Drilling Activity and Shaw Pad Incident Response at the Beaver Run Reservoir

Municipal Authority of Westmoreland County
Municipal Authority of Westmoreland County (MAWC)

- Serves Five (5) Counties in Western PA east of Pittsburgh
- Approximately 120,000 water customers and 30,000 wastewater customers
- Three (3) Water Treatment Plants and Nine (9) Wastewater Facilities
- Sources of Supply include Beaver Run Reservoir, Youghiogheny River and Greater Johnstown Water Authority
- Total Operating Revenues of Approximately $110 Million
Beaver Run Reservoir

- Constructed in 1952 and enlarged in 1962
- The Dam is an earthfill structure approximately 1095 feet long and rising 91 feet above the streambed
- Provides 34,000 acre-feet of storage at the spillway crest elevation of 1050.1
- Storage of 11 Billion Gallons at the spillway crest elevation
- Authority owned watershed of approximately 5,000 acres
MAWC Oil and GAS Drilling

Beaver Run Reservoir Property
- First leases done decades ago
- 86 Shallow Wells were on property
- 11 Vertical Marcellus Wells since 2008
- 50 Horizontal Marcellus Wells since 2010
- 3 Utica Wells in operation since 2015
- 3 Utica Wells on Shaw pad planned, 1 plugged
Historical Shallow Wells
MAWC Oil and GAS Drilling History

- Fall of 2007 MAWC was approached by Dominion Exploration (currently Consol Energy) who held the gas lease on northern half of the reservoir property.
- Dominion Exploration expressed interest in Marcellus drilling in 2008.
- MAWC had existing leases reviewed by outside legal counsel.
- Legal review was clear that the existing leases gave oil and gas rights to Dominion Exploration for Marcellus layer and below.
- Vertical Marcellus Well drilling began in fall of 2008.
11 Vertical Deep Wells were drilled on the Property by Dominion Exploration through 2009.

Vertical well production was good, so Consol believed horizontal drilling was viable.

Dominion Exploration was purchased by Consol Energy in 2010.

Seven (7) sites of approximately 17 acres each were cleared and 50 horizontal wells are in production.

CNX began drilling Utica Horizontal wells on the Gaut Pad in 2015. CNX used existing pads (Gaut, Aikens and Shaw) to reduce the disturbed acreage on the property.

Three (3) Utica wells are in production and three (3) are being prepared.
Well Pads
Incidents Associated with Drilling

- There have been twelve (12) incidents on the well pad sites reported to MAWC since drilling began in 2008

  - 3-20-12 Aikens Pad check valve ruptured releases frac fluid on to containment.
  - 8-2-12 Kuhns pad release of liquid cement to ditch
  - 6-1-13 Kuhns Pad a recycle water line overpressurized spilling 100 gallons outside containment.
  - 6-13-13 Mamont 1 Pad Excessive rain event caused a containment dike to breach. Nothing but rainwater involved
  - 2-6-14 Gaut Pad Oil based Mud discharged from truck in to contained area.
  - 4-22-14 Mamont 1 Pad 1 gallon of oil on containment from a semi-trailer
  - 6-10-14 Hutchinson Pad Soap suds from vent from on filling truck
  - 6-11-14 Hutchinson Pad Friction Reducer spill
  - 8-13-14 Shallow well brine leak in containment
  - 10-7-14 Shallow Well brine leak
  - 2-27-15 Gaut Pad drilling mud leak on containment
  - 1-27-19 Shaw Utica high gas pressure in well while fracking affecting shallow wells
Prior to 2010 MAWC conducted annual water quality monitoring on all water sources entering the Beaver Run reservoir as well as routine monitoring of the raw water entering the water treatment plant.

Beginning in 2011 MAWC contracted with IUP to conduct monitoring of these 19 sites as well as 15 additional sites, 4 sites in the reservoir itself and any water outcropping around any of the drilling pads.
Parameters Run on Reservoir Samples

Total 179

The parameters that are tested for and the testing frequency have been developed from input from MAWC Source Water Consultants, Indiana University of PA, MAWC Consulting Engineers, MAWC Water Quality staff and Public groups that are part of our Source Water Protection Committee, such as the Marcellus Citizens Group of Westmoreland County and Mt. Watershed.

In addition to the water quality testing being discussed MAWC also contracts with IUP for air quality testing around the compressor station and MAWC facilities.
All VOC’s, SVOC’s, Radionuclides, Metals (IUP tests)

Typically Conducted Quarterly
When a fracking event is scheduled then testing begins weekly one month before frac is to commence. Weekly testing continues until 1 month after fracking is completed based on pad location.

During the Shaw Event sampling for ALL these parameters was done daily the first week, 3 times per week beginning Feb. 4th and continues to be done 3 times per week. This is based on estimated flows from points in the reservoir to our water intake.
Sampling Frequencies, Cont.

- MAWC has continuous on-line monitors that run 24/7/365 on both our water intake line and the conservation discharge to Beaver Run below the dam. This is to see any change through out the water column in the reservoir.

- Testing frequency of the raw water supply in the water plant by the plant operators are shown on the following slides.
VOC

- Dichlorodifluoromethane
- Chloromethane
- Vinyl chloride
- Bromomethane
- Chloroethane
- Trichlorofluoromethane
- 1,1-Dichloroethene
- Acetone
- Methylene Chloride
- Methyl-tert-butyl ether
- rans-1,2-Dichloroethene
- 1,1-Dichloroethane
- 2-Butanone
- cis-1,2-Dichloroethene
- Chloroform
- Bromochloromethane
- 1,1,1-Trichloroethane
- 1,1-Dichloropropene
- Carbon Tetrachloride
- Benzene
- 1,2-Dichloroethane
- Trichloroethene
VOC cont

- 1,2-Dichloropropane
- Dibromomethane
- Bromodichloromethane
- cis-1,3-Dichloropropene
- 4-Methyl-2-pentanone
- Toluene
- trans-1,3-Dichloropropene
- 1,2,3-Trichloropropene
- 1,1,2-Trichloroethane
- 1,3-Dichloropropene
- Tetrachloroethene
- 2-Hexanone
- Dibromochloromethane
- 1,2-Dibromoethane
- Chlorobenzene
- 1,1,1,2-Tetrachloroethane
- Ethyl Benzene
- m,p-Xylenes
- o-Xylene
- Total Xylenes
- Styrene
- Isopropylbenzene
VOC cont

- Bromoform
- 1,1,2,2-Tetrachloroethane
- n-Propyl Benzene
- 1,3,5-Trimethylbenzene
- Bromobenzene
- 2-Chlorotoluene
- 4-Chlorotoluene
- tert-Butylbenzene
- 1,2,4-Trimethylbenzene
- sec-Butylbenzene
- 4-Isopropyltoluene
- 1,3-Dichlorobenzene
- Butylbenzene
- 1,4-Dichlorobenzene
- 1,2-Dichlorobenzene
- 1,2-Dibromo-3-chloropropane
- 1,2,4-Trichlorobenzene
- Naphthalene
- 1,2,3-Trichlorobenzene
Radionuclides

Gross Alpha
Gross Beta
Radium 226
Radium 228
SVOC

- Pyridine
- N-Nitrosodimethylamine
- Aniline
- Phenol
- bis(2-chloroethyl)ether
- 2-Chlorophenol
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- Benzyl alcohol
- 1,2-Dichlorobenzene
- 2-Methylphenol

- bis(2-chloroisopropyl)ether
- 3 & 4-Methylphenol
- N-Nitroso-di-n-propylamine
- Hexachloroethane
- Nitrobenzene
- Isophorone
- 2-Nitrophenol
- 2,4-Dimethylphenol
- bis(2-chloroethoxy)methane
- 2,4-Dichlorophenol
- Benzoic acid
SVOC Cont.

- 1,2,4–Trichlorobenzene
- Naphthalene
- 4–Chloroaniline
- Hexachlorobutadiene
- 4–Chloro–3–methylphenol
- 2–Methylnaphthalene
- Hexachlorocyclopentadiene
- 2,4,6–Trichlorophenol
- 2,4,5–Trichlorophenol
- 2–Chloronaphthalene
- 2–Nitroaniline
- Dimethylphthalate
- Acenaphthylene
- 2,6–Dinitrotoluene
- 3–Nitroaniline
- Acenaphthene
- 2,4–Dinitrophenol
- 4–Nitrophenol
- Dibenzofuran
- 2,4–Dinitrotoluene
- Diethylphthalate
- Fluorene
SVOC Cont. (3)

- 4-Chlorophenyl-phenylether
- 4-Nitroaniline
- 4,6-Dinitro-2-methylphenol
- N-Nitrosodiphenylamine
- Azobenzene
- 4-Bromophenyl-phenylether
- Hexachlorobenzene
- Pentachlorophenol
- Phenanthrene
- Anthracene
- Carbazole
- Dimethylphthalate
- Acenaphthylene
- 2,6-Dinitrotoluene
- 3-Nitroaniline
- Acenaphthene
- 2,4-Dinitrophenol
- 4-Nitrophenol
- Dibenzofuran
- 2,4-Dinitrotoluene
- Diethylphthalate
- Fluorene
SVOC Cont (4)

- Benzo[k]fluoranthene
- Benzo[a]pyrene
- Indeno(1,2,3–cd)pyrene
- Dibenzo(a,h)anthracene
- Benzo[ghi]perylene
IUP Tests

- Fluoride
- Chlorine
- Bromine
- No3
- Po4
- So4
- Calcium
- Magnesium
- Iron
- Aluminum

- Strontium
- Lead
- Arsenic
- Mercury
- Chromium
- Barium
- Cadmium
- pH
- TDS
- Conductivity
- Temp

https://www.iup.edu/energy/research-initiatives/beaver-run-reservoir/
Online monitors

- Temp
- pH
- Conductivity
- DO (dissolved oxygen)
- Raw Turbidity
- Clearwell Total Chlorine
Plant tests

- Raw turbidity (4hrs)
- Clearwell turbidity (4hrs)
- Raw pH (4hrs)
- Raw total hardness (Daily)
- Raw iron (Daily)
- Raw chlorides (Daily)
- Raw conductivity (Daily)
- Raw Alkalinity (Daily)
- Raw smell test hot and cold (8hrs)
- Uv 254 (Daily)

- Sample pH*
- Sample chlorides*
- Sample conductivity*

* Collected at all 5 sample sites run in house
IUP provides a website portal so that all the data can be view by the public. Access is available on the MAWC website.

Go to Drinking Water tab to Hot Topics tab to Natural Gas Drilling tab

MAWC wanted an independent third party to conduct the analysis and provide the data on a public forum.

No money is directly accepted from any drilling companies for this sampling, analysis and review.
Revenues of Deep Wells

2008 – $60,534.00
2009 – $165,173.00
2010 – 324,540.00
2011 – $519,000.00
2012 – $1,512,920.00
2013 – $4,444,181.00
2014 – $6,218,281.00
2015 – $4,948,691.00
2016 – $1,277,545.00
2017 – $2,307,399.00
2018 – $2,937,419.00

Total for 11 years = $24,196,683.00
Based on Total MAWC Revenues of $100 Mil/Year = 1.3 % – 6.2%
Weekly Pre-fracking sampling had begun in November 2018 as per MAWC protocol.

Fracking on the 1st well began in January 2019.

CNX contacted MAWC January 27, 2019 at approximately 7 pm to tell us they had a “pressure anomaly” on the 2nd Utica well which they were fracking on the Shaw pad (Shaw 1G). No fluids had been released and DEP had been notified.

MAWC Senior Management was contacted and a meeting with CNX was scheduled for 9 am the following morning.

MAWC Water Quality staff were directed to begin sampling at 3 sites on the reservoir below gradient from the Shaw pad. Sampling would take place daily.
At the meeting with CNX on January 28th, MAWC was informed that a shallow well near the Shaw pad showed increased pressure overnight. Other shallow wells in the vicinity were being checked for high pressure.

Discussion proceeded on implementation of CNX’s EAP so that the reservoir would be protected in case any fluids were found to be discharging. It was reiterated that no fluids had been observed.

MAWC’s Water Quality reported no visible indications of discharge into the reservoir. Plant monitors indicated no changes to water quality entering the plant or the low elevation release point from the reservoir.
MAWC began to review implementation of its EAP for any potential contamination event on the reservoir.

This included a schedule of implementation, sampling, notifications, necessary MAWC personnel/equipment, plans for alternative supplies, changes to reservoir discharge operation, etc.

Daily updates with CNX were conducted. On January 30\textsuperscript{th} it was reported that further shallow wells were being influenced.

MAWC monitoring continued. So far nothing was indicating any deviation from the normal raw water quality.
January 30th contacted PADEP Water Quality group to review the current situation and discuss MAWC‘s potential plans if indications of any reservoir contamination appeared. MAWC asked for approval to reduce our conservation discharge from the reservoir if necessary.

As part of MAWC’s EAP our major bulk water customers were contacted to discuss being prepared to open these interconnects or shutoff ones we supplied to maintain water supplies in our northern districts.
Contractors were contacted to implement other parts of the MAWC EAP to help maintain water supplies if necessary.

Indiana University was contacted to take additional samples from all around the Shaw pad. Due to the severe cold (−4) during this period sampling was required to be delayed until Feb. 2\textsuperscript{nd} however a site review indicated no new outcroppings of water. Everything was frozen at this time.

Press releases were prepared by CNX and reviewed by MAWC for release.
Sampling was reduced to Three (3) times per week after CNX reported the well was shutdown and gas pressures began to reduce.

Sampling continues on a Three (3) time per week basis.

All monitoring and sample results continue to be normal.

MAWC is waiting for the final reports from the PADEP and CNX to proceed on this event.
QUESTIONS?