Monitoring Well and Gas Probe Repairs and Upgrades Work Plan

Refuse Hideaway Landfill
Town of Middleton, Dane County, WI

Revision 0
November 2019

Prepared For:

Wisconsin Department of Natural Resources
101 S. Webster Street
Madison, WI 53707

Prepared By:

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1.0 Introduction

1.1 Background

The Refuse Hideaway Landfill (RHL) is located at 7562 Highway 14 in the Town of Middleton, Wisconsin. The landfill closed in 1988 and became a Superfund site. The State of Wisconsin, through the Wisconsin Department of Natural Resources' (WDNR) Remediation and Redevelopment Program, is responsible for maintaining the landfill monitoring systems. This includes the groundwater monitoring wells and landfill gas monitoring probes. To this end, the WDNR put out a Specifications/Scope of Work on August 23, 2019 that provided details of the monitoring well and gas probe repairs and upgrades scope of work.

1.2 Purpose

This Work Plan has been prepared to describe the planned repair and upgrade activities at the RHL. The purpose of the Work Plan is to define the scope of work for the repairs and upgrades, including the replacement equipment to be installed. TRC will complete the work as described herein.

1.3 Scope

This Work Plan consists of four sections, including:

- **Section 1** describes the background, purpose, and scope of the Work Plan.
- **Section 2** describes the monitoring well repairs and upgrades.
- **Section 3** describes the gas probe repairs and upgrades
- **Section 4** covers the details of field records/documentation.
- **Section 5** describes the schedule.

2.0 Monitoring Well Repairs and Upgrades

TRC will perform the following field inspection program as described in the Specifications/Scope of Work dated August 23, 2019 and in the TRC Proposal dated September 10, 2019. The monitoring well repairs/upgrades are summarized on the attached Table 1. Improvements include labeling wells, replacing locks, well caps, and other minor fittings, replacement of 15 dedicated pumps, installation/replacement of 10 flow control devices, and repairs to protective casings and well heads.

2.1 Labeling Wells

- Labeling of the protective casing with weather-resistant crayon/marker (16 wells noted, and any others as needed).

2.2 Replacing Locks, Well Caps, and Other Minor Fittings

- Installation of new brass, keyed-alike locks at 20 locations. Nineteen locations as listed in Table 1 and one lock on the leachate tank enclosure gate.
- Replacement of 13 well caps.
- Replacement of the QED quick-connect fitting at P-33D (as shown on attached Figure 1).
- The dedicated pump in P-35D will be checked in the field because backflow down the discharge line has been observed in the past.

2.3 Replacement of Dedicated Pumps

- Replacement of pumps at 15 wells listed in Table 1. New tubing will be installed with the new pumps.
- At (P-22E, P-29S, and P-43D), QED MicroPurge Bladder Pump P1101HM will be installed. This is a low-flow, high pressure pump that will require compressed gas to sample. The high pressure pump is necessary due to the depth of the well screen (greater than 250 feet) and the static water depth (over 170 feet). Equipment information is included in Attachment 1.
- The other 12 replacement pumps are QED Well Wizard Bladder Pump P1101M. This is a low-flow pump. Equipment information is included in Attachment 1.
- Replacement pumps will come from the factory with polyethylene tubing, fittings, cap, and freeze protection.

2.4 Installation/Replacement of Flow Control Devices

- Installation or replacement of flow control devices at 10 wells listed in Table 1. Flow control devices will be mechanical packers compatible with each well construction. Each mechanical packer is a custom product from QED.
- At P-36S and P-36D a 10-foot mechanical packer will be installed. After installation, water will be pumped from above the packer to attempt to prevent freezing of water above the packer.

- At P-9D, P24D, and P-24E a 10-foot mechanical packer with tubing will be installed. The air line will be capped. The discharge line will be used for low-flow sampling with a peristaltic pump per the latest site QA/QC Plan. If in the future a bladder pump is necessary (either rental or dedicated), the air line will be utilized. The packer will have polyethylene tubing, fittings, cap, and freeze protection. After installation and any future sampling, the air and discharge line should be blown out to ensure water is beneath the freeze protection.
- At P-31IA and P-31IB a 10-foot mechanical packer with replacement pump will be installed. The packer/pump set-up will come from the factory with polyethylene tubing, fittings, cap, and freeze protection. After installation and any future sampling, the air and discharge line should be blown out to ensure water is beneath the freeze protection.
- At P-8BR, P-31D, and P-33D a 10-foot mechanical packer with tubing will be installed. The existing pump will be fitted into the assembly in the field. The packer set-up will come from the factory with polyethylene tubing (as applicable), fittings, cap, and freeze protection. After installation and any future sampling, the air and discharge line should be blown out to ensure water is beneath the freeze protection.

2.5 Repairs to Protective Casings and Well Heads

- Repair and/or replacement of protective casings (protops) and new surface seals as listed in Table 1. Most well repairs will be completed by subcontractor On-Site Environmental Services (Sun Prairie, WI). Any other minor well repairs will be completed by TRC.
- Protective casings will be replaced at monitoring wells with new packers as needed to fit the packer assembly into the protop.
- Repairs to protective casings and surface seals will be completed in up to two mobilizations by On-Site. One mobilization is planned during pump repair for replacement of protops for pumps with new flow control devices. Depending on access, the second mobilization may be conducted after the ground is frozen in order to access areas that are typically wet.

2.6 Waste Management

- Dedicated pumps and flow control devices being removed for replacement will be double bagged and labeled for storage in one of the sheds in the leachate flare enclosure.
- All tubing and other waste from replacement of pumps, fittings, etc. will be disposed of off-site as non-contaminated general waste.

3.0 Gas Probe Repairs and Upgrades

TRC will perform the following field inspection program as described in the Specifications/Scope of Work dated August 23, 2019 and in the TRC Proposal dated September 10, 2019. The gas probe repairs/upgrades are summarized on the attached Table 2. Improvements include labeling sample tubing, replacing locks, sample tubing, and ball valves, and repairs to protective casings, well heads, and abandonment of GP-16M.

3.1 Labeling Sample Tubing

- At gas probes with multiple depth intervals, sample tubing/probes will be labeled with colored tape to easily identify the depth interval.

3.2 Replacing Locks, Sample Tubing, and Ball Valves

- Installation of new brass, keyed-alike locks at 27 locations.
- Replacement of sample tubing and ball valves (where needed) on all 62 gas probes (excluding GP-16M).

3.3 Repairs to Protective Casings, Well Heads, and Abandonment

- Repair/replacement of protective casings (protops) at six probes and soil/bentonite for repair of GP-16S as listed in Table 2. Well repairs will be completed by subcontractor On-Site Environmental Services (Sun Prairie, WI).
- Properly abandon GP-16M.
- Repairs to protective casings and surface seals will be completed in up to two mobilizations by On-Site and will be concurrent with monitoring well repairs.

4.0 Field Records and Documentation

This section describes requirements and procedures for documenting field activities. All fieldwork personnel will be cognizant of the requirement that all field documentation must provide a clear, unbiased description of field activities.

Daily field activities, including a description of all repairs/upgrades, will be recorded on paper field forms, or electronically on a field tablet computer. Entries into the field forms will be legibly written and will provide a clear record of field activities. Entries will be made in waterproof ink, in language that is objective, factual, and generally free of personal opinions, or terminology that might later prove unclear or ambiguous. No field notes may be destroyed or discarded, even if they are illegible, or known to contain inaccuracies. Errors in the field notes will be indicated by drawing a single line through the text, such that the text in error remains legible. Errors addressed in this manner will be initialed by the person making the correction. The person filling out the field forms will sign and date each page and will identify the date, the time, the location on-site, the field personnel present, and the weather conditions observed.

Photographs are a required element for the documentation of the repairs/upgrades. The fieldwork personnel will make every effort to make sure photos are in focus, show the subject object to scale, and are representative of site conditions.

Upon completion of the repairs/upgrades, the majority of which will be concurrent with the November 2019 groundwater monitoring, a brief summary report of the work will be prepared. The gas probe labeling/locks/tubing replacement is planned for November and December 2019.

5.0 Schedule

TRC will complete the inspection and reporting as follows:

Milestone	Projected Completion Date
Update HASP	October 30, 2019
Draft Work Plan	October 30, 2019
Finalize Work Plan	October 31, 2019
Repairs and Upgrades	October 31 - December 2019
Draft Report	Upon completion of the repairs/upgrades
Finalize Report	Thirty days after receipt of DNR Comments Estimated early 2020

Table 1: Monitoring Well Repairs/Upgrades
Refuse Hideaway Landfill - September 6, 2019 - Rev. September 10, 2019

Well Number	In Analytical Program?	Well Depth (Feet)	Approximate DTW (Feet)	Dedicated QED System	Label	Replace Lock	Replace Well Cap	Replace Fitting/Pump Repair	Replace Pump/ Tubing	Replace/Install Packer for Flow Control	Repair/Replace Protective Casing	Subcontractor Repairs to Well	Maintenance Issues
P-01S		--	1.9	--		X	X				X	X	No lock or cap; no protective casing Subcontractor repair is to install protective casing
P-01D		--	0.7	--									Not located
P-03S		--	4.8	--		X	X				X	X	No lock or cap; no protective casing Subcontractor repair is to install protective casing
P-04S		--	1.3	--		X	X				X	X	No lock or cap; no protective casing Subcontractor repair is to install protective casing
P-08S	X	20.5	3.5	No			X						No cap Well purges dry
P-08D	X	42.2	3.5	No			X						No cap Well purges dry
P-08BR	X	111.5	4.1	Yes						X	X	X	Well is flowing, no flow control present Install packer for flow control Replace protective casing to fit flow control assembly Subcontractor repair is to install projective casing
P-09S	X	16	3.9	No			X						No cap
P-09D	X	43	3.9	No			X			X	X	X	No cap Ball valve to be replaced with packer for flow control Replace protective casing to fit flow control assembly Subcontractor repair is to install protective casing
P-16S	X	17.2	5.5	No			X				X (as needed)	X	Ground surface eroded beneath protop & slid downward, protop will not close/lock No cap Well purges dry Subcontractor repair to seal/ground surface, possible replacement of protop
P-16D	X	42.9	11.0	No			X						No cap Well purges dry
P-17S	X	158.8	145.1	Yes	X	X							No label, no lock
P-18S	X	107.2	94.5	Yes									
P-20SR	X	66.3	35.8	No									
P-21S	X	19.7	4.2	No			X						No cap Well purges dry
P-21D	X	41.6	9.3	No								X	Bad surface seal; protop unstable. Subcontractor repair is to surface seal and protop if needed
P-21BR	X	148.3	11.1	Yes									
P-22S (No VOC sample)	X	184.7	170.3	Yes		X			X				Bladder blown Discharge tubing missing No lock Replace pump
P-22D	X	217.2	171.3	Yes, p.m.					X				Air coming up discharge line, but low pressure Discharge tube connector missing (significant leakage at cap) Replace pump
P-22E	X	273	172.0	Yes		X			X				No lock, very low flow rate with bladder pump Replace pump
P-23S	X	48.1	36.4	No									
P-23D	X	80.1	36.1	Yes									
P-24D	X	25.2	2.0	No			X			X	X	X	No cap Ball valve to be replace with packer for flow control Replace protective casing to fit flow control assembly Subcontractor repair is to replace protective casing
P-24E	X	52.5	1.6	No			X			X	X	X	Water at TOC, likely flowing well. No flow control present. No cap Well purges dry Ball valve to be replaced with packer for flow control Replace protective casing to fit flow control assembly Subcontractor repair is to replace protective casing

Table 1: Monitoring Well Repairs/Upgrades
Refuse Hideaway Landfill - September 6, 2019 - Rev. September 10, 2019

Well Number	In Analytical Program?	Well Depth (Feet)	Approximate DTW (Feet)	Dedicated QED System	Label	Replace Lock	Replace Well Cap	Replace Fitting/Pump Repair	Replace Pump/ Tubing	Replace/Install Packer for Flow Control	Repair/Replace Protective Casing	Subcontractor Repairs to Well	Maintenance Issues
P-25S	X	29.4	18.9	No		X	X						Needs new lock; no cap
P-25D	X	96.3	23.8	Yes									
P-25BR	X	140.3	22.8	Yes									
P-26S (No sample)	X	237.6	217.1	Yes					X				Bladder blown Replace pump
P-26D		--	219.0	--									
P-27S	X	188.8	171.5	Yes									
P-27D (No sample)	X	204.3	172.3	Yes, p.m.					X				Bladder blown Discharge tubing broken/leaking badly at joint (was taped with electrical tape) Replace pump
P-28S	X	207.4	196.3	Yes									
P-29S (No sample)	X	257.2	233.3	Yes					X				Bladder blown Replace pump
P-30S		--	19.0	--									
P-30I	X	142.3	17.6	Yes, p.m.	X				?				Check valve sticking - backflow on refill cycle No label on steel casing
P-30D	X	289.5	19.5	Yes, p.m.	X	X						X	No lock No label on steel casing Bad surface seal Subcontractor repair is to surface seal
P-31S	X	28.8	4.1	Yes	X	X			X				No lock No label on steel casing Bladder blown Replace pump
P-31IA (No sample)	X	95.6	*11.3*	Yes, p.m.					X	X	X	X	Discharge line and shut off valve are broken. Well not currently flowing. Needs locking protop Replace packer and pump Subcontractor repair is to replace protop
P-31IB (No sample)	X	135.7	*10.6*	Yes, p.m.		X			X	X	X	X	Mechanical packer has failed, water is flowing from top of PVC No water is produced from pump discharge when connected to air source No lock, needs locking protop Bad protop and surface seal Replace packer and pump Subcontractor repair is to replace protop and surface seal
P-31D	X	258.2	*9.8*	Yes, p.m.		X		Pull pump/ field repair		X	X	X	Water is flowing from well through pump discharge, no shut off valve No lock Bad protop and surface seal Replace packer and pull pump for field repair Subcontractor repair is to replace protop and surface seal
P-32S	X	39.5	19.3	No	X							X	Bad surface seal; heaved No label on steel casing Subcontractor repair is to repair surface seal
P-32D	X	176.2	20.0	Yes	X							X	Bad surface seal; heaved No label on steel casing Subcontractor repair is to repair surface seal
P-33S	X	27.6	2.9	No									
P-33D	X	103.4	2.7	Yes				Replace fitting		X	X	X	Well is flowing; Quick connect QED fitting cracked (loss of pumping efficiency) Install packer for flow control Replace protective casing to fit flow control assembly and broken fitting Subcontractor repair is to replace protop
P-34S	X	186	157.5	Yes									
P-34D	X	276.1	160.7	Yes, p.m.									

Table 1: Monitoring Well Repairs/Upgrades
Refuse Hideaway Landfill - September 6, 2019 - Rev. September 10, 2019

Well Number	In Analytical Program?	Well Depth (Feet)	Approximate DTW (Feet)	Dedicated QED System	Label	Replace Lock	Replace Well Cap	Replace Fitting/Pump Repair	Replace Pump/ Tubing	Replace/Install Packer for Flow Control	Repair/Replace Protective Casing	Subcontractor Repairs to Well	Maintenance Issues
P-35S	X	184	160.6	Yes					X				Leaky bladder, air coming up discharge line Replace pump
P-35D	X	252.6	162.6	Yes, p.m.				Pull pump/ field repair					Check valve sticking (backflow down discharge line) Pull pump for field repair
P-36S		--	2.1	--	X		X			X	X	X	No cap No label Confirm if well is flowing during site walk for equipment orders and install packer Subcontractor repair is to replace protop
P-36D		--	0.0	--	X	X				X	X	X	Well is flowing Protop is cracked No lock, no label Install blank packer for flow control Replace protective casing to fit flow control assembly Subcontractor repair is to replace protop
P-38S		--	5.9	--	X	X							No lock, no label on steel casing
P-39S		--	33.3	--	X	X							No lock, no label on steel casing
P-40S		--	8.1	--	X								No label on steel casing
P-40I	X	104.8	8.0	Yes, p.m.	X	X			?				Low bladder fill volume; low flow rate No lock, no label on steel casing
P-40D (No sample)	X	255.2	9.3	Yes, p.m.	X	X			X				Bladder blown No lock, no label on steel casing Replace pump
P-41S		--	7.6	--	X	X							No lock, no label on steel casing
P-41D	X	104.5	14.9	Yes, p.m.	X	X			X				Bladder blown Discharge tube connection broken/missing parts No lock, no label on steel casing Replace pump
P-42S		--	7.1	--	X								No label on steel casing
P-43S	X	205.7	189.4	Yes					X				Air coming up discharge line, but low pressure Discharge tube connection leaky at cap fitting Replace pump
P-43I	X	233.3	189.7	Yes					X				Air coming up from pump, occasional spurting (bladder blown?) Replace pump
P-43D (No sample)	X	283.6	186.0	Yes		X			X				No lock No discharge tubing Can't produce water from bladder pump Replace pump

Notes:
Indicates (No sample)
Indicates an issue with air in the pump discharge/bladder

Table 2: Gas Probe Repairs/Upgrades
Refuse Hideaway Landfill - September 6, 2019

Gas Probe Number	Repair/Replace Protective Casing Cap	Subcontractor Repairs to Probe	Maintenance Issue
GP-3	X		No protective casing cap/cap requires repair
GP-4	X		No protective casing cap/cap requires repair
GP-5	X		No protective casing cap/cap requires repair
GP-15	X		No protective casing cap/cap requires repair
GP-16	X		No protective casing cap/cap requires repair
GP-16S		X	The soil under protective casing seal has eroded. This probe could be undermined in the future if the soils continue to erode.
GP-16M		X (Abandon)	Probe is broken below the top of casing and requires complete replacement if needed for future monitoring
GP-17	X		No protective casing cap/cap requires repair

Additional notes:

1. Approximately 27 of the gas probes do not have locks.
2. Sample tubing at the top of all of the gas probes should be replaced.
3. The gas probes with multiple depth intervals should be better labeled (using colored tape or other permanent tags) to ensure correct depth intervals/measurements are recorded.

TRC - GIS

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet (Foot US)
Map Rotation: 0

Plot Date: 4/17/2019, 10:51:57 AM by JPAPEZ – LAYOUT: ANSI B(11"x17")
Path: S:\1-PROJECTS\WI_DNR\RefuseHideaway\335719-GW_Proposal\335719-001.mxd

LEGEND

- GAS PROBE
- GAS WELL
- MONITORING WELL
- PRIVATE WELL
- PARCEL BOUNDARY

NOTES

1. BASE MAP IMAGERY FROM ESRI/DANE COUNTY, 2017.
2. TOPOGRAPHY FROM DANE COUNTY LIDAR SURVEY, 2017.
3. PARCELS FROM WISCONSIN STATE CARTOGRAPHER'S OFFICE, 2018.
4. SITE FEATURES SHOWN ARE APPROXIMATE.

N

0 800 1,600 Feet

1 " = 800 '
1:9,600

PROJECT:	WISCONSIN DNR REFUSE HIDEAWAY LANDFILL
TITLE:	SITE OVERVIEW
DRAWN BY: J. PAPEZ	PROJ NO.: 335719.9990
CHECKED BY: M. WESTOVER	FIGURE 1
APPROVED BY: K. VATER	
DATE: APRIL 2019	

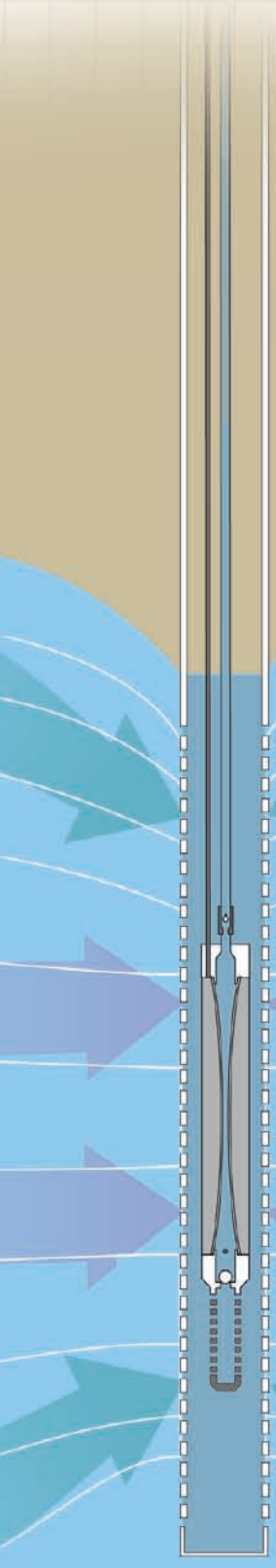
TRC
708 Heartland Trail, Suite 3000
Madison, WI 53717
Phone: 608.826.3600
www.trcsolutions.com

FILE NO.: 335719-001.mxd

Attachment 1: QED Pump Information

MicroPurge® Low-Flow Sampling Equipment Catalog

The most complete selection of pumps, controls, and accessories for groundwater sampling – from the Low-flow Specialists



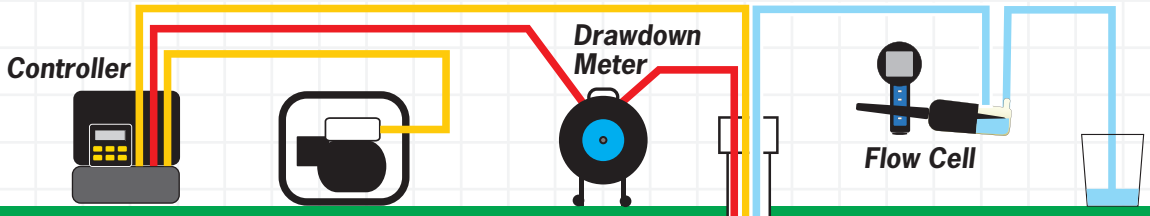
QED®
Innovative Environmental Products

Featuring Well Wizard® and Sample Pro® Pumps

800-624-2026 www.qedenv.com

Introduction

Low-flow sampling reduces purge volumes, provides less turbid samples and improves precision.



Portable and Dedicated Sampling Pumps:

- *Soft-seat check valves for zero leak-back.*
- *Independently lab-certified clean — 100% traceable.*
- *Electropolishing of all stainless steel pump parts for maximum purity and corrosion control.*
- *Bonded, high pullout strength tubing in a range of materials.*
- *Long-life bladders and standard 10-year pump warranty.*
- *Deep-well pumps for sampling to 1,000 feet or more.*

The Controller

Easy one-touch flow rate control for low-flow sampling — simpler than old-style cycle timers.

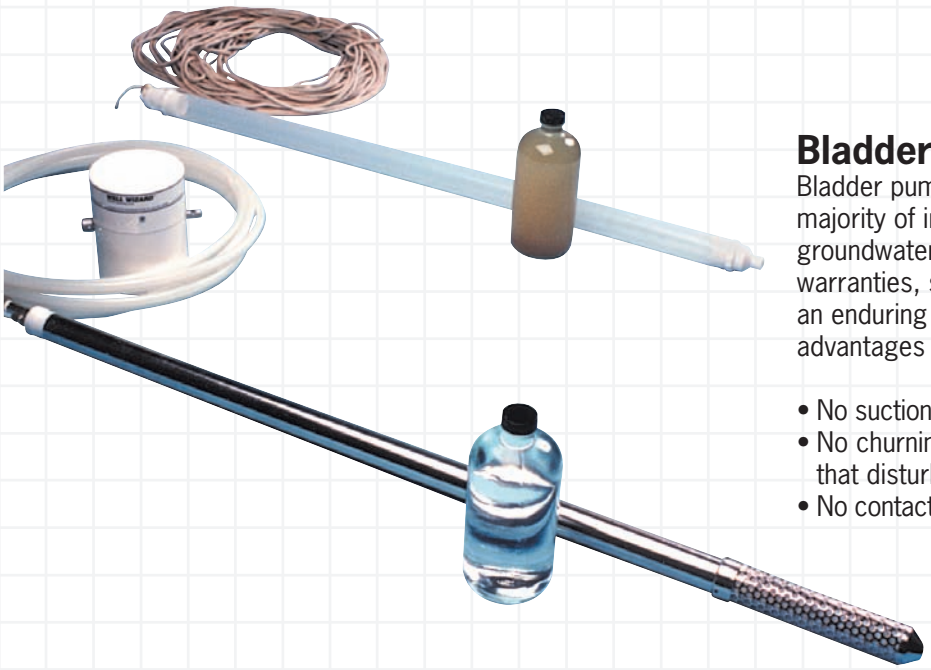
The Flow Cell

Exclusive PurgeScan™ software automatically indicates purge stabilization.

The Drawdown Meter

Patented controller connection for automatic drawdown control to prevent over-purging.

Types of Sampling



Bladder Pumps are Proven Superior

Bladder pumps have been proven superior by the overwhelming majority of independent studies for the broadest range of groundwater quality parameters. They also have the longest warranties, so when you select a bladder pump you are selecting an enduring sampling device and method. Bladder pump advantages include:

- No suction or high speed impellers to outgas volatile compounds
- No churning action, like with bailers and inertial lift samplers, that disturbs the well and increases sample turbidity
- No contact of the drive air with the sample

Low-Flow Sampling

The science of groundwater sampling has advanced significantly in the past decade. Traditional approaches such as bailing, well-volume purging and high rate pumping have been replaced with a methodology that reduces disturbances to the well and aquifer. This proven approach, low-flow rate purging and sampling, provides numerous benefits that make it the method of choice for existing and new groundwater monitoring projects. MicroPurge® low-flow sampling systems deliver all the advantages a project manager needs:

Low-flow rate purging and sampling provides numerous benefits that make it the method of choice for existing and new groundwater monitoring projects. MicroPurge® low-flow sampling systems deliver all the advantages a project manager needs.

- Low-flow samples are flow-weighted average of the entire well screen, providing a consistent picture of the subsurface conditions around the well
- More accurate and precise samples that yield consistent, reliable monitoring data
- Lower sample turbidity provides a better picture of the true contaminant level and can eliminate the need to filter samples
- Greatly reduced purge volume and the associated expense of containment, handling, and disposal
- Superior cost control over the life of the monitoring program

Dedicated and Portable Pumps Series

Dedicated pumps such as QED's leading Well Wizard® bladder pumps provide the maximum benefits of faster, easier field operations and avoiding cross-contamination of wells or samples. The dedicated pump and tubing remain in the well, so equipment insertion and removal, and decontamination between wells are eliminated. For short term projects or any situation in which dedicated pumps are not an option, special Sample Pro® portable bladder pumps are available with quick, no-tools disassembly and disposable bladders.

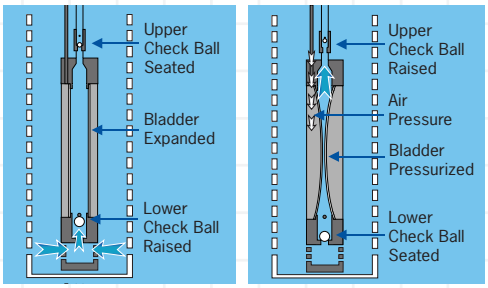
P.O. Box 3726 Ann Arbor, MI 48106 USA **800-624-2026** **INT. 734-995-2547** **F 734-995-1170** info@qedenv.com www.qedenv.com

Bladder Pump Info

How a Bladder Pump Works

Pneumatic bladder pumps operate with a unique, gentle action ideal for low-flow sampling. Timed ON/OFF cycles of compressed air alternately squeeze the flexible bladder to displace water out of the pump, and release it to allow the pump to refill by submergence, without creating any disturbance that could affect sample chemistry. Bladder pumps run easily at low rates for extended times, without the problems of other devices.

Why Bladder Pumps are Superior to Other Sampling Devices



Bladder pumps are simple in their fundamental design, which makes them desirable groundwater sampling pumps. Bladder pumps produce samples with minimal alteration, providing greater accuracy and precision than devices such as bailers and electric pumps. With only three moving parts, a flexible bladder and two check valves, bladder pumps are inherently more reliable that electric pumps, air-power piston pumps, and other devices with numerous moving parts, close tolerances and high-speed motors. This combination of sampling accuracy and reliability is unmatched by other sampling devices.

What does it take to make a superior dedicated bladder pump? The answer: ongoing attention to engineering detail based on many years of wide-ranging field experience. This attention to detail focuses on 4 four critical areas:

- Long bladder life
- Reliable, leak-tight check valves
- Consistent prevention of air and water leaks
- Purity and durability of materials of construction

Each pump is cleaned and laboratory-certified to be free of volatile organic compounds, acid extractable and base neutral contaminants. Your system is pre-assembled, with tubing cut to length, ready to install. If desired, installation by OSHA-certified field technicians is available. QED customer support backs you with unmatched expertise and service, including trained local representatives, 24-hour toll-free hotline and next-day loaners or service turnaround when needed. More MicroPurge® dedicated sampling systems and pumps have been chosen since 1982 than all other manufacturers' equipment combined. To find out why, call QED today for a Low-Flow Data Sheet and site-specific cost analysis.

QED's attention to detail doesn't stop there. QED uses tubing/fitting sets engineered and quality controlled for high pullout strength so you don't lose a pump downwell; inlet screens to prevent solids from damaging the bladder or hanging up check valves and long enough to provide clear inlet flow even if it rests on the bottom; standard low-clearance wellhead caps that fit even when the well closure installation is tight; and special packaging to keep the equipment clean and help make the installation go smoothly. QED's bladder pumps build in all these details and more. Our engineers have never stopped learning how to make QED bladder pumps better!

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P.O. Box 3726 Ann Arbor, MI 48106 USA **800-624-2026** **INT. 734-995-2547** **F 734-995-1170** info@qedenv.com www.qedenv.com

Dedicated Sampling Pumps

WELL WIZARD®

Well Wizard® Bladder Pumps: The Original, Low-Flow Sampling Standard

The leaders since 1982 in dedicated pump technology, performance and support.

The heart of every low-flow groundwater monitoring system is the sampling device. For the system to do its job properly, the sampling device must:

- run reliably even at low rates (100 ml/min or less) over a wide range of conditions;
- operate gently without increasing turbidity or altering samples;
- deliver reliable performance for many years without needing frequent repairs or maintenance.

The Original, Most Complete Low-flow Pump Selection

MicroPurge® system pumps come in an unsurpassed range of sizes, materials and capabilities, including models for deep wells, narrow or obstructed casings, and small-volume pumps for low-yield wells. Together with MicroPurge controllers, flow cells and accessories, they create the most reliable, cost-effective low-flow system available.

Field proven pump designs and exclusive, high performance PTFE bladder formulation offer the reliability critical to long-term monitoring. QED was first in the industry with a standard 10-year sampling pump warranty.

Unmatched Regulatory and User Acceptance

Bladder pumps, EPA-accepted for low-flow sampling, have been shown to deliver superior sample accuracy and precision in dozens of independent studies. Nearly 80,000 Well Wizard® bladder pumps are in use — more than all other brands and types of dedicated groundwater samplers combined.

Well Wizard® Bladder Pump Advantages

1. **EPA-accepted low-flow sampling accuracy.**
2. **Models for every well — low yield, short water column, depths over 1,000 feet, casing ID down to 1.25".**
3. **Proven reliability since 1982, with the industry's first standard 10-year warranty.**
4. **Exclusive PTFE bladder formulation rated for years more flex life than other bladder materials.**

Dedicated Sampling Pumps

Specifications

Model No.	Pump Materials	Length	Diameter	Fitting Material	Tubing* OD Size	Volume	Max. Lift
T1100M	Teflon®	3.3 ft. (1.0 m)	1.66 in. (4.2 cm)	Teflon®	1/4 & 3/8 in. (6 & 9 mm)	395 mL	250 ft. (75 m)
P1101M	PVC	3.4 ft. (1.04 m)	1.66 in. (4.2 cm)	Polypropylene	1/4 & 3/8 in. (6 & 9 mm)	395 mL	300 ft. (90 m)
P1101HM	PVC	3.3 ft. (1.0 m)	1.66 in. (4.2 cm)	Stainless Steel	1/4 & 3/8 in. (6 & 9 mm)	395 mL	600 ft. (180 m)
ST1102PM	316 Stainless Steel	3.4 ft. (1.04 m)	1.66 in. (4.2 cm)	Stainless Steel	1/4 & 3/8 in. (6 & 9 mm)	395 mL	1,000 ft. (305 m)
T1200M	316 S.S. and Teflon®	3.4 ft. (1.04 m)	1.50 in. (3.8 cm)	Stainless Steel	1/4 & 3/8 in. (6 & 9 mm)	495 mL	300 ft. (90 m)
T1250	316 Stainless Steel	1.25 ft. (0.38 m)	1.50 in. (3.8 cm)	Stainless Steel	1/4 & 1/4 in. (6 & 6 mm)	100 mL	300 ft. (90 m)
P1150	PVC, Teflon®	1.63 ft. (0.5 m)	1.66 in. (4.2 cm)	Polypropylene	1/4 & 1/4 in. (6 & 6 mm)	130 mL	300 ft. (90 m)
T1300	316 S.S. and Teflon®	3.8 ft. (1.16 m)	1.00 in. (2.5 cm)	Stainless Steel	1/4 & 3/8 in. (6 & 9 mm)	220 mL	200 ft. (90 m)

* To choose 1/2 in. OD (13 mm) rather than 3/8 in. (9 mm) discharge tube option, delete suffix M from pump model number.

Intake Screen Specifications

Model No.	Material	Screen Size	Fits Pump Model(s)
35200	Stainless Steel	.010 in. (0.25 mm) mesh	T1200M, T1250
37789	PVC	.010 in. (0.25 mm) slot	P1101M, P1101HM
37727	PVC	.010 in. (0.25 mm) slot	P1250 (also P1101M, P1101HM)
37733	Teflon®	.010 in. (0.25 mm) slot	T1100

Note: Pump models ST1101P, T1300 include intake screens. Screens are optional on other pump models, but are required for full 10-year warranty coverage.

Added System Benefits

Well Wizard® pumps will provide the most precise low-flow purging and sampling when operated by a MicroPurge® Model MP10 Controller, with purge water monitoring via the MicroPurge MP20 Flow Cell.

Materials Specifications

Stainless Steel	Type 316 electropolished
PVC	NSF-grade, extruded specifically for QED with no markings or lubricants.
Teflon® (pumps)	DuPont Teflon and other premium PTFE resins
Teflon® (bladders)	Q-flex exclusive 200,000 cycle rated PTFE.

Teflon is a registered DuPont trademark.

MicroPurge® Well Caps

MicroPurge® Well Caps

QED provides an extremely wide range of off-the-shelf and custom caps to complete the system to fit your project's needs and allow easy installation. Popular features include:

- high-purity flexible discharge tubes
- low-clearance fit beneath wellhead closure lids
- below-grade water-tight closures
- water level measurement ports
- freeze protection
- protective dust caps

Low Clearance Standard Cap

Low-clearance model includes a dust-tight cover and compact self-storing MicroPurge discharge tubing. Anodized aluminum caps fit 2" and 4" wells. Models for 1/4" and 3/8" discharge tubing available.

Low Clearance

Model No.	Cap Size	Discharge
C24L	2 in. (5 cm)	1/4 in. (6 mm)
C26L	2 in. (5 cm)	3/8 in. (9 mm)
C44L	4 in. (10 cm)	1/4 in. (6 mm)
C46L	4 in. (10 cm)	3/8 in. (9 mm)

Sealing Cap

Sealing model includes a water-tight cover and compact self-storing MicroPurge discharge tubing. Anodized aluminum caps fit 2" and 4" wells. Models for 1/4" and 3/8" discharge tubing available. QED offers dozens of custom well caps to work with any unique well casing or schedule. Contact QED with questions.

Sealing

Model No.	Cap Size	Discharge
C24S	2 in. (5 cm)	1/4 in. (6 mm)
C26S	2 in. (5 cm)	3/8 in. (9 mm)
C44S	4 in. (10 cm)	1/4 in. (6 mm)
C46S	4 in. (10 cm)	3/8 in. (9 mm)

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Dedicated Sample Pump Tubing

Sample Pump Tubing

QED tubing innovations such as Teflon®-lining and bonded twin-tube protect sample integrity while making system installation and operation easier and more economical. Careful development and quality control provide tight tubing diameter tolerances for connections that are leak-tight and have high pull-out strength, something not found in hardware store tubing. All tubing is controlled quality, virgin grade material. Economical Teflon-lined polyethylene tubing is the most frequently used, with Teflon on the inside of the sample tubing, where it's really needed. Other choices include all-Teflon, polyethylene, and polypropylene (for deep-well use). QED also stocks bulk tubing and many other sizes and materials; inquire for details.

QED Tubing Advantages

1. **Hassle-free, twin-line bonded tubing, not cable tied or loose.**
2. **Systems are custom cut, pre-assembled, leak-tested and poly-bagged for easy installation all at no additional cost.**
3. **Highest quality materials and true continuous lengths.**

Twin-line simplicity
Our standard twin-line air supply/discharge tubing has a continuous heat-welded bond to prevent tangles and hangups during pump installation and maintenance, and avoids entanglement with portable water level meters and other equipment.

Tubing assemblies are cut to exact length and pre-assembled to well cap and pump per customer specifications at no extra cost. QED stocks the largest variety of discharge adapters, elbows and couplers.

Model No.	Material	Maximum Pressure	Maximum Depth	Min. Bend Radius
Air Supply: 1/4 in. OD (6 mm) Discharge: 3/8 in. OD (9 mm)				
P5000	Polyethylene	300 psi (2,070 kPa)	600 ft. (183 m)	1.25 in. (3 cm)
PT5000	Teflon-lined PE	300 psi (2,070 kPa)	600 ft. (183 m)	1.25 in. (3 cm)
T5010	Teflon	275 psi (1,896 kPa)	550 ft. (168 m)	2.5 in. (6 cm)
Air Supply: 1/4 in. OD (6 mm) Discharge: 1/2 in. (13 mm)				
P5100	Polyethylene	200 psi (1,380 kPa)	400 ft. (122 m)	2.5 in. (6 cm)
PT5100	Teflon-lined PE	200 psi (1,380 kPa)	400 ft. (122 m)	2.5 in. (6 cm)
T5110	Teflon	200 psi (1,380 kPa)	400 ft. (122 m)	3.0 in. (7.5 cm)
Air Supply: 1/4 in. OD (6 mm) Discharge: 1/4 in. (6 mm)				
P5200	Polyethylene	300 psi (2,070 kPa)	600 ft. (183 m)	1.0 in. (2.5 cm)
PT5200	Teflon-lined PE	300 psi (2,070 kPa)	600 ft. (183 m)	1.0 in. (2.5 cm)
T5200	Teflon	275 psi (1,896 kPa)	550 ft. (168 m)	1.0 in. (2.5 cm)
Air Supply: 5/16 in. OD (8 mm) Discharge: 3/8 in. (9 mm)				
DW5000	Teflon	500 psi (3,447 kPa)	1,000 ft. (305 m)	2.5 in. (6 cm)

Well Development Pumps

When a monitoring well is installed, it is essential to clear soil particles and drilling fines out of the well that interfere with pumping and result in excessive turbidity. The Sample Pro® Well Development Pump is ideal for fast, easy development of 2" and 4" diameter wells. The operator pulls up on the hoses to surge the well with the pumps flexible wipers that sweep the inside of the casing. The surge-block action's reversing flow loosens fines in the well filter pack so they can be pumped out of the well. Two models are available – standard PVC/Stainless Steel, and Stainless/Teflon for sensitive sampling situations. Wipers to fit both 2" and 4" wells are included. (This pump can also be used for purging).

Specificatons

Model No.	Well Dia.	Pump Material	Tube Fittings	Wiper Material	Max. Lift	Length	Dia.	Pump Wt.
Development Pumps								
HR4105D	2 or 4 in.	PVC/303 S.S.	Brass	PVC/Buna-N	200 ft.	65.00 in.	1.66 in.	6.0 lbs.
HR4105SS	2 or 4 in.	304 S.S.	304 S.S.	S.S./Teflon	200 ft.	65.00 in.	1.66 in.	15.0 lbs.

HR4105SS uses barbed S.S. fittings and clamps with 0.50 in. OD air supply and 0.75 in. OD discharge tubing. All other pumps have brass quick connect air supply and thread-on dischange fittings for use with model P5700 Flexible Hose Bundle.

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Beyond the Basics...

Since 1981, QED's Well Wizard® and Sample Pro® bladder pumps have been the best choice for producing accurate, precise samples while controlling sampling program costs. The addition of QED's MicroPurge® line of low-flow sampling controls simplifies the low-flow sampling process, further improving sample quality and reducing costs. QED's industry-leading team of technical experts will configure a dedicated or portable sampling system to meet your project needs based on site-specific data and well configurations.

Accessories

- MicroPurge® Flow Cell
- MicroPurge® Drawdown Meter
- Bonded twin-tubing, well caps and discharge adapters
- Electric or Engine-Powered Compressors
- Custom components for special applications

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for prompt, expert assistance on your project needs.
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