

**ELEVATED SPECIFIC CONDUCTANCE LEVELS
of an unnamed tributary of the Ramapo River
Town of Monroe, NY**



Field work and analysis performed by:
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ORANGE COUNTY WATER AUTHORITY
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Introduction and Overview

The Orange County Water Authority has been monitoring stream water quality countywide since 2004 through its Stream Water Quality Biomonitoring Project.¹ The Project was designed as a comprehensive, county-wide assessment of ambient water quality in streams, using the stream biomonitoring methods developed by the NY State Department of Environmental Conservation's Stream Biomonitoring Unit. All monitoring work that is referenced in this report was performed by Watershed Assessment Associates, LLC (WAA) as part of the OCWA's Stream Water Quality Biomonitoring Project.

Biomonitoring involves the collection and analysis of benthic macroinvertebrate communities to assess overall water quality, which is then expressed as a numerical value ranging from 0 to 10, called a Biological Assessment Profile (BAP) score. Biomonitoring also includes measurement of certain chemical and physical attributes found in and along streams, such as specific conductance, pH, temperature, dissolved oxygen, stream width and depth, etc.

Specific conductance is an indicator of anthropogenic-source effects (land use) within a watershed and is routinely measured during stream biomonitoring. Specific conductance (SC) is a measure of electrical conductance ($\mu\text{mhos/cm}$) that estimates the concentration of dissolved ions in the water, including salinity, total dissolved solids, and chlorides (Allan 1995). Stream biological communities (macroinvertebrates and fish) may be negatively impacted by increases in developed land area and SC may be used as a proxy. However, there is no evidence that specific conductance directly exerts a negative effect on macroinvertebrate communities. NYS DEC has designated specific conductance concentrations exceeding 800 $\mu\text{mhos/cm}$ as a level of concern and that biological impairment is expected to occur at this level (Bode et al, 2005).

This Report summarizes the data collected at and upstream of station 4089_005, which is located on an unnamed tributary of the upper Ramapo River in Monroe NY, where elevated specific conductance levels have been documented since the mid-2000's. This Report is based upon and is an update of a 2008 investigative report by WAA, entitled "Investigation of Elevated Specific Conductance Levels: Station 4089_005," that pinpointed the Kiryas Joel wastewater treatment discharge as a primary source of elevated specific conductance levels at station 4089_005. This updated Report includes data collected at that station in years subsequent to 2008.

Results

Station 4089_005 was surveyed through OCWA's Stream Water Quality Biomonitoring Project from 2005 – 2009 and then again in 2012. Survey results, based on the benthic macroinvertebrate community structure for all years have indicated Moderately Impacted water quality. However, specific conductance readings obtained during these years show a dramatic and steady increase in specific conductance levels (Figure 1).

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¹ All reports are available at <http://waterauthority.orangecountygov.com/streams.html>

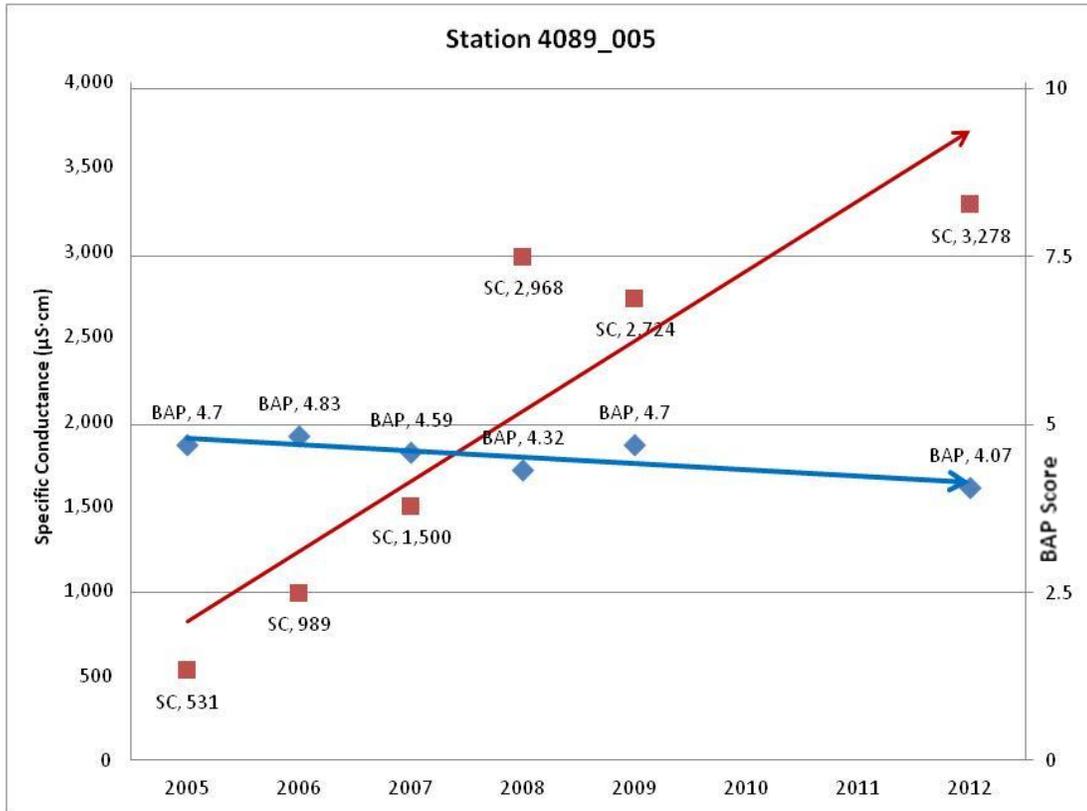


Figure 1. Biological Assessment Profile (BAP) scores and specific conductance levels illustrating values and associated trend lines from 2004 – 2009, and 2012 for station 4089_005, an unnamed tributary of the Ramapo River.

The spike in specific conductance readings in 2008 prompted the OCWA to request that additional field chemical analysis be conducted at strategic locations above station 4089_005 in an attempt to isolate the potential sources responsible for the elevated specific conductance readings. A similar investigation, using field chemical assessments to detect potential sources, was successfully employed in Woodbury Creek by the NYS DEC in 2005, which resulted in the identification and remediation of the Woodbury Commons salt storage shed.

On September 12, 2008, just days after WAA had alerted OCWA that the readings at site 4089_005 were at 2,968 µS/cm, WAA visited eight (8) stations at and above Station 4089_005 where non-nutrient water quality information (temperature, dissolved oxygen, percent oxygen saturation, specific conductance, salinity, and pH) was collected using an YSI multi-probe following the OCWA Water Quality Biomonitoring Project Quality Assurance Project Plan for water chemistry analysis (Gruber, 2004). The stations were strategically located in an attempt to isolate potential tributaries or point sources that may be causing the increased specific conductance levels. Table 1 and Figure 2 provide the water quality data results for each station.

Station	Date	Time	SC ($\mu\text{mhos/cm}$)	Salinity (PSS)
4089_005	17-Sep-08	8:47 AM	4260	2.28
1	17-Sep-08	9:30 AM	4169	2.23
2	17-Sep-08	9:15 AM	426	0.21
3	17-Sep-08	9:18 AM	4890	2.63
4005_001	17-Sep-08	9:42 AM	743	0.37
4	17-Sep-08	10:00 AM	307	0.15
5	17-Sep-08	10:13 AM	681	0.33
6	17-Sep-08	10:37 AM	235	2.14

Table 1. Station information and specific conductance (SC) for the eight stations sampled above Station 4089_005 in 2008.

Station location descriptions (shown in Figure 2):

- Station 4089_005 is located just above County Route 105 bridge
- Station 1 is located just above the highway 6 culvert
- Station 2 is located just above the Kiryas Joel sewage treatment plant discharge pipe
- Station 3 is located just below the Kiryas Joel sewage treatment plant discharge pipe
- Station 4005_001 is located just above Kahan Drive bridge
- Station 4 is located at the mouth of Coronet Lake
- Station 5 is located at the mouth of Amdur Park Lake
- Station 6 is located at the mouth of Forest Road Lake

The results of this investigation implicated the Kiryas Joel wastewater treatment plant's discharge as the primary source of the elevated specific conductance levels in this unnamed tributary of the upper Ramapo River. As shown in Table 1 and Figure 2, the specific conductance readings taken at site 4089_005 during the investigation *exceeded* the level recorded just a week prior, reaching 4,260 $\mu\text{S/cm}$ at station 4089_005. Note that Figure 1 displays the earlier, and lower, reading of 2,968 $\mu\text{S/cm}$, which was the reading when the biomonitoring sample was taken; it is included in the graph so as to be consistent in methodology with other years.

Specific conductance levels were slightly lower when station 4089_005 was sampled in 2009, but levels again increased to 3,278 when sampled on September 9, 2012.

Conclusion

As of September 2012, specific conductance levels at station 4089_005 continue to substantially exceed the NYS DEC's level of concern (800 $\mu\text{S/cm}$). The Kiryas Joel wastewater treatment plant was implicated as the primary source of specific conductance in 2008 and it is likely that the plant's discharge is continuing to negatively impact downstream waterbodies, including the unnamed tributary of the Ramapo River where site 4089_005 is located.

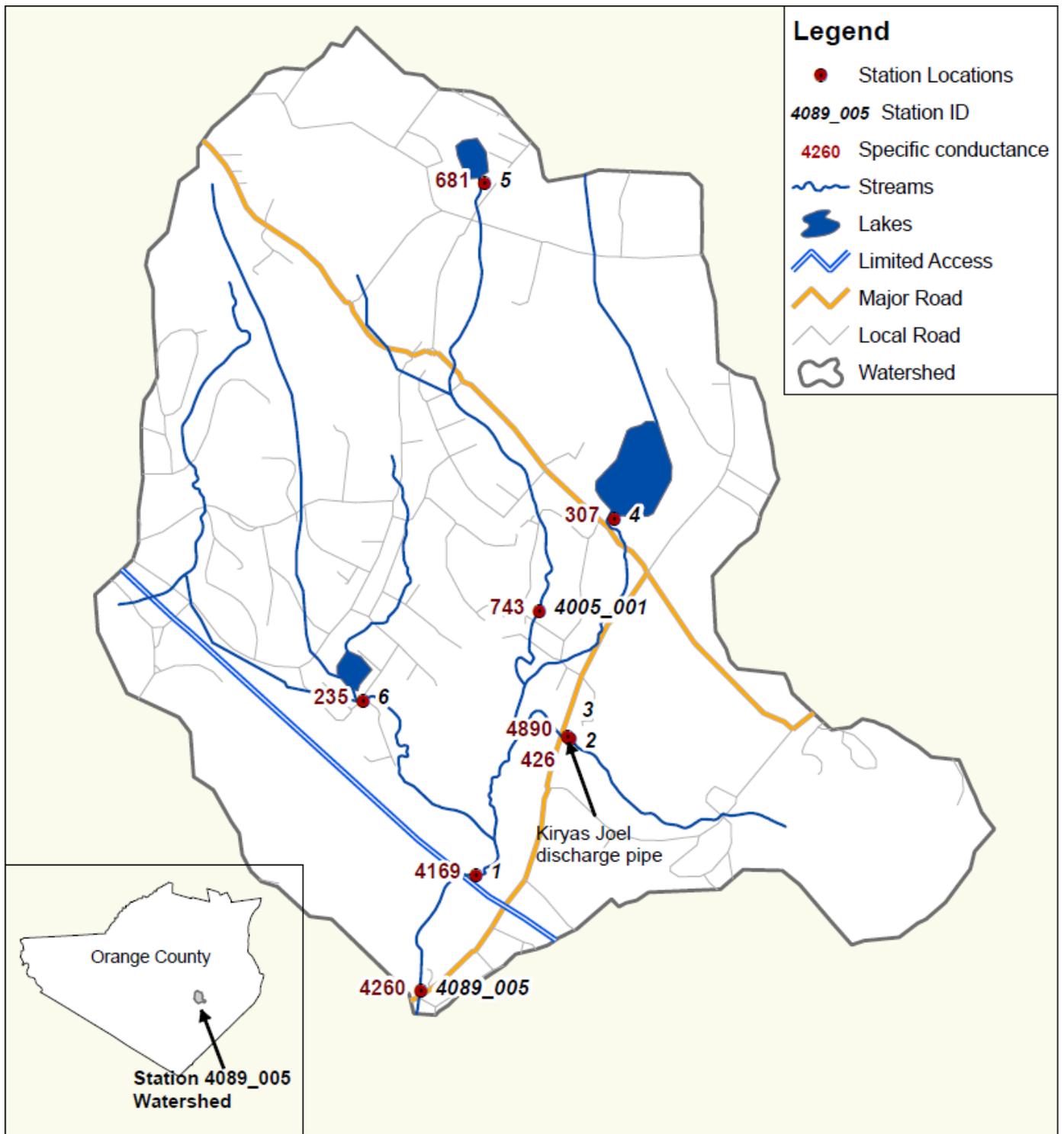
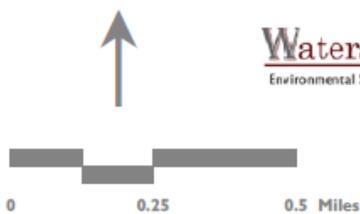


Figure 2

Station 4089_005 Watershed
Orange Co., New York

Orange County Water Authority
Water Quality Biomonitoring Project
Source:
NYS DEC Mid Atlantic/New England
ArcInfo Coverage 3/4/2002



Watershed Assessment Associates **WAA**
Environmental Services / Biomonitoring / Invertebrate Taxonomy / Professional Training

Citations

Allan, J.D. 1995. *Stream Ecology*. Chapman and Hall, London, 388pp.

Bode, R. W., M.A. Novak, L.E. Abele, D.L. Heitzman, and A.J. Smith. 2005. Woodbury Creek Biological Assessment. NYS DEC technical report.

Gruber, Simon. 2004. Water Quality Biomonitoring Project Quality Assurance Project Plan. OCWA technical report.

Nolan, J. Kelly. 2008. Investigation of Elevated Specific Conductance Levels: Station 1089_005. Watershed Assessment Associates technical report for OCWA.