TETRA TECH

# SURFACE WATER METERING PLAN FOR TUNKHANNOCK CREEK

# ATLANTIC SUNRISE PROJECT

## Nicholson Township, Wyoming County, Pennsylvania

**Prepared For:**

**TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC**
**HOUSTON, TEXAS**

**Prepared By:**

**TETRA TECH, INC.**
**PITTSBURGH, PENNSYLVANIA**

**September 2016**

complex world

CLEAR SOLUTIONS™

**SRBC Surface Water Withdrawal Application Metering Plan**

## A. Intake Design

The surface water withdrawal location on Tunkhannock Creek is located along the proposed gas pipeline route where the water will be required for hydrostatic testing. The anticipated volume of water to be withdrawn from Tunkhannock Creek for pipeline hydrotesting does not trigger any Susquehanna River Basin Commission (SRBC) permitting requirement (i.e., more than 100,000 gallons per day average over a 30-day period or 3,000,000 gallons in any consecutive 30-day period). No withdrawals from the creek in excess of these amounts are allowed at any time. All withdrawals must follow this document to protect the environment and ensure that the water volumes withdrawn from the creek are below the SRBC permit threshold volume. Water will be transferred from Tunkhannock Creek directly to the pipeline and/or hydrotest equipment for hydrostatic testing. This water source will only be used to supply water during pipeline construction and testing. Transcontinental Gas Pipe Line Company, LLC (Transco) proposes to use two (2), 5-foot long, 3-inch radius stainless steel screens with slot-size openings of 0.100-inch that are manufactured by Bilfinger Water Technologies™ to withdraw water from Tunkhannock Creek. The 5-foot long screens are connected by a tee fitting and include a foot valve to maintain a flooded suction and prevent backflow. The intake screen will be connected to a 10-inch diameter flexible hose or HDPE suction pipe. The intake screen will be a floated intake submerged in the approximate location of the creek's thalweg (lowest point of creek channel) in close proximity to the project site. The approximate water depth at the point of withdrawal is 3 feet. The slot openings were sized to avoid potential aquatic impacts associated with impingement and entrainment. Calculations for the intake's through-screen approach velocity (provided in Attachment A-1) show the screen entrance velocity to be less than 0.5 feet per second (ft/s). Manufacturer information for the intake screens is included in Attachment A-2. The PNDI Report, which indicates no agency coordination required, is included in Attachment A-3.

Transco proposes to use one 6'' by 6'' Pioneer Prime Series PP66C14 vacuum assisted, end suction centrifugal pump. This pump is mechanically driven and operates at a maximum of 2,200 revolutions per minute. Pump specification sheets and head curves are included in Attachments A-4 and A-5, respectively. Transco will limit the instantaneous pumping rate by using a Cla Val Combination Rate of Flow Controller & Solenoid Shut-off Valve (Model 43-01)) on the discharge end of the pump. Specifications are included in Attachment A-6. This valve will be locked to prevent unintentional changes to the flow rate. Transco's staff will be prepared to comply with monthly passby rates and withdrawal rates. To protect aquatic resources and downstream users, Transco will cease withdrawals from Tunkhannock Creek when the creek flow rate at the assigned reference gage is at or falls below the prescribed monthly passby flow rate.

Transco will ensure that the intake screen is regularly maintained and free of debris. Specifically, to ensure that the screen area is open and not clogged, prior to each operating event, Transco will retrieve the screen intake apparatus from the creek and inspect it for any debris or material that could clog the intake and reduce pumping efficiencies. In addition, the flow rate will be monitored during operation. If the pumping flow rate decreases by 20% or more during operation, the pump will be turned off and the screen intake assembly will be retrieved from the creek and inspected to ensure the screen is not clogged which could result in increased entrance velocities. If debris is

present in and around the screen opening, the screen will be cleaned prior to being put back into operation.

Water will be conveyed to the pipeline for hydrostatic testing from the skid/trailer-mounted pump through a combination of 6-inch steel and 8-inch flexible hose or HDPE pipe. This pipe was sized to accommodate a maximum flow rate of up to 1,800 gpm (see Attachment A-7 for basis). Water used for the pipeline hydrostatic testing will be discharged at a Pennsylvania Department of Environmental Protection permitted location (i.e., PAG-10 permit). The main pipeline hydrostatic testing is scheduled for 2017.

A wetland study was completed for the area on July 8, 2015. One wetland was identified in the vicinity of the proposed withdrawal equipment; equipment will not be placed within the wetland, and crossing the wetlands by personnel or equipment will be minimized. The intake pump will be located within the Federal Emergency Management Agency (FEMA) floodplain, but out of the FEMA floodway. The slope of the creek bank at the proposed location is gradual. All equipment will be temporary and removable, minimizing impact to riparian vegetation. Portable secondary containment will be utilized around the pump. It should also be noted that the pump will be located within the Transco project right-of-way and limit-of-disturbance.

Transco intends to put in place protective controls at its withdrawal site to enforce the passby requirements set by the SRBC with the intent to protect the stream during low-flow periods. For this project, flows at the proposed withdrawal point were calculated by proportioning based on the drainage area ratio method from a selected USGS gaging station on Tunkhannock Creek. At the proposed location, Tunkhannock Creek has a drainage area of 186 square miles ($mi^2$). The selected USGS reference gage on Tunkhannock Creek for this project site is located in Tunkhannock, Pennsylvania and is identified as Gage No. 01534000**.** This gaging station is located downstream of the proposed intake location for this project and has a drainage area of approximately 383 $mi^2$. Based on a drainage area at the withdrawal point of approximately 186 $mi^2$, the Aquatic Resource Class (ARC) of Tunkhannock Creek is classified as 'ARC 3', which represents a small river. Creeks classified as ARC 3 are likely to be moderately sensitive to potential impacts from withdrawals due to their size, position in the landscape, and flow volumes. USGS records (scaled Gage Station data) indicate that at the proposed withdrawal location on Tunkhannock Creek the Q7-10 flow rate is 8.4 cubic feet per second (cfs) or 5.43 MGD. The requested daily withdrawal rates vary by month and range from 1.78 cfs (1.152 MGD) to 4.01 cfs (2.592 MGD). See withdrawal calculations in A-8.

Transco will stop or decrease withdrawals during low flow periods to avoid negatively impacting the quality of Tunkhannock Creek. The USGS gaging station located on Tunkhannock Creek at Tunkhannock, Pennsylvania (Gage No. 01534000) will be used to determine the flow rates of Tunkhannock Creek during surface water withdrawal operations.

**B. Metering**

To meter the volume of water withdrawn at the surface water withdrawal location, a 6-inch Seametrics AG2000 Irrigation Magmeter will be used (see manufacturer information in A-9). This spool-type electromagnetic flow meter and totalizer has no moving parts and minimal straight pipe

requirements both above (i.e., 12 inches, minimum) and below (i.e., 6 inches, minimum) the meter. This allows unobstructed flow and makes it an ideal choice for use in surface water withdrawal applications where debris may cause damage to the equipment. This model is capable of displaying up to 5 digits for flow rate and 8 digits for the totalizer. The minimum flow rate for this model of flow meter is 32 gpm; the maximum rate is 2,400 gpm. The proposed withdrawal rate range of 800 gpm to 1,800 gpm is within this range. The meter is accurate to within +/-1% for flows between 240 gpm and 2400 gpm and +/- 2% for flows under 240 gpm. The flow meter will be installed so that it cannot be bypassed, zeroed, or reset.

Transco will check the totalizer daily prior to pumping water from Tunkhannock Creek and at the end of each day to ensure that the proposed month-specific maximum daily withdrawal rate [1.78 cfs (1.152 MGD) to 4.01 cfs (2.592 MGD)] is not exceeded. Transco will maintain daily records of the project's withdrawal and consumptive water use and shall report the data to the SRBC on a quarterly and annual basis or as prescribed. Transco will also ensure that the meter readout will be accessible for SRBC staff at all times without locks, keys or other special access requirements.

### C. Plans, Details, and Maps

A site plan, cross-section, details, and location map can be found in Attachment A-10. Site Photographs are included in Attachment A-11.

# A-1 Intake Screen Calculations

| | | | | | |
|---|---|---|---|---|---|
| CLIENT: | TRANSCONTINENTAL PIPE LINE COMPANY, LLC | | | JOB NUMBER: | 212C-PB-00282 |
| SUBJECT: | TUNKHANNOCK CREEK SCREENED INTAKE EVALUATION | | | | |
| BASED ON: | Bilfinger Water Technologies | | | DRAWING NUMBER: | |
| BY: | DTK | CHECKED BY: | LMH | APPROVED BY: | CAR |
| DATE: | 12/11/2015 | DATE: | 12/15/2015 | DATE: | 12/15/15 |

**PURPOSE:**

The purpose of this calculation is to evaluate the minimum number of intake screens necessary to meet the requirement of maximum intake velocity of 0.5 feet per second. Creek depth is less than 3 feet.

**APPROACH:**

Use typical industry equations to calculate the minimum number of Bilfinger Water Technologies 6-inch diameter well screens necessary to allow a flow rate of 1,800 gallons per minute. Assume multiple intake screens with 0.1-inch slots.

**CALCULATIONS:**

(1) Data was obtained from Bilfinger Water Technologies® for the well screen.

| | | | | |
|---|---|---|---|---|
| d | = | 0.100 | = | Maximum perforation diameter, inches |
| V | = | 0.5 | = | Maximum intake velocity, feet per second |
| Q | = | 1,800 | = | Maximum flow (withdrawal) rate, gallons per minute |
| r | = | 3.09 | = | Radius of perforated intake pipe, inches |
| b | = | 5.000 | = | length of perforated intake pipe, feet |
| n | = | unknown | = | number of screens |
| $A_s$ | = | 790 | = | Area of screen, square inches |
| $A_o$ | = | 494 | = | Open area of screen, square inches (see attached) |
| P | = | 62.5% | = | Open area of perforated intake pipe ($P = A_o/A_s$) |

(2) Use the following equation from the Handbook of Groundwater Development, Roscoe Moss Company, to calculate first the minimum number of Bilfinger Water Technologies intake screens necessary for a withdrawal of 1,800 gallons per minute.

$$V = \frac{Q / n}{235 \times r \times b \times P}$$

$$n = \frac{Q}{235 \times r \times b \times P \times V}$$

$$n = \frac{1{,}800}{235 \times 3.09 \times 5 \times 0.625 \times 0.5}$$

$$n = 1.59$$

$$n = 2 \quad \text{(round up)}$$

The minimum number of Bilfinger Water Technologies 6-inch diameter well screens necessary to allow for a total flow of 1,800 gpm to be withdrawn is 2.

(3) Using the equation from Step 2, calculate the entrance velocity when 2 Bilfinger Water Technologies 6-inch diameter well screens are used.

$$V = \frac{Q / n}{235 \times r \times b \times P}$$

$$V = \frac{1{,}800 / 2}{235 \times 3.09 \times 5 \times 0.625}$$

$$V = 0.40 \quad \text{feet per second}$$

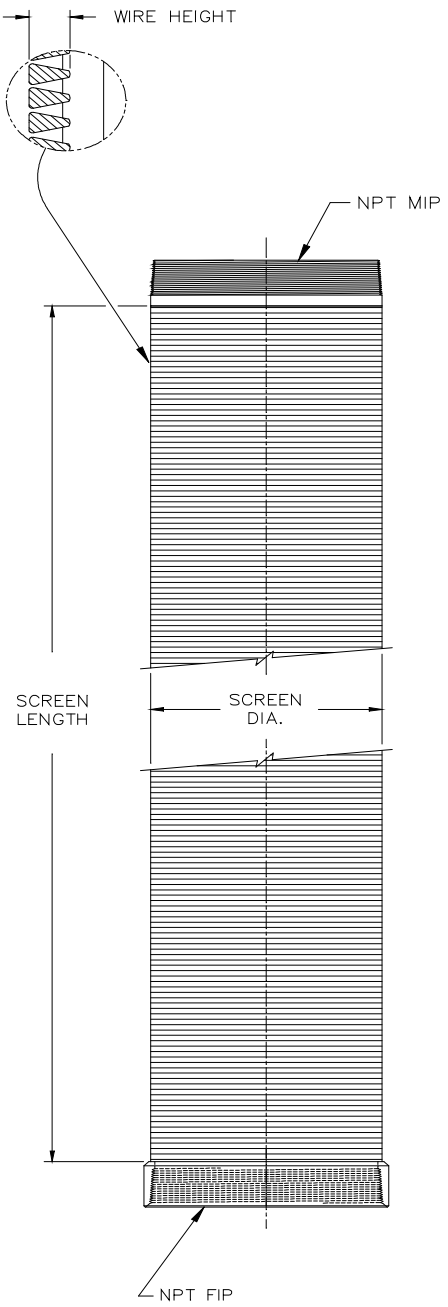
| | | | | | |
|---|---|---|---|---|---|
| CLIENT: | TRANSCONTINENTAL PIPE LINE COMPANY, LLC | | | JOB NUMBER: | 212C-PB-00282 |
| SUBJECT: | TUNKHANNOCK CREEK SCREENED INTAKE EVALUATION | | | | |
| BASED ON: | Bilfinger Water Technologies | | | DRAWING NUMBER: | |
| BY: | DTK | CHECKED BY: | LMH | APPROVED BY: | CAR |
| DATE: | 12/11/2015 | DATE: | 12/15/2015 | DATE: | 12/15/15 |

**CONCLUSION:**

Two Bilfinger Water Technologies 6-inch diameter well screens provide an intake flow capacity of 1,800 gallons per minute with a maximum screen entrance velocity of 0.40 feet per second, which is conservatively below the required maximum intake velocity of 0.5 feet per second. Therefore, Tetra Tech believes that the resulting velocity will minimize impingement and entrainment of aquatic organisms during operation. Additionally, to minimize sediment uptake, the intake screens will be cradled to elevate them a minimum of 6-inches off of the creek bed.

# A-2 Intake Manufacturer Information

| SCREEN INFORMATION | | |
|---|---|---|
| **CUSTOMER** | **Tetra-tech** | |
| **REFERENCE** | | |
| **DIAMETER** | 6 in | PS |
| **MATERIAL** | 304 Stainless | |
| **COLLAPSE** | 45 | PSI |
| **SLOT SIZE** | 0.100 | IN |
| **OPEN AREA** | 62.50% | |
| **ROD AREA** | 0.864 | SQ IN |
| **HANGING WT**[1] | 11,000 | LB |
| [1] *MAXIMUM RECOMMENDED HANGING WEIGHT FOR THE TOP SCREEN JOINT* | | |
| **LENGTH (ft)** | 5 | FULL |
| **NO. OF PIECES** | 1 | Joints |
| **TOP FITTING** | 1.5 in | F/NPT |
| **BTM FITTING** | 1.5 in | M/NPT |




* A broad range of site conditions can impact the physical strength requirements for a successful screen installation. Consult Johnson Screens with questions for successful screen installation. Consult Johnson Screens with questions regarding the parameters presented above as they relate to your specific requirements.

** Vertical weight on screen that should not be exceeded without use of ridgid centralizers!

Prepared by Waterwell Sales. Subject to Bilfinger Water Technologies, Inc Standard Terms and Conditions.

10/14/2015

BILFINGER WATER TECHNOLOGIES

# WELL SCREEN SUBMITTAL DATA

CLIENT: Tetra-tech
PROJECT:

| | | | | |
|---|---|---|---|---|
| Material | 304 Stainless | | | |
| Nom Size | 6 | PS | *150* | *mm* |
| Top x Bottom Fitting Configuration | NPT x WR W/PB | | | |
| Estimated Total Well Depth | 2 | ft | *1* | *meters* |
| Estimated Feet of Screen | 5 | ft | *2* | *meters* |
| Design Slot Size | 0.100 | in | *2.5* | *mm* |
| Approx. Outside Diameter | 6.72 | in | *171* | *mm* |
| Screen Barrel Inside Diameter | 6.18 | in | *157* | *mm* |
| Approx. Clear ID at Fittings | 6.02 | in | *153* | *mm* |
| Approx. Weight Per Ft | 6 | lbs | *3* | *kg* |
| Wire Width | 0.060 | in | *1.5* | *mm* |
| Wire Height | 0.100 | in | *2.5* | *mm* |
| Calc. Collapse Strength * | 45 | PSI | *3* | *kg/sq.cm* |
| Open Area | 62.5% | | | |
| Intake Area | 158 | sq.in./ft | *3,349* | *sq.cm./meter* |
| Transmitting Capacity-at 0.1 ft/sec | 49 | gpm/ft | *10* | *lps/meter* |
| Support Rod Diam | 0.150 | in | *3.8* | *mm* |
| No Rods | 40 | | | |
| Cross Sectional Rod Area | 0.86 | sq.in. | *5.57* | *sq.cm.* |
| Design Yield Strength | 30,000 | PSI | *2,109* | *kg/sq.cm* |
| Calc.Tensile Strength * | 22,000 | lbs | *10,000* | *kg* |
| Max.Recomended Hang Wt. * | 11,000 | lbs | *5,000* | *kg* |
| Column Load ** | 5,000 | lbs | *2,300* | *kg* |

* A broad range of site conditions can impact the physical strength requirements for a successful screen installation. Consult Johnson Screens with questions regarding the parameters presented above as they relate to your specific requirements.

** Vertical weight on screen that should not be exceeded without consulting manufacturer. Column load calculations should include some allowance for gravel pack contribution.

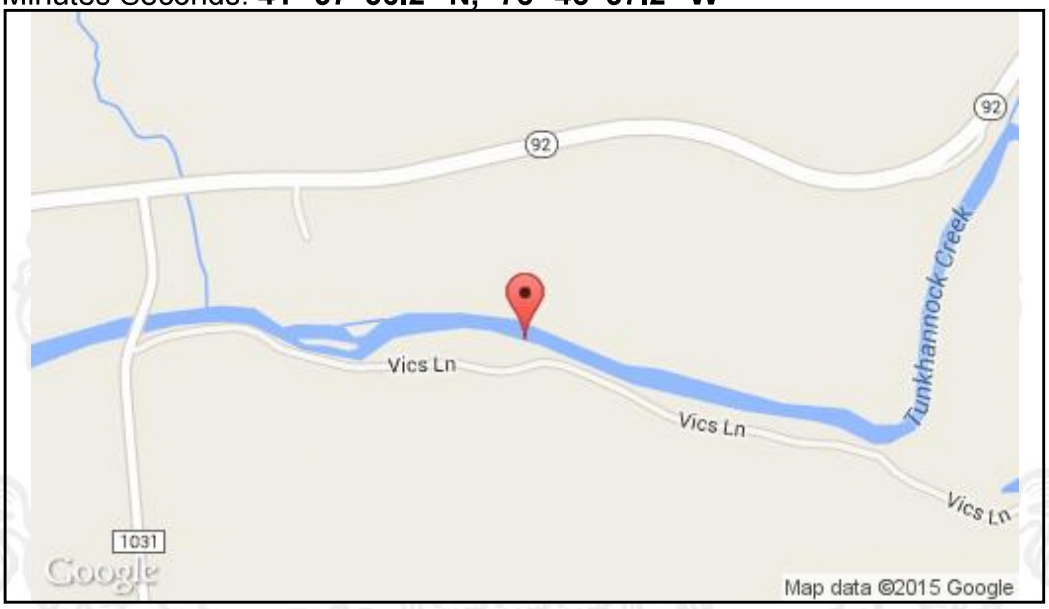
Prepared by Albert Smith
Subject to Bilfinger Water Technologies, Inc.
Standard Terms and Conditions.
**www.johnsonscreens.com**

**A-3 PNDI**

PNDI Project Environmental Review Receipt Project Search ID: 20150901529847

# 1. PROJECT INFORMATION

Project Name: **Tunkhannock**
Date of review: **9/1/2015 7:57:28 AM**
Project Category: **Water extraction/transfer,Extraction of surface water (e.g., from stream, river, creek, lake, or pond)**
Project Area: **N/A**
County: **Wyoming** Township/Municipality: **Nicholson Twp**
Quadrangle Name: **HOP BOTTOM** ~ ZIP Code: **18446**
Decimal Degrees: **41.626716 N, -75.760338 W**
Degrees Minutes Seconds: **41° 37' 36.2" N, -75° 45' 37.2" W**




# 2. SEARCH RESULTS

| Agency | Results | Response |
|---|---|---|
| PA Game Commission | No Known Impact | No Further Review Required |
| PA Department of Conservation and Natural Resources | No Known Impact | No Further Review Required |
| PA Fish and Boat Commission | No Known Impact | No Further Review Required |
| U.S. Fish and Wildlife Service | No Known Impact | No Further Review Required |

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

# 3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jurisdictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

## PA Game Commission

**RESPONSE:** No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

## PA Department of Conservation and Natural Resources

**RESPONSE:** No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

## PA Fish and Boat Commission

**RESPONSE:** No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

## U.S. Fish and Wildlife Service

**RESPONSE:** No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

# 4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. For cases where a "Potential Impact" to threatened and endangered species has been identified before the application has been submitted to DEP, the application should not be submitted until the impact has been resolved. For cases where "Potential Impact" to special concern species and resources has been identified before the application has been submitted, the application should be submitted to DEP along with the PNDI receipt. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. DEP and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at http://www.naturalheritage.state.pa.us.

# 5. ADDITIONAL INFORMATION

The PNDI environmental review website is a **preliminary** screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

# 6. AGENCY CONTACT INFORMATION

### PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552, Harrisburg, PA. 17105-8552
Fax:(717) 772-0271

### U.S. Fish and Wildlife Service
Pennsylvania Field Office
110 Radnor Rd; Suite 101, State College, PA 16801
NO Faxes Please.

### PA Fish and Boat Commission
Division of Environmental Services
450 Robinson Lane, Bellefonte, PA. 16823-7437
NO Faxes Please

### PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA. 17110-9797
Fax:(717) 787-6957

# 7. PROJECT CONTACT INFORMATION

Name:_____
Company/Business Name:_____
Address:_____
City, State, Zip:_____
Phone:(____)_____Fax:(____)_____
Email:_____

# 8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

_____ 12-28-2015
applicant/project proponent signature date

# A-4 Pump Specification

PIONEER PUMP
PERFORMANCE THROUGH INNOVATION™

Pioneer Prime

# PP66C14L71

*Typical Pump Configuration*

## Performance

### Pioneer Prime series - vacuum assisted, end suction centrifugal pump

Bare shaft, frame mounted, fully automatic dry priming, vacuum assisted, run dry, heavy duty pump

| | |
|---|---|
| Size | 6" x 6"<br>150 x 150 mm |
| Flow, Max | 2,825 USgpm<br>660 $m^3/h$<br>180 l/s |
| Head, Max | 320 feet<br>100 meters |
| Flow at BEP | 2,625 USgpm<br>600 $m^3/h$<br>170 l/s |
| Efficiency at BEP | 81% |
| Solids Handling, Max | 1.0"<br>25 mm |
| Operating Speed, Max | 2200 rpm |
| Suction Connection | 6" (150 mm)<br>150 ANSI Flanges |
| Delivery Connection | 6" (150 mm)<br>150 ANSI Flanges |
| Bearing Lubrication | Oil STD<br>Grease optional |
| Fasteners | Imperial |

## Applications

| | |
|---|---|
| Oil & Gas | Construction |
| Industrial | Mining |
| Petrochemical | Rental |
| Agriculture | Irrigation |

PosiValve™ Patent #6,783,730

### High flow, heavy duty pump

The PP66C14 is a high flow, ruggedized pump designed to run over a broad range of performance and deliver outstanding suction lift. The rugged construction and modular design provide proven reliability and flexibility in the most demanding applications.

## UltraPrime™ Priming System

| | |
|---|---|
| Priming System | Mechanically Driven Diaphragm Style Vacuum Pump |
| Air Removal Capability | 50 CFM |
| Priming Chamber | Single chamber with positive sealing air separation PosiValve™ with stainless steel float ball & linkage. |
| Discharge Check Valve | Swing Style - ductile iron with Buna-n Disc |

## Other Specifications

| | |
|---|---|
| Mechanical Seal | Single seal w/ tungsten carbide vs. silicon carbide seal faces, Viton® elastomers, 300 series stainless steel hardware and spring, designed for indefinite dry running |
| Pump End Bearing | Single Row Ball |
| Drive End Bearing | Single Row Ball |
| Shaft | 17-4 PH Stainless Steel |

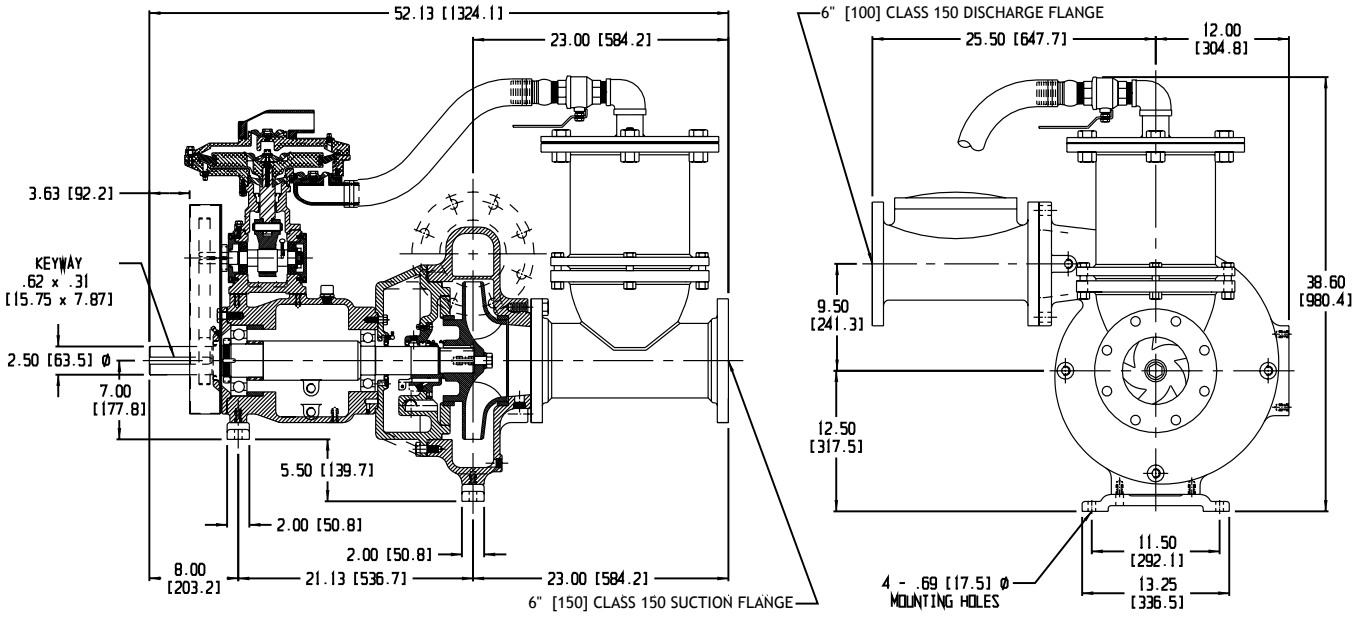
## Construction Materials

| | Standard Construction | CD4MCu Stainless Steel |
|---|---|---|
| Impeller | CA6NM SS | CD4MCu |
| Volute | Ductile Iron ASTM A536 65-45-12 | CD4MCu |
| Wear Ring | ASTM A48 Class 40 Gray Iron | 316 SS |
| Suction Cover | Ductile Iron ASTM A536 65-45-12 | CD4MCu |
| Brac-plate | Ductile Iron ASTM A536 65-45-12 | CD4MCu |

## Mechanical Dimensions

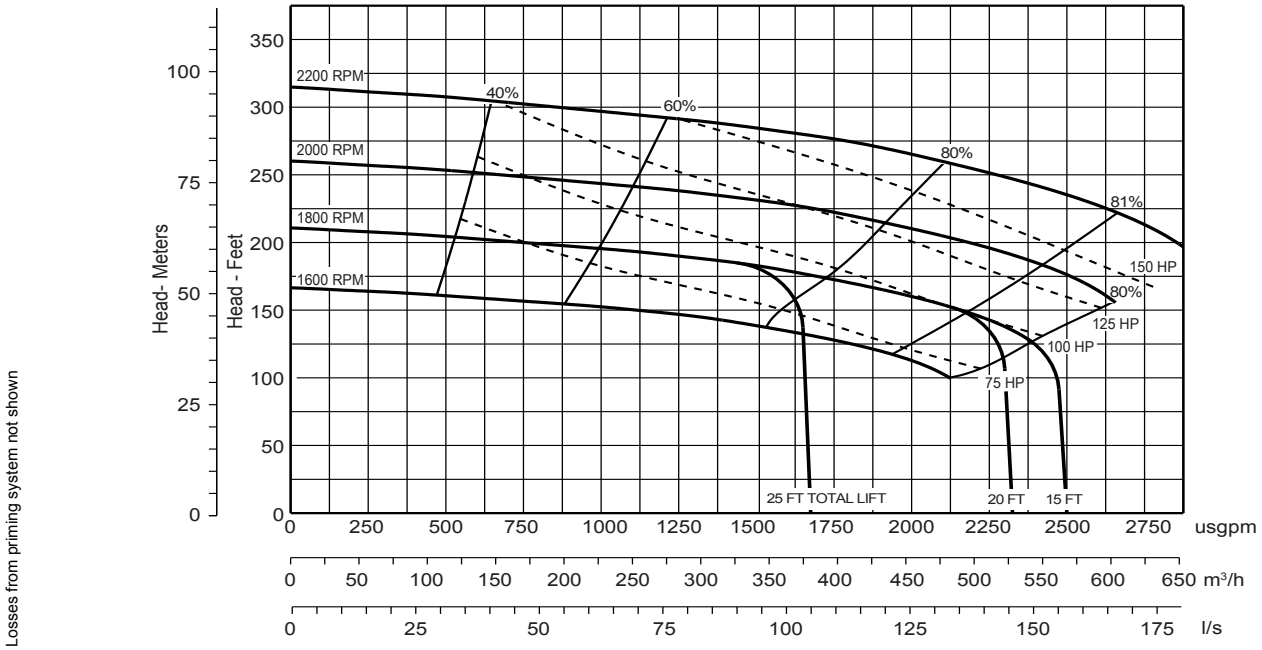
*Typical Pump Configuration*

**PP66C14**



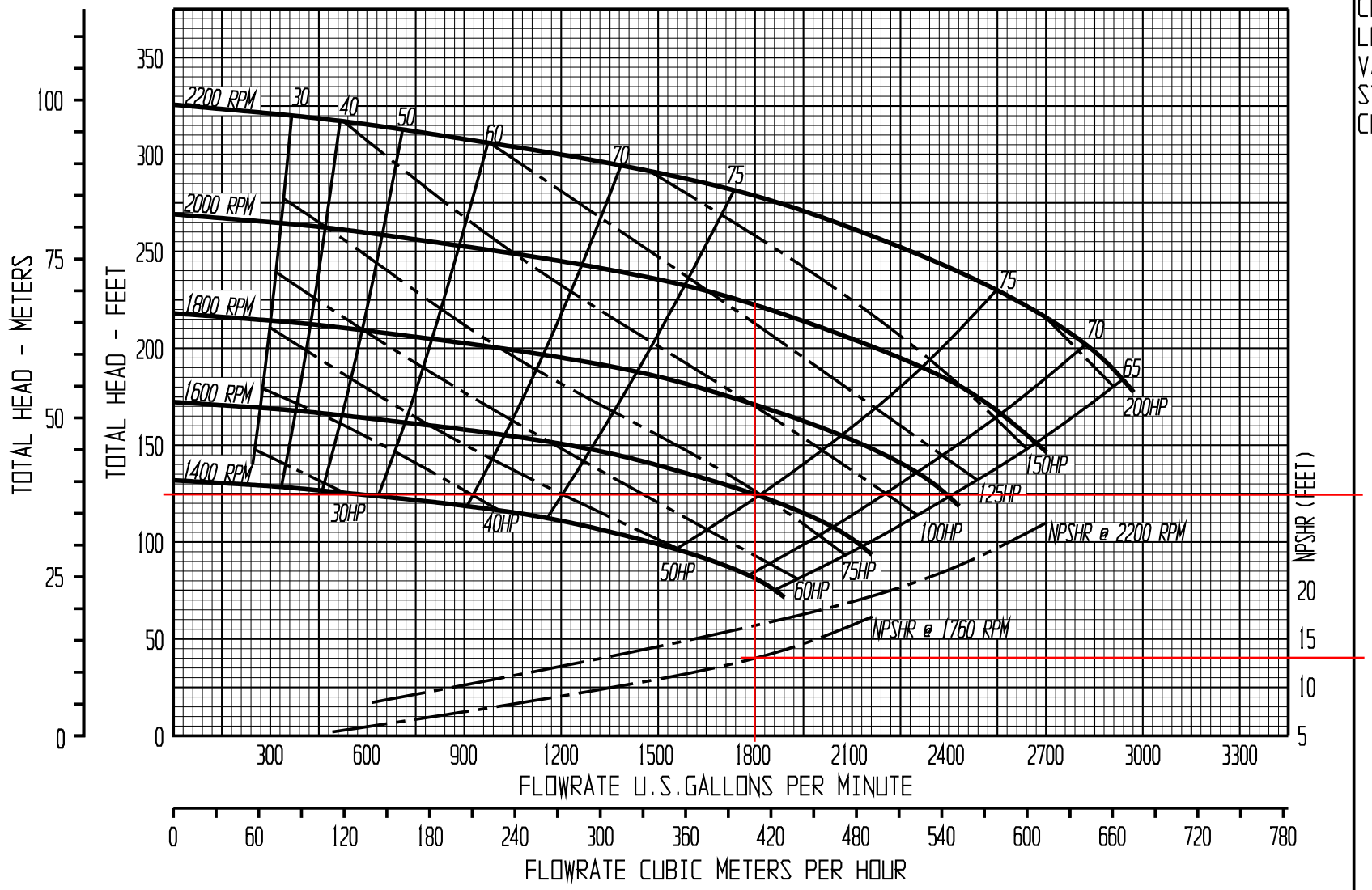

## Performance Curve

| Model: PP66C14 | Impeller Dia: 14” | Speed: Variable | Solids Size: 1.0” | Curve #A2578HQ |
|---|---|---|---|---|




Note: Losses from priming system not shown

# A-5 Pump Head Curves and Pump Selection Justification



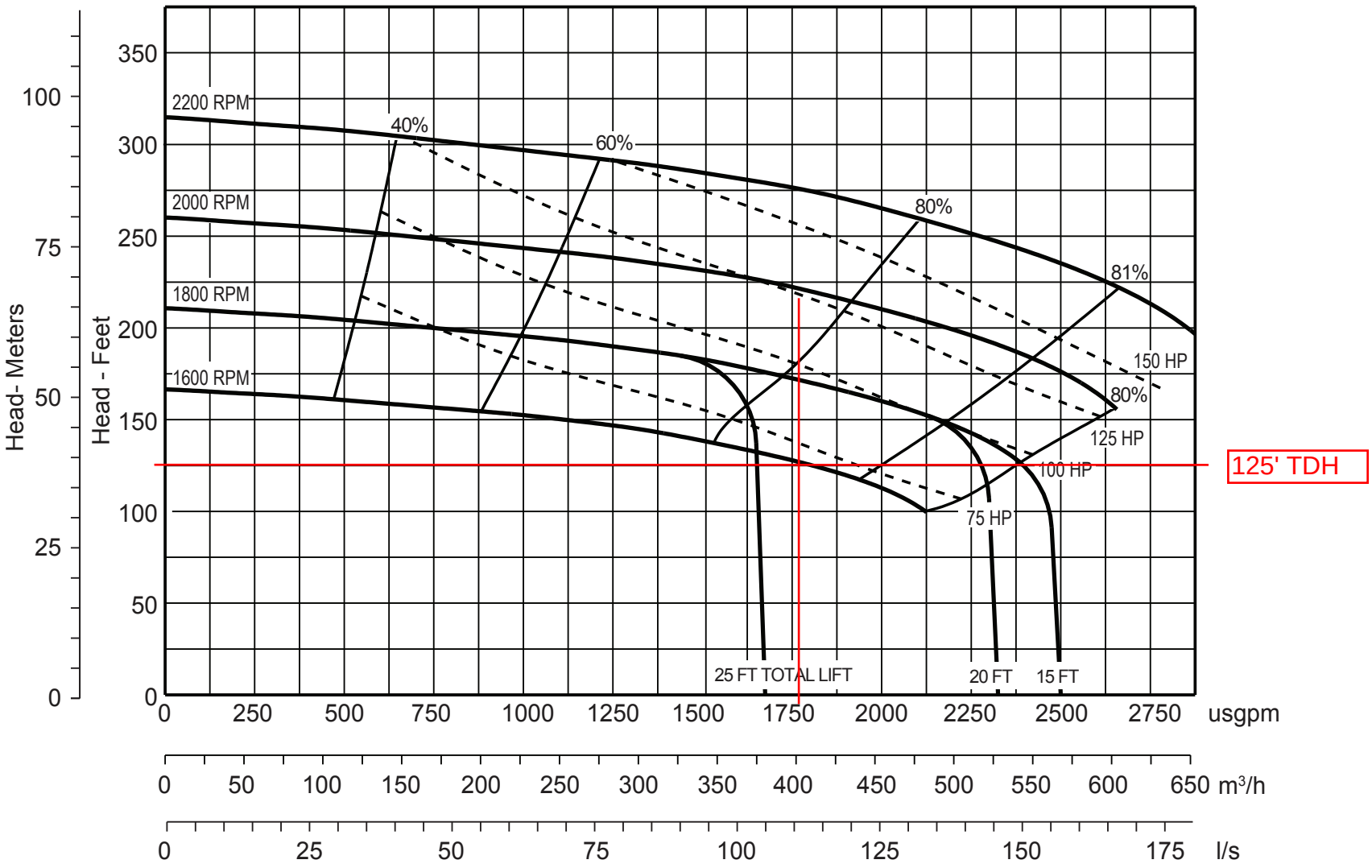

NOTES:

CURVE ACCOUNTS FOR LOSSES FROM CHECK VALVE, PRIMING SYSTEM, AND OPEN CLEARANCE WEAR RING

PIONEERPUMP
PERFORMANCE THROUGH INNOVATION™

| | |
|---|---|
| MODEL: PP66C14 | IMPELLER DIA. 14.0" |
| SIZE: 6" x 6" | SOLIDS SIZE: 1.0" |

DWG NO. A7524HQ
REVISION: 001
DRAWN BY: DAP
DATE: 09/16/2010




Note: Losses from priming system not shown

PIONEER PUMP
PERFORMANCE THROUGH INNOVATION™

| Model | PP66C14 | |
|---|---|---|
| Size | 6” x 6” | 150 mm x 150 mm |
| Impeller Diameter | 14.0” | 356 mm |
| Solids Handling Size | 1.38” | 35 mm |

DWG No. A2578HQ
Revision 001
Drawn By DAP
Date 23 Jul 2010

# A-6 Flow Control Valve Specification

## Model 43-01 (Uses Basic Valve Model 100-01)

## Pressure Ratings (Recommended Maximum Pressure - psi)

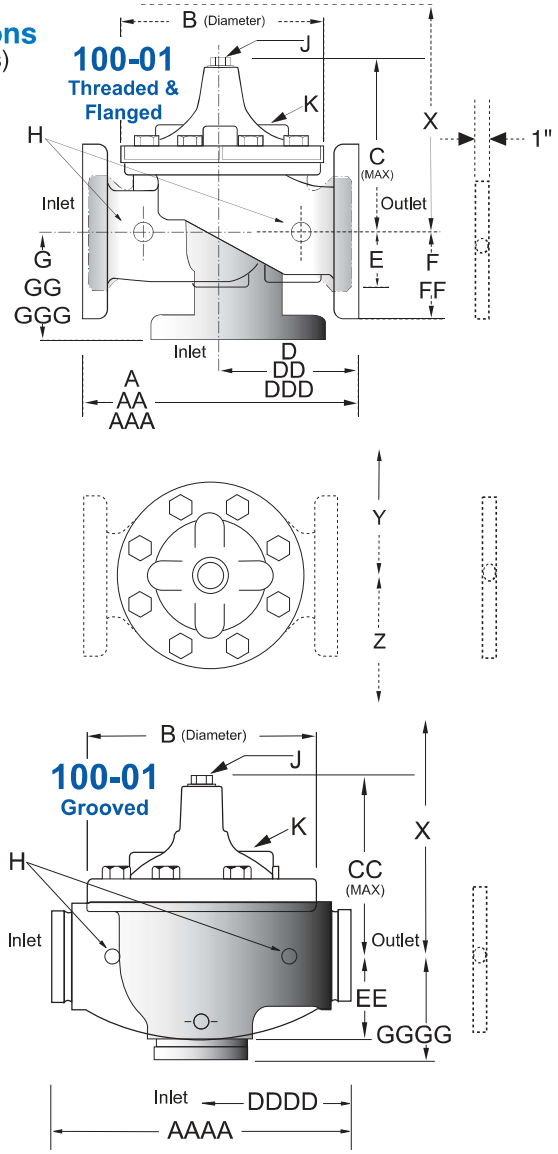
| Valve Body & Cover | | Pressure Class | | | | |
|---|---|---|---|---|---|---|
| | | Flanged | | | Grooved | Threaded |
| Grade | Material | ANSI Standards* | 150 Class | 300 Class | 300 Class | End‡ Details |
| ASTM A536 | Ductile Iron | B16.42 | 250 | 400 | 400 | 400 |
| ASTM A216-WCB | Cast Steel | B16.5 | 285 | 400 | 400 | 400 |
| ASTM B62 | Bronze | B16.24 | 225 | 400 | 400 | 400 |

Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
‡ End Details machined to ANSI B2.1 specifications.
***Valves for higher pressure are available; consult factory for details***

## Materials

| Component | Standard Material Combinations | | |
|---|---|---|---|
| Body & Cover | Ductile Iron | Cast Steel | Bronze |
| Available Sizes | 1-1/2" - 36" | 1-1/2" - 16" | 1-1/2" - 16" |
| Disc Retainer & Diaphragm Washer | Cast Iron | Cast Steel | Bronze |
| Trim: Disc Guide, Seat & Cover Bearing | Bronze is Standard<br>Stainless Steel is Optional | | |
| Disc | Buna-N® Rubber | | |
| Diaphragm | Nylon Reinforced Buna-N® Rubber | | |
| Stem, Nut & Spring | Stainless Steel | | |
| For material options not listed, consult factory.<br>Cla-Val manufactures valves in more than 50 different alloys. | | | |

## Dimensions (In inches)




## Model 43-01 Dimensions (In Inches)

| Valve Size (Inches) | 1 1/2 | 2 | 2 1/2 | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 30 | 36 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** Threaded | 7.25 | 9.38 | 11.00 | 12.50 | — | — | — | — | — | — | — | — | — | — | — | — |
| **AA** 150 ANSI | 8.50 | 9.38 | 11.00 | 12.00 | 15.00 | 20.00 | 25.38 | 29.75 | 34.00 | 39.00 | 41.38 | 46.00 | 52.00 | 61.50 | 63.00 | 76.00 |
| **AAA** 300 ANSI | 9.00 | 10.00 | 11.62 | 13.25 | 15.62 | 21.00 | 26.38 | 31.12 | 35.50 | 40.50 | 43.50 | 47.64 | 53.62 | 63.24 | 64.50 | 76.00 |
| **AAAA** Grooved End | 8.50 | 9.00 | 11.00 | 12.50 | 15.00 | 20.00 | 25.38 | — | — | — | — | — | — | — | — | — |
| **B** Dia. | 5.62 | 6.62 | 8.00 | 9.12 | 11.50 | 15.75 | 20.00 | 23.62 | 28.00 | 32.75 | 35.50 | 41.50 | 45.00 | 53.16 | 56.00 | 66.00 |
| **C** Max. | 5.50 | 6.50 | 7.56 | 8.19 | 10.62 | 13.38 | 16.00 | 17.12 | 20.88 | 24.19 | 25.00 | 39.06 | 41.90 | 43.93 | 54.60 | 61.50 |
| **CC** Max. Grooved End | 4.75 | 5.75 | 6.88 | 7.25 | 9.31 | 12.12 | 14.62 | — | — | — | — | — | — | — | — | — |
| **D** Threaded | 3.25 | 4.75 | 5.50 | 6.25 | — | — | — | — | — | — | — | — | — | — | — | — |
| **DD** 150 ANSI | 4.00 | 4.75 | 5.50 | 6.00 | 7.50 | 10.00 | 12.69 | 14.88 | 17.00 | 19.50 | 20.81 | — | — | 30.75 | — | — |
| **DDD** 300 ANSI | 4.25 | 5.00 | 5.88 | 6.38 | 7.88 | 10.50 | 13.25 | 15.56 | 17.75 | 20.25 | 21.62 | — | — | 31.62 | — | — |
| **DDDD** Grooved End | — | 4.75 | — | 6.00 | 7.50 | — | — | — | — | — | — | — | — | — | — | — |
| **E** | 1.12 | 1.50 | 1.69 | 2.06 | 3.19 | 4.31 | 5.31 | 9.25 | 10.75 | 12.62 | 15.50 | 12.95 | 15.00 | 17.75 | 21.31 | 24.56 |
| **EE** Grooved End | 2.00 | 2.50 | 2.88 | 3.12 | 4.25 | 6.00 | 7.56 | — | — | — | — | — | — | — | — | — |
| **F** 150 ANSI | 2.50 | 3.00 | 3.50 | 3.75 | 4.50 | 5.50 | 6.75 | 8.00 | 9.50 | 10.50 | 11.75 | 15.00 | 16.50 | 19.25 | 22.50 | 25.60 |
| **FF** 300 ANSI | 3.06 | 3.25 | 3.75 | 4.13 | 5.00 | 6.25 | 7.50 | 8.75 | 10.25 | 11.50 | 12.75 | 15.00 | 16.50 | 19.25 | 24.00 | 25.60 |
| **G** Threaded | 1.88 | 3.25 | 4.00 | 4.50 | — | — | — | — | — | — | — | — | — | — | — | — |
| **GG** 150 ANSI | 4.00 | 3.25 | 4.00 | 4.00 | 5.00 | 6.00 | 8.00 | 8.62 | 13.75 | 14.88 | 15.69 | — | — | 22.06 | — | — |
| **GGG** 300 ANSI | 4.25 | 3.50 | 4.31 | 4.38 | 5.31 | 6.50 | 8.50 | 9.31 | 14.50 | 15.62 | 16.50 | — | — | 22.90 | — | — |
| **GGGG** Grooved End | — | 3.25 | — | 4.25 | 5.00 | — | — | — | — | — | — | — | — | — | — | — |
| **H** NPT Body Tapping | .375 | .375 | .50 | .50 | .75 | .75 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| **J** NPT Cover Center Plug | .25 | .50 | .50 | .50 | .75 | .75 | 1 | 1 | 1.25 | 1.5 | 2 | 1.5 | 1.5 | 1.5 | 2 | 2 |
| **K** NPT Cover Tapping | .375 | .375 | .50 | .50 | .75 | .75 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 |
| Stem Travel | 0.4 | 0.6 | 0.7 | 0.8 | 1.1 | 1.7 | 2.3 | 2.8 | 3.4 | 4.0 | 4.5 | 5.1 | 5.63 | 6.75 | 7.5 | 8.5 |
| Approx. Ship Wt. Lbs. | 15 | 35 | 50 | 70 | 140 | 285 | 500 | 780 | 1165 | 1600 | 2265 | 2982 | 3900 | 6200 | 7703 | 11720 |
| **X** Pilot System | 11 | 13 | 14 | 15 | 17 | 29 | 31 | 33 | 36 | 40 | 40 | 43 | 47 | 68 | 79 | 85 |
| **Y** Pilot System | 9 | 9 | 10 | 11 | 12 | 20 | 22 | 24 | 26 | 29 | 30 | 32 | 34 | 39 | 40 | 45 |
| **Z** Pilot System | 9 | 9 | 10 | 11 | 12 | 20 | 22 | 24 | 26 | 29 | 30 | 32 | 34 | 39 | 42 | 47 |

Note: The top two flange holes on valve size 36 are threaded to 1 1/2"-6 UNC.

## Model 643-01 (Uses Basic Valve Model 100-20)

## Pressure Ratings (Recommended Maximum Pressure - psi)

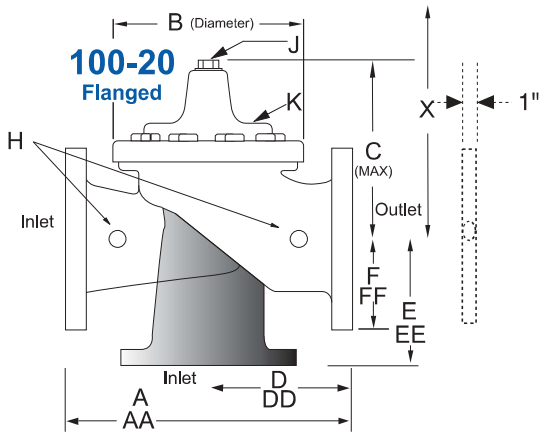
| Valve Body & Cover | | Pressure Class | | |
|---|---|---|---|---|
| | | Flanged | | |
| Grade | Material | ANSI Standards* | 150 Class | 300 Class |
| ASTM A536 | Ductile Iron | B16.42 | 250 | 400 |
| ASTM A216-WCB | Cast Steel | B16.5 | 285 | 400 |
| ASTM B62 | Bronze | B16.24 | 225 | 400 |

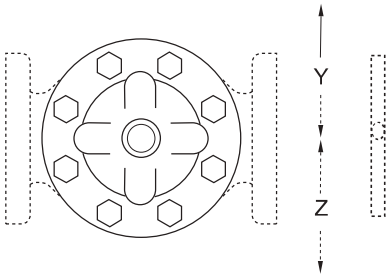
Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
***Valves for higher pressure are available; consult factory for details***

## Materials

| Component | Standard Material Combinations | | |
|---|---|---|---|
| Body & Cover | Ductile Iron | Cast Steel | Bronze |
| Available Sizes | 3" - 48" | 3" - 16" | 3" - 16" |
| Disc Retainer & Diaphragm Washer | Cast Iron | Cast Steel | Bronze |
| Trim: Disc Guide, Seat & Cover Bearing | Bronze is Standard<br>Stainless Steel is Optional | | |
| Disc | Buna-N® Rubber | | |
| Diaphragm | Nylon Reinforced Buna-N® Rubber | | |
| Stem, Nut & Spring | Stainless Steel | | |
| For material options not listed, consult factory.<br>Cla-Val manufactures valves in more than 50 different alloys. | | | |

## Dimensions
(In inches)




## Model 643-01 Dimensions (In Inches)

| Valve Size (Inches) | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 30 | 36 | 42 | 48 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** 150 ANSI | 10.25 | 13.88 | 17.75 | 21.38 | 26.00 | 30.00 | 34.25 | 35.00 | 42.12 | 48.00 | 48.00 | 63.25 | 65.00 | 76.00 | 94.50 |
| **AA** 300 ANSI | 11.00 | 14.50 | 18.62 | 22.38 | 27.38 | 31.50 | 35.75 | 36.62 | 43.63 | 49.62 | 49.75 | 63.75 | 67.00 | 76.00 | 94.50 |
| **B** Dia. | 6.62 | 9.12 | 11.50 | 15.75 | 20.00 | 23.62 | 27.47 | 28.00 | 35.44 | 35.44 | 35.44 | 53.19 | 56.00 | 66.00 | 66.00 |
| **C** Max. | 7.00 | 8.62 | 11.62 | 15.00 | 17.88 | 21.00 | 20.88 | 25.75 | 25.00 | 31.00 | 31.00 | 43.94 | 54.60 | 61.50 | 61.50 |
| **D** 150 ANSI | — | 6.94 | 8.88 | 10.69 | CF* | CF* | CF* | CF* | CF* | CF* | CF* | — | — | — | — |
| **DD** 300 ANSI | — | 7.25 | 9.38 | 11.19 | CF* | CF* | CF* | CF* | CF* | CF* | CF* | — | — | — | — |
| **E** 150 ANSI | — | 5.50 | 6.75 | 7.25 | CF* | CF* | CF* | CF* | CF* | CF* | CF* | — | — | — | — |
| **EE** 300 ANSI | — | 5.81 | 7.25 | 7.75 | CF* | CF* | CF* | CF* | CF* | CF* | CF* | — | — | — | — |
| **F** 150 ANSI | 3.75 | 4.50 | 5.50 | 6.75 | 8.00 | 9.50 | 11.00 | 11.75 | 15.88 | 14.56 | 17.00 | 19.88 | 25.50 | 28.00 | 31.50 |
| **FF** 300 ANSI | 4.12 | 5.00 | 6.25 | 7.50 | 8.75 | 10.25 | 11.50 | 12.75 | 15.88 | 16.06 | 19.00 | 22.00 | 27.50 | 28.00 | 31.50 |
| **H** NPT Body Tapping | .375 | .50 | .75 | .75 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| **J** NPT Cover Center Plug | .50 | .50 | .75 | .75 | 1 | 1 | 1.25 | 1.25 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **K** NPT Cover Tapping | .375 | .50 | .75 | .75 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| Stem Travel | 0.6 | 0.8 | 1.1 | 1.7 | 2.3 | 2.8 | 3.4 | 3.4 | 4.5 | 4.5 | 4.5 | 6.5 | 7.5 | 8.5 | 8.5 |
| Approx. Ship Wt. Lbs. | 45 | 85 | 195 | 330 | 625 | 900 | 1250 | 1380 | 1500 | 2551 | 2733 | 6500 | 8545 | 12450 | 13100 |
| **X** Pilot System | 13 | 15 | 27 | 30 | 33 | 36 | 36 | 41 | 40 | 46 | 55 | 68 | 79 | 85 | 86 |
| **Y** Pilot System | 10 | 11 | 18 | 20 | 22 | 24 | 26 | 26 | 30 | 30 | 30 | 39 | 40 | 45 | 47 |
| **Z** Pilot System | 10 | 11 | 18 | 20 | 22 | 24 | 26 | 26 | 30 | 30 | 30 | 39 | 42 | 47 | 49 |

*Consult Factory

Note: The top two flange holes on valve sizes 36 thru 48 are threaded to 1 1/2"-6 UNC.

| 43-01 Valve Selection | 100-01 Pattern: Globe (G), Angle (A), End Connections: Threaded (T), Grooved (GR), Flanged (F) Indicate Available Sizes | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inches | 1½ | 2 | 2½ | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 30 | 36 |
| | mm | 40 | 50 | 65 | 80 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 600 | 750 | 900 |
| Basic Valve 100-01 | Pattern | G, A | G, A | G, A | G, A | G, A | G, A | G, A | G, A | G, A | G, A | G, A | G | G | G, A | G | G |
| | End Detail | T, F, Gr* | T, F, Gr | T, F, Gr* | T, F, Gr | F, Gr | F, Gr* | F, Gr* | F | F | F | F | F | F | F | F | F |
| Suggested Flow (gpm) | Maximum | 125 | 210 | 300 | 460 | 800 | 1800 | 3100 | 4900 | 7000 | 8400 | 11000 | 14000 | 17000 | 25000 | 42000 | 50000 |
| | Maximum Intermittent | 160 | 260 | 370 | 580 | 990 | 2250 | 3900 | 6150 | 8720 | 10540 | 13700 | 17500 | 21700 | 31300 | 48000 | 62500 |
| | Minimum | 1 | 1 | 2 | 2 | 4 | 10 | 15 | 35 | 50 | 70 | 95 | 120 | 150 | 275 | 450 | 650 |
| Suggested Flow (Liters/Sec) | Maximum | 8 | 13 | 19 | 29 | 50 | 113 | 195 | 309 | 442 | 530 | 694 | 883 | 1073 | 1577 | 2650 | 3150 |
| | Maximum Intermittent | 10 | 16 | 23 | 37 | 62 | 142 | 246 | 387 | 549 | 664 | 863 | 1104 | 1369 | 1972 | 3028 | 3940 |
| | Minimum | .03 | .06 | .09 | 0.13 | 0.25 | 0.63 | 0.95 | 2.2 | 3.2 | 4.4 | 6.0 | 7.6 | 9.5 | 17.4 | 28.4 | 41.0 |

**100-01 Series is the full internal port Hytrol.** **For Lower Flows Consult Factory** *Globe Grooved Only

| 643-01 Valve Selection | 100-20 Pattern: Globe (G), Angle (A), End Connections: Flanged (F) Indicate Available Sizes | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Inches | 3 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 | 30 | 36 | 42 | 48 |
| | mm | 80 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 600 | 750 | 900 | 1000 | 1200 |
| Basic Valve 100-20 | Pattern | G | G, A | G, A | G, A | G | G | G | G | G | G | G | G | G | G | G |
| | End Detail | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F |
| Suggested Flow (gpm) | Maximum | 260 | 580 | 1025 | 2300 | 4100 | 6400 | 9230 | 9230 | 16500 | 16500 | 16500 | 28000 | 33500 | 33500 | 33500 |
| | Minimum | 1 | 2 | 4 | 10 | 15 | 35 | 50 | 50 | 95 | 95 | 95 | 275 | 450 | 450 | 450 |
| Suggested Flow (Liters/Sec) | Maximum | 16 | 37 | 65 | 145 | 258 | 403 | 581 | 581 | 1040 | 1040 | 1040 | 1764 | 2115 | 2115 | 2115 |
| | Minimum | .06 | .13 | .25 | .63 | .95 | 2.2 | 3.2 | 3.2 | 6.0 | 6.0 | 6.0 | 17.4 | 28.4 | 41.0 | 41.0 |

**100-20 Series is the reduced internal port size version of the 100-01 Series.** **For Lower Flows Consult Factory**

## Pilot System Specifications

### Adjustment Range

Low flow equals one-fourth maximum flow.

### Temperature Range

Water: to 180°F

### Electrical Ratings

24, 48, 120, 240, 480 - 60 Hz AC
6, 12, 24, 120, 240 DC

### Materials

Standard Pilot System Materials

Pilot Control: Bronze ASTM B62
Trim: Stainless Steel 303
Orifice Plate: Stainless Steel 303
Rubber: Buna-N® Synthetic Rubber

Optional Pilot System Materials

Pilot systems are available with optional Aluminum, Stainless Steel or Monel materials.

**Note:** Orifice plate assembly (X52E) may be attached to the main valve outlet flange, however, better control is obtained if it is located one to five pipe diameters downstream. Orifice plate sensing connection should be located in the pipeline on the side of the orifice plate assembly. The orifice plate assembly should not be mounted directly to a butterfly valve. See E-X52E Data Sheet for Orifice Bore adjustment range.

## When Ordering, Please Specify

1. Catalog No. 43-01 or No. 643-01
2. Valve Size
3. Pattern - Globe or Angle
4. Pressure Class
5. Threaded or Flanged
6. Trim Material
7. Adjustment Range/Orifice Bore
8. Energized or De-Energized to Open
9. Desired Options
10. When Vertically Installed

CLA-VAL P.O. Box 1325 • Newport Beach, CA 92659-0325 • Phone: 949-722-4800 • Fax: 949-548-5441 • E-mail: claval@cla-val.com • Website cla-val.com

# A-7 Pipeline Sizing Justification

Title: Tunkhannock Creek Pipe Size Calculation
Project Name: Atlantic Sunrise
Client: Transcontinental Gas Pipe Line Company LLC

Prepare By: DTK Date: 12/9/2015
Checked By: LMH Date: 12/15/2015

| | | | |
|---|---|---|---|
| Design Flow Rate | 1,800 | gpm | |
| Length[1] | 246 | ft | |
| Elevation at Start[1] | 727 | ft MSL | |
| Elevation at Pump | 729 | ft MSL | |
| Elevation at End[1] | 729 | ft MSL | |
| Backpressure at Discharge | 46 | psig | (NOTE: to account for minor losses; throttle discharge valve as required) |
| Hazen-Williams Coefficient | 140 | | |
| Suction Pipe Length | 105 | ft | |

[1] design basis to transfer water to pipeline, additional equipment to be used by hydrotest contractor.

*Estimate Pipe Size based on velocity*

Maintain Velocity at 15.0 ft/sec or less (temporary piping)
needed area 0.27 sf or a dia. = 7.0 inches I.D.

*Pressure Drop Calculations*

*Use: Hazen-Williams Eq.:*

$$h_f = \frac{0.2083 * \left(\frac{100}{C}\right)^{1.85} * Q^{1.85} * L}{100 * D^{4.8655}}$$

| | | | | | | |
|---|---|---|---|---|---|---|
| Flow rate, gpm | (gpm) | 1,800 | 1,800 | 1,800 | | |
| Pipe Size | (inch) | 8 | 10 | 10 | | |
| Outer Diameter | (inch) | 8.625 | 10.75 | 10.75 | | |
| DR rating | - | 13.5 | 13.5 | 13.5 | | |
| Diameter (D)* | (inch) | 7.27 | 9.06 | 9.06 | | |
| Length (L) | (feet) | 246 | 246 | 105 | | |
| Friction Head Loss (dH) | (feet) | 18.6 | 6.4 | 3.7 | | |
| Total Head loss | (feet) | **125.25** | **113.02** | *24.6* | *NPSHa* | *> NPSHr =* 13.0 ft |
| | (psi) | 54 | 49 | | | |

* - includes 6% safety factor on wall thickness

*Horsepower Required*

| | | | |
|---|---|---|---|
| Determine Theoretical Hp req'd: | HP | 57 | 51 |
| Pump Efficiency (est) | | 80% | 80% |
| Motor Efficiency (est) | | 85% | 85% |
| Motor Horsepower (est) | HP | **84** | **76** |

*Design Considerations for Hydrotest*

CPL Max Elevation: 1366.49 ft MSL
Max Static Head: 637 ft

| LOOKUP TABLE: DIAMETER | |
|---|---|
| 2 | 2.375 |
| 3 | 3.5 |
| 4 | 4.5 |
| 6 | 6.625 |
| 8 | 8.625 |
| 10 | 10.75 |
| 12 | 12.75 |
| 14 | 14 |
| 16 | 16 |
| 18 | 18 |
| 20 | 20 |
| 22 | 22 |
| 24 | 24 |

| DR | MAWP |
|---|---|
| 7.3 | 317 |
| 9 | 250 |
| 11 | 200 |
| 13.5 | 160 |
| 17 | 125 |
| 21 | 100 |
| 26 | 80 |
| 32.5 | 63 |

Google Earth Pro

File Edit View Tools Add Help

Sign in

▼ Search

Search Google | Parcel Search (APN)

41 37 36.94 -75 45 37.24 Search

ex: 37 25.818' N, 122 05.36' W

Get Directions History

41 37 36.94 -75 45 37.24

▼ Places

- Temporary Places
  - ASR- Hydrotest Withdraw and Fill Location.kmz
  - ASR- Hydrotest Withdraw and Fill Location
    - CPLN
      - Fishing Creek Withdraw Location
      - Fishing Creek Fill Location
      - Susquehanna River Withdraw Location
      - Susquehanna River Fill Location
      - Tunkhannock Creek Withdraw Location
      - Tunkhannock Creek Fill Location
    - CPLS
    - Unity
    - Chapman
  - Tunkhannock

▼ Layers Earth Gallery »

- Primary Database
  - Earth Pro (US)
  - Voyager New!
  - Happy 10th Birthday, Google Earth!
  - Edition 1
    - Highlight tour
    - Street View highlights
    - Earth View landscapes
    - 3D cities
    - Satellite imagery updates
  - Download
  - Borders and Labels
  - Places
  - Photos
  - Roads
  - 3D Buildings
  - Ocean

Tunkhannock Creek Fill Location

Tunkhannock Creek Withdraw Location

41 37 36.94 -75 45 37.24

Google earth

Imagery Date: 5/10/2014 1992 41°37'39.61" N 75°45'28.87" W elev 732 ft Eye alt 1901 ft

Graph: Min. Avg. Max Elevation: 722, 727, 729 ft

Range Totals: Distance: 246 ft Elev Gain/Loss: 12.3 ft, -6.22 ft Max Slope: -, - Avg Slope: -, -

729 ft
725 ft
722 ft
728 ft
0.0%
18.8 ft 25 ft 50 ft 75 ft 100 ft 125 ft 150 ft 175 ft 200 ft 225 ft 246 ft

5:30 PM
10/8/2015

# A-8 Withdrawal Calculation

# Withdrawal Location: Tunkhannock Creek

| Watershed Information | |
|---|---|
| **Watershed:** | Upper Susquehanna-Tunkhannock |
| **Designation:** | TSF |
| **Trout Sensative Stream?** | No |
| **USGS Station:** | 01534000 |
| **Station Drainage Area[1] ($mi^2$):** | 383.0 |
| **Station Average Daily Flow[1] (cfs):** | 544.4 |
| **Station $Q_{7-10}$ Flow Rate[1] (cfs):** | 17.3 |
| **Operator Withdrawal Rate[2] (cfs)** | 4.01 |
| **Operator 30-day Average Withdrawal Rate[7] (cfs)** | 0.079 |

**Method:**

Follow Susquehanna River Basin Commission (SRBC) Policy No. 2012-01.

**Footnotes:**

[1] From USGS StreamStats Data-Collection Station Rprt for Station Tunkhannock Crk @ Tunkhannock, PA
[2] Typical maximum withdrawal rate by operator is 42.9 bpm = 1,800 gpm = 2.6 MGD = 4.01 cfs.
[3] From USGS StreamStats Ungaged Report
[4] Area-weighted flow rate.
[5] From SRBC Policy No. 2012-01 Attachment E
[6] Total required flow rate is the sum of the weighted $P_x$ flow rate and the required operator withdrawal rate. The minimum passby flow must be equal to or greater than the monthly P95 flow rate.
[7] Total Withdrawal Rate averaged over 30 days = 1,530,400 gallons/30 days =0.051 MGD = 0.079 cfs

**Step #1: Determine ARC Classification**

| Withdrawal Location | Latitude / Longitude | Drainage Area[3] ($mi^2$) | ARC Classificaiton |
|---|---|---|---|
| Tunkhannock Creek | 41.626897<br>-75.760386 | 186 | 3 |

**Step #2: Determine $Q_{7-10}$ Flow Rate and Total Flow Requirement and Monthly Percent Exceedance**

| Withdrawal Location | Drainage Area[3] ($mi^2$) | $Q_{7-10}$ flow[4] (cfs) | Monthly Percent Exceedance ($P_x$) | 30-day Average Withdrawal Rate as a Percentage of $Q_{7-10}$ | Maximum Withdrawal Rate as a percentage of $Q_{7-10}$ |
|---|---|---|---|---|---|
| Tunkhannock Creek | 186 | 8.40 | 80 | 0.94% | 47.7% |

**Step #3: Determine the Months of the Year When the Total Required Flow Will Be Available**

| Month | Station Mean Flow Rate[1] (cfs) | Weighted Mean Flow Rate[4] (cfs) | Station $P_x$ Flow Rate[5] (cfs) | Weighted $P_x$ Flow Rate[4] (cfs) | Total Required Flow Rate[6] (cfs) | Is There Sufficient Flow To Allow For Withdrawal? |
|---|---|---|---|---|---|---|
| January | 594 | 288.5 | 150 | 72.8 | 76.9 | Yes |
| February | 646 | 313.7 | 177 | 86.0 | 90.0 | Yes |
| March | 1170 | 568.2 | 384 | 186.5 | 190.5 | Yes |
| April | 1100 | 534.2 | 416.5 | 202.3 | 206.3 | Yes |
| May | 632 | 306.9 | 219 | 106.4 | 110.4 | Yes |
| June | 364 | 176.8 | 93 | 45.2 | 49.2 | Yes |
| July | 218 | 105.9 | 53 | 25.7 | 29.7 | Yes |
| August | 183 | 88.9 | 38 | 18.5 | 22.5 | Yes |
| September | 242 | 117.5 | 37 | 18.0 | 22.0 | Yes |
| October | 348 | 169.0 | 52 | 25.3 | 29.3 | Yes |
| November | 545 | 264.7 | 104 | 50.5 | 54.5 | Yes |
| December | 656 | 318.6 | 180 | 87.4 | 91.4 | Yes |

**CONCLUSION**

There is sufficient flow in Tunkhannock Creek to allow a varying withdrawal rate of 1.78 cfs to 4.01 cfs and maintain a monthly passby flow based on a percent exceedance of 80. A rule-of-thumb (Weighted Mean Flow Rate > 2 × Total Required Flow Rate) was used to determine the months when flow rates may be too low for withdrawal. SRBC methodology was used to determine allowable withdrawal rates (See attached Withdrawal Worksheet).

| Month | Station P80 Flow Rate (cfs) | Weighted P80 Flow Rate (cfs) | 10% P80 (cfs) | 10% P80 (gpm) | Weighted P80 Flow Rate Divided by 9 (cfs) | Weighted P80 Flow Rate Divided by 9 (gpm) | Transco Proposed Withdrawal Rate (gpm) |
|---|---|---|---|---|---|---|---|
| January | 150 | 72.8 | 7.3 | 3269.3 | 8.1 | 3632.6 | 1800 |
| February | 177 | 86.0 | 8.6 | 3857.8 | 9.6 | 4286.5 | 1800 |
| March | 384 | 186.5 | 18.6 | 8369.5 | 20.7 | 9299.4 | 1800 |
| April | 416.5 | 202.3 | 20.2 | 9077.8 | 22.5 | 10086.5 | 1800 |
| May | 219 | 106.4 | 10.6 | 4773.2 | 11.8 | 5303.6 | 1800 |
| June | 93 | 45.2 | 4.5 | 2027.0 | 5.0 | 2252.2 | 1800 |
| July | 53 | 25.7 | 2.6 | 1155.2 | 2.9 | 1283.5 | 1200 |
| August | 38 | 18.5 | 1.8 | 828.2 | 2.1 | 920.3 | 800 |
| September | 37 | 18.0 | 1.8 | 806.4 | 2.0 | 896.0 | 800 |
| October | 52 | 25.3 | 2.5 | 1133.4 | 2.8 | 1259.3 | 1200 |
| November | 104 | 50.5 | 5.1 | 2266.7 | 5.6 | 2518.6 | 1800 |
| December | 180 | 87.4 | 8.7 | 3923.2 | 9.7 | 4359.1 | 1800 |

| Month | Required Flow Rate at USGS Gage (cfs) |
|---|---|
| January | 158 |
| February | 185 |
| March | 392 |
| April | 425 |
| May | 227 |
| June | 101 |
| July | 59 |
| August | 42 |
| September | 41 |
| October | 58 |
| November | 112 |
| December | 188 |

| Month | Station P95 Flow Rate (cfs) | Weighted P95 Flow Rate (cfs) | De Minimus Flow Rate at 5% of Weighted P95 Flow Rate (cfs) | De Minimus Flow Rate at 5% of Weighted P95 Flow Rate (gpm) |
|---|---|---|---|---|
| January | 90 | 43.7 | 2.19 | 980.8 |
| February | 98 | 47.6 | 2.38 | 1068.0 |
| March | 200 | 97.1 | 4.86 | 2179.6 |
| April | 252 | 122.4 | 6.12 | 2746.2 |
| May | 131 | 63.6 | 3.18 | 1427.6 |
| June | 55 | 26.7 | 1.34 | 599.4 |
| July | 30 | 14.6 | 0.73 | 326.9 |
| August | 22 | 10.7 | 0.53 | 239.8 |
| September | 21 | 10.2 | 0.51 | 228.9 |
| October | 27 | 13.1 | 0.66 | 294.2 |
| November | 45.5 | 22.1 | 1.10 | 495.8 |
| December | 76 | 36.9 | 1.85 | 828.2 |

# A-9 Flow Meter Specification

# AG2000
# Irrigation Magmeter

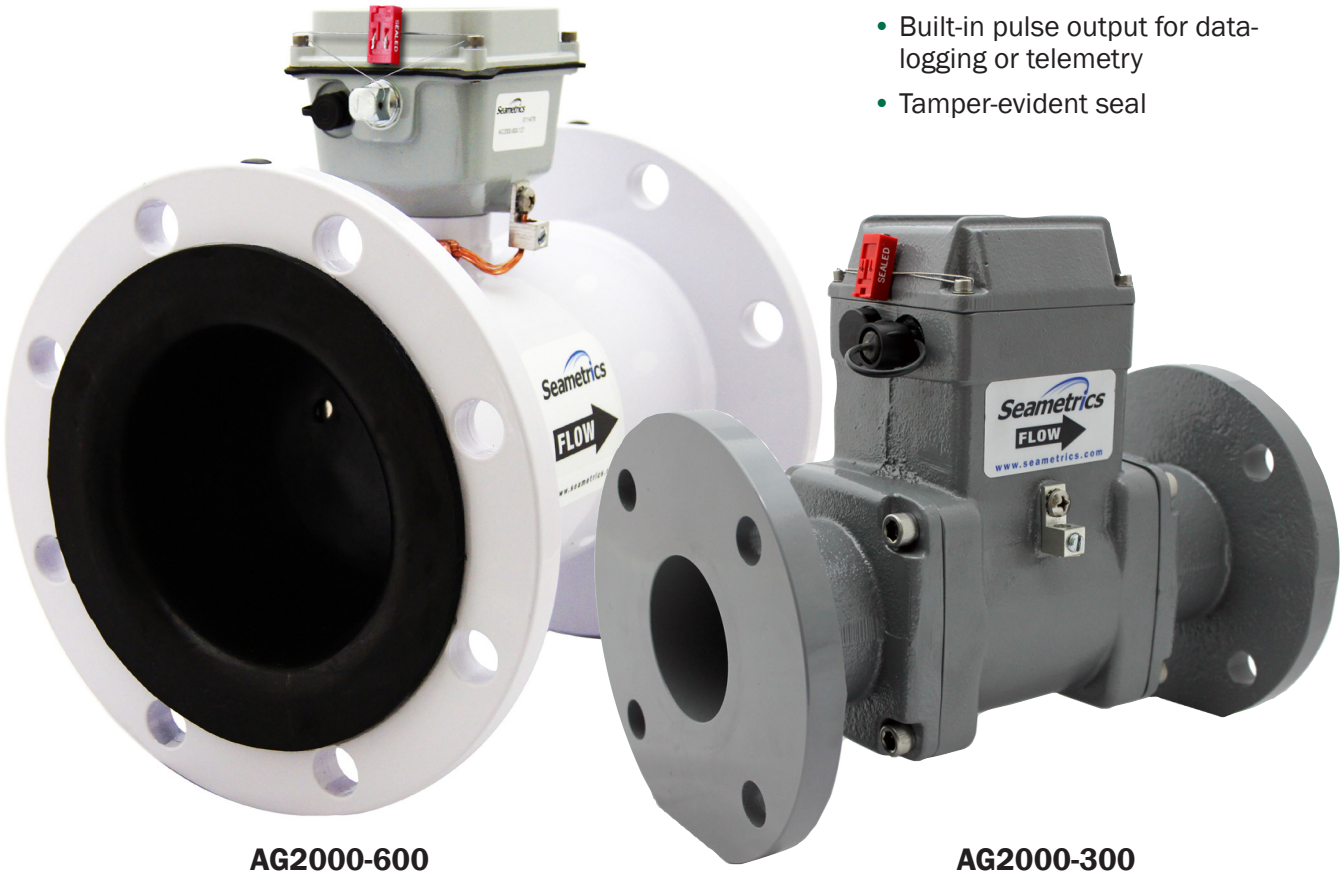
ISO 9001:2008 CERTIFIED COMPANY

## APPLICATIONS

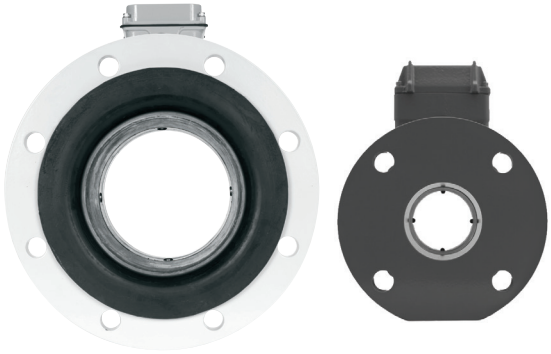
- Irrigation
- Chemigation
- Agricultural automation
- Well usage monitoring
- Dairy Lagoons

## FEATURES

- Simple as a mechanical meter
- No moving parts
- Minimal straight pipe required
- Battery power standard; External power optional
- Solar compatible
- Built-in rate & total indicator
- Built-in pulse output for data-logging or telemetry
- Tamper-evident seal




AG2000-600 AG2000-300



Unobstructed Flow

**Seametrics' series of standard and IP68 (submersible) flanged magmeters.**

**Available in sizes from 3" up to 12".**

# AG2000
# Irrigation Magmeter

## GENERAL INFORMATION

The AG2000 is a spool-type electromagnetic flowmeter for use in irrigation applications in 3" to 12" pipe. With no moving parts, these meters provide unobstructed flow and are resistant to wear from debris found in ground or surface water. Little maintenance is required because there are no bearings to wear out or propellers to stop turning. Minimal straight pipe requirements allow AG2000 meters to be used in piping configurations where there is little space between the meter and an elbow.

The standard AG2000 is battery powered. Where an external power source is available, the AG2000 can be optionally converted to 8-32 Vdc, with the batteries then serving as back-up to maintain continuous operation in case of power failure. This configuration will prolong battery life indefinitely.

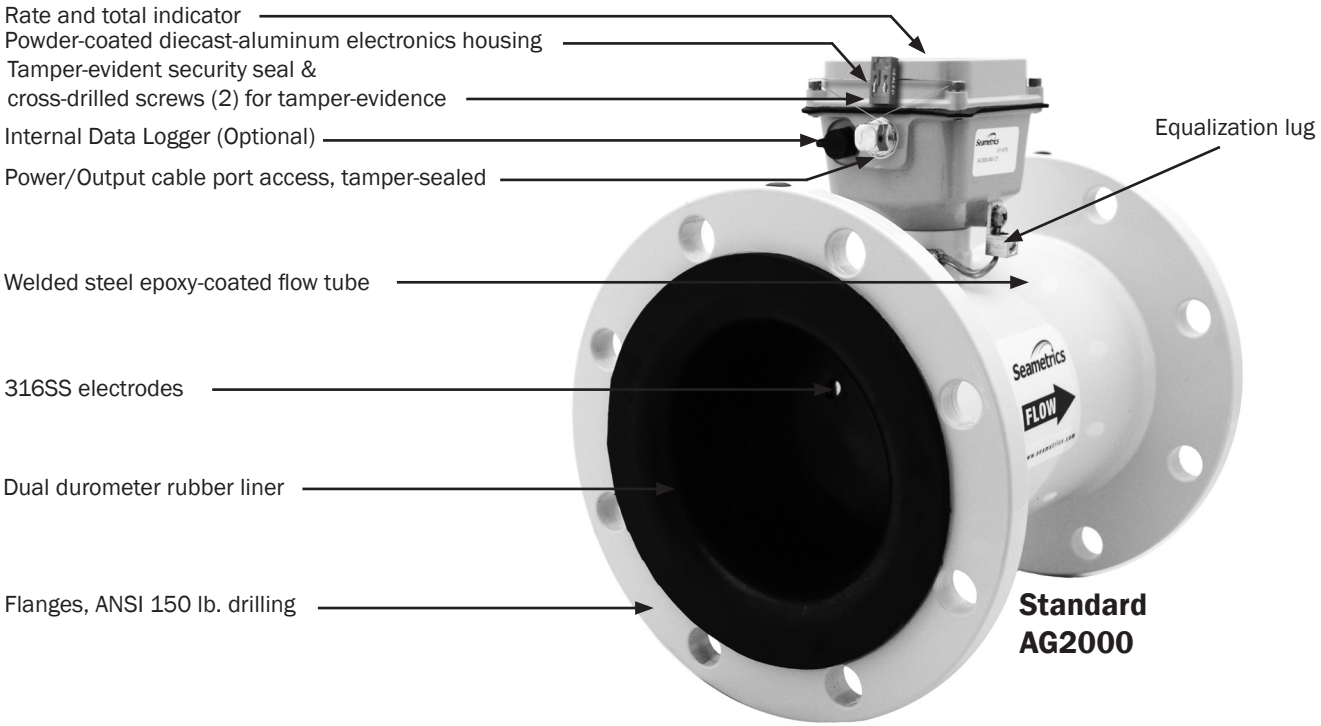
An IP68 version (-168 option) is available for burial or applications where the meter may be under water up to a depth of 3 meters for prolonged periods of time.

The meter comes with built-in pulse output (requires optional cable) for data logging or telemetry. Several pulse rates are available. An internal data logger is also available for secure flow logging (-127 option). A Seametrics FT415W or FT420W display can be added if remote rate/total reading is desired, or an AO55W if a (4-20 mA) analog signal is required. (High-frequency pulse rate is required for use with most Seametrics controllers.)

The AG2000 is secured with a seal wire to protect against unauthorized access. The seal can be broken by an authorized agent, to change units of measure, replace the battery pack, or to field-install an optional power/output cable. The cable can be factory or field-installed where external power is available and/or pulse output is needed. An accessory weather guard is available for additional protection in outdoor applications.

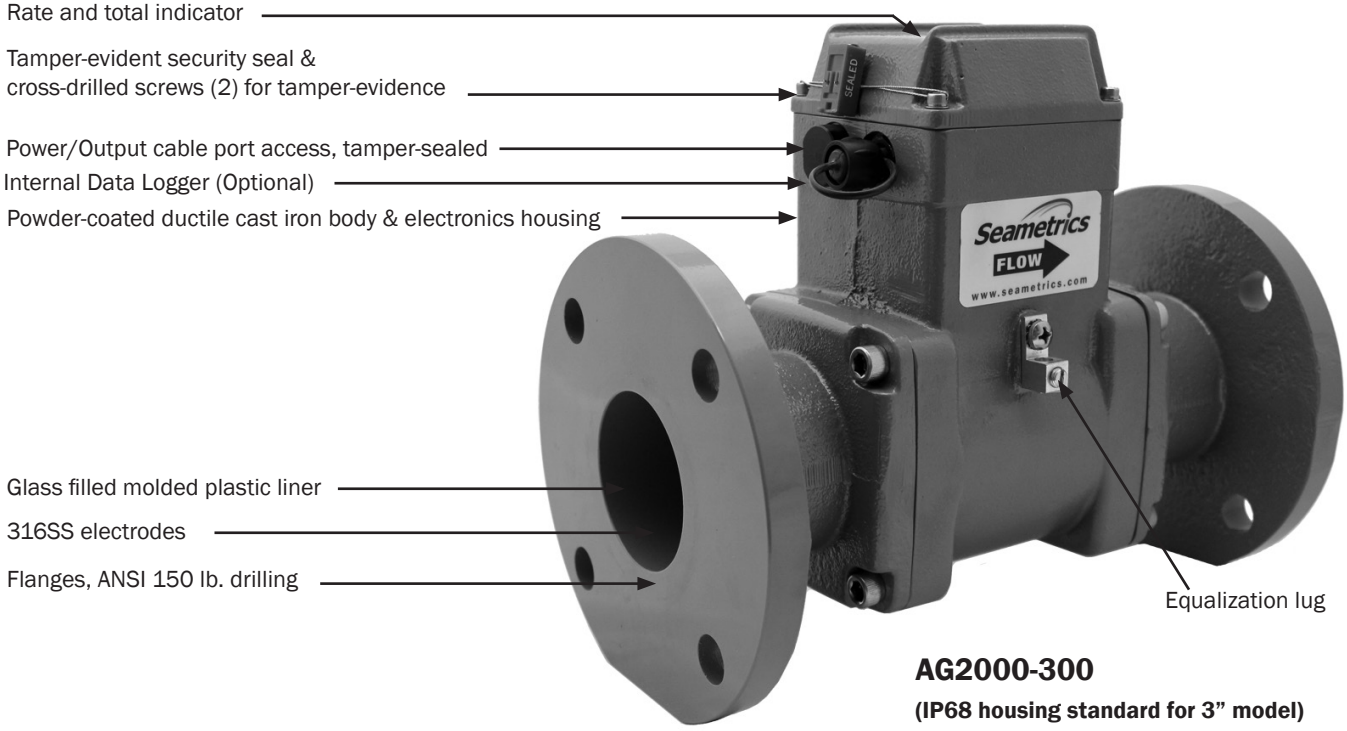
For chemigation applications, the chemical injection point must be placed downstream of the meter **OR** far enough upstream for **complete mixing** to occur before the flow reaches the meter. (See tech bulletin on Seametrics' website, www.seametrics.com).

## FEATURES

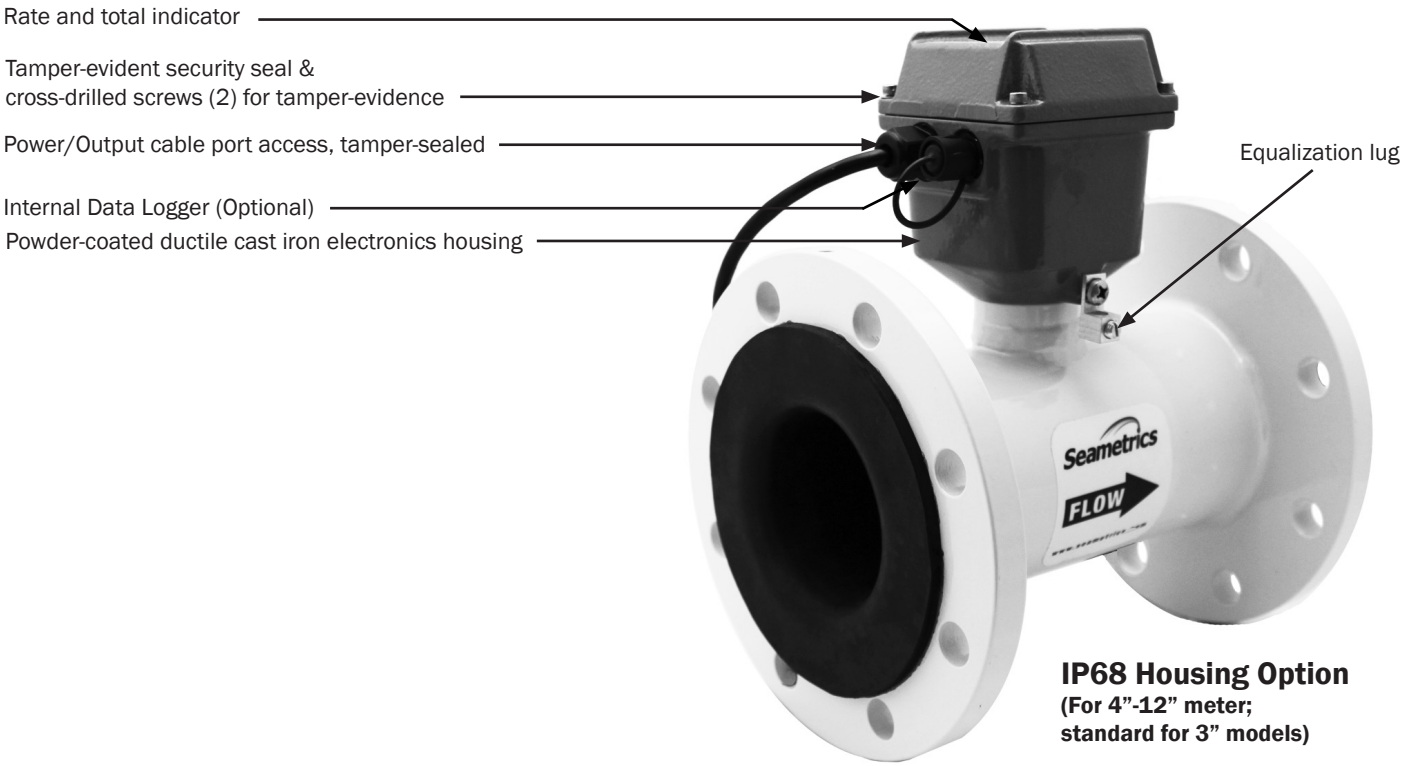


# AG2000
# Irrigation Magmeter

## FEATURES Continued




**AG2000-300**
**(IP68 housing standard for 3" model)**




**IP68 Housing Option**
**(For 4"-12" meter;**
**standard for 3" models)**

# AG2000
# Irrigation Magmeter

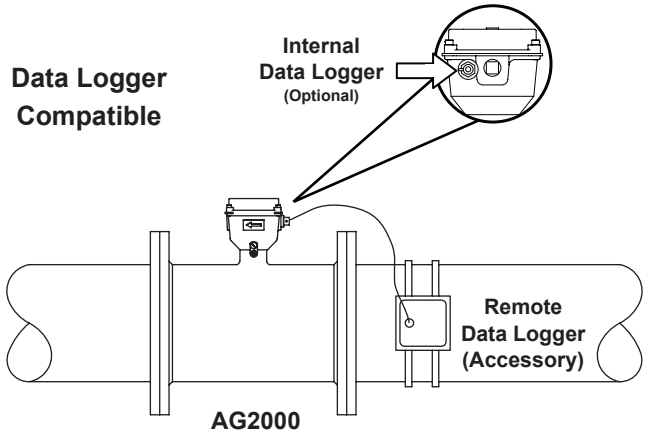
## SPECIFICATIONS*

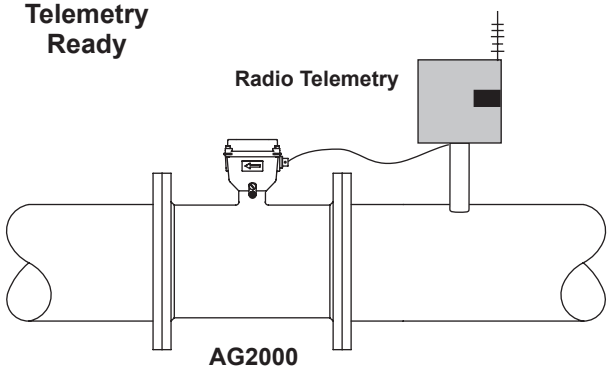
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Pipe Sizes** | | 3”, 4” 6” 8”, 10”, 12” | | | | | |
| **Fittings** | | ANSI 150 lb. drilling | | | | | |
| **Pressure** | | 150 psi (10.3 bar) working pressure | | | | | |
| **Temperature** | **Operating** | 10˚ to 130˚ F (-12˚ to 54˚ C) | | | | | |
| | **Non-Operating** | -40˚ to 158˚ F (-40˚ to 70˚ C) | | | | | |
| **Accuracy** | | +/- 1% of reading for flow between 10% to 100% of max flow | | | | | |
| | | +/- 2% of reading for flow from cutoff to 10% of max flow | | | | | |
| **Materials** | **Body (3” Only)** | Ductile cast iron, powder coated w/NSF61 listed epoxy powder | | | | | |
| | **Body (4”-12”)** | Welded steel, epoxy-coated | | | | | |
| | **Liner (3” Only)** | Noryl® | | | | | |
| | **Liner (4”-12”)** | Santoprene/Polypropylene | | | | | |
| | **Electronics Housing** | Diecast aluminum, powder-coated (non-IP68) | | | | Ductile Cast Iron (IP68) | |
| | **Electrodes** | 316 stainless steel | | | | | |
| | **O-ring (3” Only)** | EPDM | | | | | |
| **Display** | | **Rate** | | | | **Total** | |
| | **Digits** | 5 | | | | 8 | |
| | **Units** | Gallon/Minute, Liter/Minute, Cubic Feet/Minute, Cubic Meter/Hour, Gallons/Sec, Liter/Second Cubic Feet/ Sec, Miner’s Inch, Cubic Meter/Min | | | | Gallon, Gallon x 1000, Liter, Liter x 1000, Mega Liter, Cubic Meters, Cubic Meter x 1000, Acre Feet, Cubic Feet, Cubic Feet x 1000, Million Gallon, Miner’s Inch Day, Acre Inch | |
| **Power** | | 1 battery pack that contains 2 Lithium 3.6V “D” batteries, replaceable.<br>Standard battery life 2.5 years<br>5 years with extended battery life (EBL) option | | | | | |
| | | With external power option (uses 8-32 Vdc, 30 mA),<br>Lithium batteries serve as backup in power failure (10 year life) | | | | | |
| **Pulse Output (with optional cable)** | | | | | | | |
| | **Signal** | Current sinking pulse, opto-isolated, 30 Vdc at 10 mA max | | | | | |
| | **Pulse Rates** | High Frequency; 10 units/pulse; 100 units/pulse; 1000 units/pulse | | | | | |
| | **High Frequency (pulse/gal)** | **3”** | **4”** | **6”** | **8”** | **10”** | **12”** |
| | | 25.228 | 16.362 | 6.307 | 3.344 | 2.15 | 1.530 |
| **Conductivity** | | >20 microSiemens/cm | | | | | |
| **Empty Pipe Detection** | | Hardware/software, conductivity-based | | | | | |
| **Environmental** | | NEMA 4X Standard (IP68 Option) | | | | | |

**Specifications subject to change. Please consult our website for the most current data (www.seametrics.com).*
***Extended battery life option is standard on all IP68 meters.*

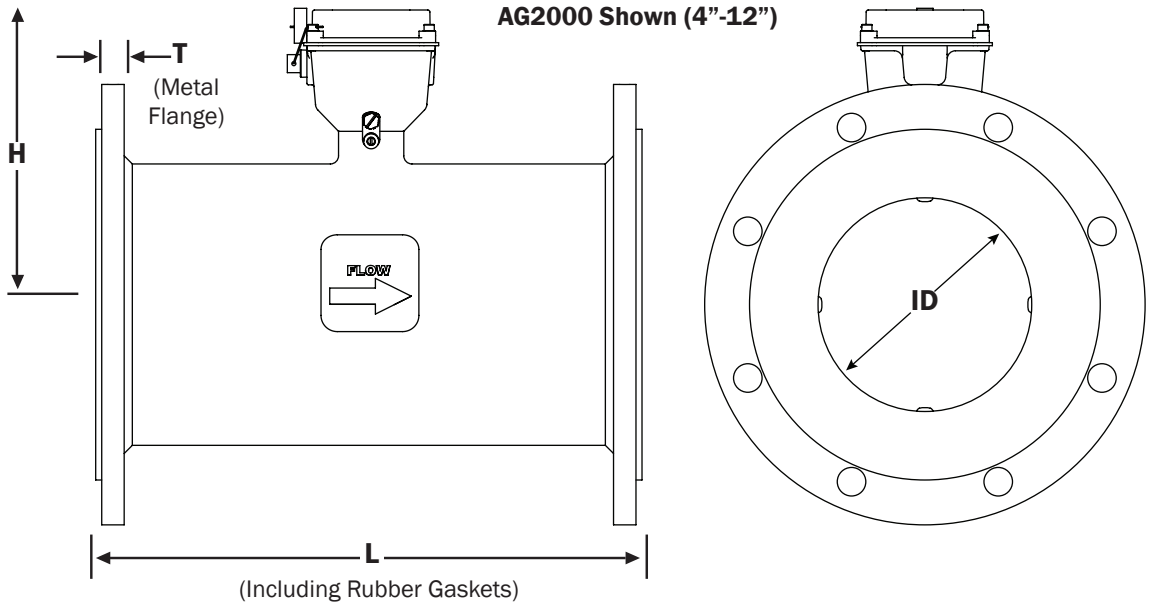
# AG2000
# Irrigation Magmeter

## OUTPUT CAPABILITIES




## DIMENSIONS



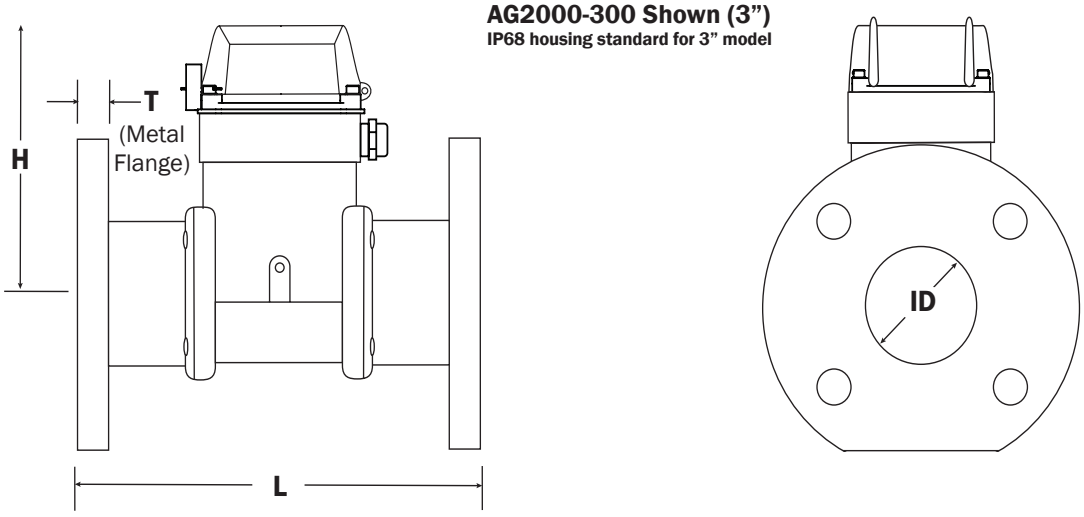

### AG2000 (Standard Housing)

| Standard AG2000 Meter Size | L | | H | | T | | ID | | Shipping Weight Standard | |
|---|---|---|---|---|---|---|---|---|---|---|
| | inch | mm | inch | mm | inch | mm | inch | mm | pounds | Kg |
| 4” | 10.24 | 260 | 7.0 | 178 | .62 | 20.9 | 3.12 | 79.25 | 32 | 15 |
| 6” | 12.27 | 312 | 8.1 | 206 | .69 | 23.3 | 5.05 | 128.27 | 47 | 21 |
| 8” | 14.24 | 362 | 9.1 | 231 | .69 | 23.3 | 6.44 | 163.58 | 69 | 31 |
| 10” | 18.18 | 462 | 10.1 | 257 | .69 | 23.3 | 8.61 | 218.69 | 125 | 57 |
| 12” | 19.68 | 500 | 11.1 | 282 | .81 | 20.6 | 10.55 | 267.97 | 145 | 66 |
| Flanges | Standard ANSI 150 lb. drilling | | | | | | | | Cable (AG2000) 1 lb. | |

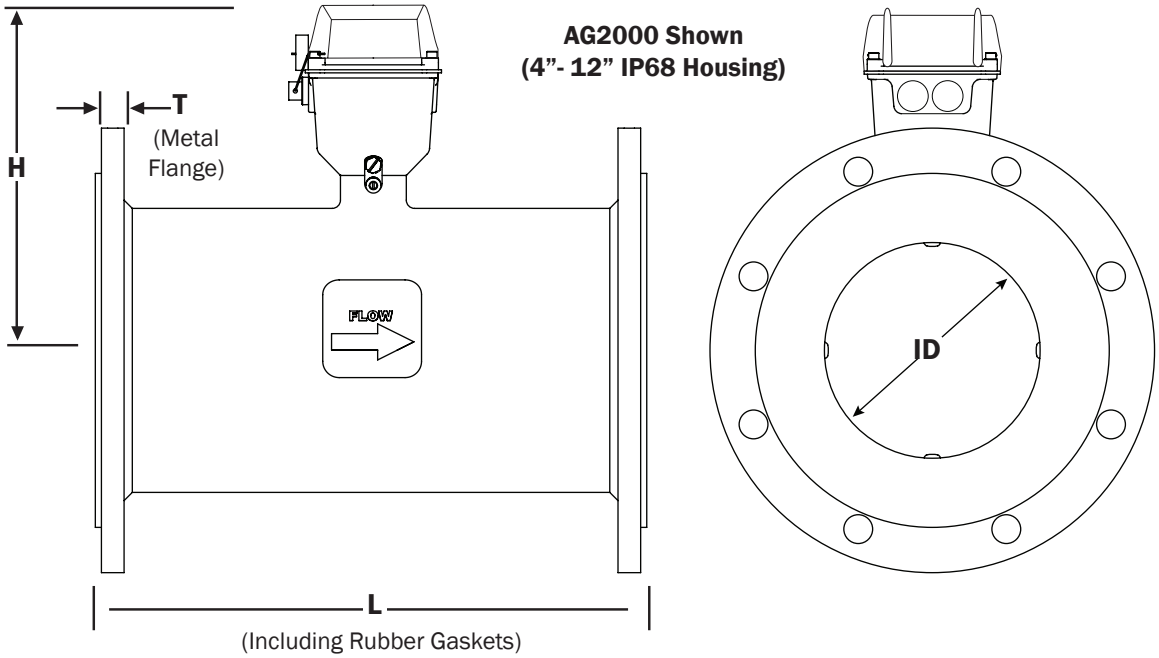
# AG2000
# Irrigation Magmeter

## DIMENSIONS

**AG2000-300 Shown (3")**
**IP68 housing standard for 3" model**




**AG2000 Shown**
**(4"- 12" IP68 Housing)**




(Including Rubber Gaskets)

### AG2000 with IP68 Housing (-168 option)

| IP68 AG2000 Meter Size | L | | H | | T | | ID | | Shipping Weight IP68 Version | |
|---|---|---|---|---|---|---|---|---|---|---|
| | inch | mm | inch | mm | inch | mm | inch | mm | pounds | Kg |
| 3" | 12.0 | 305 | 6.80 | 173 | .68 | 17.3 | 2.60 | 66.04 | 41 | 19 |
| 4" | 10.24 | 260 | 8.12 | 206 | .62 | 20.9 | 3.12 | 79.25 | 35 | 16 |
| 6" | 12.27 | 312 | 9.22 | 234 | .69 | 23.3 | 5.05 | 128.27 | 50 | 23 |
| 8" | 14.24 | 362 | 10.22 | 260 | .69 | 23.3 | 6.44 | 163.58 | 72 | 33 |
| 10" | 18.18 | 462 | 11.22 | 285 | .69 | 23.3 | 8.61 | 218.69 | 128 | 58 |
| 12" | 19.68 | 500 | 12.28 | 312 | .81 | 20.6 | 10.55 | 267.97 | 148 | 67 |
| **Flanges** | Standard ANSI 150 lb. drilling | | | | | | | | Cable (AG2000) 1 lb. | |

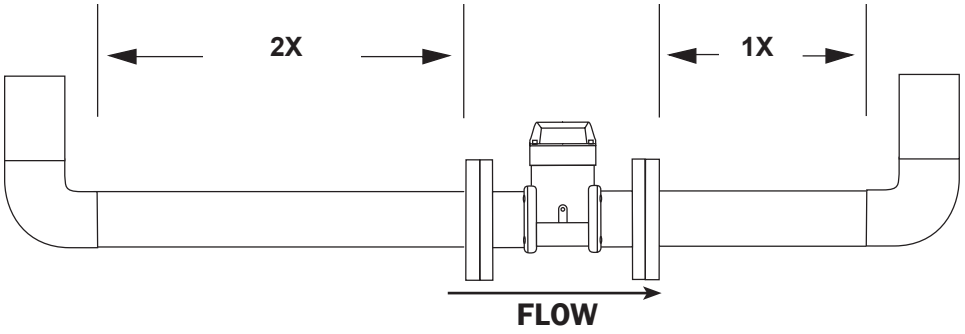
# AG2000
# Irrigation Magmeter

## STRAIGHT PIPE RECOMMENDATIONS

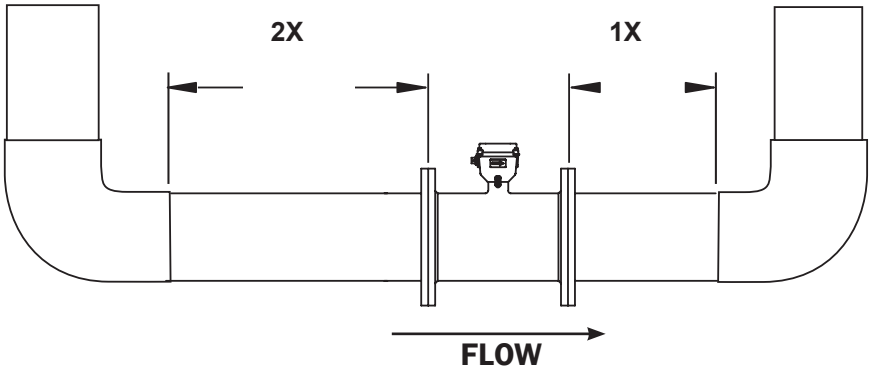
**(X = pipe diameter)**

*Minimal straight pipe required between elbows.*

*For other piping configurations, consult factory.*




**(X = pipe diameter)**




## FLOW RANGE (3” - 12”)

| Meter Size | 3” | | 4” | | 6” | | 8” | | 10” | | 12” | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Gal/Min | Liter/Sec | Gal/Min | Liter/Sec | Gal/Min | Liter/Sec | Gal/Min | Liter/Sec | Gal/Min | Liter/Sec | Gal/Min | Liter/Sec |
| **Minimum** | 7.5 | .47 | 12 | .75 | 32 | 2 | 60 | 3.8 | 95 | 6 | 130 | 8.2 |
| **Maximum** | 700 | 44.2 | 1,000 | 63 | 2,400 | 151.4 | 4,400 | 277.6 | 7,000 | 441.6 | 10,000 | 630.9 |

# AG2000
# Irrigation Magmeter

## HOW TO ORDER

### MODEL

AG2000

### SIZE

3" = **-300***
4" = **-400**
6" = **-600**
8" = **-800**
10" = **-1000**
12" = **-1200**

*-300 available in IP68 only

### OPTIONS

Factory Installed Power/ Output Cable:
6m (20 ft) = **-11/6**
15m (50 ft) = **-11/15**
30m (100 ft) = **-11/30**

Factory Installed IP68 Power/Output Cable:
6m (20 ft) = **-11/6S**
15m (50 ft) = **-11/15S**
30m (100 ft) = **-11/30S**

Internal Data Logger = **-127**
Serial Output = **-131**
IP68 Submersible = **-168**
Extend. Battery Life[1] = **-178**

[1] Extended battery life is standard on all IP68 meters

### PULSE RATE
**(With Option -11)**

10 Units*/Pulse = **-PxX**
100 Units*/Pulse = **-PxH**
1000 Units*/Pulse = **-PxK**
High Frequency**= **-HF**

*Units = Gal or Liter depending on Rate/Total unit selection
**High Frequency pulse rate will shorten battery life

### UNITS

| | | | |
|---|---|---|---|
| Gal/Min | = **GPM** | Gal | = **G** |
| Liter/Min | = **LPM** | Gal x 1000 | = **GT** |
| Cu Ft/Min | = **CFM** | Liter | = **L** |
| Cu Meter/Hr | = **CMH** | Liter x 1000 | = **LT** |
| Gal/Sec | = **GPS** | Mega Liters | = **ML** |
| Liters/Sec | = **LPS** | Cubic Meters | = **CM** |
| Cu Ft/Sec | = **CFS** | Cu Met x 1000 | = **CMT** |
| Miner's In** | = **MI** | Acre Feet | = **AF** |
| Cu Met/Min | = **CMM** | Cubic Feet | = **CF** |
| | | Cu Feet x 1000 | = **CFT** |
| | | Million Gal | = **MG** |
| | | Miner's Inch Day | = **MID** |
| | | Acre Inch | = **AI** |

Consult factory for additional units
Any rate selection can be combined with any total selection
** 1 Miner's Inch = 1.2 CFM

### ACCESSORIES

Remote 4-20 mA (analog) signal = **AO55W**
Remote Rate and Total Indicator (Battery) = **FT415W***
Remote Rate and Total Indicator (Powered) = **FT420W***
Remote Data Logger = **DL76W**
Dual Power Supply, 115 Vac, 12/24 Vdc = **PC42**
(Use with High Frequency pulse rate)
Replacement Battery Pack = 100889
Weather Guard = **100961**

Post-Factory 20-ft. Power/Output Cable (Standard Housing Only) = **DC30**
Post-Factory 50-ft. Power/Output Cable (Standard Housing Only) = **DC35**
Post-Factory 20-ft. Power/Output Cable (IP68 Housing Only) = **DC30S**
Post-Factory 50-ft. Power/Output Cable (IP68 Housing Only) = **DC35S**

Grounding Rings
(not needed for most applications):
3" = **102157**
4" = **100876**
6" = **100877**
8" = **100878**
10" = **100879**
12" = **103288**

*Consult customer service to determine the appropriate indicator based on the distance it will be installed from the meter.

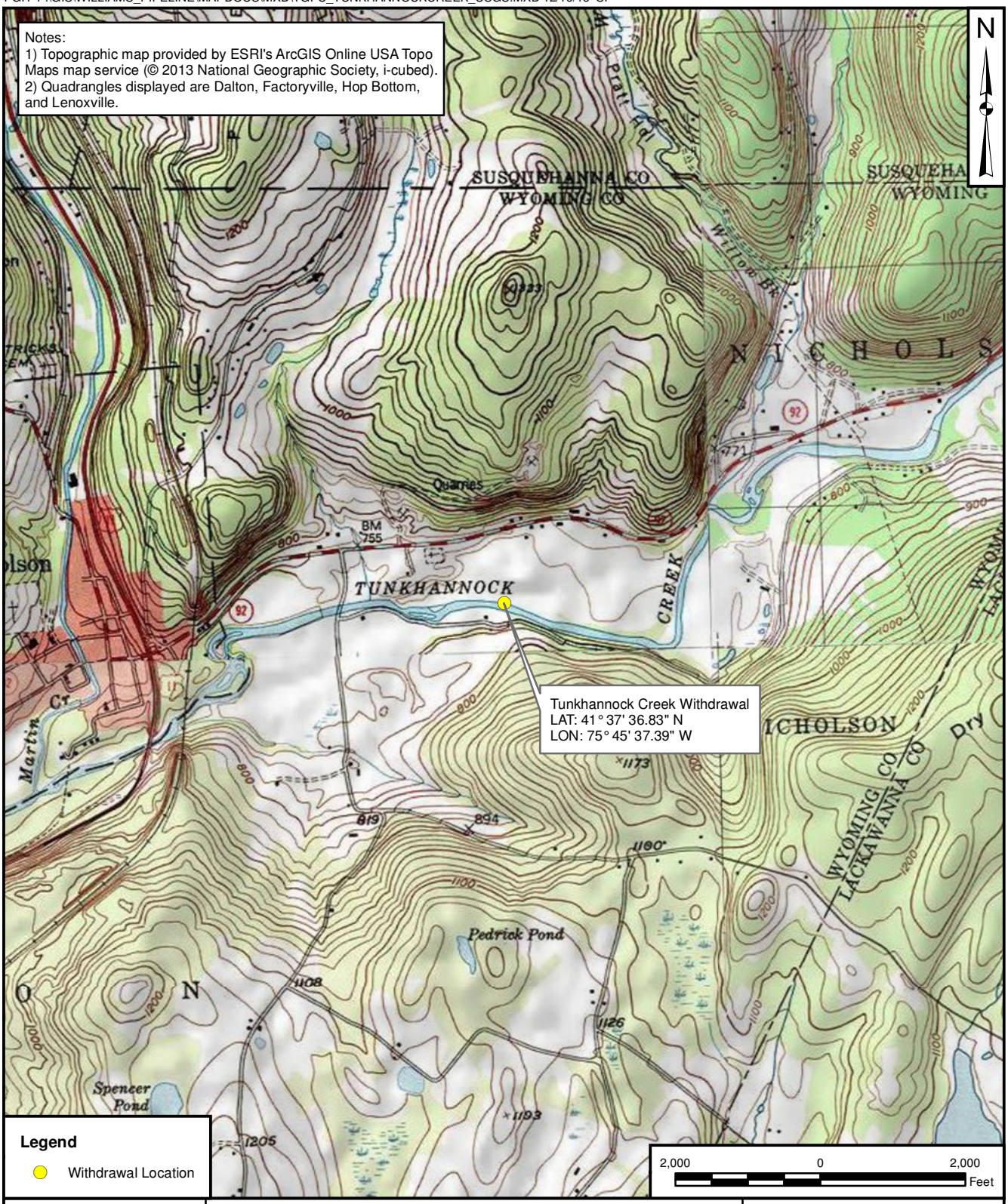
## CONTACT YOUR SUPPLIER

**Seametrics Incorporated • 19026 72nd Avenue South • Kent, Washington 98032 • USA**
**(P) 253.872.0284 • (F) 253.872.0285 • 1.800.975.8153 • www.seametrics.com**

LT-65650278-Rev A
2/15

# A-10 Plans, Details, and Maps

PGH P:\GIS\WILLIAMS_PIPELINE\MAPDOCS\MXD\TGPC_TUNKHANNOCKCREEK_USGS.MXD 12/16/15 SP



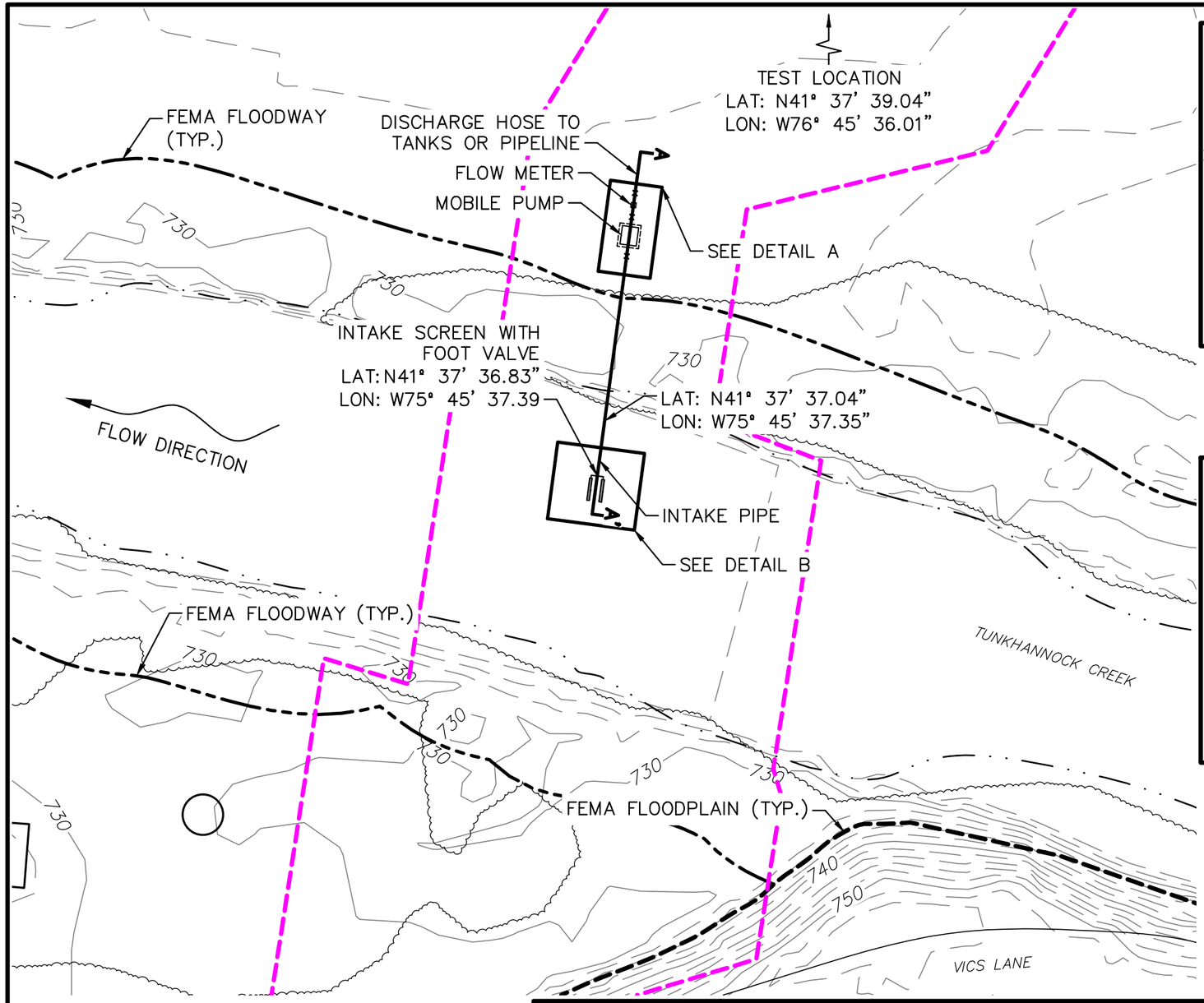

TETRA TECH

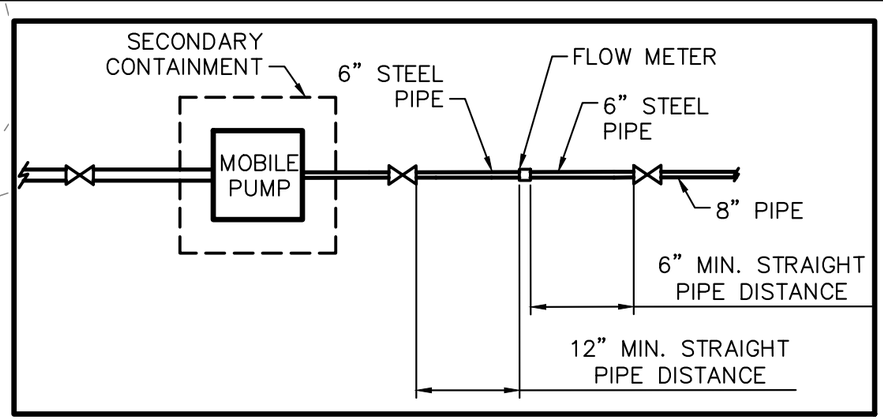
USGS LOCATION MAP
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
TUNKHANNOCK CREEK WITHDRAWAL
NICHOLSON TOWNSHIP
WYOMING COUNTY, PA

DRAWN BY: J. HERNING 12/11/15
CHECKED BY: L. HERRING 12/16/15
APPROVED BY:

CONTRACT NUMBER: 212C-PB-00282

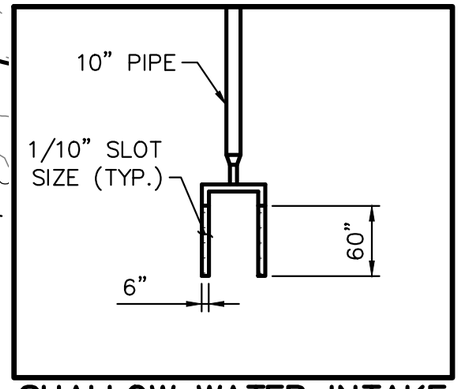
| FIGURE NUMBER | REV |
|---|---|
| 1 | 0 |




## PUMP & FLOW METER DETAIL A

NOT TO SCALE




## SHALLOW WATER INTAKE DETAIL B

NOT TO SCALE

## LEGEND

- LIMIT OF DISTURBANCE
- 1320 EXISTING 10' CONTOUR
- EXISTING 2' CONTOUR
- EXISTING ROAD
- EXISTING TREE LINE
- EXISTING BUILDING
- EXISTING STREAM WITH FLOW DIRECTION
- FEMA FLOODWAY
- FEMA FLOODPLAIN
- VALVE

0 50 100
SCALE IN FEET

## NOTES:

SURVEY DATUM:
HORIZONTAL: PA STATE PLANE NAD83
VERTICAL: NAVD88

TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
TUNKHANNOCK CREEK, NICHOLSON TWP, WYOMING CO.

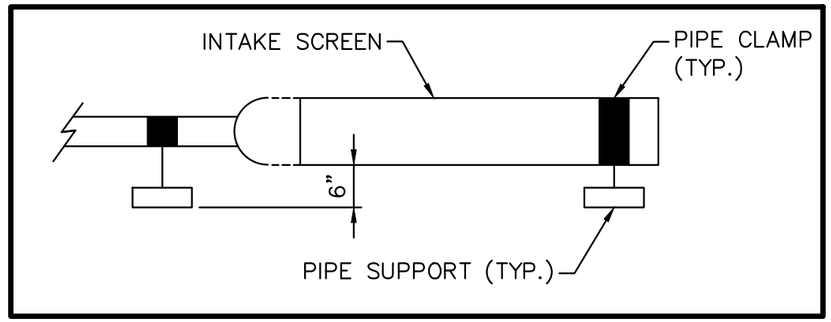
SITE PLAN

| | |
|---|---|
| DATE: | 08/12/16 |
| PROJECT NO.: | 212C-PB-00282 |
| DESIGNED BY: | RD |
| DRAWN BY: | NN |
| CHECKED BY: | CR |
| SHEET: | 1 OF 2 |



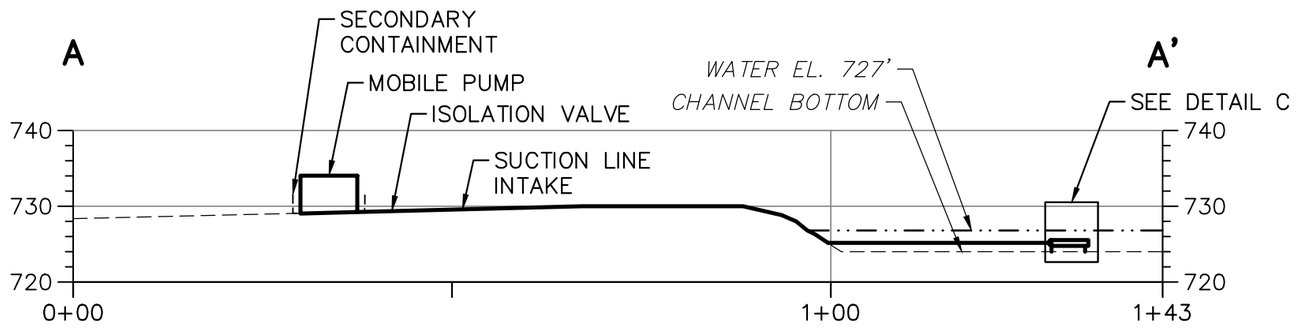
FIGURE 2

R:_212 – OGA\O&G\Williams\00282 – Atlantic Sunrise Water Sourcing\Figures\00282FG019.dwg PIT JOY.SCABILLONI 9/8/2016 11:58:22 AM




## INTAKE PROFILE DETAIL C

NOT TO SCALE




## CROSS-SECTION A-A'

0 20 40

SCALE IN FEET

**NOTES:**

SURVEY DATUM:
HORIZONTAL: PA STATE PLANE NAD83
VERTICAL: NAVD88

TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
TUNKHANNOCK CREEK, NICHOLSON TWP, WYOMING CO.

## CROSS-SECTION OF INTAKE SYSTEM

| | |
|---|---|
| DATE: | 12/1/15 |
| PROJECT NO.: | 212C-PB-00282 |
| DESIGNED BY: | RD |
| DRAWN BY: | NN |
| CHECKED BY: | CR |
| SHEET: | 2 OF 2 |



**FIGURE 3**

# A-11 Field Photographs


**Tunkhannock Creek**


**Tunkhannock Creek**