	12-R13722-7	83	118	80	7	6
875	1.794	12-R14032-7	86	120	73	7	6
973	1.863	15-R13446-7	87	121	76	7	8
1042	1.992	15-R13446-8	85	122	79	8	8
1077	1.993	15-R13446-10	84	123	81	10	8
7.0" SP *(continued)*							
1160	2.257	15-R14032-8	85	125	76	8	8
1182	2.237	15-R14032-10	85	126	79	10	8
1188	2.157	15-R14032-7	87	124	74	7	8
1328	3.143	15-R15134-7	87	127	60	7	8
1500	3.932	15-R16322-7	86	133	60	7	8
1528	3.693	15-R15134-8	88	128	61	8	8
1616	3.850	15-R15134-10	88	129	65	10	8
1618	4.133	15-R15450-7	87	130	57	7	8
1647	4.274	15-R16322-8	87	134	61	8	8
1705	4.347	15-R16322-10	88	135	62	10	8
1802	4.599	15-R15450-8	90	131	59	8	8
1861	5.149	15-R16550-7	89	136	52	7	8
1927	4.693	15-R15450-10	89	132	59	10	8
2104	5.785	15-R16550-8	90	137	52	8	8
2278	5.989	15-R16550-10	92	138	52	10	8
7.5 " SP							
465	1.028	12-R14016-7	83	119	87	7	6
539	1.023	12-R13032-7	82	117	94	7	6
572	1.164	12-R13722-7	82	118	86	7	6
825	1.697	12-R14032-7	85	120	79	7	6
832	1.647	15-R13446-7	88	121	82	7	8
886	1.735	15-R13446-8	85	122	85	8	8
915	1.725	15-R13446-10	84	123	86	10	8
1006	1.969	15-R14032-7	88	124	79	7	8
1032	2.024	15-R14032-8	85	125	81	8	8
1060	2.025	15-R14032-10	85	126	84	10	8
1247	2.930	15-R15134-7	87	127	65	7	8
1430	3.737	15-R16322-7	86	133	64	7	8
1431	3.403	15-R15134-8	87	128	65	8	8
1511	3.569	15-R15134-10	88	129	70	10	8
1554	3.951	15-R15450-7	87	130	61	7	8
1570	4.062	15-R16322-8	88	134	65	8	8
1579	4.046	15-R16322-10	88	135	66	10	8
1727	4.363	15-R15450-8	89	131	64	8	8
1816	5.045	15-R16550-7	89	136	55	7	8
1834	4.496	15-R15450-10	89	132	63	10	8
2046	5.565	15-R16550-8	90	137	56	8	8
2189	5.787	15-R16550-10	92	138	56	10	8
8.0 " SP							
331	.849	12-R14016-7	82	119	93	7	6
462	.997	12-R13722-7	82	118	92	7	6
678	1.403	15-R13446-7	86	121	87	7	8
694	1.427	15-R13446-10	84	123	92	10	8
713	1.428	15-R13446-8	83	122	91	8	8
768	1.591	12-R14032-7	84	120	84	7	6
872	1.744	15-R14032-7	89	124	84	7	8
892	1.784	15-R14032-8	84	125	87	8	8
920	1.833	15-R14032-10	85	126	90	10	8
1165	2.726	15-R15134-7	87	127	69	7	8
1323	3.133	15-R15134-8	87	128	70	8	8
1353	3.526	15-R16322-7	87	133	68	7	8
1379	3.249	15-R15134-10	88	129	74	10	8
1449	3.736	15-R16322-10	87	135	71	10	8
1483	3.834	15-R16322-8	89	134	70	8	8
1486	3.770	15-R15450-7	86	130	65	7	8
1637	4.110	15-R15450-8	89	131	68	8	8
1732	4.274	15-R15450-10	89	132	68	10	8
1768	4.942	15-R16550-7	89	136	59	7	8
1946	5.355	15-R16550-8	89	137	59	8	8
2098	5.600	15-R16550-10	91	138	59	10	8
8.5 " SP							
210	.673	12-R13722-7	82	118	98	7	6
390	1.079	15-R13446-10	81	123	98	10	8
444	1.025	15-R13446-7	83	121	92	7	8
474	1.063	15-R13446-8	82	122	96	8	8
691	1.474	12-R14032-7	85	120	89	7	6
692	1.438	15-R14032-7	86	124	90	7	8
722	1.508	15-R14032-8	82	125	92	8	8
742	1.631	15-R14032-10	85	126	96	10	8
1072	2.507	15-R15134-7	87	127	73	7	8
1204	2.857	15-R15134-8	87	128	74	8	8
1237	2.928	15-R15134-10	88	129	79	10	8

Radial Wheels 3000 RPM 50 Hz

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
8.5" SP *(continued)*							
1264	3.293	15-R16322-7	86	133	73	7	8
1322	3.426	15-R16322-10	87	135	75	10	8
1383	3.579	15-R16322-8	89	134	74	8	8
1411	3.582	15-R15450-7	86	130	69	7	8
1540	3.850	15-R15450-8	89	131	72	8	8
1625	4.038	15-R15450-10	89	132	72	10	8
1717	4.829	15-R16550-7	88	136	63	7	8
1854	5.152	15-R16550-8	89	137	63	8	8
2008	5.414	15-R16550-10	90	138	63	10	8
9.0 " SP							
962	2.266	15-R15134-7	87	127	78	7	8
1070	2.563	15-R15134-8	86	128	78	8	8
1087	2.614	15-R15134-10	88	129	84	10	8
1135	2.965	15-R16322-7	86	133	77	7	8
1183	3.099	15-R16322-10	87	135	80	10	8
1221	3.201	15-R16322-8	90	134	79	8	8
1328	3.383	15-R15450-7	86	130	73	7	8
1435	3.582	15-R15450-8	89	131	76	8	8
1510	3.789	15-R15450-10	89	132	76	10	8
1662	4.703	15-R16550-7	88	136	66	7	8
1772	4.960	15-R16550-8	88	137	67	8	8
1923	5.241	15-R16550-10	90	138	67	10	8
9.5 " SP							
787	1.932	15-R15134-7	86	127	82	7	8

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
9.5" SP *(continued)*							
903	2.228	15-R15134-8	86	128	83	8	8
938	2.340	15-R15134-10	87	129	88	10	8
982	2.606	15-R16322-7	86	133	81	7	8
1021	2.742	15-R16322-10	87	135	84	10	8
1030	2.782	15-R16322-8	91	134	83	8	8
1222	3.168	15-R15450-7	86	130	77	7	8
1316	3.307	15-R15450-8	89	131	81	8	8
1392	3.529	15-R15450-10	90	132	80	10	8
1600	4.557	15-R16550-7	88	136	70	7	8
1704	4.786	15-R16550-8	88	137	70	8	8
1839	5.070	15-R16550-10	89	138	70	10	8
10.0 " SP							
603	1.599	15-R15134-7	85	127	86	7	8
707	1.865	15-R15134-8	85	128	87	8	8
759	2.035	15-R15134-10	85	129	93	10	8
771	2.196	15-R16322-7	86	133	85	7	8
788	2.311	15-R16322-8	89	134	87	8	8
799	2.288	15-R16322-10	86	135	89	10	8
1094	2.913	15-R15450-7	85	130	81	7	8
1185	3.014	15-R15450-8	89	131	87	8	8

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
10.0" SP *(continued)*							
1261	3.244	15-R15450-10	90	132	85	10	8
1525	4.357	15-R16550-7	88	136	74	7	8
1630	4.602	15-R16550-8	87	137	74	8	8
1750	4.884	15-R16550-10	88	138	74	10	8
11.0 " SP							
259	1.150	15-R15134-8	82	128	96	8	8
279	1.080	15-R15134-7	83	127	95	7	8
338	1.324	15-R16322-7	84	133	94	7	8
376	1.641	15-R16322-10	83	135	97	10	8
379	1.476	15-R16322-8	84	134	96	8	8
818	2.331	15-R15450-7	84	130	89	7	8
892	2.370	15-R15450-8	87	131	93	8	8
938	2.528	15-R15450-10	89	132	93	10	8
1355	3.925	15-R16550-7	87	136	81	7	8
1461	4.191	15-R16550-8	86	137	82	8	8
1551	4.438	15-R16550-10	87	138	81	10	8
12.0 " SP							
1143	3.445	15-R16550-7	87	136	88	7	8
1221	3.662	15-R16550-8	90	137	89	8	8
1307	3.857	15-R16550-10	87	138	89	10	8
13.0 " SP							
818	2.656	15-R16550-7	91	136	96	7	8
909	2.893	15-R16550-8	91	137	96	8	8
979	3.082	15-R16550-10	87	138	96	10	8

Backward Curve 3000 RPM 50 Hz

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
.5 " SP							
162	.102	8-B07025-3	80	167	21	3	4
190	.132	8-B08125-3	80	169	16	3	4
198	.101	8-B07025-4	79	168	23	4	4
251	.168	8-B08125-4	79	170	17	4	4
1.0 " SP							
137	.097	8-B07025-3	80	167	43	3	4
168	.095	8-B07025-4	79	168	47	4	4
170	.129	8-B08125-3	80	169	32	3	4
223	.159	8-B08125-4	79	170	35	4	4
309	.181	9-B08725-4	80	171	27	4	4
321	.185	9-B08725-5	80	172	28	5	4
376	.283	9-B10127-4	81	173	21	4	4
414	.300	9-B10127-5	81	174	22	5	4
479	.486	10-B10127-6	79	175	23	6	5
1.5 " SP							
100	.089	8-B07025-3	79	167	64	3	4
122	.084	8-B07025-4	79	168	70	4	4
151	.124	8-B08125-3	80	169	48	3	4
191	.146	8-B08125-4	79	170	52	4	4
280	.170	9-B08725-4	80	171	40	4	4
292	.174	9-B08725-5	80	172	42	5	4
347	.267	9-B10127-4	82	173	31	4	4
384	.286	9-B10127-5	81	174	33	5	4
444	.467	10-B10127-6	79	175	35	6	5
541	.641	10-B10727-6	81	176	29	6	5
924	1.289	12-B13031-7	86	177	20	7	6

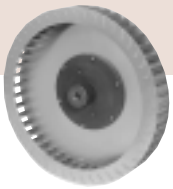
CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
2.0" SP							
49	.073	8-B07025-3	80	167	86	3	4
49	.069	8-B07025-4	79	168	94	4	4
116	.114	8-B08125-3	80	169	64	3	4
152	.131	8-B08125-4	79	170	70	4	4
250	.158	9-B08725-4	80	171	53	4	4
261	.160	9-B08725-5	80	172	56	5	4
317	.249	9-B10127-4	81	173	42	4	4
353	.272	9-B10127-5	81	174	45	5	4
410	.456	10-B10127-6	79	175	47	6	5
510	.621	10-B10727-6	80	176	39	6	5
882	1.244	12-B13031-7	86	177	27	7	6
2.5" SP							
74	.101	8-B08125-3	80	169	80	3	4
91	.109	8-B08125-4	79	170	87	4	4
216	.143	9-B08725-4	80	171	67	4	4
225	.146	9-B08725-5	80	172	70	5	4
282	.229	9-B10127-4	81	173	52	4	4
312	.252	9-B10127-5	81	174	56	5	4
368	.432	10-B10127-6	78	175	58	6	5
475	.597	10-B10727-6	80	176	49	6	5
839	1.198	12-B13031-7	85	177	34	7	6
1001	1.595	12-B14132-7	88	178	29	7	6

CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
3.0" SP							
20	.087	8-B08125-3	80	169	96	3	4
157	.117	8-B08725-4	80	171	80	4	4
165	.120	9-B08725-5	80	172	84	5	4
252	.211	9-B10127-4	81	173	63	4	4
279	.226	9-B10127-5	81	174	67	5	4
311	.381	10-B10127-6	79	175	70	6	5
436	.567	10-B10727-6	79	176	58	6	5
798	1.153	12-B13031-7	84	177	41	7	6
964	1.557	12-B14132-7	87	178	34	7	6
3.5" SP							
57	.081	9-B08725-5	81	172	98	5	4
157	.117	9-B08725-4	80	171	94	4	4
209	.184	9-B10127-4	81	173	73	4	4
242	.200	9-B10127-5	81	174	78	5	4
269	.343	10-B10127-6	79	175	82	6	5
390	.526	10-B10727-6	79	176	68	6	5
758	1.109	12-B13031-7	84	177	48	7	6
927	1.517	12-B14132-7	86	178	40	7	6
4.0" SP							
149	.151	9-B10127-4	81	173	84	4	4
163	.170	9-B10127-5	81	174	89	5	4
192	.282	10-B10127-6	79	175	93	6	5
350	.495	10-B10727-6	79	176	78	6	5
719	1.066	12-B13031-7	83	177	54	7	6
890	1.475	12-B14132-7	85	178	46	7	6

Backward Curve 3000 RPM 50 Hz

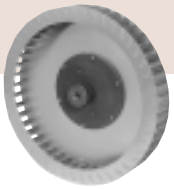
CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
4.5" SP							
56	.119	9-B10127-4	81	173	94	4	4
296	.435	10-B10727-6	79	176	88	6	5
682	1.025	12-B13031-7	83	177	61	7	6
851	1.429	12-B14132-7	85	178	52	7	6
1103	1.610	15-B14132-7	82	179	48	7	8
1124	1.655	15-B14132-10	83	181	54	10	8
1134	1.648	15-B14132-8	83	180	50	8	8
5.0" SP							
181	.343	10-B10727-6	79	176	97	6	5
647	.985	12-B13031-7	83	177	68	7	6
812	1.380	12-B14132-7	84	178	57	7	6
1035	1.568	15-B14132-10	83	181	60	10	8
1037	1.540	15-B14132-7	82	179	54	7	8
1055	1.557	15-B14132-8	82	180	56	8	8
1356	2.563	15-B15247-7	85	182	47	7	8
1429	2.755	15-B15247-8	86	183	48	8	8
1515	2.782	15-B15247-10	86	184	51	10	8
5.5" SP							
647	.985	12-B13031-7	83	177	75	7	6
812	1.380	12-B14132-7	84	178	63	7	6
960	1.497	15-B14132-10	82	181	66	10	8
967	1.465	15-B14132-7	81	179	59	7	8
973	1.475	15-B14132-8	82	180	62	8	8
1301	2.461	15-B15247-7	84	182	51	7	8
1361	2.632	15-B15247-8	85	183	53	8	8
1431	2.662	15-B15247-10	85	184	56	10	8
6.0" SP							
549	.879	12-B13031-7	83	177	82	7	6
734	1.277	12-B14132-7	84	178	69	7	6
886	1.429	15-B14132-10	81	181	72	10	8
888	1.380	15-B14132-7	81	179	64	7	8
890	1.411	15-B14132-8	81	180	67	8	8
1241	2.347	15-B15247-7	84	182	56	7	8
1298	2.489	15-B15247-8	84	183	58	8	8
1354	2.544	15-B15247-10	84	184	61	10	8
6.5" SP							
466	.791	12-B13031-7	88	177	88	7	6
690	1.214	12-B14132-7	83	178	75	7	6
799	1.353	15-B14132-10	81	181	78	10	8
801	1.285	15-B14132-7	81	179	70	7	8
801	1.330	15-B14132-8	81	180	73	8	8
1166	2.194	15-B15247-7	83	182	61	7	8
1232	2.339	15-B15247-8	83	183	63	8	8
1271	2.412	15-B15247-10	84	184	66	10	8
6.5" SP *(continued)*							
1590	3.914	15-B16550-7	89	188	48	7	8
1764	4.271	15-B16550-8	89	189	50	8	8
1847	4.361	15-B16550-10	88	190	51	10	8
7.0" SP							
349	.674	12-B13031-7	83	177	95	7	6
638	1.120	12-B14132-7	83	178	80	7	6
687	1.264	15-B14132-10	81	181	84	10	8
701	1.178	15-B14132-7	81	179	75	7	8
701	1.228	15-B14132-8	81	180	79	8	8
1086	2.027	15-B15247-7	83	182	65	7	8
1158	2.181	15-B15247-8	83	183	68	8	8
1178	2.259	15-B15247-10	83	184	71	10	8
1547	3.813	15-B16550-7	89	188	52	7	8
1704	4.151	15-B16550-8	88	189	53	8	8
1784	4.228	15-B16550-10	88	190	55	10	8
7.5" SP							
526	1.147	15-B14132-10	80	181	90	10	8
575	1.022	12-B14132-7	83	178	86	7	6
575	1.044	15-B14132-7	81	179	80	7	8
590	1.092	15-B14132-8	80	180	84	8	8
994	1.856	15-B15247-7	82	182	70	7	8
1066	2.008	15-B15247-8	82	183	73	8	8
1070	2.057	15-B15247-10	82	184	76	10	8
1502	3.705	15-B16550-7	89	188	56	7	8
1642	4.023	15-B16550-8	88	189	57	8	8
1720	4.098	15-B16550-10	87	190	59	10	8
8.0" SP							
300	.973	15-B14132-10	80	181	96	10	8
429	.875	15-B14132-7	81	179	86	7	8
436	.906	15-B14132-8	80	180	90	8	8
483	.916	12-B14132-7	83	178	92	7	6
882	1.681	15-B15247-7	82	182	75	7	8
940	1.806	15-B15247-8	82	183	78	8	8
946	1.846	15-B15247-10	82	184	82	10	8
1452	3.588	15-B16550-7	90	188	59	7	8
1580	3.880	15-B16550-8	88	189	61	8	8
1652	3.971	15-B16550-10	87	190	63	10	8
8.5" SP							
240	.699	15-B14132-8	80	180	95	8	8
277	.697	15-B14132-7	80	179	91	7	8
346	.763	12-B14132-7	83	178	98	7	6
757	1.495	15-B15247-7	82	182	79	7	8
788	1.596	15-B15247-10	82	184	87	10	8
799	1.592	15-B15247-8	82	183	82	8	8
1396	3.440	15-B16550-7	90	188	63	7	8
1516	3.728	15-B16550-8	87	189	65	8	8
1580	3.835	15-B16550-10	86	190	67	10	8
9.0" SP							
152	.587	15-B14132-7	80	179	97	7	8
588	1.332	15-B15247-10	81	184	92	10	8
610	1.293	15-B15247-7	82	182	84	7	8
629	1.357	15-B15247-8	81	183	87	8	8
1335	3.285	15-B16550-7	90	188	67	7	8
1446	3.567	15-B16550-8	87	189	69	8	8
1502	3.687	15-B16550-10	86	190	71	10	8
9.5" SP							
392	1.170	15-B15247-10	81	184	97	10	8
448	1.099	15-B15247-8	81	183	92	8	8
449	1.067	15-B15247-7	82	182	89	7	8
1268	3.123	15-B16550-7	91	188	71	7	8
1370	3.394	15-B16550-8	86	189	72	8	8
1416	3.522	15-B16550-10	85	190	75	10	8
10.0" SP							
243	.821	15-B15247-8	81	183	97	8	8
288	.845	15-B15247-7	82	182	93	7	8
1193	2.952	15-B16550-7	91	188	74	7	8
1275	3.188	15-B16550-8	86	189	76	8	8
1314	3.321	15-B16550-10	85	190	79	10	8
11.0" SP							
975	2.539	15-B16550-7	88	188	82	7	8
1041	2.701	15-B16550-8	88	189	84	8	8
1078	2.858	15-B16550-10	84	190	87	10	8
12.0" SP							
702	2.021	15-B16550-7	88	188	89	7	8
746	2.139	15-B16550-8	87	189	92	8	8
770	2.240	15-B16550-10	84	190	95	10	8
13.0" SP							
199	1.129	15-B16550-8	84	189	99	8	8
307	1.290	15-B16550-7	87	188	96	7	8

Forward Curve 3000 RPM 50 Hz



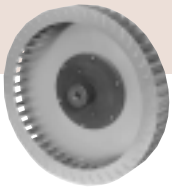
CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
.5" SP							
321	.244	8-F07620-3	78	142	14	3	4
504	.522	8-F07620-4	79	143	14	4	4
1.0" SP							
301	.237	8-F07620-3	78	142	29	3	4
474	.493	8-F07620-4	78	143	29	4	4
651	1.125	9-F10020-4	83	144	17	4	4
766	1.365	9-F10020-5	83	145	17	5	4
1.5" SP							
276	.227	8-F07620-3	77	142	43	3	4
439	.454	8-F07620-4	77	143	43	4	4
1.5" SP *(continued)*							
630	1.072	9-F10020-4	83	144	25	4	4
739	1.316	9-F10020-5	83	145	25	5	4
1042	2.413	10-F10020-6	85	146	24	6	5
1078	2.613	10-F10520-6	86	147	21	6	5
2.0" SP							
246	.213	8-F07620-3	79	142	58	3	4
397	.406	8-F07620-4	77	143	58	4	4

Forward Curve 3000 RPM 50 Hz



CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
2.0" SP *(continued)*							
606	1.020	9-F10020-4	82	144	34	4	4
712	1.262	9-F10020-5	82	145	33	5	4
1008	2.303	10-F10020-6	85	146	32	6	5
1047	2.529	10-F10520-6	85	147	29	6	5
1880	5.823	12-F12220-7	89	148	21	7	6
2.5" SP							
207	.191	8-F07620-3	78	142	72	3	4
350	.353	8-F07620-4	77	143	72	4	4
579	.970	9-F10020-4	82	144	42	4	4
684	1.201	9-F10020-5	82	145	42	5	4
973	2.188	10-F10020-6	85	146	40	6	5
1015	2.439	10-F10520-6	85	147	36	6	5
1838	5.698	12-F12220-7	89	148	26	7	6
1949	6.042	12-F12224-7	90	149	24	7	6
2006	6.934	12-F13420-7	91	150	22	7	6
2117	7.390	12-F13430-7	92	151	21	7	6
3.0" SP							
146	.148	8-F07620-3	79	142	87	3	4
299	.296	8-F07620-4	79	143	87	4	4
548	.921	9-F10020-4	81	144	50	4	4
655	1.137	9-F10020-5	82	145	50	5	4
938	2.067	10-F10020-6	84	146	48	6	5
984	2.341	10-F10520-6	85	147	43	6	5
1795	5.566	12-F12220-7	88	148	31	7	6
1912	5.908	12-F12224-7	90	149	29	7	6
1972	6.819	12-F13420-7	91	150	26	7	6
2072	7.212	12-F13430-7	92	151	25	7	6
3.5" SP							
514	.878	9-F10020-4	81	144	59	4	4
622	1.071	9-F10020-5	82	145	58	5	4
907	1.931	10-F10020-6	84	146	55	6	5
958	2.233	10-F10520-6	85	147	50	6	5
1751	5.427	12-F12220-7	88	148	36	7	6
1874	5.769	12-F12224-7	90	149	34	7	6
1938	6.702	12-F13420-7	91	150	31	7	6
2028	7.035	12-F13430-7	92	151	29	7	6
4.0" SP							
477	.828	9-F10020-4	80	144	67	4	4
586	1.001	9-F10020-5	82	145	67	5	4
872	1.795	10-F10020-6	83	146	63	6	5
930	2.121	10-F10520-6	84	147	57	6	5
1706	5.279	12-F12220-7	87	148	41	7	6
1834	5.625	12-F12224-7	89	149	39	7	6
1903	6.583	12-F13420-7	90	150	35	7	6
1984	6.861	12-F13430-7	91	151	33	7	6
4.5" SP							
441	.750	9-F10020-4	80	144	76	4	4
547	.925	9-F10020-5	82	145	75	5	4
835	1.656	10-F10020-6	83	146	71	6	5
900	2.005	10-F10520-6	84	147	64	6	5
1660	5.117	12-F12220-7	87	148	46	7	6
1793	5.476	12-F12224-7	89	149	44	7	6
1868	6.462	12-F13420-7	90	150	39	7	6
1950	6.728	12-F13430-7	91	151	38	7	6
5.0" SP							
399	.654	9-F10020-4	81	144	84	4	4
507	.846	9-F10020-5	81	145	84	5	4
791	1.514	10-F10020-6	83	146	79	6	5
866	1.883	10-F10520-6	84	147	71	6	5
1614	4.948	12-F12220-7	87	148	52	7	6
1750	5.312	12-F12224-7	88	149	49	7	6
1832	6.339	12-F13420-7	90	150	44	7	6
1915	6.591	12-F13430-7	91	151	42	7	6
5.5" SP							
117	.194	9-F10020-5	81	145	92	5	4
324	.535	9-F10020-4	81	144	93	4	4
739	1.367	10-F10020-6	82	146	87	6	5
828	1.753	10-F10520-6	83	147	78	6	5
1565	4.773	12-F12220-7	87	148	57	7	6
5.5" SP *(continued)*							
1704	5.142	12-F12224-7	88	149	53	7	6
1801	6.242	12-F13420-7	90	150	48	7	6
1879	6.448	12-F13430-7	91	151	46	7	6
6.0" SP							
668	1.218	10-F10020-6	82	146	95	6	5
780	1.610	10-F10520-6	83	147	86	6	5
1515	4.591	12-F12220-7	86	148	62	7	6
1657	4.965	12-F12224-7	87	149	58	7	6
1770	6.146	12-F13420-7	90	150	52	7	6
1842	6.300	12-F13430-7	90	151	50	7	6
6.5" SP							
710	1.427	10-F10520-6	81	147	93	6	5
1463	4.401	12-F12220-7	86	148	67	7	6
1606	4.780	12-F12224-7	87	149	63	7	6
1738	6.043	12-F13420-7	90	150	57	7	6
1802	6.146	12-F13430-7	90	151	54	7	6
2924	13.117	15-F15020-7	93	152	52	7	8
3253	14.114	15-F15020-8	93	153	51	8	8
7.0" SP							
566	1.164	10-F10520-6	82	147	100	6	5
1409	4.202	12-F12220-7	86	148	72	7	6
1553	4.586	12-F12224-7	86	149	68	7	6
1704	5.932	12-F13420-7	89	150	61	7	6
1762	5.985	12-F13430-7	90	151	58	7	6
2802	10.910	15-F15020-10	90	154	57	10	8
2870	12.850	15-F15020-7	93	152	56	7	8
2984	15.323	15-F16420-7	95	161	50	7	8
3185	13.820	15-F15020-8	93	153	55	8	8
3229	13.701	15-F15040-7	99	158	51	7	8
7.5" SP							
1353	3.992	12-F12220-7	85	148	77	7	6
1495	4.380	12-F12224-7	86	149	73	7	6
1668	5.811	12-F13420-7	89	150	65	7	6
1719	5.816	12-F13430-7	89	151	63	7	6
2738	10.729	15-F15020-10	90	154	61	10	8
2813	12.575	15-F15020-7	93	152	60	7	8
3102	13.061	15-F15030-7	94	155	53	7	8
3114	13.517	15-F15020-8	92	153	59	8	8
3160	13.380	15-F15040-7	99	158	55	7	8
3245	15.289	15-F16420-10	92	163	52	10	8
3376	17.001	15-F16420-8	94	162	52	8	8
3425	15.049	15-F15030-10	92	157	52	10	8
3617	16.341	15-F15030-8	94	156	51	8	8
3754	16.956	15-F15040-8	100	159	51	8	8
8.0" SP							
1298	3.777	12-F12220-7	82	148	83	7	6
1432	4.161	12-F12224-7	86	149	78	7	6
1674	5.637	12-F13430-7	89	151	67	7	6
2659	10.526	15-F15020-10	90	154	65	10	8
2753	12.288	15-F15020-7	92	152	64	7	8
2879	14.823	15-F16420-7	95	161	58	7	8
3037	12.726	15-F15030-7	93	155	57	7	8
3040	13.205	15-F15020-8	92	153	63	8	8
3087	13.058	15-F15040-7	99	158	59	7	8
3151	15.922	15-F16440-7	98	164	51	7	8
3191	15.099	15-F16420-10	92	163	55	10	8
3337	16.750	15-F16420-8	93	162	56	8	8
3376	14.755	15-F15030-10	91	157	55	10	8
3543	15.986	15-F15030-8	94	156	54	8	8
3667	16.483	15-F15040-8	100	159	54	8	8
4045	19.143	15-F15040-10	98	160	51	10	8
8.5" SP							
1238	3.546	12-F12220-7	82	148	88	7	6
1363	3.925	12-F12224-7	81	149	78	7	6
8.5" SP *(continued)*							
1588	5.531	12-F13420-7	89	150	74	7	6
1626	5.447	12-F13430-7	89	151	71	7	6
2573	10.298	15-F15020-10	90	154	70	10	8
2690	11.987	15-F15020-7	92	152	68	7	8
2823	14.559	15-F16420-7	94	161	61	7	8
2963	12.881	15-F15020-8	92	153	67	8	8
2969	12.383	15-F15030-7	93	155	61	7	8
3011	12.729	15-F15040-7	98	158	62	7	8
3086	15.607	15-F16440-7	98	164	54	7	8
3132	14.898	15-F16420-10	92	163	59	10	8
3292	16.490	15-F16420-8	93	162	59	8	8
3323	14.458	15-F15030-10	91	157	59	10	8
3466	15.613	15-F15030-8	94	156	57	8	8
3578	16.006	15-F15040-8	100	159	57	8	8
3592	18.448	15-F16440-8	100	165	51	8	8
3963	18.646	15-F16040-10	98	160	55	10	8
9.0" SP							
1160	3.282	12-F12220-7	83	148	93	7	6
1363	3.925	12-F12224-7	81	149	87	7	6
1541	5.365	12-F13420-7	89	150	78	7	6
1575	5.243	12-F13430-7	88	151	75	7	6
2481	10.040	15-F15020-10	89	154	74	10	8
2623	11.669	15-F15020-7	92	152	72	7	8
2764	14.285	15-F16420-7	94	161	65	7	8
2883	12.556	15-F15020-8	92	153	71	8	8
2896	12.027	15-F15030-7	93	155	64	7	8
2929	12.392	15-F15040-7	98	158	66	7	8
3020	15.341	15-F16440-7	98	164	57	7	8
3059	14.674	15-F16420-10	92	163	62	10	8
3223	16.200	15-F16420-8	93	162	63	8	8
3265	14.160	15-F15030-10	91	157	62	10	8
3387	15.209	15-F15030-8	94	156	61	8	8
3489	15.544	15-F15040-8	99	159	61	8	8
3530	18.163	15-F16440-8	100	165	54	8	8
3879	18.143	15-F15040-10	98	160	58	10	8
4028	21.215	15-F16440-10	99	166	50	10	8
9.5" SP							
1024	2.874	12-F12220-7	83	148	98	7	6
1192	3.340	12-F12224-7	82	149	92	7	6
1489	5.171	12-F13420-7	89	150	83	7	6
1519	5.014	12-F13430-7	88	151	79	7	6
2384	9.747	15-F15020-10	89	154	78	10	8
2552	11.326	15-F15020-7	92	152	76	7	8
2702	13.999	15-F16420-7	94	161	68	7	8
2797	12.218	15-F15020-8	91	153	75	8	8
2817	11.648	15-F15030-7	92	155	68	7	8
2838	12.055	15-F15040-7	96	158	70	7	8
2953	15.111	15-F16440-7	98	164	61	7	8
2976	14.424	15-F16420-10	92	163	66	10	8
3151	15.898	15-F16420-8	93	162	66	8	8
3178	13.900	15-F15030-10	91	157	65	10	8
3305	14.780	15-F15030-8	93	156	67	8	8
3397	15.073	15-F15040-8	99	159	64	8	8
3465	17.868	15-F16440-8	100	165	57	8	8
3793	17.634	15-F15040-10	98	160	61	10	8
3949	20.773	15-F16440-10	99	166	53	10	8
10.0" SP							
1070	2.934	12-F12224-7	82	149	97	7	6
1459	4.764	12-F13430-7	88	151	83	7	6
2282	9.409	15-F15020-10	89	154	82	10	8
2476	10.959	15-F15020-7	91	152	80	7	8
2638	13.700	15-F16420-7	94	161	72	7	8
2706	11.851	15-F15020-8	91	153	79	8	8
2735	11.279	15-F15030-7	92	155	71	7	8
2737	11.710	15-F15040-7	96	158	73	7	8
2883	14.857	15-F16440-7	97	164	64	7	8
2889	14.152	15-F16420-10	92	163	69	10	8
3076	15.584	15-F16420-8	93	162	70	8	8
3089	13.603	15-F15030-10	90	157	69	10	8
3218	14.335	15-F15030-8	93	156	67	8	8
3301	14.586	15-F15040-8	97	159	67	8	8
3399	17.560	15-F16440-8	99	165	60	8	8

Forward Curve 3000 RPM 50 Hz



CFM	BHP	MODEL	DBA @ 5'	CURVE NO.	% OF PEAK SP	INLET DIA.	OUTLET DIA.
10.0" SP *(continued)*							
3706	17.119	15-F15040-10	97	160	64	10	8
3867	20.326	15-F16440-10	98	166	56	10	8
11.0" SP							
1229	4.129	12-F13420-7	83	150	96	7	6
1311	4.244	12-F13430-7	83	151	92	7	6
2038	8.547	15-F15020-10	86	154	90	10	8
2300	10.131	15-F15020-7	85	152	80	7	8
2496	13.049	15-F16420-7	93	161	79	7	8
2500	10.994	15-F15020-8	86	153	87	8	8
2527	10.928	15-F15040-7	96	158	81	7	8
2555	10.484	15-F15030-7	91	155	78	7	8
2703	13.530	15-F16420-10	91	163	76	10	8
2735	14.264	15-F16440-7	97	164	70	7	8
2904	12.888	15-F15030-10	90	157	76	10	8
3028	13.386	15-F15030-8	92	156	74	8	8
3091	13.553	15-F15040-8	96	159	74	8	8
3258	16.902	15-F16440-8	97	165	66	8	8
3528	16.075	15-F15040-10	97	160	71	10	8
3695	19.388	15-F16440-10	98	166	62	10	8
12.0" SP							
2064	9.096	15-F15020-7	86	152	96	7	8
2241	9.875	15-F15020-8	87	153	95	8	8
2307	9.934	15-F15040-7	95	158	88	7	8
2330	12.297	15-F16420-7	92	161	86	7	8
2350	9.681	15-F15030-7	90	155	86	7	8
2578	13.485	15-F16440-7	97	164	77	7	8
2703	12.793	15-F16420-10	91	163	83	10	8
2720	14.159	15-F16420-8	92	162	84	8	8
2726	11.964	15-F15030-10	89	157	83	10	8
2799	12.340	15-F15030-8	91	156	81	8	8
2844	12.404	15-F15040-8	96	159	81	8	8
3106	16.176	15-F16440-8	97	165	72	8	8
3363	15.066	15-F15040-10	96	160	77	10	8
3513	18.440	15-F16440-10	98	166	67	10	8
13.0" SP							
2084	8.638	15-F15030-7	86	155	93	7	8
2124	11.467	15-F16420-7	92	161	93	7	8
2261	11.829	15-F16420-10	94	163	90	10	8
2403	12.530	15-F16440-7	96	164	83	7	8
2495	13.243	15-F16420-8	91	162	91	8	8
2524	10.858	15-F15030-10	85	157	90	10	8
2526	11.074	15-F15030-8	88	156	88	8	8
2558	11.086	15-F15040-8	95	159	88	8	8
2940	15.365	15-F16440-8	96	165	78	8	8
13.0" SP *(continued)*							
3173	13.975	15-F15040-10	96	160	84	10	8
3323	17.511	15-F16440-10	98	166	73	10	8
14.0" SP							
1540	6.487	15-F15030-7	86	155	100	7	8
1912	10.420	15-F16420-10	88	163	97	10	8
2175	9.178	15-F15030-8	86	156	94	8	8
2192	11.425	15-F16440-7	92	164	89	7	8
2200	9.447	15-F15040-8	94	159	94	8	8
2209	11.946	15-F16420-8	88	162	98	8	8
2236	9.392	15-F15030-10	86	157	97	10	8
2751	14.427	15-F16440-8	96	165	84	8	8
2941	12.747	15-F15040-10	93	160	90	10	8
3125	3.647	15-F16440-10	97	166	78	10	8
15.0" SP							
1906	10.043	15-F16440-7	92	164	96	7	8
2523	13.277	15-F16440-8	95	165	90	8	8
2608	11.489	15-F15040-10	94	160	97	10	8
2917	15.905	15-F16440-10	93	166	84	10	8
16.0" SP							
2214	11.657	15-F16440-8	96	165	96	8	8
2696	14.892	15-F16440-10	94	166	90	10	8
17.0" SP							
2461	13.435	15-F16440-10	94	166	95	10	8

SPARK RESISTANT CONSTRUCTION

TYPE A
All parts of the fan in contact with the air or gas being handled shall be made of non-ferrous material.

TYPE B
Fan shall have entirely non-ferrous wheel and a non-ferrous ring about the opening through which the shaft passes.

TYPE C
Fan shall be so constructed that a shift of the wheel or shaft will not permit two ferrous parts of the fan to rub or strike.

Model AF meets the requirements of Type A Spark Resistant Construction
(with the exception of the shaft) since they have aluminum wheels and housings.

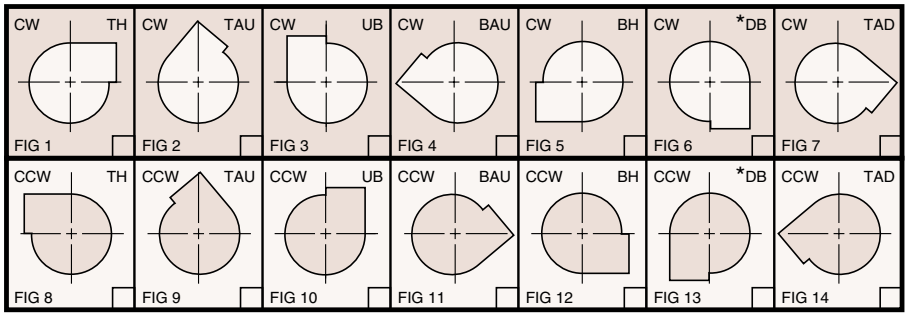
HI-TEMPERATURE CONSTRUCTION

All AF arrangements with cast aluminum radial or backward curve wheels can be operated with airstream temperatures up to 200°F. Blowers with aluminum forward curve wheels can be operated with airstream temperatures up to 150°F. Higher temperature construction up to 700°F is available with welded steel construction (radial wheels only) and welded steel housings in arrangements 1, 8, and 9.

CONVERSION FACTORS

Volume — cubic meters/sec. x 2119 = cubic feet/min. (CFM)
Pressure — Pascals (N/m²) x 0.004 = inches water
Power — kilowatts (Kw) x 1.341 = horsepower
Length — centimeters (cm) x 0.3937 = inches
Temperature — (°C x 1.8) + 32 = °F

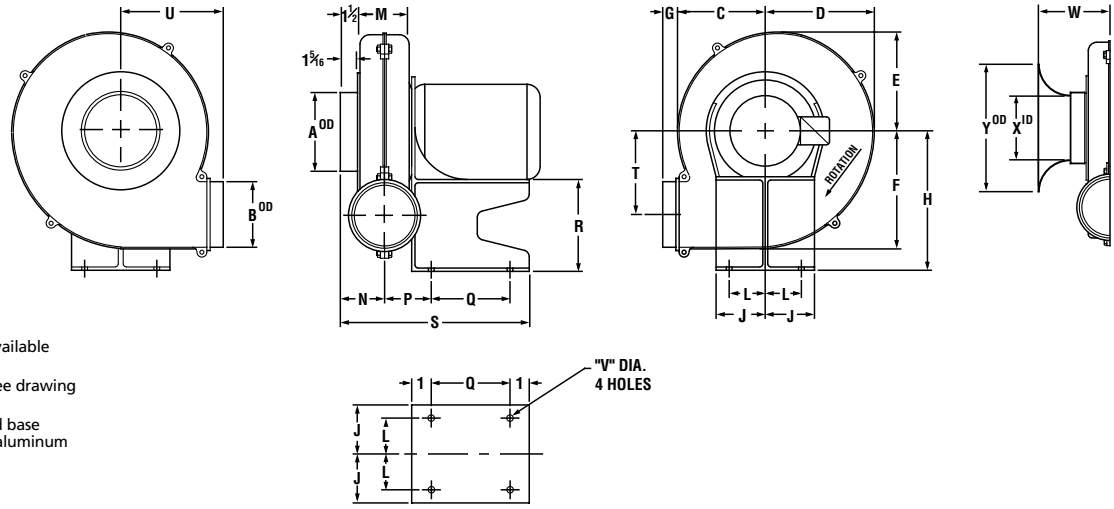
DISCHARGE POSITIONS



NOTE:
Rotation is viewed from driven side.

NOTE:
Downblast discharge not available with outlet flange.

ARR'T 4 CAST ALUMINUM BASE



NOTES:

① Outlet flange not available on DB discharge

② For flange details, see drawing AFA11421F

③ Housing, wheel, and base constructed of cast aluminum

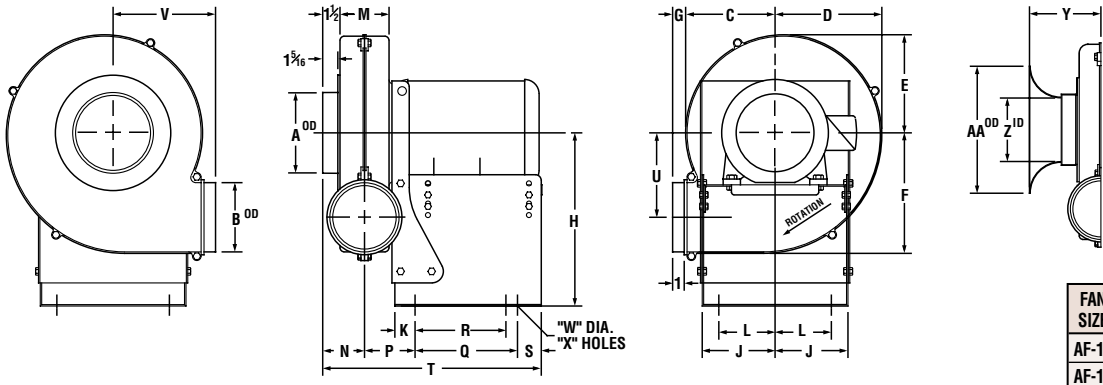
ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	MOTOR FRAME SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	NET WTS. NO MOTOR LBS.
AF-8	56-C, 143-TC, 145-TC	3 4	4	4 5/16	5 13/16	5 3/32	6 11/16	1 3/8	8 1/2	3 3/4	1 1/8	2 3/4	3 1/2	2 7/8	2 7/8	5	5	11 3/4	4 9/16	6 5/16	7/16	25
AF-9	56-C, 143-TC, 145-TC	4 5	4	6	7 1/4	6 17/32	7 3/4	1 3/16	10 1/2	3 3/4	1 3/16	2 3/4	3 3/4	3 1/16	3 1/16	6	7	13 1/8	5 5/8	7 3/16	7/16	33
AF-10	56-C, 143-T, 145-TC	6	5	6 11/16	8 5/16	7 15/32	9	1 1/8	10 1/2	3 3/4	1 1/2	2 3/4	3 3/4	3 3/8	3 1/16	6	7	14 7/16	6 3/8	7 13/16	7/16	39

MOTORS	
FRAME SIZE	WT. LBS.
56-C	24
143-TC	33
145-TC	45

FAN SIZE	INLET DIA.	INLET BELL		
		W	X	Y
AF-8	3	4 1/4	2 5/8	5 1/4
AF-8	4	4 3/4	3 5/8	7 1/4
AF-9	4	4 15/16		
AF-9	5	5 7/16	4 5/8	9 1/4
AF-10	6	6 3/16	5 1/2	11

ARR'T 4 STEEL BASE



NOTES:

① AF-15 with 182T/184-T frame motor is not available in DB discharge

② AF-15, Add 7/8" to dimensions "P" & "T" for DB discharge (213T, 215T, 254T, 284TS, 286TS only)

③ AF-15 not available with 56 or 56C frame motors

④ For flange details, see drawing AFA11421F

⑤ Motor base is field adjustable to accept motor frames as shown

⑥ All sizes "DB" discharge only available less outlet flange

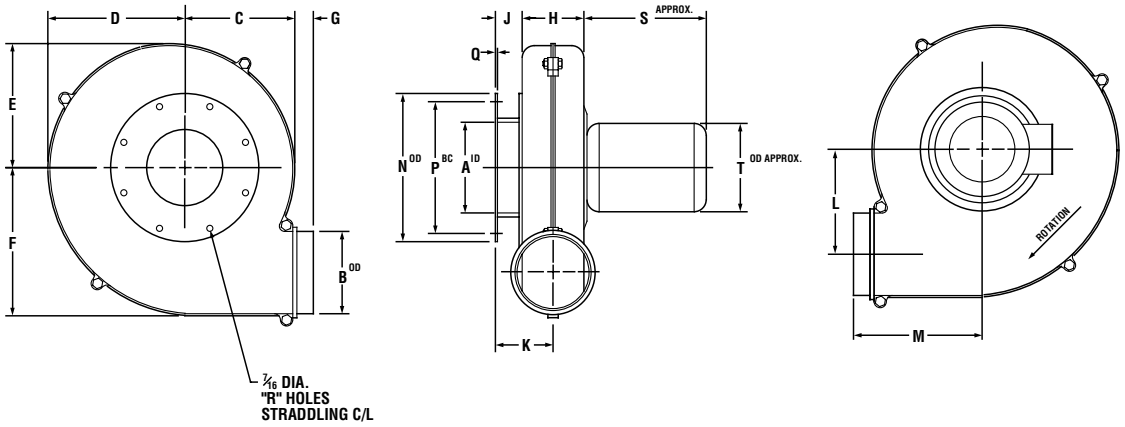
FAN SIZE	INLET DIA.	INLET BELL		
		Y	Z	AA
AF-10	6	6 3/16	5 1/2	11
AF-12	7	6 15/16	6 1/2	13
AF-15	7	7 3/4		
AF-15	8	8 1/4	7 1/2	15
AF-15	10	9 1/4	9 1/2	19

ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	MOTOR FRAME SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	NET WTS. NO MOTOR LBS.
AF-10	56, 143T, 145T, 56C, 143TC, 145TC, 182T	6	5	6 11/16	8 5/16	7 15/32	9	1 1/8	11 1/2	5	1 1/16	4	3 3/4	3 3/8	3 1/8	8	7	13/16	15 5/16	6 3/8	7 13/16	1/2	6	39
AF-12	56, 143T, 145T, 56C, 143TC, 145TC, 182T, 184T	7	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	11 1/2	5	1 1/16	4	4 1/4	3 5/8	3 3/8	8	7	13/16	15 13/16	7 5/16	8 7/8	1/2	6	46
AF-12	213T, 215T	7	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	11 1/2	6 5/16	1 1/16	4 7/8	4 1/4	3 5/8	4 1/16	8 7/8	–	2 1/16	18 5/8	7 5/16	8 7/8	9/16	4	46
AF-15	143T, 145T, 182T, 184T, 213T, 215T	7 8 10	8	9 3/8	11	10	12	1 9/16	15	6 5/16	1 3/4	4 7/8	5 7/8	4 7/16	② 5 1/8	8 7/8	–	2 1/16	② 20 1/2	7 7/8	10 15/16	9/16	4	79
AF-15	254T, 256T, 284TS, 286TS	7 8 10	8	9 3/8	11	10	12	1 9/16	15	7	1 3/4	4 7/8	5 7/8	4 7/16	② 5 1/8	16 1/4	–	2	② 27 13/16	7 7/8	10 15/16	1 1/16	4	121

MOTORS	
FRAME SIZE	WT. LBS.
56C	24
143T	32
145T	40
182T	58
184T	70
213T	100
215T	130
254T	240
256T	300
284TS	403
286TS	420

ARR'T 4 INLET FLANGE MOUNT



ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	MOTOR FRAME SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	NET WTS. NO MOTOR LBS.
AF-8	56-C, 143-TC, 145-TC	2 3/16	4	4 15/16	5 13/16	5 3/32	6 1/16	1 3/8	3 1/2	1 3/8	3 1/8	4 9/16	6 5/16	7 1/2	6	1/4	4	14
		3 3/16												9	7 1/2		8	
AF-9	56-C, 143-TC, 145-TC	3 3/16	4	6	7 1/4	6 17/32	7 3/4	1 3/16	3 3/4	1 1/16	3 5/16	5 5/8	7 3/16	9	7 1/2	1/4	8	20
		4 3/16												10	8 1/2			
AF-10	56-C, 143-TC, 145-TC	5 1/2	5	6 1/16	8 5/16	7 15/32	9	1 1/8	3 3/4	1 3/16	3 1/16	6 3/8	7 13/16	11	9 1/2	1/4	8	35
AF-12	56-C, 143-TC, 145-TC 182-TC, 184-TC	6 1/4	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	4 1/4	1 3/16	3 15/16	7 5/16	8 7/8	11	9 1/2	5/16	8	40
AF-15	143-TC, 145-TC, 182-TC, 184-TC, 213-TC, 215-TC	6 1/4	8	9 3/8	11	10	12	1 5/16	5 3/8	2	4 15/16	7 3/8	10 15/16	11	9 1/2	1/2	8	56
		7 1/2												13 1/2	11 3/4		8	
		9 11/16												16	14 1/4		12	

MOTORS			
FRAME SIZE	WT. LBS.	S	T
56-C	25	11 1/2	6 1/4
143-TC	33	11 1/2	7
145-TC	45	11 1/2	7
182-TC	60	14 1/2	9
184-TC	70	14 1/2	9
213-TC	120	16	10 1/2
215-TC	140	16	10 1/2

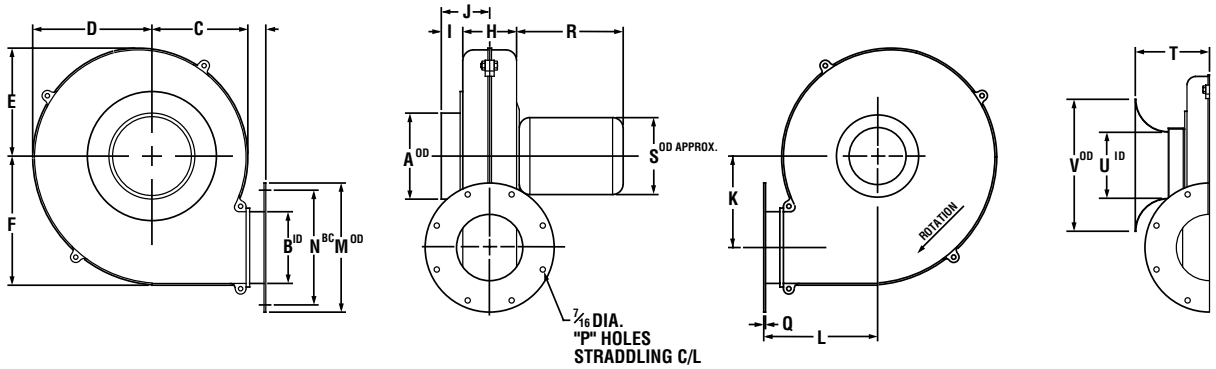
NOTES:

① For optional outlet flange, see drawing AFA11421F

② Inlet flange is welded to inlet side housing

③ Housing, flange, and wheel are constructed of cast aluminum

ARR'T 4 OUTLET FLANGE MOUNT



ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	MOTOR FRAME SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	NET WTS. NO MOTOR LBS.
AF-8	56-C, 143-TC, 145-TC	3	3 3/16	4 15/16	5 13/16	5 3/32	6 1/16	1 5/8	3 1/2	1 1/8	2 1/8	4 9/16	6 9/16	9	7 1/2	8	1/4	14
		4																
AF-9	56-C, 143-TC, 145-TC	4	3 3/16	6	7 1/4	6 17/32	7 3/4	1 7/16	3 3/4	1 3/16	3 1/16	5 5/8	7 7/16	9	7 1/2	8	1/4	20
		5																
AF-10	56-C, 143-TC, 145-TC	6	4 3/16	6 1/16	8 5/16	7 15/16	9	1 3/8	3 3/4	1 1/2	3 3/8	6 3/8	8 1/16	10	8 1/2	8	5/16	35
AF-12	56-C, 143-TC, 145-TC 182-TC, 184-TC	7	5 1/2	7 3/4	9 1/4	8 1/2	10 7/16	1 7/16	4 1/4	1 1/2	3 5/8	7 5/16	9 3/16	11	9 1/2	8	5/16	40
AF-15	143-TC, 145-TC, 182-TC, 213-TC, 215-TC	7	7 1/2	9 3/8	11	10	12	2 1/16	5 3/8	1 1/2	4 7/16	7 3/8	11 7/16	13 1/2	11 3/4	8	5/16	56
		8															1/2	
		10															1/2	

MOTORS			
FRAME SIZE	WT. LBS.	S	T
56-C	25	11 1/2	6 1/4
143-TC	33	11 1/2	7
145-TC	45	11 1/2	7
182-TC	60	14 1/2	9
184-TC	70	14 1/2	9
213-TC	120	16	10 1/2
215-TC	140	16	10 1/2

NOTES:

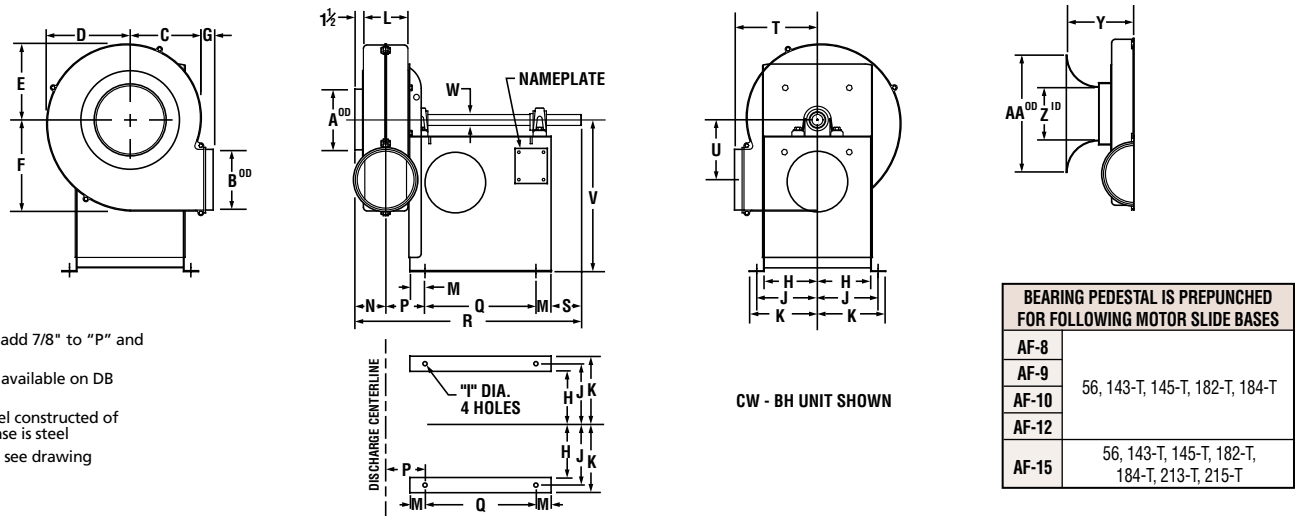
① For optional inlet flange, see drawing AFA11421F

② Inlet flange is welded to motor side housing and bolted to inlet side housing

③ Housing, flange, and wheel are constructed of cast aluminum

FAN SIZE	INLET DIA.	INLET BELL		
		T	U	V
AF-8	3	4 1/4	2 5/8	5 1/4
AF-8	4	4 3/4	3 3/8	7 1/4
AF-9	4	4 15/16		
AF-9	5	5 7/16	4 5/8	9 1/4
AF-10	6	6 3/16	5 1/2	11
AF-12	7	6 15/16	6 1/2	13
AF-15	7	7 3/4		
AF-15	8	8 1/4	7 1/2	15
AF-15	10	9 1/4	9 1/2	19

ARR'T 1



CW - BH UNIT SHOWN

NOTES:

① For DB discharge, add 7/8" to "P" and "R" dimensions

② Outlet flange not available on DB discharge

③ Housing and wheel constructed of cast aluminum, base is steel

④ For flange details, see drawing AFA11421F

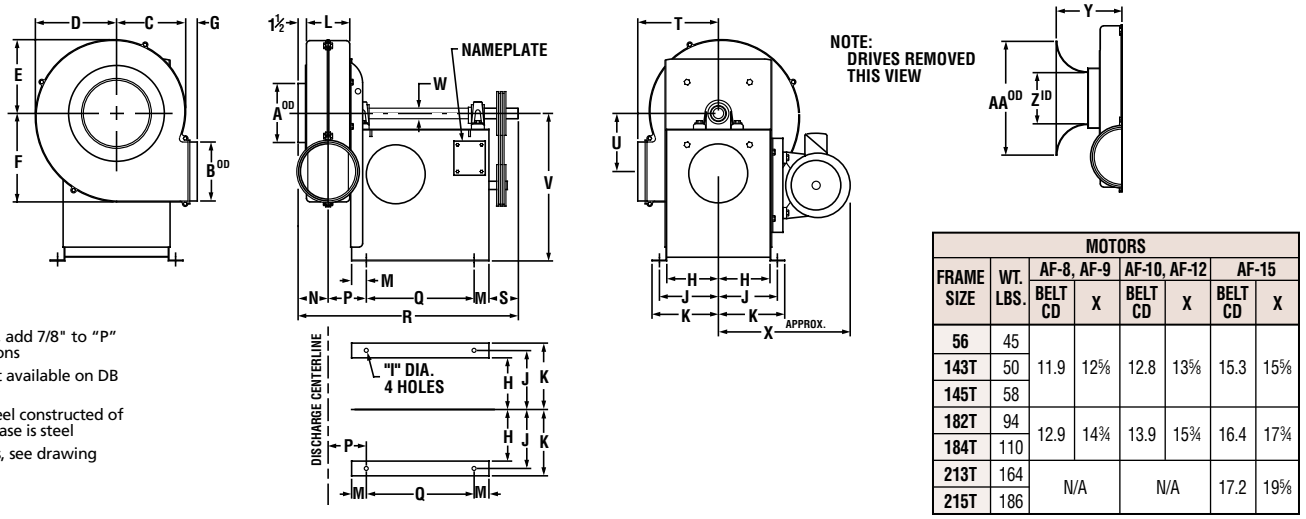
BEARING PEDESTAL IS PREPUNCHED FOR FOLLOWING MOTOR SLIDE BASES	
AF-8	56, 143-T, 145-T, 182-T, 184-T
AF-9	
AF-10	
AF-12	
AF-15	56, 143-T, 145-T, 182-T, 184-T, 213-T, 215-T

ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	I	J	K	L	M	N	① P	Q	① R	S	T	U	V	STANDARD DUTY W	STANDARD DUTY KEYWAY	STANDARD DUTY WEIGHTS LBS.	HEAVY DUTY W	HEAVY DUTY KEYWAY	HEAVY DUTY WEIGHTS LBS.
AF-8	3	4	4 15/16	5 13/16	5 3/32	6 1/16	1 3/8	4	7/16	5	6	3 1/2	1	2 7/8	3	12	21 7/8	3	6 5/16	4	15	3/4	1/4 x 1/8	36	1	1/4 x 1/8	41
	4																										
AF-9	4	4	6	7 1/4	6 17/32	7 3/4	1 3/8	4	7/16	5	6	3 3/4	1	3 1/16	3 1/8	12	22 3/16	3	7 3/16	5 5/8	15	3/4	1/4 x 1/8	39	1	1/4 x 1/8	45
	5																										
AF-10	6	5	6 1/16	8 5/16	7 15/32	9	1 1/8	5	9/16	6	7	3 3/4	1	3 3/8	3 1/8	12	22 1/2	3	7 13/16	6 3/8	15	1	1/4 x 1/8	49	1 3/16	1/4 x 1/8	58
AF-12	7	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	5	9/16	6	7	4 1/4	1	3 5/8	3 3/8	12	23	3	8 7/8	7 5/16	15	1	1/4 x 1/8	52	1 3/16	1/4 x 1/8	63
AF-15	7	8	9 3/8	11	10	12	1 9/16	7	9/16	8	9	5 7/8	2	4 7/16	5 3/16	14 5/8	30 1/4	4	10 15/16	7 7/8	20	1 7/16	3/8 x 3/16	94	1 11/16	3/8 x 3/16	118
	8																										
	10																										

FAN SIZE	INLET DIA.	INLET BELL Y	INLET BELL Z	INLET BELL AA
AF-8	3	4 1/4	2 5/8	5 1/4
AF-8	4	4 3/4	3 5/8	7 1/4
AF-9	4	4 15/16		
AF-9	5	5 7/16	4 5/8	9 1/4
AF-10	6	6 3/16	5 1/2	11
AF-12	7	6 15/16	6 1/2	13
AF-15	7	7 3/4		
AF-15	8	8 1/4	7 1/2	15
AF-15	10	9 1/4	9 1/2	19

ARR'T 9



NOTE: DRIVES REMOVED THIS VIEW

NOTES:

① For DB discharge, add 7/8" to "P" and "R" dimensions

② Outlet flange not available on DB discharge

③ Housing and wheel constructed of cast aluminum, base is steel

④ For flange details, see drawing AFA11421F

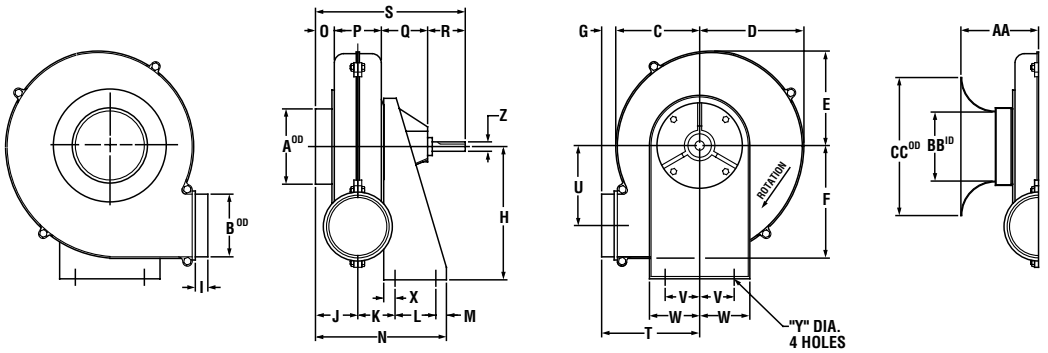
MOTORS							
FRAME SIZE	WT. LBS.	AF-8, AF-9 BELT CD	AF-8, AF-9 X	AF-10, AF-12 BELT CD	AF-10, AF-12 X	AF-15 BELT CD	AF-15 X
56	45	11.9	12 5/8	12.8	13 3/8	15.3	15 5/8
143T	50						
145T	58						
182T	94	12.9	14 3/4	13.9	15 3/4	16.4	17 3/4
184T	110						
213T	164	N/A		N/A		17.2	19 5/8
215T	186						

ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	I	J	K	L	M	N	① P	Q	① R	S	T	U	V	STANDARD DUTY W	STANDARD DUTY KEYWAY	STANDARD DUTY NET WTS. NO MOTOR LBS.	HEAVY DUTY W	HEAVY DUTY KEYWAY	HEAVY DUTY NET WTS. NO MOTOR LBS.
AF-8	3	4	4 15/16	5 13/16	5 3/32	6 1/16	1 3/8	4	7/16	5	6	3 1/2	1	2 7/8	3	12	21 7/8	3	6 5/16	4	15	3/4	1/4 x 1/8	36	1	1/4 x 1/8	41
	4																										
AF-9	4	4	6	7 1/4	6 17/32	7 3/4	1 3/8	4	7/16	5	6	3 3/4	1	3 1/16	3 1/8	12	22 3/16	3	7 3/16	5 5/8	15	3/4	1/4 x 1/8	39	1	1/4 x 1/8	45
	5																										
AF-10	6	5	6 1/16	8 5/16	7 15/32	9	1 1/8	5	9/16	6	7	3 3/4	1	3 3/8	3 1/8	12	22 1/2	3	7 13/16	6 3/8	15	1	1/4 x 1/8	49	1 3/16	1/4 x 1/8	58
AF-12	7	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	5	9/16	6	7	4 1/4	1	3 5/8	3 3/8	12	23	3	8 7/8	7 5/16	15	1	1/4 x 1/8	52	1 3/16	1/4 x 1/8	63
AF-15	7	8	9 3/8	11	10	12	1 9/16	7	9/16	8	9	5 7/8	2	4 7/16	5 3/16	14 5/8	30 1/4	4	10 15/16	7 7/8	20	1 7/16	3/8 x 3/16	94	1 11/16	3/8 x 3/16	118
	8																										
	10																										

FAN SIZE	INLET DIA.	INLET BELL Y	INLET BELL Z	INLET BELL AA
AF-8	3	4 1/4	2 5/8	5 1/4
AF-8	4	4 3/4	3 5/8	7 1/4
AF-9	4	4 15/16		
AF-9	5	5 7/16	4 5/8	9 1/4
AF-10	6	6 3/16	5 1/2	11
AF-12	7	6 15/16	6 1/2	13
AF-15	7	7 3/4		
AF-15	8	8 1/4	7 1/2	15
AF-15	10	9 1/4	9 1/2	19

ARR'T 2



ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	SHAFT DIA. Z	KEYWAY	NET WT. NO MOTOR LBS.
AF-8	3	4	4 15/16	5 13/16	5 3/32	6 11/16	1 3/8	10	2 7/8	2 7/8	3 1/4	3/4	9 3/4	1 1/8	3 1/2	3 11/16	3	11 5/16	6 5/16	4 9/16	2 7/8	4	1	7/16	3/4	1/4 x 1/8	27
	4																										
AF-9	4	4	6	7 1/4	6 17/32	7 3/4	1 3/16	10	3 1/16	2 31/32	3 1/4	3/4	10 1/32	1 3/16	3 3/4	3 11/16	3	11 5/8	7 3/16	5 5/8	2 7/8	4	1	7/16	3/4	1/4 x 1/8	33
	5																										
AF-10	6	5	6 11/16	8 5/16	7 15/32	9	1 1/8	10	3 3/8	2 31/32	3 1/4	3/4	10 11/32	1 1/2	3 3/4	3 11/16	3	11 15/16	7 13/16	6 3/8	2 7/8	4	1	7/16	3/4	1/4 x 1/8	47
AF-12	7	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	11 1/2	3 5/8	3 13/16	4 1/2	1 1/4	12 25/32	1 1/2	4 1/4	5 3/16	4	15 5/16	8 7/8	7 5/16	3 1/8	4 1/2	1 1/4	3/4	1	1/4 x 1/8	70
AF-15	7	8	9 3/8	11	10	12	1 9/16	15	4 7/16	4 3/8	4 1/2	1 1/4	14 9/16	1 1/2	5 7/8	5 9/16	4	16 15/16	10 15/16	7 7/8	3 3/4	5	1 1/4	3/4	1 7/16	3/8 x 3/16	93
	8																										
	10																										

FAN SIZE	INLET DIA.	INLET BELL		
		AA	BB	CC
AF-8	3	4 1/4	2 5/8	5 1/4
AF-8	4	4 3/4	3 5/8	7 1/4
AF-9	4	4 15/16		
AF-9	5	5 7/16	4 5/8	9 1/4
AF-10	6	6 3/16	5 1/2	11
AF-12	7	6 15/16	6 1/2	13
AF-15	7	7 3/4		
AF-15	8	8 1/4	7 1/2	15
AF-15	10	9 1/4	9 1/2	19

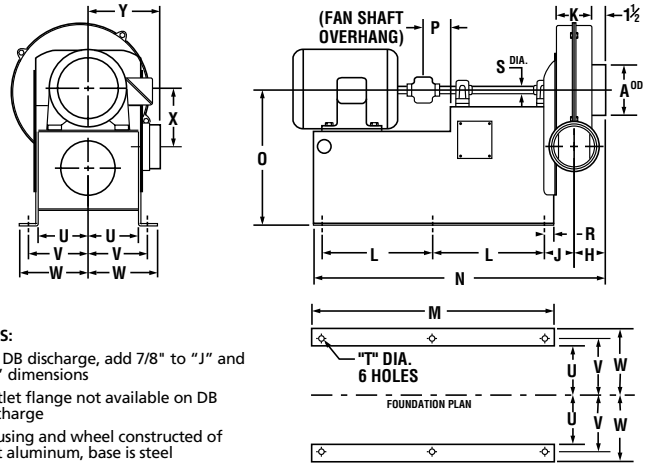
NOTES:

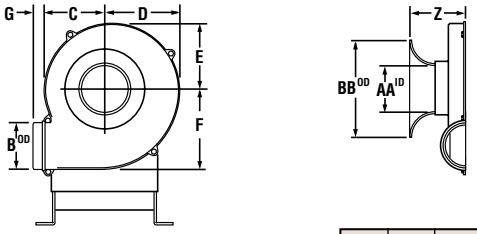
① Outlet flange not available on DB discharge

② For flange details, see drawing AFA11421F

③ Housing, wheel and base constructed of cast aluminum, bearing housing constructed of cast iron

ARR'T 8





NOTES:

① For DB discharge, add 7/8" to "J" and "N" dimensions

② Outlet flange not available on DB discharge

③ Housing and wheel constructed of cast aluminum, base is steel

④ For flange details, see drawing AFA11421F

FAN WEIGHT (LBS) LESS MOTOR					
FAN SIZE	56/143T 145T	182T 184T	213T 215T	254T 256T	284TS 286TS
AF-8	56	56	–	–	–
AF-9	61	61	–	–	–
AF-10	84	84	–	–	–
AF-12	90	90	95	–	–
AF-15	152	152	156	156	168

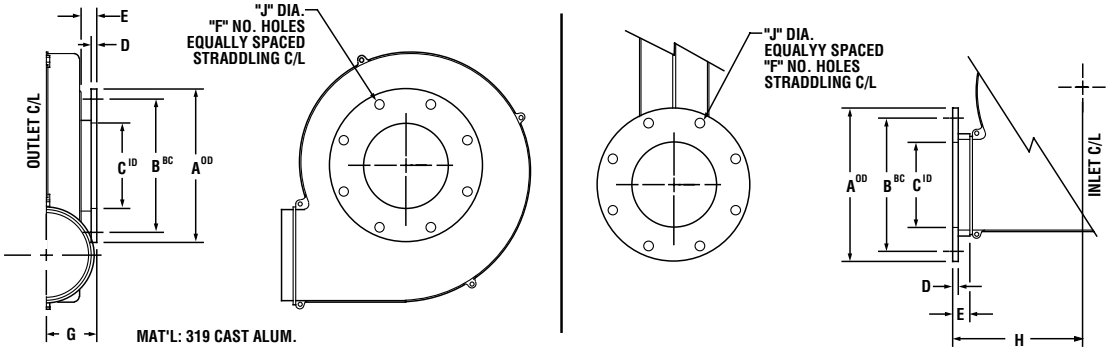
FAN SIZE	INLET DIA.	INLET BELL		
		Y	Z	AA
AF-8	3	4 1/2	2 5/8	11
AF-8	4	4 3/4	3 5/8	13
AF-9	4	4 15/16		
AF-9	5	5 7/16	4 5/8	15
AF-10	6	6 3/16	5 1/2	11
AF-12	7	6 15/16	6 1/2	13
AF-15	7	7 3/4		
AF-15	8	8 1/4	7 1/2	15
AF-15	10	9 1/4	9 1/2	19

MOTORS	
FRAME SIZE	WT. LBS.
56	45
143T	45
145T	52
182T	85
184T	100
213T	150
215T	170
254T	260
256T	290
284TS	390
286TS	440

ALL DIMENSIONS SHOWN IN INCHES

FAN SIZE	INLET DIA. A	OUTLET DIA. B	C	D	E	F	G	H	J①	K	56 / 143T / 145T			182T / 184T			213T / 215T			254T / 256T			284TS / 286TS			P	Q	R	STANDARD DUTY		HEAVY DUTY		T	U	V	W	X	Y
											L	M	N①	L	M	N①	L	M	N①	L	M	N①	L	M	N①				S	KEYWAY	S	KEYWAY						
AF-8	3	4	4 15/16	5 13/16	5 3/32	6 11/16	1 3/8	2 7/8	3	3 1/2	11 3/16	24 3/8	29 1/4	11 15/16	25 7/8	30 3/4	—	—	—	—	—	—	—	—	—	3	15	1	3/4	3/16 x 3/32	1	1/4 x 1/8	7/16	4 1/2	5 1/2	6 1/2	4 9/16	6 5/16
	4																																				
AF-9	4	4	6	7 1/4	6 17/32	7 3/4	1 3/16	3 1/16	3 1/8	3 3/4	11 3/16	24 3/8	29 9/16	11 15/16	25 7/8	31 1/16	—	—	—	—	—	—	—	—	—	3	15	1	3/4	3/16 x 3/32	1	1/4 x 1/8	7/16	4 1/2	5 1/2	6 1/2	5 5/16	7 3/16
	5																																				
AF-10	6	5	6 11/16	8 5/16	7 15/32	9	1 1/8	3 3/8	3 1/8	3 3/4	11 1/2	25	30 1/2	12 1/4	26 1/2	32	—	—	—	—	—	—	—	—	—	3	15	1	1	1/4 x 1/8	1 3/16	1/4 x 1/8	9/16	4 1/2	5 1/2	6 1/2	6 3/16	7 13/16
AF-12	7	6	7 3/4	9 1/4	8 1/2	10 7/16	1 1/8	3 5/8	3 3/8	4 1/4	11 1/2	25	31	12 1/4	26 1/2	32 1/2	15 5/16	32 5/8	38 5/8	—	—	—	—	—	—	3	15	1	1	1/4 x 1/8	1 3/16	1/4 x 1/8	9/16	5 1/2	6 1/2	7 1/2	7 5/16	8 7/8
AF-15	7	8	9 3/8	11	10	12	1 9/16	4 7/16	5 3/16	5 7/8	12 3/8	28 3/8	36 3/8	13 3/8	30 3/4	38 3/8	14 13/16	33 5/8	41 1/4	17 7/8	39 3/4	47 3/8	18 3/8	40 3/4	48 3/8	4	20	2	1 7/16	3/8 x 3/16	1 11/16	3/8 x 3/16	9/16	7	8	9	7 7/8	10 15/16
	8																																				
	10																																				

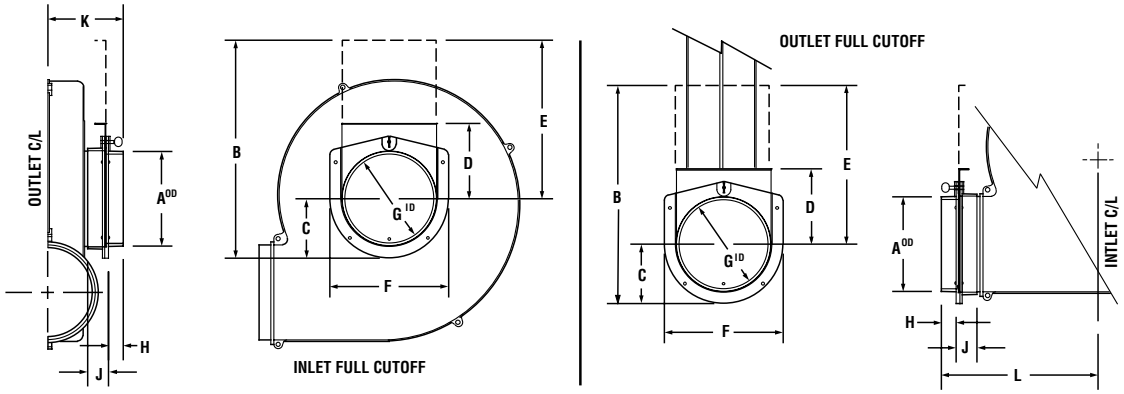
FLANGES



FAN SIZE	INLET	OUTLET	A	B	C	D	E	F	G	H	MATCHES 125/150 lb. ANSI FLANGE BOLT PATTERN		MATCHES 125/150 lb. ANSI FLANGE BOLT PATTERN EXCEPT HOLE DIA. = 7/16 (AFC STANDARD)	
											J	PART NUMBER	J	PART NUMBER
AF-8	3	X	7½	6	2⁹⁄₁₆	¼	1¼	4	3⅛	—	¾	24149F	7⁄16	24149F-7⁄16
	4	4	9	7½	3⁹⁄₁₆	¼	1¼	8	3⅛	6⁹⁄₁₆	¾	24101F	7⁄16	24101F-7⁄16
AF-9	4	4	9	7½	3⁹⁄₁₆	¼	1¼	8	3⁵⁄₁₆	7⁷⁄₁₆	¾	24101F	7⁄16	24101F-7⁄16
	5	X	10	8½	4⁹⁄₁₆	¼	1¼	8	3⁵⁄₁₆	—	¾	24103F	7⁄16	24103F-7⁄16
AF-10	X	5	10	8½	4⁹⁄₁₆	¼	1¼	8	—	8⅛	¾	24103F	7⁄16	24103F-7⁄16
	6	X	11	9½	5½	5⁄16	1¼	8	3⅝	—	⅞	24106F	7⁄16	24106F-7⁄16
AF-12	X	6	11	9½	5½	5⁄16	1¼	8	—	9³⁄₁₆	⅞	24106F	7⁄16	24106F-7⁄16
	7*	X	11	9½	6¼	5⁄16	1¼	8	3¹⁵⁄₁₆	—	⅞	24129F	7⁄16	24129F-7⁄16
AF-15	7*	X	11	9½	6¼	5⁄16	1¼	8	4¾	—	⅞	24129F	7⁄16	24129F-7⁄16
	8	8	13½	11¾	7½	½	1½	8	4¹⁵⁄₁₆	11⁷⁄₁₆	⅞	24044F	7⁄16	24044F-7⁄16
	10	X	16	14¼	9¹¹⁄₁₆	½	1½	12	4¹⁵⁄₁₆	—	1	24130F	7⁄16	24130F-7⁄16

*O.D. and B.C. match 6" ANSI flange

FULL CUT-OFF DAMPERS



INLET	OUTLET	SIZE	PART NO.	A	B	C	D	E	F	G	H	J	K	L
AF-8	—	3"	63649	2¹⁵⁄₁₆	7⅜	2³⁄₁₆	3	5³⁄₁₆	4	2½	1¼	1⁷⁄₁₆	5½	8⅛
AF-8	AF-8	4"	63650	3¹⁵⁄₁₆	9⅞	2¾	3¾	7⅛	5	3½	1¼	1⁷⁄₁₆	5½	8⅛
AF-9	AF-9												5⅝	8¹⁵⁄₁₆
AF-9	AF-10	5"	63651	4¹⁵⁄₁₆	12⅝	3⅝	4⅞	9	6¾	4½	1¼	1⁷⁄₁₆	5⅝	9⅜
AF-10	AF-12	6"	63652	5¹⁵⁄₁₆	13⅝	3¾	4¾	9⅞	7½	5½	1¼	1⁷⁄₁₆	5⅝	10⅝
AF-12	—	7"	63653	6¹⁵⁄₁₆	15⅝	4¼	5¼	11⅝	8½	6½	1¼	1⁷⁄₁₆	5⅞	10⅝
AF-15													6¹¹⁄₁₆	12¹¹⁄₁₆
AF-15	AF-15	8"	63654	7¹⁵⁄₁₆	18⁵⁄₁₆	5	6⁵⁄₁₆	13⁵⁄₁₆	10	7½	1¼	1⁷⁄₁₆	6¹¹⁄₁₆	12¹¹⁄₁₆
AF-15	—	10"	63655	9¹⁵⁄₁₆	22⁵⁄₁₆	6	7⁵⁄₁₆	16⁵⁄₁₆	12	9½	1¾	1¹⁵⁄₁₆	6¹¹⁄₁₆	12¹¹⁄₁₆

AMERICAN FAN COMPANY®

WOODS U.S.A. DIVISION

2933 Symmes Road, Fairfield, Ohio 45214
Ph. 513-874-2400 Fax 513-870-5577
www.amfan-woods.com

Market Information Industrial

AMERICAN FAN C0MPANY MODIFIES STANDARD UNITS AND DESIGNS AND BUILDS SPECIAL PRODUCTS TO MEET INDIVIDUAL CUSTOMER REQUIREMENTS.

AP-010

MODEL: AF-15 Pressure Blower, Direct Drive, Arrg't #4 CW TH with 5HP 3600 RPM TEFC Motor

FEATURES:
-Cast Aluminum Radial Blade Wheel
-Cast Aluminum Housing
-Full Inlet Cutoff Damper
-Inlet Guard
-Housing Drain Connection

APPLICATION: Lightweight, rustproof and durable AF-series fans are well suited to Groundwater Remediation applications, a field that is growing nationally. Air-strippers use fans to aerate tanks of contaminated water; bubbling action causes the air to be separated into small bubbles and the contaminant binds itself to the air. The air is then collected for further treatment and the purified water is reclaimed.

PERFORMANCE: 1311 ACFM @ 14.0"SP @ 3495 BRPM @ 4.7 BHP @ 0.075 #/CF Density

American Fan Company

2933 Symmes Road
Fairfield, Ohio 45014
Phone: 513.874.2400
Fax: 513.870.6249
www.americanfan.com

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Product Information Packet

ELECTRIC MOTOR WHOLESALE.COM

M3613T

5HP,3460RPM,3PH,60HZ,184T,3626M,TEFC,F1

Part Detail							
Revision:	J	**Status:**	INA/A	**Change #:**		**Proprietary:**	No
Type:	AC	**Prod. Type:**	3626M	**Elec. Spec:**	36WGT850	**CD Diagram:**	
Enclosure:	TEFC	**Mfg Plant:**		**Mech. Spec:**	36A001	**Layout:**	
Frame:	184T	**Mounting:**	F1	**Poles:**	02	**Created Date:**	
Base:	RG	**Rotation:**	R	**Insulation:**	F	**Eff. Date:**	07-20-2010
Leads:	9#16	**Literature:**		**Elec. Diagram:**		**Replaced By:**	

Nameplate NP1256L								
CAT.NO.	M3613T							
SPEC.	36A001T850H1							
HP	5							
VOLTS	208-230/460							
AMP	12.6-11.6/5.8							
RPM	3450							
FRAME	184T	**HZ**	60	**PH**	3			
SER.F.	1.15	**CODE**	K	**DES**	B	**CLASS**	F	
NEMA-NOM-EFF	87.5	**PF**	93					
RATING	40C AMB-CONT							
CC	010A	**USABLE AT 208V**						
DE	6206	**ODE**	6205					
ENCL	TEFC	**SN**						

Parts List

Part Number	Description	Quantity
SA117263	SA 36A001T850H1	1.000 EA
RA108164	RA 36A001T850H1	1.000 EA
S/P101-000-000	EPACT PROCEDURES-FS PLANT-POLYREX EM, NO	1.000 EA
36CB3004	36 CB CASTING W/1.09 DIA LEAD HOLE @ 6:0	1.000 EA
36GS1000SP	GASKET-CONDUIT BOX, .06 THICK #SV-330 LE	1.000 EA
51XB1016A08	10-16X 1/2HXWSSLD SERTYB	2.000 EA
11XW1032G06	10-32 X .38, TAPTITE II, HEX WSHR SLTD U	1.000 EA
HW3001B01	003SS CUP WASHER, FOR #8 SCREW	1.000 EA
36EP3104A01	FREP MACH W/GRSR, RAISED FH PADS	1.000 EA
HW4500A01	1641B(ALEMITE)400 UNIV, GREASE FITT	1.000 EA
HW5100A05	WVY WSHR F/205 & 304 BRGS	1.000 EA
36EP3100A01SP	PU ENDPLATE, MACH	1.000 EA
HW4500A01	1641B(ALEMITE)400 UNIV, GREASE FITT	1.000 EA
XY2520A12	1/4-20 HEX NUT, DIRECTIONAL SERRATIONS	4.000 EA
51XB1214A16	12-14X1.00 HXWSSLD SERTYB	1.000 EA
36FH4009A102SP	IEC FH GREASER W/AUTOPHERETIC PRIMER	1.000 EA
51XW1032A06	10-32 X .38, TAPTITE II, HEX WSHR SLTD S	3.000 EA
36CB4516	36 LIPPED CB LID	1.000 EA
37GS1001SP	GASKET, CONDUIT BOX LID, .06 THICK LEXID	1.000 EA
51XW0832A07	8-32 X .44, TAPTITE II, HEX WSHR SLTD SE	4.000 EA
HW2501E16	KEY, 1/4 SQ X 1.750	1.000 EA
HA7000A02	KEY RETAINER RING, 1 1/8 DIA, 1 3/8 DIA	1.000 EA
85XU0407S04	4X1/4 U DRIVE PIN STAINLESS	2.000 EA
MJ1000A75	GREASE, POLYREX EM EXXON	0.050 LB

Parts List (continued)

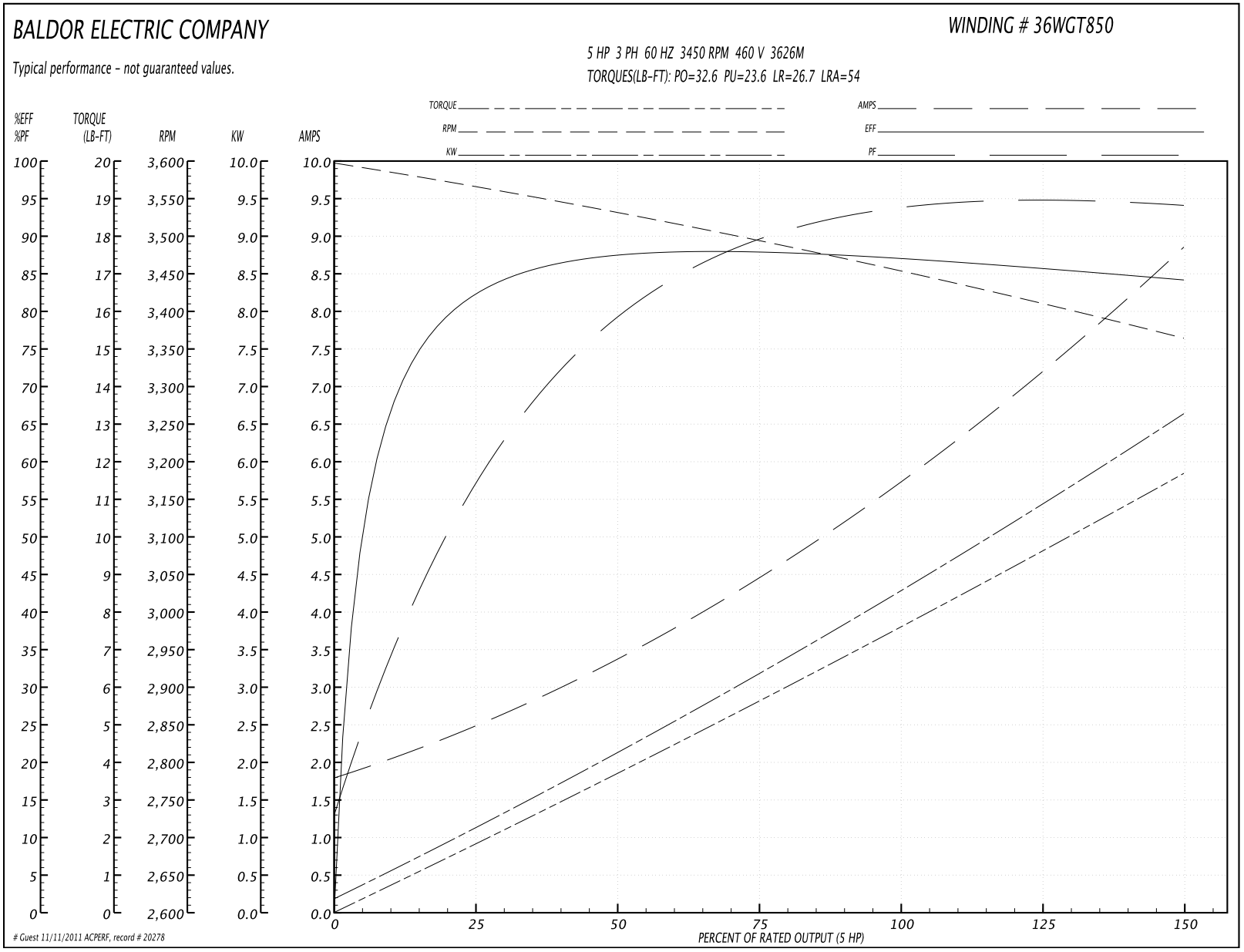
Part Number	Description	Quantity
MG1000G27	PAINT- S9282E CHARCOAL GREY	0.022 GA
36FN3000C01SP	EXFN, PLASTIC, 5.25 OD, .912 ID	1.000 EA
HA3101A25	THRUBOLT 1/4-20 X 11.000 OHIO ROD	4.000 EA
LB1125C04	STD-E (STOCK CTN LABEL STD-E WITH FLAG)	1.000 EA
LC0005E01	CONN.DIA./WARNING LABEL (LC0005/LB1119)	1.000 EA
NP1256L	ALUM, UL CSA CC, W/O THERMAL, LASER	1.000 EA
36PA1000	PACK GROUP W/LB5001	1.000 EA

Accessories

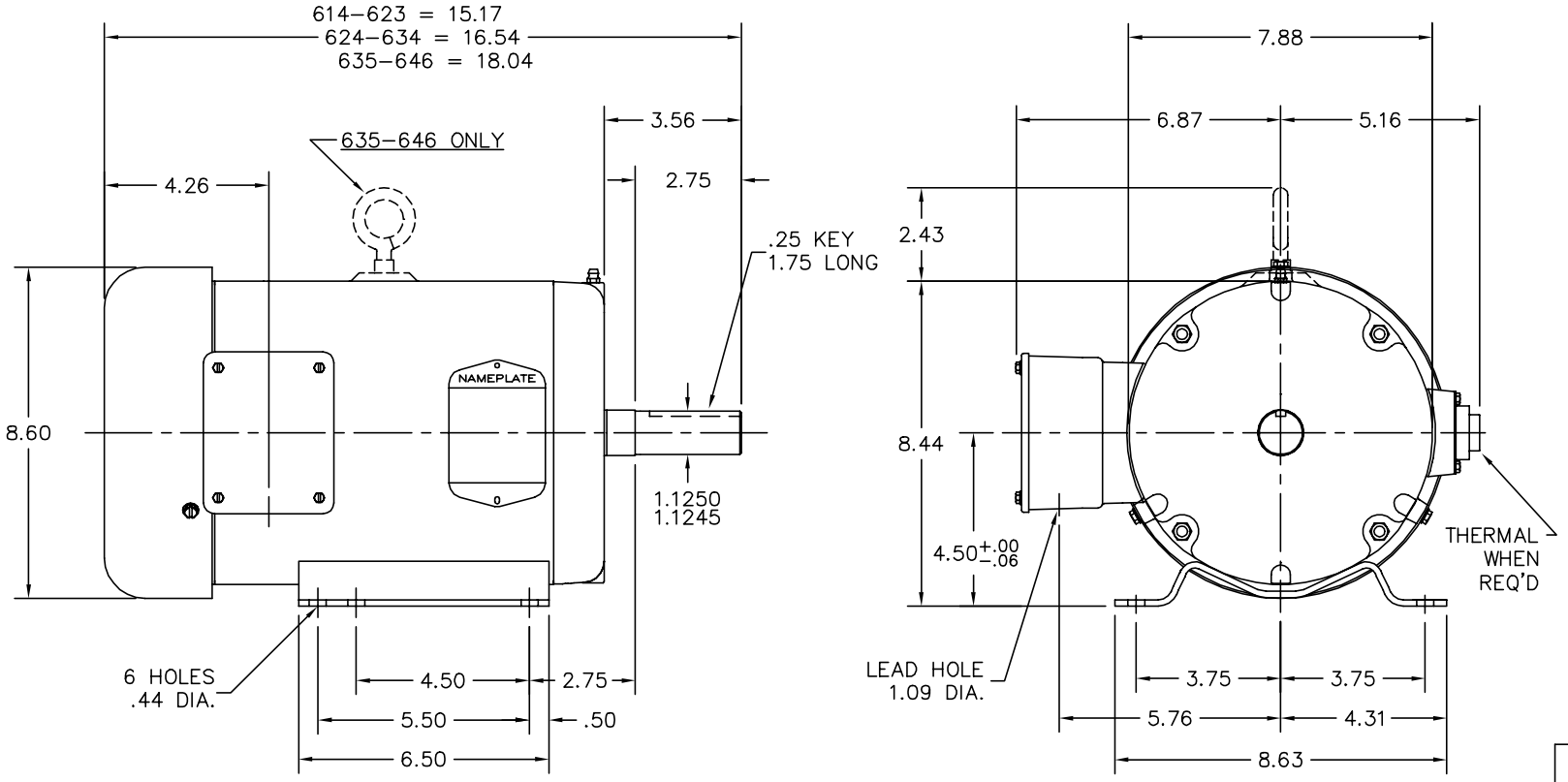
Part Number	Description	Multiplier
36-3301	C FACE KIT	A8
36EP1304A62SP	FLANGE MTD ENDPLATE 182-4TD -ENCL (LESS	A8

Performance Data at 460V, 60Hz, 5.0HP (Typical performance - Not guaranteed values)							
General Characteristics							
Full Load Torque:	7.62 LB-FT			**Start Configuration:**		DOL	
No-Load Current:	1.89 Amps			**Break-Down Torque:**		32.6 LB-FT	
Line-line Res. @ 25°C.:	2.44 Ohms A Ph / 0.0 Ohms B Ph			**Pull-Up Torque:**		23.6 LB-FT	
Temp. Rise @ Rated Load:	71 C			**Locked-Rotor Torque:**		26.7 LB-FT	
Temp. Rise @ S.F. Load:	90 C			**Starting Current:**		54.0 Amps	
Load Characteristics							
% of Rated Load	**25**	**50**	**75**	**100**	**125**	**150**	**S.F.**
Power Factor:	60.0	81.0	89.0	93.0	94.0	95.0	94.0
Efficiency:	82.4	87.8	88.3	87.5	86.0	84.1	86.6
Speed:	3564.0	3530.0	3494.0	3454.0	3412.0	3363.0	3429.0
Line Amperes:	2.34	3.36	4.52	5.79	7.24	8.8	6.66

Performance Graph at 460V, 60Hz, 5.0HP Typical performance - Not guaranteed values



36LYA001

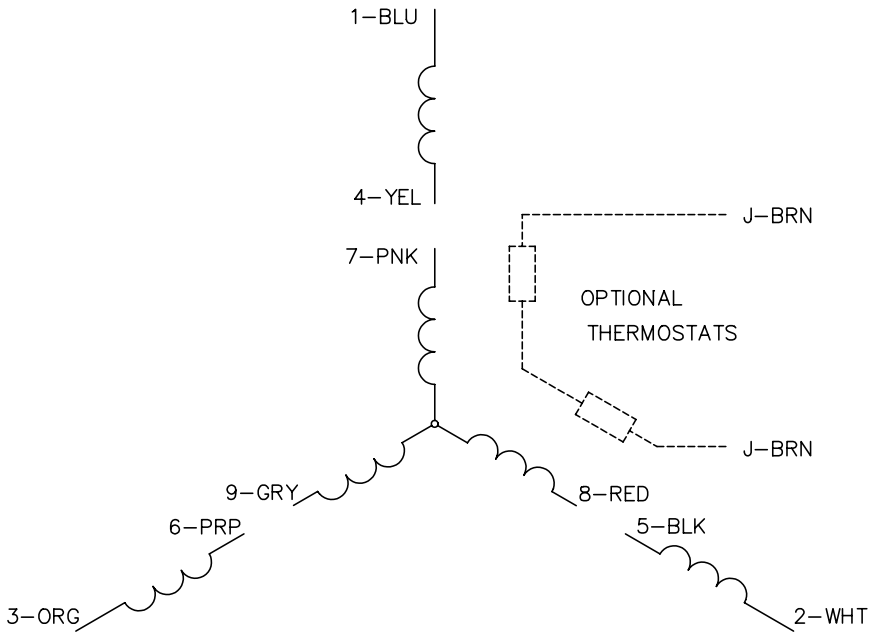


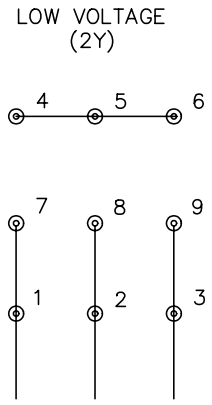
36LYA001

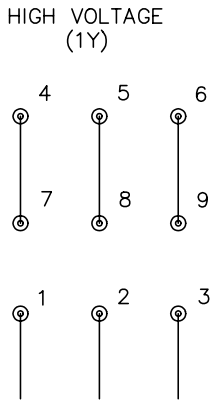
CUSTOMER IS RESPONSIBLE FOR DETERMINING THAT BALDOR'S PRODUCT WILL PERFORM SUITABLY IN THE INTENDED APPLICATION.

REV. DESC: CORRECT DESCRIPTION			BALDOR • DODGE • RELIANCE
REV. LTR: U	VERSION: 04	TDR: 000000496634	
FILE: \AAA\00000\777		REVISED: 15:20:39 04/13/2009	STD HORZ 182–4T TEFC 36M
MTL: –		BY: ENBRAM0	SH 1 of 1

CD0005







NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

CD0005

REV. DESC: REVISE TO SHOW OPTIONAL COLORS			BALDOR ELECTRIC Co.
REV. LTR: E	BY: JLP	REVISED: 01/19/99 10:15	TDR: 0171435
CD0005		FILE: AAA00005140	MDL: –
		MTL: –	3PH, DV, 9 LEADS

TABLE 3D

COSCO GROUNDWATER REMEDIATION

AIR STRIPPER DESIGN - ESTIMATED VOC EMISSIONS (BASED ON NEW AIR STRIPPER DESIGN CONCS & MAX. FLOW)

CHEMICAL	Toxicity Rating	CAS Registry Number	Air Stripper Influent Design Value (µg/l)	Contaminant Emissions (lb/h)	Contaminant Emissions (lb/yr)	Calculated Max. Actual Annual Impact (µg/m³)	AGC (µg/m³)	% of Allowable Emissions	Calculated Max. Short Term Impact (µg/m³)	SGC (µg/m³)	% of Allowable Emissions
Vinyl Chloride	High	00075-01-4	5	0.000	1	0.00	0.11	1.00%	0.072	180,000	0.00%
1,2-Dichloroethene (total	Moderate	00540-59-0	150	0.002	16	0.03	1900	0.00%	2.151	190,000	0.00%
Trichloroethene	Moderate	00079-01-6	500	0.006	55	0.11	0.5	22.06%	7.169	54,000	0.01%
Tetrachloroethene	Moderate	00127-18-4	500	0.006	55	0.11	1	11.03%	7.169	1,000	0.72%
TOTALS				0.0144	127						

Based on the New York State Air Guide - 1, 1997

1. Air Stripper Influent Design Value - The level of contaminant assumed to be the maximum of the source area.
2. Contaminant Emissions - Assumes that 100% of the volatile contaminants in the water are removed by the air stripper.

Assumed Stack Height: **35 ft.**

Treatment System Flow Rate: **25 gpm**

APPENDIX D
SITE MANAGEMENT FORMS

Annual Site Wide Inspection COSCO 15 West Street, Spring Valley, NY NYSDEC Site No. 3-44-035			
	Yes	**No**	**Notes**
Tailings Dump Area:			
Perimeter Fencing Intact ?			
Asphalt Cap Intact ?			
Remedial Shed:			
Piping Leaks Observed ?			
Biofouling/Sediment in 1,500 Gallon Influent Tank ?			
Transfer Pump Operational ?			
Check Bag Filter Housings?			
Air Stripper Trays Plugged/Fouled ?			
Air Stripper Sump Fouled ?			
Air Stripper Sump Floats Operational ?			
Air Stripper Internal Cleaning Recommended ?			
Air Stripper AIR Intake Free of Debris ?			
Air Stripper Blower Sound OK ?			
Check Air Stripper Stack for Plumbness.			
Check Guy Wires for Plumbness.			
Discharge Pump Operational ?			
Flow Meters Operational ?			
Pressure Gauges Operational ?			
Interior Lighting Operational ?			
Exterior Lighting Operational ?			
Roll-Up Doors Operational ?			
Floor Sump Operational ?			
Heater Operational ?			
Louver/Vent Fan Operational ?			
Roof Condition ?			
Floor Condition			
Roof Condition ?			
Haz Waste Drums On-Site ?			
First Aid Kit ?			
Fire Extinguisher up to Code ?			
Lock/Keybox Condition ?			

Inspected By: **Date:**

Annual Site Wide Inspection
COSCO
(Continued)
NYSDEC Site No. 3-44-035

	Yes	No	Notes
General Site Condition:			
Locate all Monitoring Wells ?			
Monitoring Well Road Box Repairs Needed ?			
Overgrown ?			
Trash ?			
Vandalism ?			
Have Any New Businesses Opened on the Property ?			
Have Any Businesses Vacated the Property ?			

Notes/Comments:

Inspected By: **Date:**

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Other:

CERTIFICATION BY CONTRACTOR
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of the Company/Corporation herein referenced and contractor for the work described in the foregoing application for payment. According to my knowledge and belief, all items and amounts shown on the face of this application for payment are correct, all work has been performed and/or materials supplied, the foregoing is a true and correct statement of the contract account up to and including that last day of the period covered by this application. _____ **Date** **Contractor**

RAMBOLL

Groundwater Monitoring Purging and Sampling Form

COSCO Site
Spring Valley, New York

General

Well No.:
Field Personnel:
Weather Conditions:
Physical Condition of Well:
Equipment used:

Purging Information

Date:
Purging Time: Start:
Stop:
Volume to be Purged (3 vol.): gal.
Volume Purged: gal.
Purging Method: Dedicated Bailer
Purge Water Disposal Method: Containerize, transport to, and treat at the remedial shed on-site.

Measuring Point Elevation: ft. amsl
Well Diameter: in.
Total Depth of Well Installed: ft. bmp
Total Depth of Well Measured: ft. bmp
Depth to Water: ft. bmp
1 Well Volume: X = gal.

Purge Water Characteristics

Color:
Odor:
Turbidity:

Presence of NAPL:
Other:

Sampling Information

Date of Sample Collection:
Time of Sample Collection:
Sample Identification:
Method of Sample Collection: Dedicated Bailer
Sample Description:
Containers: 3 x 40ml glass voa vials unpreserved
Type of Preservative if any: none, cool 4°C
Analytical Method Requested: VOCs by USEPA Method 624

4" well volume multiplier (gallons per foot) = 0.653 2" well volume multiplier (gallons per foot) = 0.163

Notes

COSCO- Groundwater Remediation System Checklist

Date: **Personnel Onsite Initials:**

NOTE: Bag filters should only be changed during **non-sampling** site visits. If bag filters are changed, note filter pressures **before** and **after** the change.

Location	*Flow Rates (GPM)*
RW-1S	
RW-3D	
RW-8S	
Effluent	

Location	*VFD Frequency (Hz)*
Transfer Pump	
Effluent Pump	
Blower	

Location	*Pressure (psi)*
Transfer Pump	
Left-Bagfilter	Old Filter:
	* New Filter:
Right Bagfilter	Old Filter:
	* New Filter:
Effluent Pump	

* Only if bag filter is changed

(Circle One):

Samples Collected?: Yes / No

Bag Filters Changed: Yes / No

Comments:

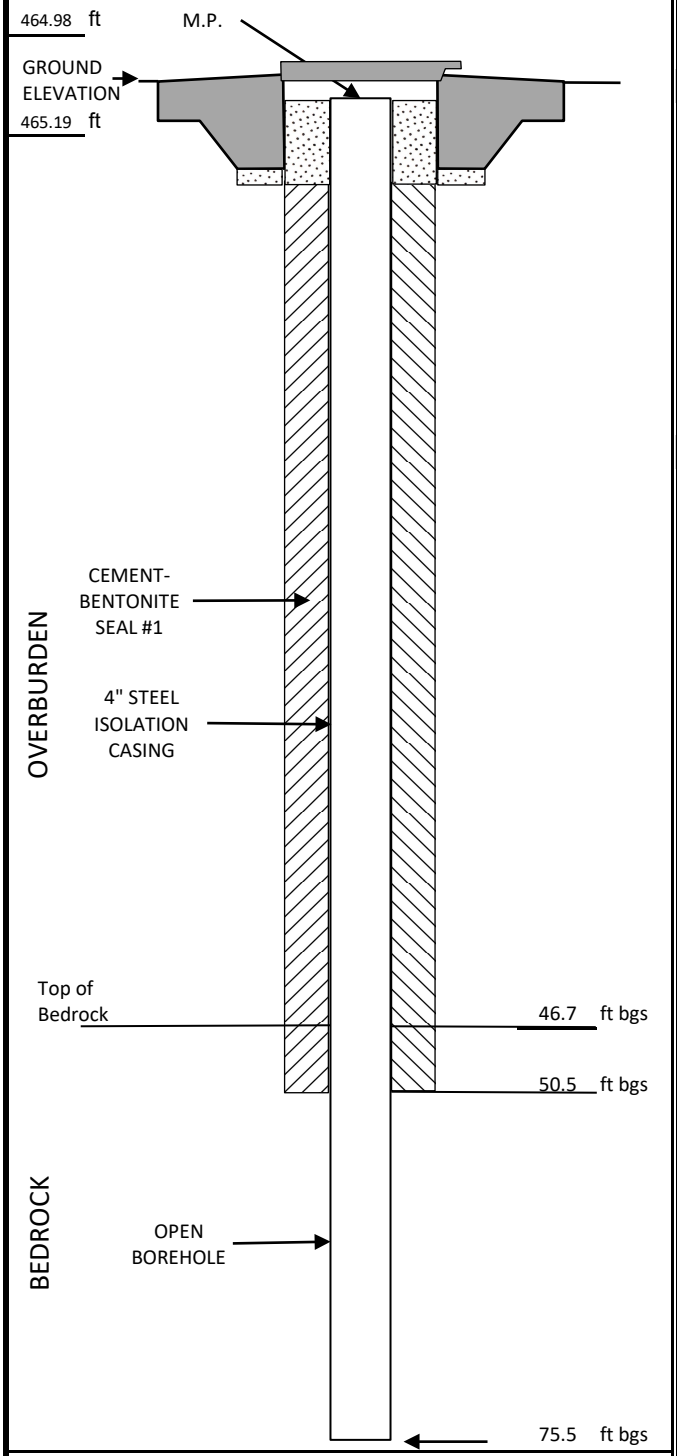
APPENDIX E
MONITORING WELL CONSTRUCTION LOGS

WELL COMPLETION LOG

Well ID: BDW-1S
Northing: 829973.443
Easting: 615783.633

Site Name:	COSCO	Drilling Subcontractor:	CASCADE	Date Drilled:	5/4 -11/2022
Site Location:	Spring Valley, NY	Master Driller:	Timothy Van Ness	Date Installed:	5/11/2022
Project #:	1940075217				
Client:	NYSDEC	Installation Inspector:	Alayna Fuess	Date Developed:	6/23/2022

WELL CONSTRUCTION DETAIL (NOT TO SCALE)



ft bgs - Feet Below Ground Surface in. - Inches M.P. - Measurement Point
ft bmp - Feet Below Measuring Point

INSPECTION NOTES

Well Type: Monitoring Well
Static Water Level: 29.97 ft bmp
Measurement Point: Protective Casing

Borehole Advancement

Overburden

Method 1: Mud Rotary **Diameter:** 6" ID
Interval 1: 0.0 to 50.5 ft bgs
Method 2: - **Diameter:** -
Interval 2: - to - ft bgs
P. Casing: Steel **Interval:** 0.0 to ft bgs
Sampling Method:
Type: - **Diameter:** -
Weight: - **Fall:** -
Interval: - to - ft bgs

Bedrock

Method: HQ3 Wireline Diameter: 3.85 in.
Interval: 50.5 to 75.5 ft bgs
P. Casing 2: - Interval: - to - ft bgs
P. Casing 3: - Interval: - to - ft bgs
Sampling Method:
Type: Wireline Diameter: 2.75 in.
Interval: 50.5 to 75.5 ft bgs

Well Construction

Riser Pipe

Material: Steel **Diameter:** 4"
Interval: 0 to 50.5 ft bgs **Joint:** -

Screen:

Material: - **Diameter:** 3.75"
Slot Size: - **Joint:** -
Interval: 50.5 to 75.5 ft bgs

Sump:

Material: - **Diameter:** -
Interval: - to - ft bgs **Joint:** -

Filter Pack:

Type: - **Grade:** -
Interval: - to - ft bgs

Seal(s):

Type: Bentonite Grout **Interval:** 0.0 to 50.5 ft bgs
Type: **Interval:** to ft bgs
Type: **Interval:** to ft bgs
Type: **Interval:** to ft bgs

Surface Completion:

Type: Stick up casing with locking cap attachment.

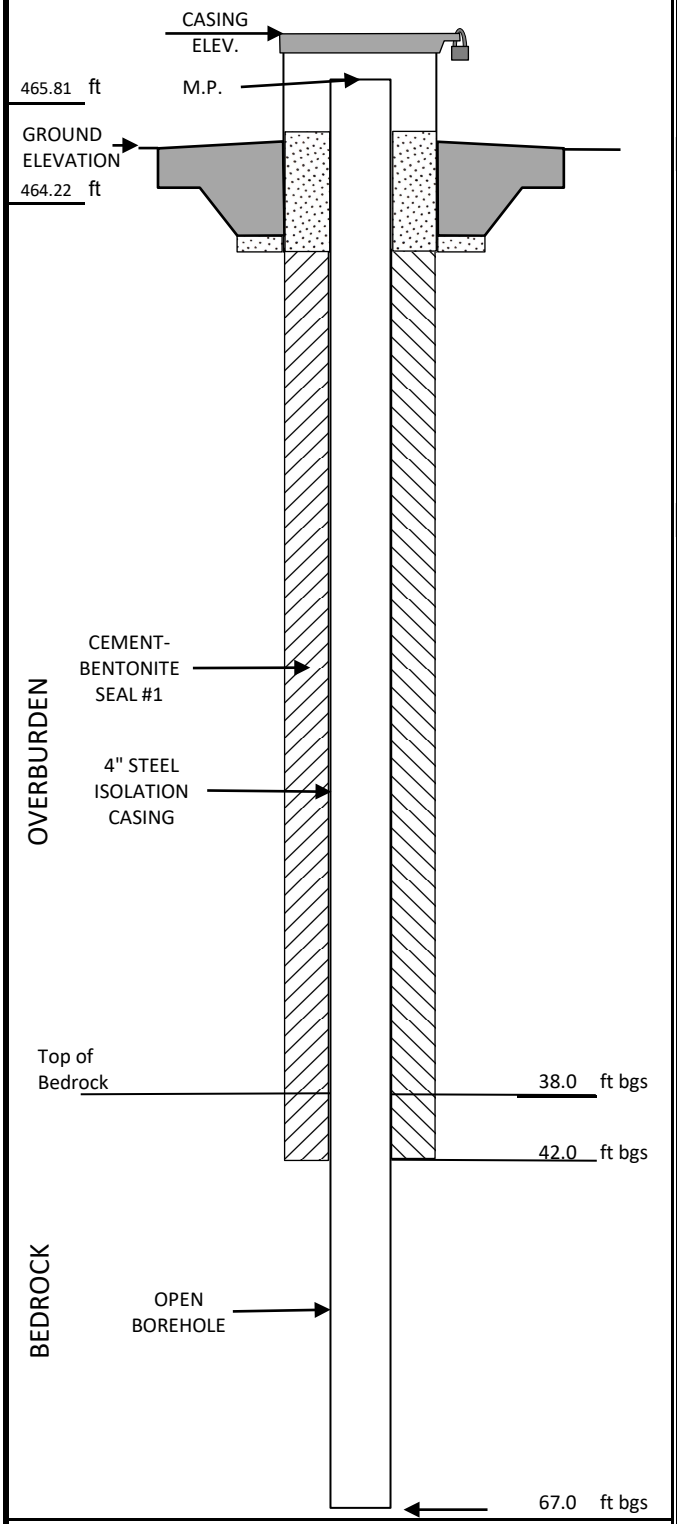
Additional Notes:

WELL COMPLETION LOG

Well ID:	BDW-2S
Northing:	829910.454
Easting:	615770.002

Site Name:	COSCO	Drilling Subcontractor:	CASCADE	Date Drilled:	5/18/2022
Site Location:	Spring Valley, NY	Master Driller:	Timothy Van Ness	Date Installed:	5/19/2022
Project #:	1940075217				
Client:	NYSDEC	Installation Inspector:	Alayna Fuess	Date Developed:	6/22/2022

WELL CONSTRUCTION DETAIL (NOT TO SCALE)



ft bgs - Feet Below Ground Surface in. - Inches M.P. - Measurement Point

ft bmp - Feet Below Measuring Point

INSPECTION NOTES

Well Type: Monitoring Well

Static Water Level: 31.18 ft bmp

Measurement Point: Protective Casing

Borehole Advancement

Overburden

Method 1: Mud Rotary **Diameter:** 6" ID

Interval 1: 0.0 to 42.0 ft bgs

Method 2: - **Diameter:** -

Interval 2: - to - ft bgs

P. Casing: Steel **Interval:** 0.0 to 42.0 ft bgs

Sampling Method:

Type: - **Diameter:** -

Weight: - **Fall:** -

Interval: - to - ft bgs

Bedrock

Method: HQ3 Wireline Diameter: 3.85 in.

Interval: 42.0 to 67.0 ft bgs

P. Casing 2: - Interval: - to - ft bgs

P. Casing 3: - Interval: - to - ft bgs

Sampling Method:

Type: Wireline Diameter: 2.75 in.

Interval: 42.0 to 67.0 ft bgs

Well Construction

Riser Pipe

Material: Steel **Diameter:** 4"

Interval: 0 to 42 ft bgs **Joint:** -

Screen:

Material: 42 **Diameter:** 3.75"

Slot Size: - **Joint:** -

Interval: 42.0 to 67.0 ft bgs

Sump:

Material: - **Diameter:** -

Interval: - to - ft bgs **Joint:** -

Filter Pack:

Type: - **Grade:** -

Interval: - to - ft bgs

Seal(s):

Type: Bentonite Grout **Interval:** 0.0 to 42.0 ft bgs

Type: **Interval:** to ft bgs

Type: **Interval:** to ft bgs

Type: **Interval:** to ft bgs

Surface Completion:

Type: Stick up casing with locking cap attachment.

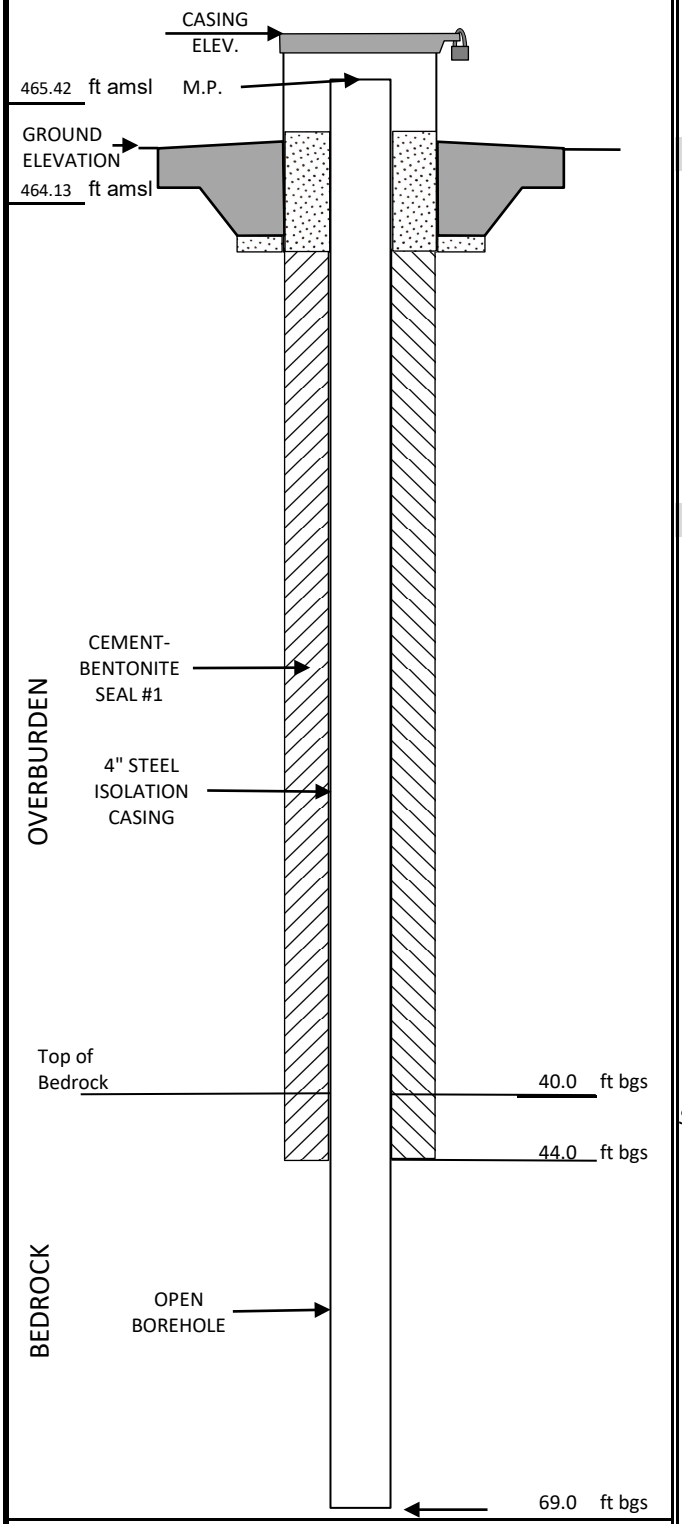
Additional Notes:

WELL COMPLETION LOG

Well ID: INJ-1S
Northing: 829900.407
Easting: 615760.574

Site Name:	COSCO	Drilling Subcontractor:	CASCADE	Date Drilled:	5/20/2022 ; 5/24/2022
Site Location:	Spring Valley, NY	Master Driller:	Timothy Van Ness	Date Installed:	5/24/2022
Project #:	1940075217				
Client:	NYSDEC	Installation Inspector:	Chris Weiman, Rob Hornung	Date Developed:	6/23/2022

WELL CONSTRUCTION DETAIL (NOT TO SCALE)



ft bgs - Feet Below Ground Surface in. - Inches M.P. - Measurement Point
ft bmp - Feet Below Measuring Point

INSPECTION NOTES

Well Type: Monitoring Well
Static Water Level: 33.14 ft bmp
Measurement Point: Protective Casing

Borehole Advancement

Overburden

Method 1: Mud Rotary **Diameter:** 6" ID
Interval 1: 0.0 to 44.0 ft bgs
Method 2: - **Diameter:** -
Interval 2: - to - ft bgs
P. Casing: Steel **Interval:** 0.0 to 44.0 ft bgs
Sampling Method:
Type: - **Diameter:** -
Weight: - **Fall:** -
Interval: - to - ft bgs

Bedrock

Method: HQ3 Wireline Diameter: 3.85 in.
Interval: 44.0 to 69.0 ft bgs
P. Casing 2: - Interval: - to - ft bgs
P. Casing 3: - Interval: - to - ft bgs
Sampling Method:
Type: Wireline Diameter: 2.75 in.
Interval: 44.0 to 69.0 ft bgs

Well Construction

Riser Pipe

Material: Steel **Diameter:** 4"
Interval: - to - ft bgs **Joint:** -

Screen:

Material: Open Rock **Diameter:** 3.75"
Slot Size: - **Joint:** -
Interval: 44.0 to 69.0 ft bgs

Sump:

Material: - **Diameter:** -
Interval: - to - ft bgs **Joint:** -

Filter Pack:

Type: - **Grade:** -
Interval: - to - ft bgs

Seal(s):

Type: Bentonite Grout **Interval:** 0.0 to 44.0 ft bgs
Type: **Interval:** to ft bgs
Type: **Interval:** to ft bgs
Type: **Interval:** to ft bgs

Surface Completion:

Type: Stick up casing with locking cap attachment.

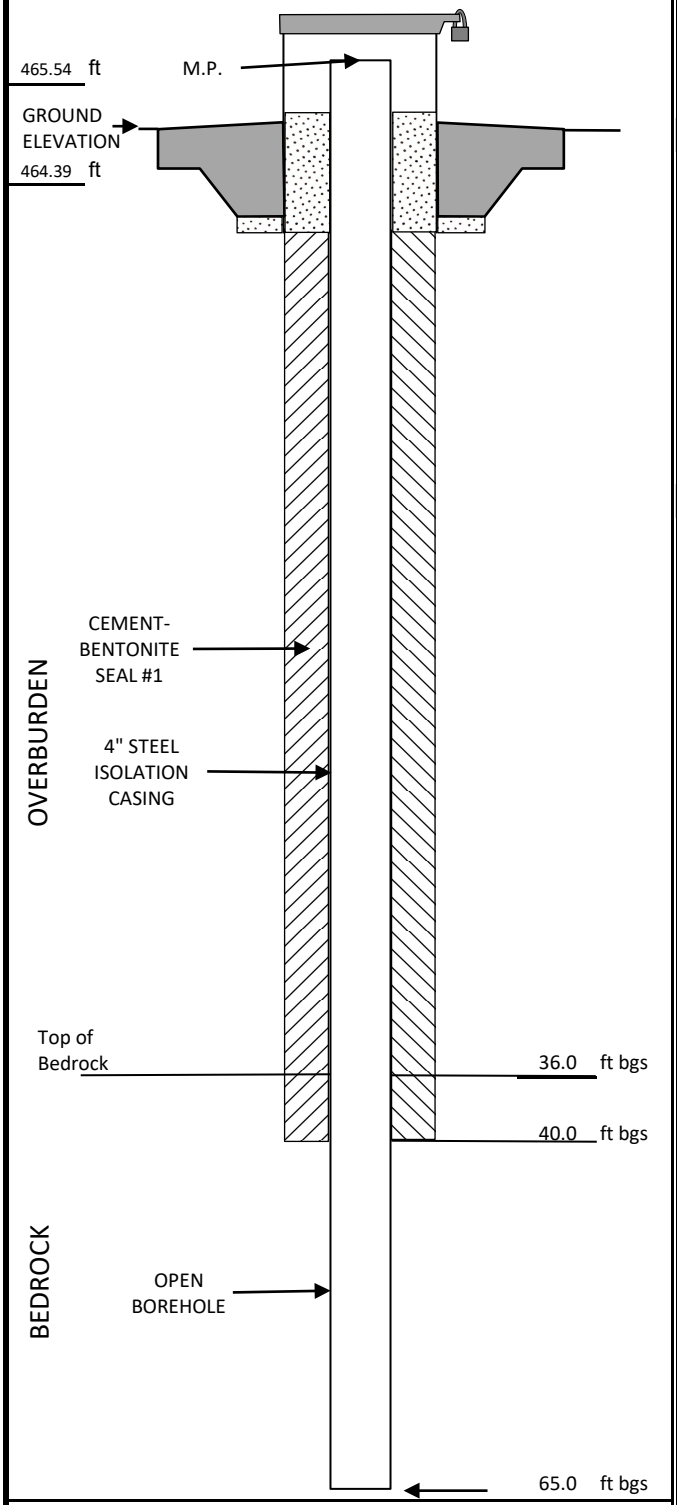
Additional Notes:

WELL COMPLETION LOG

Well ID: INJ-2S
Northing: 829903.421
Easting: 615778.881

Site Name:	COSCO	Drilling Subcontractor:	CASCADE	Date Drilled:	5/13/2022; 5/16/2022
Site Location:	Spring Valley, NY	Master Driller:	Timothy Van Ness	Date Installed:	5/17/2022
Project #:	1940075217				
Client:	NYSDEC	Installation Inspector:	Alayna Fuess	Date Developed:	6/22/022

WELL CONSTRUCTION DETAIL (NOT TO SCALE)



ft bgs - Feet Below Ground Surface in. - Inches M.P. - Measurement Point
ft bmp - Feet Below Measuring Point

INSPECTION NOTES

Well Type: Monitoring Well
Static Water Level: 30.92 ft bmp
Measurement Point: Inner Casing

Borehole Advancement

Overburden

Method 1: Mud Rotary **Diameter:** 6" ID
Interval 1: 0.0 to 40.0 ft bgs
Method 2: - **Diameter:** -
Interval 2: - to - ft bgs
P. Casing: Steel **Interval:** 0.0 to 40.0 ft bgs
Sampling Method:
Type: - **Diameter:** -
Weight: - **Fall:** -
Interval: - to - ft bgs

Bedrock

Method: HQ3 Wireline Diameter: 3.85 in.
Interval: 40.0 to 65.0 ft bgs
P. Casing 2: - Interval: - to - ft bgs
P. Casing 3: - Interval: - to - ft bgs
Sampling Method:
Type: Wireline Diameter: 2.75 in.
Interval: 40.0 to 65.0 ft bgs

Well Construction

Riser Pipe

Material: Steel **Diameter:** 4"
Interval: 0 to 40 ft bgs **Joint:** -

Screen:

Material: Open Rock **Diameter:** 3.75"
Slot Size: - **Joint:** -
Interval: 40.0 to 65.0 ft bgs

Sump:

Material: - **Diameter:** -
Interval: - to - ft bgs **Joint:** -

Filter Pack:

Type: - **Grade:** -
Interval: - to - ft bgs

Seal(s):

Type: Bentonite Grout **Interval:** 0.0 to 40.0 ft bgs
Type: **Interval:** to ft bgs
Type: **Interval:** to ft bgs
Type: **Interval:** to ft bgs

Surface Completion:

Type: Stick up casing with locking cap attachment.

Additional Notes:

APPENDIX F
STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Water, Bureau of Water Permits
625 Broadway, Albany, New York 12233
www.dec.ny.gov

M E M O R A N D U M
SPDES Permit Equivalent

TO: Robert Strang, DER

FROM: Percival, Bureau of Water Permits, DOW

SUBJECT: SPDES Permit Equivalent: COSCO.CPC, DER Site ID# 344035

DRAINAGE BASIN: NJ-5 / NY Pascack Brook & Tribs. (1501-0015, NY)

DATE: September 9, 2020

In response to your request dated May 14, 2020, attached please find the effluent limitations and monitoring requirements for the above noted remediation discharge.

The discharge consists of treated groundwater from three remediation recovery wells. The treatment system consists of pumping raw well water to a holding tank followed by sedimentation, filtration, granular activated carbon (GAC) filtration, sampling; and discharge to drainage ditch (Reach B) to the Pascack Brook Tributary.

The DOW does not have any regulatory authority over a discharge from a State, PRP, or Federal Superfund Site. DER will be responsible for ensuring compliance with the attached effluent limitations and monitoring requirements, and approval of all engineering submissions. The additional conditions identify the appropriate DER contact person who will receive all effluent results, engineering submissions, and modification requests. The Regional Water Engineer should be kept appraised of the status of this discharge and, in accordance with the attached criteria, receive a copy of the effluent results for informational purposes.

If you have any questions, please call Percival Miller at 518-402-8120.

Attachment (Effluent Limitations and Monitoring Requirements)

cc: Region 3 Regional Water Engineer (via email, w/attach)
BWP Section Chief, DOW (via email, w/attach)

EFFLUENT LIMITATIONS & MONITORING REQUIREMENTS

OUTFALL	DISCHARGE TYPE	LATITUDE/ LONGITUDE	RECEIVING WATER and CLASS	EFFECTIVE	EXPIRING
001	Treated Remediation Wastewater	41° 6' 39" N -74° 3' 5" W	Trib. to Pascack Brook, Class C	9/15/2020	9/15/2025

The discharges from the treatment facility shall be limited and monitored by the operator as specified below:

Outfall and Parameters	**CAS No.**	**Monthly Average Limits**	**Daily Maximum Limits**	**Units**	**Minimum Monitoring Requirements**		**FN**
Outfall 001					**Measurement Frequency**	**Sample Type**	
Flow	NA	-	0.065	MGD	Continuous	Recorder	
pH	NA	-	6.5-8.5	SU	Monthly	Grab	
Vinyl Chloride	75-01-4	-	10	µg/l	Monthly	Grab	
1,1-Dichloroethene	75-35-4	-	10	µg/l	Monthly	Grab	
1,2-Dichloroethene (Total)	…	-	10	µg/l	Monthly	Grab	
Trichloroethene	79-01-6	-	10	µg/l	Monthly	Grab	
Tetrachloroethene	127-18-4	-	3.7	µg/l	Monthly	Grab	
Aluminum	7429-90-5	-	4000	µg/l	Monthly	Grab	
Arsenic (Total)	7440-38-2	-	550	µg/l	Monthly	Grab	
Arsenic (Dissolved)	..	-	550	µg/l	Monthly	Grab	
Barium	7440-39-3	-	4000	µg/l	Monthly	Grab	
Iron	7439-89-6	-	1800	µg/l	Monthly	Grab	
Copper (Total)	7440-50-8	-	2.1	µg/l	Monthly	Grab	
Copper (Dissolved)	7440-50-8	-	2.0	µg/l	Monthly	Grab	
Lead (Total)	7439-92-1	-	20	µg/l	Monthly	Grab	
Lead (Dissolved)	7439-92-1	-	15	µg/l	Monthly	Grab	
Manganese	7439-96-5	-	2400	µg/l	Monthly	Grab	
Vanadium	7440-62-2	-	52	µg/l	Monthly	Grab	
Zinc (Total)	7440-66-6	-	333	µg/l	Monthly	Grab	
Zinc (Dissolved)	7439-92-1	-	330	µg/l	Monthly	Grab	

Additional Conditions:

1. Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

   Robert Strang
   Division of Environmental Remediation
   NYSDEC, 625 Broadway, Albany, New York 12233- 7015,
   Tel: 518-402- 8642.

With a copy sent to:

Regional Water Engineer, Region 3
100 Hillside Avenue, Suite 1W
White Plains, New York, 10603-2860
Phone: (914) 428-2505

2. Samples and measurements, to comply with the monitoring requirements specified above, must be taken from the effluent side of the final treatment unit prior to discharge to the receiving water body unless otherwise noted above.

3. Only site generated wastewater is authorized for treatment and discharge.

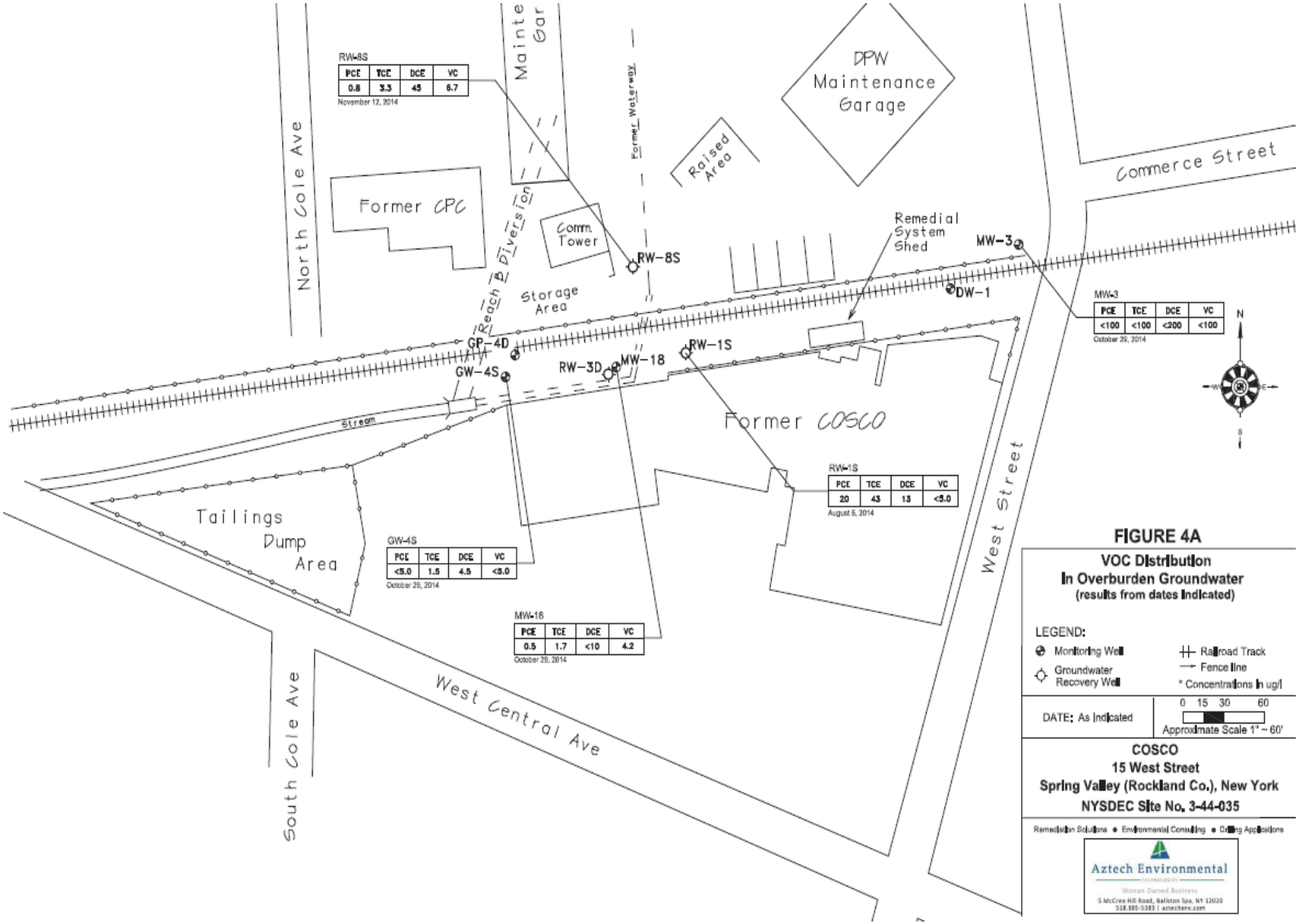
4. Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

5. Both concentration (mg/l or µg/l) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

6. Any use of corrosion/scale inhibitors, biocidal-type compounds, or other water treatment chemicals used in the treatment process must be approved by the department prior to use.

7. This discharge and administration of this discharge must comply with the substantive requirements of 6 NYCRR Part 750.

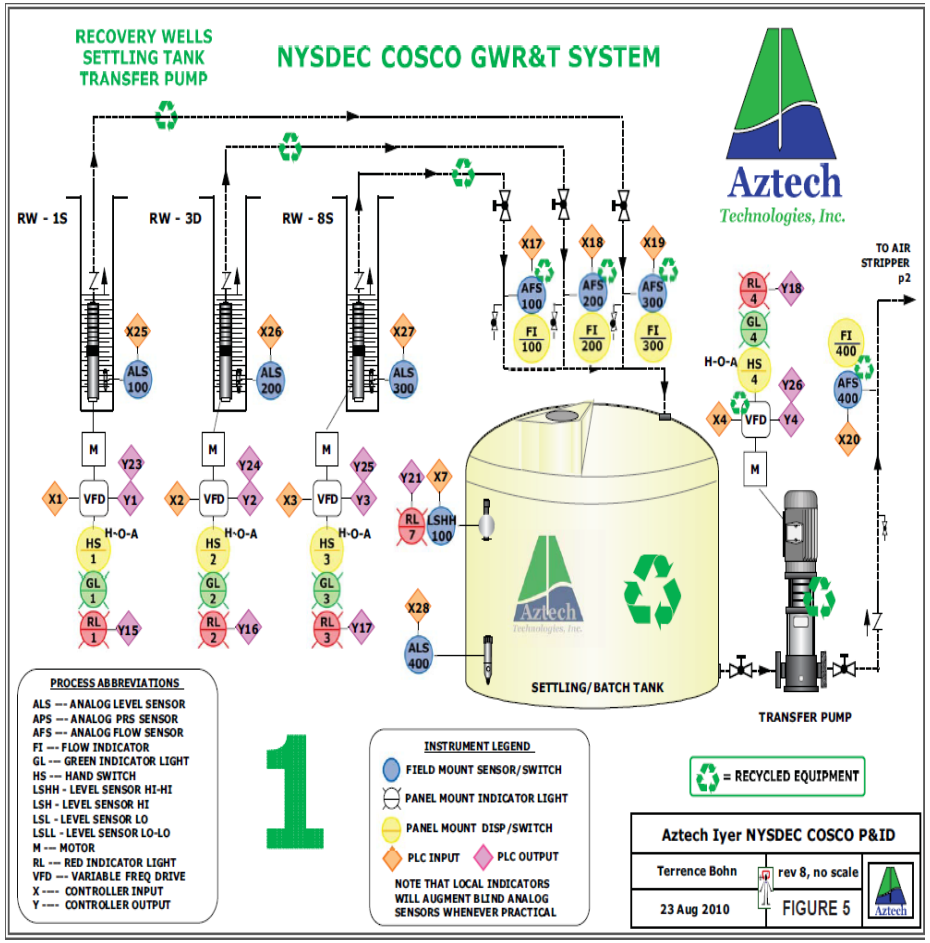
MONITORING LOCATIONS



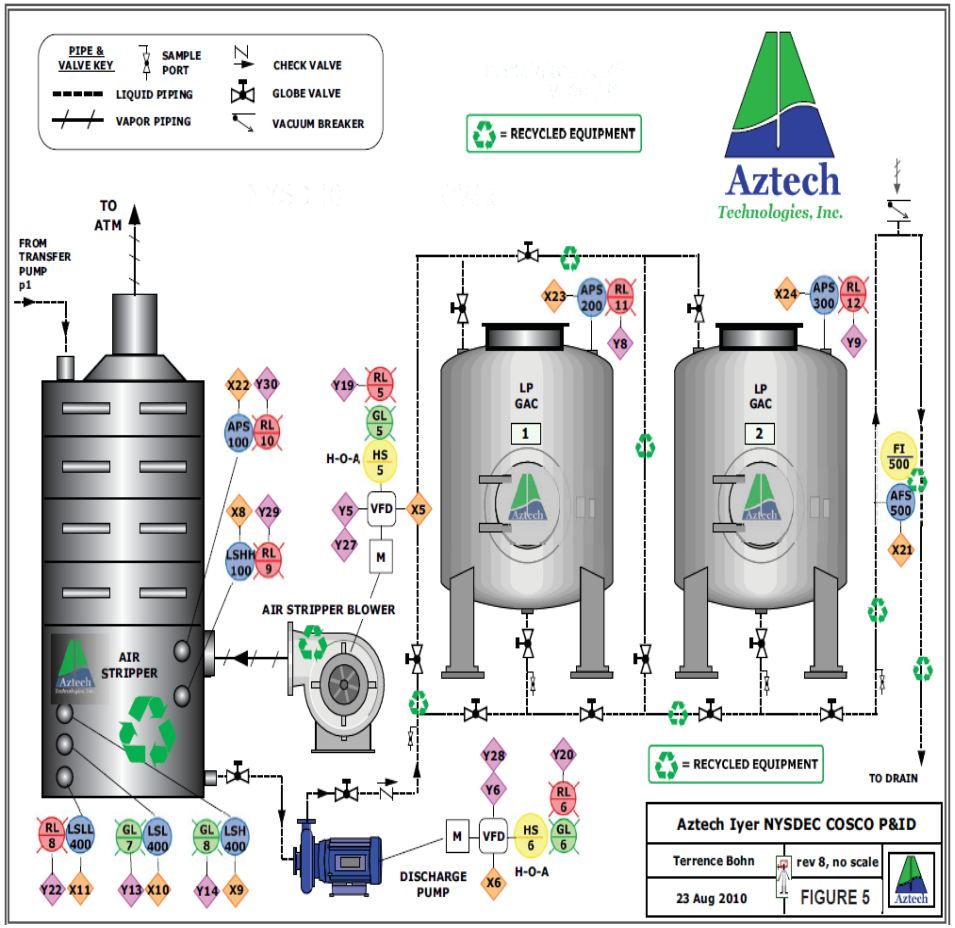
NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Groundwater Remediation and Treatment System

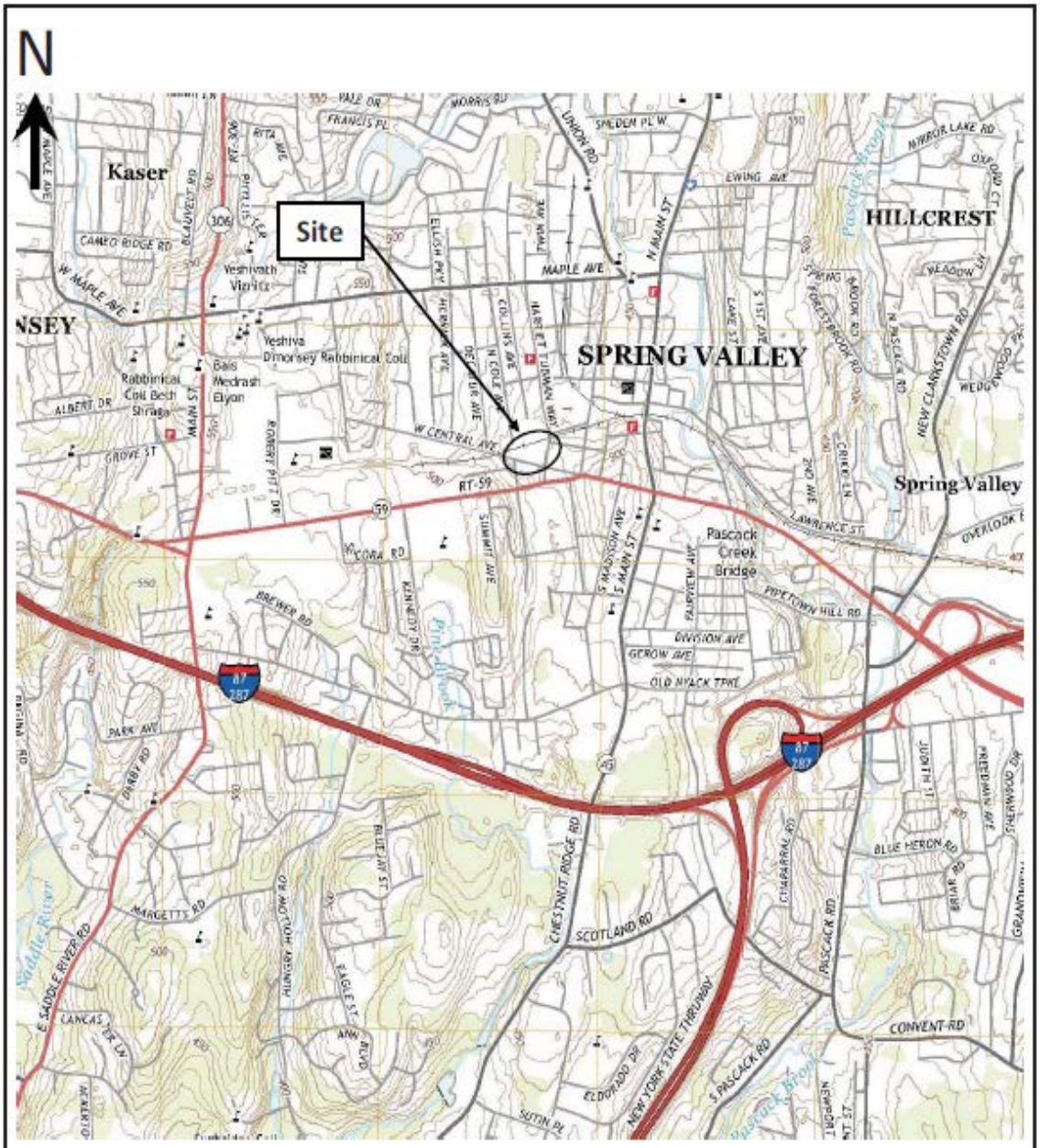
RW Wells 1-S, 3-D, and 8-S; Settling Tank and Transfer Pump



From Transfer Pump, to Air-Stripper, GAC Filters, and Drain



SITE LOCATION



USGS Topographic Quadrangle Map – Park Ridge, NJ — Scale 1:24,000

Remediation • Environmental • Drilling

Woman Owned Business
Aztec Environmental
TECHNOLOGIES

SITE: NYSDEC – Site # 3-44-035
COSCO
15 West Street
Spring Valley, New York

FIGURE 1

Site Location Map

NEW YORK STATE OF OPPORTUNITY
Department of Environmental Conservation