Figure 7. Specific Conductance: Continuous Measurements at West Branch Brandywine Creek at Modena

Figure 8. Continuous Specific Conductance and Precipitation at West Branch Brandywine Creek at Modena

Winter period: January 1 - March 4

Chester County Water Quality Summary:
Chloride and Specific Conductance

Chester County Water Resources Authority and U.S. Geological Survey have partnered since the 1970’s to maintain a county-wide water monitoring program for Chester County. Since its inception, the program has monitored quality and quantity of groundwater and streams across the county on an annual, and in some cases more frequent, basis. The program includes an annual streams monitoring program that collects water quality and biodiversity data for 18 fixed sites and several additional flexible sites in the fall of each year to characterize annual and long-term water conditions in Chester County’s watersheds.

As shown in Figures 1 through 6, chloride concentrations have steadily increased across Chester County’s watersheds. The current chloride levels are well below the drinking water standard, however, the trend is increasing and is expected to continue to increase. Chloride data presented below were collected in the fall, typically before snow has fallen that year. Therefore, the chloride values represent seasonal base flow conditions and do not illustrate conditions immediately after de-icing materials were applied.

Specific conductance can be used as an indicator of chloride and when measured on a continuous basis indicates when “pulses” occur during the year. Specific conductance measures how well water can conduct an electrical current, and conductance increases with increasing amount and mobility of ions. Therefore, specific conductance can be used as an indirect measure of the presence and relative levels of chloride and when measured on a continuous basis indicates when “pulses” occur during the year. Specific conductance can be used as an indicator of chloride and when measured on a continuous basis indicates when “pulses” occur during the year. Specific conductance can be used as an indicator of chloride and when measured on a continuous basis indicates when “pulses” occur during the year. Specific conductance can be used as an indicator of chloride and when measured on a continuous basis indicates when “pulses” occur during the year. 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Figure 2. County-wide Chloride Levels: Fall 2018

Figure 3. Long-Term Chloride Trend: Brandywine Creek at Chadds Ford

Figure 4. Chloride trends in the French Creek, Valley Creek and Chester Creek watersheds

Figure 5. Chloride trends in the Chesapeake Bay watershed and Red/White Clay Creeks watersheds

Figure 6. Chloride trends in the Brandywine Creek watershed

Chloride: Relative to 250 mg/L Standard
- Below 62.5 mg/L (below 25%) | 13 sites
- From 62.5 to 125 mg/L (25 - 50%) | 3 sites
- From 125 to 187.5 mg/L (50 - 75%) | 2 sites
- From 187.5 to 235 mg/L (75 - 90%) | 0 sites
- Above 225 mg/L (90% and up) | 0 sites

Map ID Location Chloride, mg/L
1 Pigeon Creek near Settlement 24.5
2 French Creek near Phoenixville 20.6
3 Pickering Creek near Phoenixville 48.7
4 Valley Creek at PA Turnpike near Valley Forge 146
5 Crum Creek at Newtown Square 61.0
6 Ridley Creek at Rt. 3 near Willistown 82.7
7 East Branch Chester Creek at Westown 131
8 East Branch Brandywine Creek at Syrians 21.5
9 East Branch Brandywine Creek below Downingtown 51.7
10 West Branch Brandywine Creek near Honey Brook 36.4
11 West Branch Brandywine Creek at Modena 51.7
12 Brandywine Creek at Darby 33.9
13 East Branch Red Clay Creek near Five Points 83.5
14 West Branch Red Clay Creek near Kennett Square 64.9
15 East Branch White Clay Creek at Avondale 34.2
16 Middle Branch White Clay Creek near Avondale 41.8
17 Big Elk Creek at Maple Grove 33.8
18 East Branch Octoraro Creek near Steelville 23.0

Background ranges compared to PADEP Standard:
- Dark Blue: 0% - 25%
- Light Blue: 25% - 50%
- Light green: 50% - 75%
- Pale yellow: 75% - 90%
- Tan: Over 90%

Chester County Water Resources Authority
May 2019

PADEP Standard for Potable Water Supply of 250 mg/L
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- From 125 to 187.5 mg/L (50 - 75%) | 2 sites
- From 187.5 to 250 mg/L (75 - 90%) | 0 sites
- Above 250 mg/L (90% and up) | 0 sites

Figure 3. Long-Term Chloride Trend: Brandywine Creek at Chadds Ford

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Since the early 1970's, chloride and specific conductance, among other parameters, have been monitored annually at the 18 sites. At the USGS stream gage on Brandywine Creek at Chadds Ford, USGS conducted short term annual monitoring of chloride in the 1940s, 1950s, 1960s, 1970s, and 2000s, and has been conducting annual monitoring for PA Department of Environmental Protection since 2008. Beginning in April 2018, the Chester County monitoring program maintains continuous year-round monitoring of specific conductance at the USGS stream gage on West Branch Brandywine Creek at Modena. The current results and long-term trends for chloride and specific conductance are summarized in the figures below.

One source of chloride is roadway de-icing materials, which include chloride and other constituents. Use of salt products for roadway de-icing reportedly began in the U.S. shortly after World War II. Melt water from roadways, driveways and parking areas after winter precipitation events drains from impervious surfaces carrying the residue of de-icing materials into nearby groundwater and streams.

Chloride compounds also enter the County’s waters from public wastewater treatment plant discharges and onlot wastewater treatment systems. Calcium chloride is also used to reduce dust on dirt roads and parking areas. The water quality impacts of roadway de-icing materials are a recognized national concern. Research is underway by many entities to develop practices to reduce de-icing impacts in streams, lakes and groundwater.

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