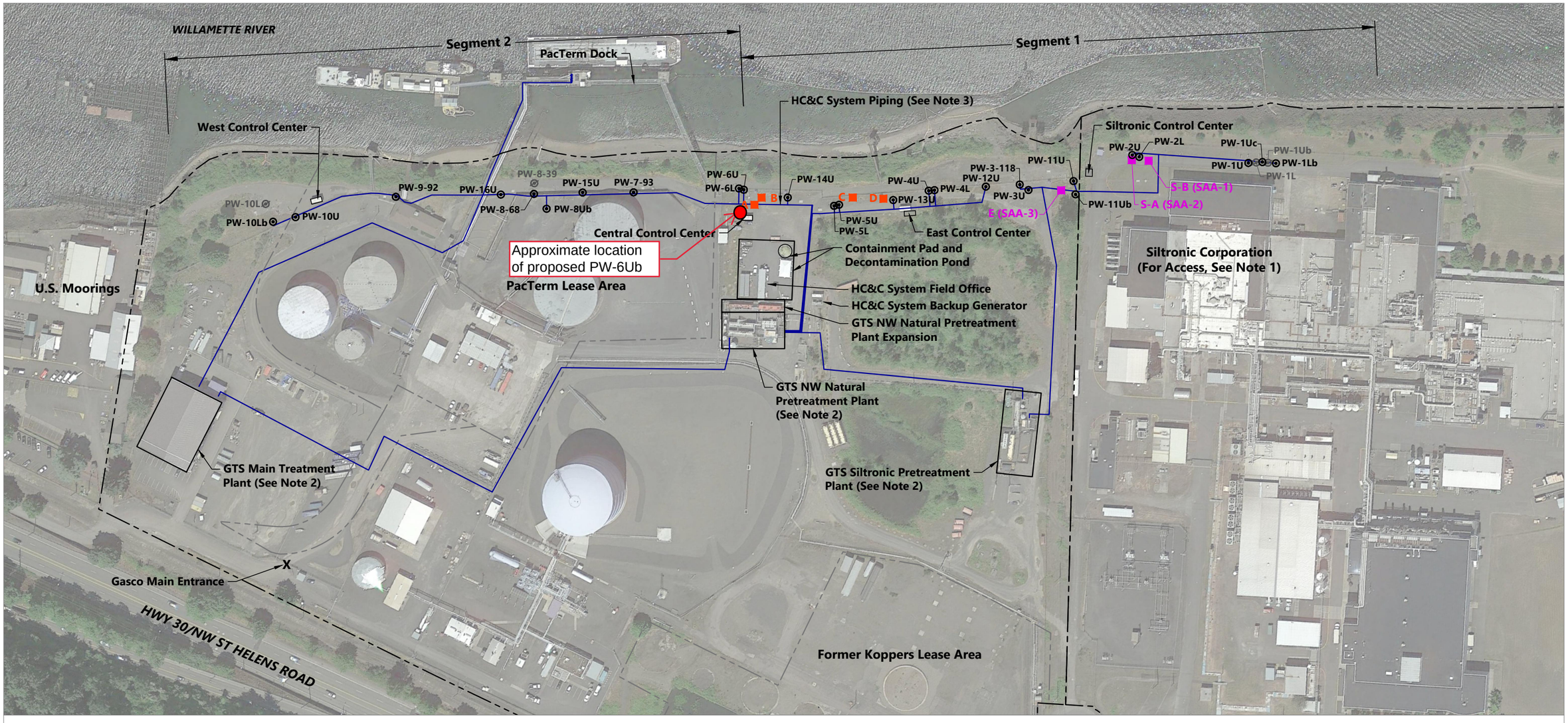


HORIZONTAL DATUM: Oregon State Plane North Zone, North American Datum (NAD83/HARN 91), International Feet
VERTICAL DATUM: City of Portland
AERIAL: Google Earth Pro, dated June 2021
NOTES:

1. Access to Siltronic Corporation property is not available from the Gasco property. Main entrance to Siltronic Corporation property is not shown herein.
2. Piping for Groundwater Treatment System (GTS) not shown herein.
3. Control well and monitoring well installations not shown herein.
4. PW-1Ub was decommissioned in February 2021.
5. PW-1Uc was brought into service in December 2021.

LEGEND:

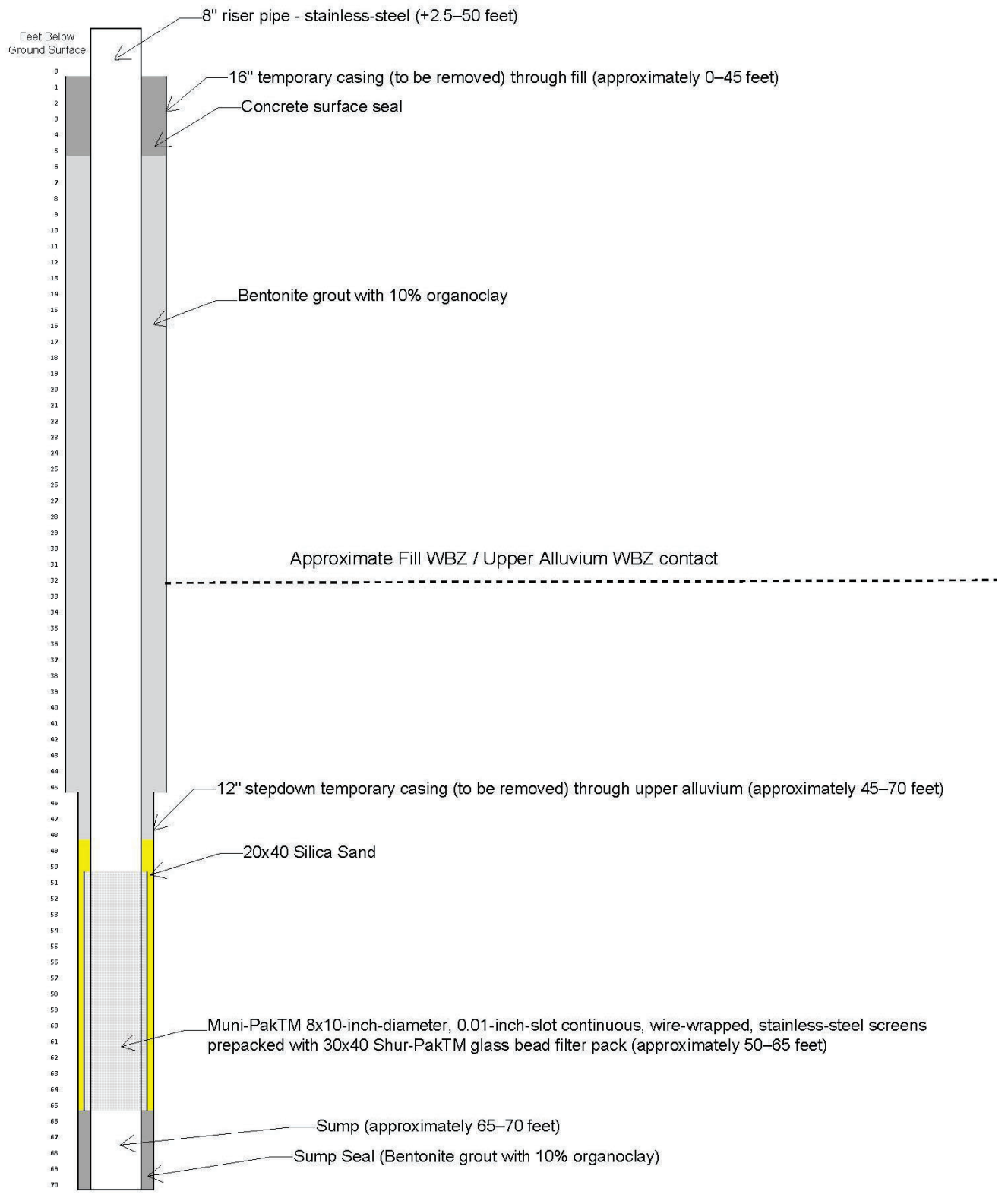
- HC&C System Piping Footprint
- Existing HC&C System Extraction Well
- Decommissioned Extraction Well
- MGP-Only DNAPL Storage Location
- MGP/TCE DNAPL Storage Location (RCRA Satellite Accumulation Area – SAA)
- Lease Boundary (Approximate)
- Property Boundary (Approximate)

0 180
Feet

Publish Date: 2022/07/05 3:04 PM | User: dholmer
Filepath: K:\Projects\0029-NW Natural Gas Co\Gasco Source Control\HC&C System Annual Report 2021\0029-RP-002 (HC&C System Map).dwg Figure 1-2

ANCHOR QEA

Figure 1
Proposed PW-6Ub Location Map
Gasco OU



Filepath: P:\Projects\NW_Natural_Gas_Co\GASCO\Groundwater Source Control\OPERATIONS AND MAINTENANCE\HC&C System Well Installation\ PW-6Ub

ANCHOR QEA

Figure 1
PW-6Ub Well Design
NW Natural Gasco Site

LOG OF EXPLORATORY BORING

PROJECT NAME	**NW Natural Gasco Site**	BORING NO.	**PW-6U**
LOCATION	**Portland, Oregon**	PAGE	**1 of 5**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**31.5 ft COP**
DRILL METHOD	**Rotosonic**	TOTAL DEPTH	**75.0 ft.**
LOGGED BY	**John Renda/Matt Wilson**	DATE COMPLETED	**4/17/12**
SAMPLING METHOD	**1.5-in. ID by 5-ft. core barrel (CB)**	PERMIT/STARTCARD NO.	**1016219**
BOREHOLE DIAMETER	**12-in (0-48 ft)/10-in (48-75 ft)**	WATER RESOURCES WELL ID	**L105589**

SAMPLING METHOD	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	FINES %
CB	3	0			**0 to 0.5 foot: SANDY SILT (MH)**, dark brown, medium plasticity fines, fine sand, 10 percent grass and roots (topsoil), moist.	0	30	70
					0.5 to 4.5 feet: SILTY GRAVELLY SAND (SM), fine to coarse sand, medium plasticity fines, angular to subrounded gravel, brick, fire brick (yellow), black sooty material. (FILL)	20	50	30
CB	3	5			**4.5 to 14.0 feet: SANDY SILT WITH GRAVEL (MH)**, reddish brown, medium to high plasticity fines, fine to medium sand, fine to coarse gravel, brick, yellow fire brick, vesicular basalt cobble, moist. (FILL)	20	30	50
CB	4	10						
CB	4	15			**14.0 to 22.0 feet: SILT WITH GRAVEL (MH)**, reddish brown to gray brown, medium to high plasticity fines, fine to coarse, angular to subrounded gravel, trace organics (wood fibers), mottled appearance, firm, moist to damp, naphthalene-like odor. (FILL)	20-30	5-10	60
		20						

REMARKS

COP = City of Portland Datum.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**NW Natural Gasco Site**	BORING NO.	**PW-6U**
LOCATION	**Portland, Oregon**	PAGE	**2 of 5**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**31.5 ft COP**
DRILL METHOD	**Rotosonic**	TOTAL DEPTH	**75.0 ft.**
LOGGED BY	**John Renda/Matt Wilson**	DATE COMPLETED	**4/17/12**
SAMPLING METHOD	**1.5-in. ID by 5-ft. core barrel (CB)**	PERMIT/STARTCARD NO.	**1016219**
BOREHOLE DIAMETER	**12-in (0-48 ft)/10-in (48-75 ft)**	WATER RESOURCES WELL ID	**L105589**

SAMPLING METHOD	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	FINES %
CB	3.7				**14.0 to 22.0 feet: SILT WITH GRAVEL (MH)**, continued.	20-30	5-10	60
					22.0 to 25.0 feet: SILT WITH GRAVEL (MH), gray to black, medium to high plasticity fines, firm, fine to coarse gravel and brick, angular to subrounded, loose, oily, tar blebs. (FILL) @ 24.5 to 25.0 feet: sandy silt layer.	20-30	5-10	70
CB	5.0	25			**25.0 to 31.4 feet: SILT WITH SAND AND GRAVEL (ML)**, black, wet, very soft, nonplastic, gravel is well rounded, coarse to cobble size, abundant brick and fire brick pieces, very strong hydrocarbon-like odor, soft, sticky tar in matrix (tar and oil mix), heavy rainbow sheen. (FILL) @ 28.0 feet: driller notes easier drilling and softer formation, fluid oil in seams and cracks.	20-30	10-20	50-60
CB	5.0	30			**31.4 to 32.6 feet: SILTY SAND WITH GRAVEL (SM)**, dark gray to black, wet, fine sand, well rounded, fine to coarse gravel, very strong hydrocarbon-like odor, heavy sheen visible. (FILL) @ 32.3 to 32.6 feet: saturated with oil.	10	60	30
					32.6 to 32.8 feet: SILT (MH), olive gray, medium to high plasticity. (ALLUVIUM)	0	0	100
CB	5.0	35			**32.8 to 36.2 feet: SAND (SP)**, dark gray, loose, wet, poorly graded, fine grained, saturated with oily product, very strong hydrocarbon-like odor, dark brown oil visible on sample bag. (ALLUVIUM) @ 34.1 to 34.6 feet: silt layer, olive gray, silt has a sheen "halo" around its edges. @ 35.2 to 36.2 feet: this section appears to be slough from upper units, very soft, wet, gravelly silt, soupy, saturated with oil, trace sand.	0	100	0
					36.2 to 38.2 feet: SANDY SILT (ML), very soft, low plasticity, soupy, black, saturated with oil, strong hydrocarbon-like odor, fine sand.	0	30-40	60-70
		40			**38.2 to 60.9 feet: SAND (SP)**, description on following page.	0	95	5

REMARKS

COP = City of Portland Datum.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**NW Natural Gasco Site**	BORING NO.	**PW-6U**
LOCATION	**Portland, Oregon**	PAGE	**3 of 5**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**31.5 ft COP**
DRILL METHOD	**Rotosonic**	TOTAL DEPTH	**75.0 ft.**
LOGGED BY	**John Renda/Matt Wilson**	DATE COMPLETED	**4/17/12**
SAMPLING METHOD	**1.5-in. ID by 5-ft. core barrel (CB)**	PERMIT/STARTCARD NO.	**1016219**
BOREHOLE DIAMETER	**12-in (0-48 ft)/10-in (48-75 ft)**	WATER RESOURCES WELL ID	**L105589**

SAMPLING METHOD	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	FINES %
CB	5.0				**38.2 to 60.9 feet: SAND (SP)**, dark gray to black, loose, very wet, poorly graded, fine grained, saturated with oil, strong hydrocarbon-like odor from 38.2 to 40.4 feet. @ 38.4 to 38.5 feet: saturated with black oil. @ 38.5 to 38.6 feet: heavy rainbow sheen. @ 38.6 to 38.7 feet: saturated with black oil. @ 38.8 to 38.9 feet: heavy rainbow sheen. @ 39.2 to 41.0 feet: rainbow sheen visible on sample. @ 39.1 to 39.2 feet: black oil blebs visible in standing water. @ 40.0 to 40.1 feet: silt layer. @ 40.0 to 60.9 feet: strong hydrocarbon-like odor.	0	95	5
CB	4.7	45			@ 40.4 to 40.5 feet: silt layer. @ 41.0 to 41.3 feet: silt layer. @ 41.0 to 45.0 feet: spotty sheen. @ 41.8 to 41.9 feet: silt layer. @ 42.1 to 42.3 feet: silt layer. @ 45.0 to 50.0 feet: spotty sheen. @ 45.0 to 45.4 feet: saturated with oil. @ 45.4 to 45.6 feet: silt layer. @ 45.6 to 46.4 feet: sand has a rubbery "tar-like" texture, saturated with oil. @ 47.8 to 48.1 feet: silt layer. @ 48.4 to 48.5 feet: silt layer. @ 48.6 to 49.1 feet: silt layer. @ 50.0 to 52.5 feet: sheen visible on outside edge of sample core. @ 50.0 to 55.0 feet: no oil.			
CB	3.3	50			@ 52.5 to 55.0 feet: no sheen.			
CB	5.0	55			@ 55.0 to 57.4 feet: rainbow sheen visible on sample. @ 55.6 to 57.4 feet: small amounts of oil in sample - <u>not</u> saturated.			
		60			@ 57.4 to 57.8 feet: silt layer. @ 57.8 to 57.9 feet: sheen visible. @ 57.8 to 60.9 feet: grain size change to fine to medium grained sand, no fines. @ 57.9 to 60.0 feet: no sheen.	0	100	0

REMARKS

COP = City of Portland Datum.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**NW Natural Gasco Site**	BORING NO.	**PW-6U**
LOCATION	**Portland, Oregon**	PAGE	**4 of 5**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**31.5 ft COP**
DRILL METHOD	**Rotosonic**	TOTAL DEPTH	**75.0 ft.**
LOGGED BY	**John Renda/Matt Wilson**	DATE COMPLETED	**4/17/12**
SAMPLING METHOD	**1.5-in. ID by 5-ft. core barrel (CB)**	PERMIT/STARTCARD NO.	**1016219**
BOREHOLE DIAMETER	**12-in (0-48 ft)/10-in (48-75 ft)**	WATER RESOURCES WELL ID	**L105589**

SAMPLING METHOD	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	FINES %
CB	4.6				**38.2 to 60.9 feet: SAND (SP)**, continued. @ 60.2 to 60.5 feet: sheen visible on sample.	0	100	0
					60.9 to 62.3 feet: SAND WITH SILT (SP-SM), dark brownish gray, wet, loose, poorly graded fine sand, sheen visible on outside of edge of sample core, moderate hydrocarbon-like odor.	0	85-90	10-15
					62.3 to 67.0 feet: SAND (SP), dark brownish gray, wet, loose, poorly graded fine sand, trace fines, slight hydrocarbon-like odor. @ 62.9 to 63.3 feet: numerous thin silt bandings 0.01- to 0.05-feet thick. @ 63.8 feet: 0.02-feet-thick silt banding.	0	95	5
CB	4.0	65						
					67.0 to 68.4 feet: SANDY SILT (ML), dark grayish brown, moist, soft, low plasticity, no sheen, no hydrocarbon-like odor, faint dirty gym sock/onion odor, intermittent very thin sand seams.	0	20-30	70-80
					68.4 to 69.8 feet: SILT (MH), dark grayish brown, moist, firm, medium to high plasticity, no sheen, faint dirty gym sock odor.	0	0	100
CB	3.5	70			**69.8 to 75.0 feet: SAND (SP)**, dark brownish gray, loose, wet, poorly graded, fine grained, trace fines, trace shell fragments, intermittent thin (0.01- to 0.02-foot) plant debris, vegetation and wood debris layers, no sheen, slight dirty gym sock odor, increasing fines with depth. @ 71.6 feet: soil type change to sand with silt. @ 72.4 feet: soil type change to silty sand. @ 73.3 feet: soil type change to sandy silt. @ 73.6 to 74.1 feet: soil type change to silt.	0 0 0 0 0 0	95 85 70 30 0 100	5 15 30 70 100 0
		75			Total depth: 75.0 feet.			
		80						

REMARKS
COP = City of Portland Datum.

ANCHOR QEA

LOG OF EXPLORATORY BORING

PROJECT NAME	**NW Natural Gasco Site**	BORING NO.	**PW-6U**
LOCATION	**Portland, Oregon**	PAGE	**5 of 5**
DRILLED BY	**Cascade Drilling, Inc.**	GROUND SURFACE ELEVATION	**31.5 ft COP**
DRILL METHOD	**Rotosonic**	TOTAL DEPTH	**75.0 ft.**
LOGGED BY	**John Renda/Matt Wilson**	DATE COMPLETED	**4/17/12**
SAMPLING METHOD	**1.5-in. ID by 5-ft. core barrel (CB)**	PERMIT/STARTCARD NO.	**1016219**
BOREHOLE DIAMETER	**12-in (0-48 ft)/10-in (48-75 ft)**	WATER RESOURCES WELL ID	**L105589**

SAMPLING METHOD	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	FINES %
		85			**WELL COMPLETION DETAILS** +2.7 to 49.4 feet: 6-inch-diameter, flush-threaded, mild steel, blank riser pipe. Riser pipe expands to 8-inch diameter at ground surface and terminates in a 14-inch diameter flange. 49.4 to 64.4 feet: 6-inch-diameter, flush-threaded, continuous wire-wrapped stainless steel well screen with 0.020-inch slots. Rubber NAPL funnel attached at base of screen. 64.4 to 69.4 feet: 6-inch-diameter stainless steel sump. 0 to 1.0 foot: Concrete. 1.0 to 45.5 feet: Bentonite grout with 10% organoclay by volume. 45.5 to 47.5 feet: Bentonite. 47.5 to 64.4 feet: 16-30 Colorado silica sand. 64.4 to 70.0 feet: Bentonite. 70.0 to 75.0 feet: Native.			
		90						
		95						
		100						

REMARKS
COP = City of Portland Datum.

ANCHOR QEA

Johnson Screens

A brand of
Aqseptence Group

Muni-Pak screens — A better way to gravel pack

Johnson Screens' solution for improving gravel packing is the Muni-Pak™ screen. This pre-packed screen eliminates the need for a larger borehole, shortens the time required to drill a well and speeds development time.

For the well owner, the Muni-Pak screen offers long-term benefits. The latest Johnson Screens innovation uses glass beads as the filter media—a unique concept that reduces the likelihood of filter pack fouling from biofilm and encrustation, lowering overall well maintenance costs.

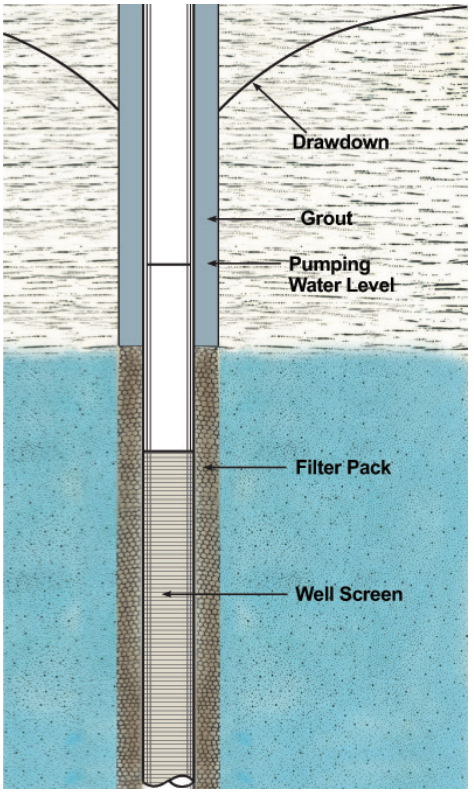
Artificial filter pack is one of the most common designs used today for high-capacity municipal, industrial and agricultural wells. Before the installation of a filter pack, the contractor and the well owner must take into account some significant issues:

- The borehole must be sufficiently oversized to allow for adequate placement of the filter pack. In practice, an annular thickness of 3 to 5 in. is considered minimum. The oversized borehole is costly to the contractor (and therefore to the well owner) and keeps the crew on site for additional time.
- The filter pack must be carefully selected, placed and developed to avoid bridging and sand pumping.
- The well owner is concerned with long-term performance. Biofouling and encrustation are issues that will eventually affect performance.

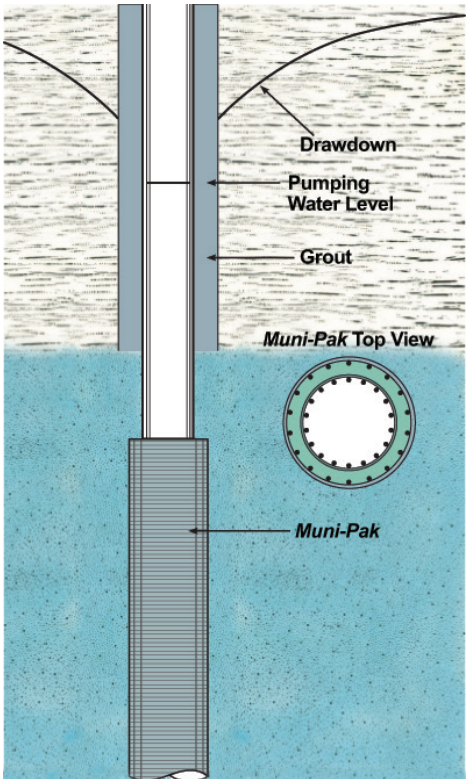
Applications

- Controls sand infiltration in new, high-capacity municipal, industrial and agricultural wells
- Can be used as a liner in existing wells to eliminate the need for constructing a new well
- Custom applications such as infiltration galleries
- Environmental remediations
- Horizontal applications.

Features, Advantages and Benefits



A Typical Gravel Pack Well



Muni-Pak Well

- The pre-packed construction of Muni-Pak screens allows the use of a smaller borehole versus gravel packed filtering, with fewer cuttings, reduced circulating volume and increased uphole velocity. This feature lowers bit and cement costs and reduces the drilling time.
- Since the media is included as part of the screen package, gravel placement is not required—eliminating bridging filter packs and time spent packing, as well as reduction of equipment requirements. The results are reduced installation time and lower costs.
- The Muni-Pak's dual-screen construction is four times stronger than standard rod-based screens, allowing more aggressive development and better immunity to unexpected hole problems—providing lower costs.
- A thinner filter pack results in a smaller annulus for easier development and rehabilitation of the near-well area over time, better formation penetration and more aggressive development. The benefits are a perfect media pack, reduced site time and lower risk.
- The wide range of diameters (1.25 to 20 in.) and connections (weld rings or threaded fittings) provides flexibility for meeting most application needs with a variety of standard or custom-end fittings—offering easier adaptation for a wide array of uses.
- The continuous-slot construction provides maximum open area, optimizing development and redevelopment. The result is thorough development.
- With custom lengths up to 20 ft., with no mid-weld, on-site welding requirements are reduced; thus, minimizing field assembly time and associated costs.
- Multiple wire-size and filter-media options enable custom applications and maximum depth capabilities, providing a wide range of uses.
- Glass beads improves efficiency by offering excellent roundness and sphericity, a lower uniformity coefficient for better hydraulic conductivity, better flow characteristics than silica sands, less buildup of biofilm and encrustation and easier media cleaning than with irregularly shaped silica sand grains.
- Muni-Pak works great as a liner in existing well construction, eliminating the need the construction and the cost of a new.

Installation costs: Muni-Pak Screen versus gravel pack filtering

Description	Single-String Completion	
	Gravel Pack	Muni-Pak
Mobilization	$13,000	$13,000
Demobilization	$7,500	$7,500
Drilling	$94,509	$74,184
Casing	$35,827	$35,827
Screen	$27,633	$76,700
Gravel Pack	$14,959	$0
Grout	$40,881	$28,350
Development	$24,844	$16,148
Testing	$7,800	$7,800
Disinfection	$275	$275
Video	$700	$700
Site Cleanup	$12,000	$12,000
Totals	$279,928	$272,484

Muni-Pak Screen Specifications

Size[1] (in.)	Approx. Screen ID (in.)	Approx. Screen OD (in.)	Media Annular Thick-ness (in.)	Inner Screen Open Area - sq. in./ft. of Screen								Outer Screen Open Area - sq. in./ft. of Screen								Approx. Screen Weight (lbs/ft.)
				Screen Slot Size (thousandths of an in.)								Screen Slot Size (thousandths of an in.)								
				10	20	30	40	50	60	80	100	10	20	30	40	50	60	80	100	
2 x 4	1.5	4.5	0.85	13	22	30	35	40	44	51	55	24	42	56	68	77	85	97	106	17
3 x 5	2.8	5.7	0.97	20	35	46	55	63	69	79	86	30	53	70	84	96	105	120	132	23
4 x 6	3.8	6.7	0.94	25	44	59	70	80	87	100	110	36	62	83	100	114	125	143	156	25
5 x 7	4.7	7.7	0.87	30	53	70	84	96	105	120	132	40	70	94	113	128	141	161	176	27
6 x 8	5.8	8.7	0.84	36	62	83	100	114	125	143	156	46	81	108	129	147	162	185	202	35
8 x 10	7.7	10.8	0.84	33	60	82	101	117	131	155	172	41	74	102	125	145	162	191	213	55
10 x 12	9.8	12.8	0.84	41	74	102	125	145	162	191	213	48	88	121	148	172	193	226	253	70
12 x 15	11.8	15.0	0.84	59	106	143	173	199	220	255	281	69	122	165	200	230	255	295	325	85
14 x 16	13.0	16.0	0.64	42	78	108	135	159	180	215	244	48	89	125	155	183	207	247	281	100
16 x 18	15.0	18.0	0.64	48	89	125	155	183	207	247	281	54	99	139	173	204	230	276	313	115
18 x 20	16.9	20.0	0.78	54	99	139	173	204	230	276	313	59	110	154	192	226	256	306	347	128

Muni-Pak Screen vs. Standard Rod Based Screen

Nominal Size (in.)[2]		Collapse Strength (PSI)		Tensile Strength (lbs.)	
Rod Based	Muni-Pak	Rod Based	Muni-Pak	Rod Based	Muni-Pak
2	2 x 4	1,940	16,500	4,300	12,500
3	3 x 5	540	5,650	5,200	15,000
4	4 x 6	730	2,830	6,100	18,800
5	5 x 7	440	1,550	7,000	20,700
6	6 x 8	260	990	17,600	41,600
8	8 x 10	250	1,160	24,200	50,000
10	10 x 12	360	630	30,800	81,400
12	12 x 15	220	880	35,200	87,000
14	14 x 16	170	1,110	35,200	95,400
16	16 x 18	170	760	72,200	135,900
18	18 x 20	130	540	74,200	147,200

Standard Glass Filter Pack Sizes

Screen Slot Size (Thousandths of an in.)	Bead Diameter (in.)	Bulk Density (lb. ft.[3])
10	0.016 - 0.024	93.0
20	0.030-.0390	93.0
30	0.039 - 0.051	94.3
40	0.049 - 0.065	94.3
50	0.061 - 0.073	94.9
60	0.079 - 0.094	95.5
80	0.094 - 0.114	95.5
100	0.112 - 0.136	95.5

Notes:

- Other sizes available upon request
- Values compare 1,000 ft. construction Muni-Pak to 1,000 ft. construction rod base

1. Other sizes available upon request
2. Table compares 1,000 ft. rod-based construction vs 1,000 ft. Muni-Pak construction

Packing process allows for a thinner filter pack

Improving the life cycle of wells

Success showcases

New life for an old collector well

Collector wells are major investments and not easily replaced. The City of Nekoosa, Wisconsin, constructed two in the 1960s. One became so severely biofouled and encrusted that pumping just 200 GPM practically dewatered the laterals. The problem was that the design of the original laterals did not facilitate effective rehabilitation (The original laterals were slotted 8 in. PVC).

The advantages of Muni-Pak screens were introduced the contractor:

- The prepack design simplified installation
- The high open area with a compact, highly conductive ceramic or glass beads pack facilitated development (and future maintenance)
- The properties of the ceramic or glass beads deter biological growth

Three Muni-Pak laterals were successfully installed without removal of the existing PVC laterals. After development and testing, the refurbished collector well had more than a sevenfold increase in specific capacity and testing determined that 78 percent of the production came from the Muni-Pak laterals.

New pre-pack screen installed in Indiana well

The City of LaPorte, Indiana, was planning construction of a new well in its Warneke field. Existing wells in this field were underreamed, gravel packed completions drilled by reverse circulation and had been plagued with decreased specific capacity.

The city's contractor worked with the city engineers on presenting the Muni-Pak product.

Despite an initial concern about proper packing and adequate production from a pre-pack design, the city chose the Muni-Pak solution for several reasons:

- The pre-pack design negated concerns over proper pack placement
- The slim pack afforded greater development potential than an underreamed completion
- Ceramic or glass beads pack are considered superior to conventional silica sand

After successful placement of the Muni-Pak screen, the new well was developed without a problem, and a 24 hr. pumping test was conducted. The well produced 805 GPM with a specific capacity of a 24.6 gal./min./ft. drawdown. This production compared favorably to the existing wells in the Warneke field, which had much larger underreamed holes.

Aqseptence Group, Inc.
Water Well Screens

North and South America
Phone +1 651 636 3900
Fax +1 651 638 3177
waterwell.johnsonscreens.us@aqseptence.com

www.aqseptence.com

07 _1010.02B

Johnson Screens

A brand of
Aqseptence Group

Shur-Pak™ Glass Bead Filter Pack

Easier to install than traditional filter pack, Shur-Pak™ is stronger, chemically inert and are almost perfect spheres — virtually eliminating bridging during installation that can be an issue in traditional filter pack.

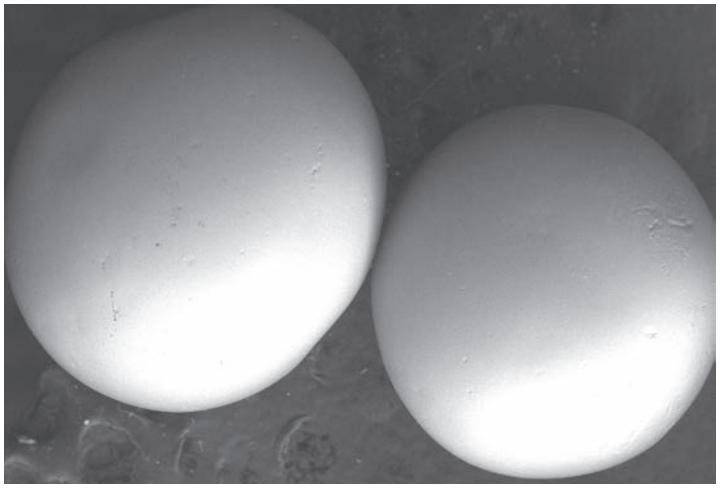
Shur-Pak Glass Beads are used as an upgrade from traditional filter packs for water wells. Shur-Pak is easy to handle and can be sized and installed using similar methods and techniques.

Features and Benefits

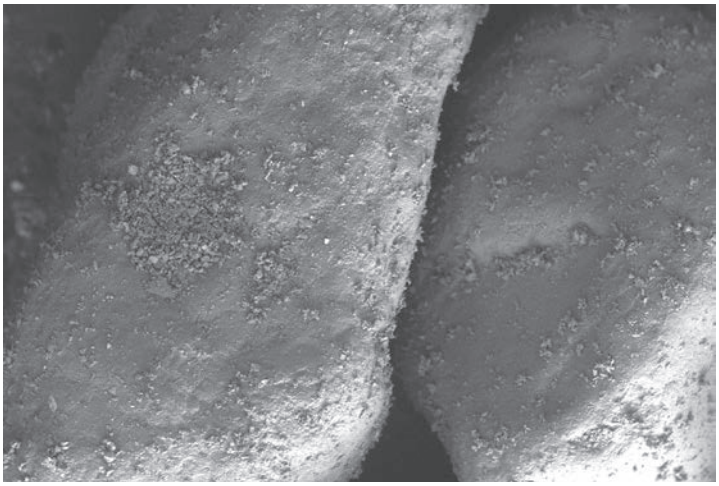
Glass beads for filter packs in water wells provide:

- Uniform and consistent bead size
- Stronger crush strength than gravel
- Simple to install and greatly reduces bridging
- Less compaction over the well life
- Faster development than gravel (40% - 60% reduction of time)
- Higher well efficiency
- Less loss of capacity from reduced bio-fouling and mineral scaling
- Extended operation intervals between well rehabilitation
- Easy to clean and chemical resistance
- Reduced operational costs
- Available in 1 metric ton sacks and 25 kg bags

Shur-Pak glass beads at 60x magnification



Shur-Pak 14-18 beads magnified 50x with a scanning electron microscope (SEM)



8-12 Sand magnified 35x under a scanning electron microscope (SEM)

Chemical Composition

Composition		Percentage
Silicon Dioxide	SiO_2	69.6%
Sodium Oxide	Na_2O	13.3%
Calcium Oxide	CaO	10.9%
Magnesium Oxide	MgO	4.23%
Aluminum Oxide	Al_2O_3	1.17%

Shur-Pak Sizing

Product Description	US Mesh	Bead Diameter (in.)	Bead Diameter (mm)	Bulk Density (lb. ft.^{3})
Shur-Pak 30-40	30 - 40	0.024 - 0.016	0.6 - 0.4	101.13
Shur-Pak 20-30	20 - 30	0.033 - 0.024	0.85 - 0.6	101.13
Shur-Pak 18-20	18 - 20	0.039 - 0.033	1.0 - 0.85	101.13
Shur-Pak 16-18	16 - 18	0.046 - 0.039	1.18 - 1.0	101.13
Shur-Pak 14-16	14 - 16	0.055 - 0.046	1.4 - 1.18	101.13
Shur-Pak 14-18	14 - 18	0.055 - 0.039	1.4 - 1.0	101.13
Shur-Pak 12-14	12 - 14	0.067 - 0.055	1.7 - 1.4	101.13
Shur-Pak 10-12	10 - 12	0.079 - 0.067	2.0 - 1.7	100.51
Shur-Pak 6-10	6 - 10	0.118 - 0.079	3.0 - 2.0	99.88
Shur-Pak 5-7	5 - 7	0.157 - 0.118	4.0 - 3.0	98.01

Chemical and Physical Properties

Parameter	Description
Physical Form	Solid, odorless, transparent, soda lime glass beads
Mean Roundness by Bead Diameter	>93%
Hardness	≥6.0-6.7 on Mohs scale
Melting point	1450 – 1500 deg C
Deformation temperature	580 – 650 deg C
Uniformity Coefficient	1.1 to < 1.45
Acidic Resistance (according to DIN 12116)	S2 (0.7 up to 1.5)
Specific Gravity	>2.45
Loss on Ignition	Not applicable

Aqseptence Group, Inc.
Water Well Screens

North and South America
Phone +1 651 636 3900
Fax +1 651 638 3177
info.johnsonscreens.us@aqseptence.com

www.aqseptence.com

07_1022.00