

Introduction to Urban Watershed Geochemistry
Part 1: Analysis of Water Chemistry Using Hach Colorimeters and YSI
Multiprobes
Lab Exercise #1

1 Introduction

Urban runoff can lead to flooding and water quality problems. In today's field trip we will visit Filbin Creek in North Charleston, SC – this creek is a typical urban creek that receives water from groundwater discharge as well as from runoff in adjacent impervious surfaces. The “headwaters” of this creek is between the Charleston Coliseum and the I-526 highway. The stream grows larger downstream as it drains a larger watershed area and passes under I-26, I-526, Rivers Avenue, N. Rhett Ave, and several other smaller streets before discharging into the Cooper River near Virginia Ave. Along the way, the creek grows in size and is impacted by runoff from impervious cover and urban debris.

During today's trip to Filbin Creek, we will make three stops and assess the hydrologic conditions in and around the stream. The first stop is near the Coliseum (headwaters), the second stop is near Liberty Mall Shopping Center at Rivers and I-526, and the third stop is at Attaway Rd. in N. Charleston. Time permitting, we will also stop at Virginia Avenue and conduct analyses at the Filbin Creek estuary, where the stream discharges into the Cooper River.

The main objectives of today's lab are:

1. To determine whether water in Filbin creek is impaired,
2. If impaired, to identify the sources of the impairment, and
3. To determine if concentrations of measured analytes are representative of urban creeks.

We will use Hach colorimeter Kits and YSI multiprobes to measure NO_3^- -N, PO_4^{3-} , SO_4^{2-} , Cu, Cr(VI), dissolved O_2 (DO), turbidity, conductivity, total dissolved solids, salinity, pH, and water temperature.

2 Required Materials

The following materials and equipment required for each group for today's lab exercise:

1. One Hach DR/890 portable colorimeter (record the unit you use for your group)
2. Reagent packets for NO_3^- -N, PO_4^{3-} , SO_4^{2-} , Cu, and Cr(VI)
3. Instructions for Hach kit to perform analyses
4. Mettler-Toledo SG23 portable pH/Conductivity meter, Mettler-Toledo SevenGo portable DO meter and YSI 556 multiparameter instrument
5. Water sampling pole
6. Deionized (DI) H_2O in squeeze bottle
7. 100 mL plastic beakers
8. Kim wipes
9. 1-L bottles for collecting wastewater from Hach colorimeter analyses
10. A garbage bag
11. Gloves, safety glasses
12. Sharpie, Lab notebook
13. 1" in diameter AMS soil corer with 3' and 4' extension rods
14. Soil corer handle and slide hammer
15. Plastic liners and end caps for soil cores
16. Two adjustable wrenches

3 Tasks to be Performed:

A. Student group assignments Break into 4 groups of students. Each group will be tasked with analyses of all specific water quality parameters.

Table 1: Group assignments for the analytes

Group	Analytes
1	NO_3^- , Turbidity
2	PO_4^{3-} , pH, DO, T ,
3	SO_4^{2-} , Conductivity, TDS, Salinity
4	Cu, Cr(VI)

B. Measurement of analytes using the Hach kits Follow all provided printed Hach instructions carefully to analyze your samples for NO_3^- , SO_4^{2-} , PO_4^{3-} , Cu, Cr(VI), and turbidity. Each group is tasked to measure one or two analytes from this list for all sites.

C. Remainder of analytes Use the conductivity-, DO-, and pH-meters to measure conductivity, salinity, total dissolved solids (TDS), pH, and temperature in the water samples.

D. Soil core collection We will collect soil cores at each site to bring back to the lab and to conduct soil analyses over the next few weeks. Follow my directions closely to collect soil core samples with the soil corer.

E. Data sharing Share all your data with me upon completing your analyses at each stop. I'll compile all the information and email it to the class by tomorrow.

4 What to Include in Your Lab Report:

In addition to the primary objectives, be sure to address these points:

1. Summarize all data.
2. Discuss the water quality parameters at each of the sites and compare them with respect to US EPA's drinking water quality standards for those parameters (see <http://water.epa.gov/drink/contaminants/index.cfm>).
3. Discuss potential sources of these chemical analytes in the water.
4. Discuss what potential impacts landuse change can have on the water quality of the creek and the local ecosystem.
5. Discuss how much confidence you have in the analyses you conducted. Are the concentrations within acceptable guidelines?

The following components should be included in your report:

1. Title of the exercise, your name, name of partner, and date of lab exercise.
2. Abstract (≈ 150 words): A summary of the lab experiment (no more than 150 words.) Needs to include basic objectives and a summary of the results and your interpretations.
3. Introduction (≈ 150 words): A statement of what the analysis involves and the basic objectives.
4. Methods (≈ 300 words): What you actually did. Do NOT just copy the procedures from the exercise sheet. Keep a record of what actually happened during your analysis. This is what goes into the report.
5. Results (≈ 400 words): Present the data you acquired in tabular and graphical form, along with commentary about general problems or events of significance. The data sheets in the lab handouts are guidelines only; do not hand them in, but re-type your data clearly. If there are important relationships or patterns that are easily observed, point these out. Note: All figures should have a descriptive figure captions underneath the figure and tables should have descriptive caption on top of the table. Embed the figures and tables within the text and make

sure that they appear AFTER they have been mentioned in the text. All figures and tables have to be cited in appropriate locations within the text.

6. Discussion (\approx 400 words): Now you can put your results into the appropriate context. For example, (i) you can expand upon the thermodynamic relationships, comparing them with other studies (where appropriate), (ii) you can theorize about the origin of the tested sample based upon your results and supported where necessary by references to previous investigations. In short, this is the section where you answer the questions raised in the introductory paragraphs. All comparisons to other studies have to be cited in appropriate format – see instructions below.
7. Conclusions (\approx 100 words): Recapitulate the major points from the results and discussion.
8. References: Use the format of “Environmental Pollution” journal (see <http://bit.ly/qyZNhg> for more information.)

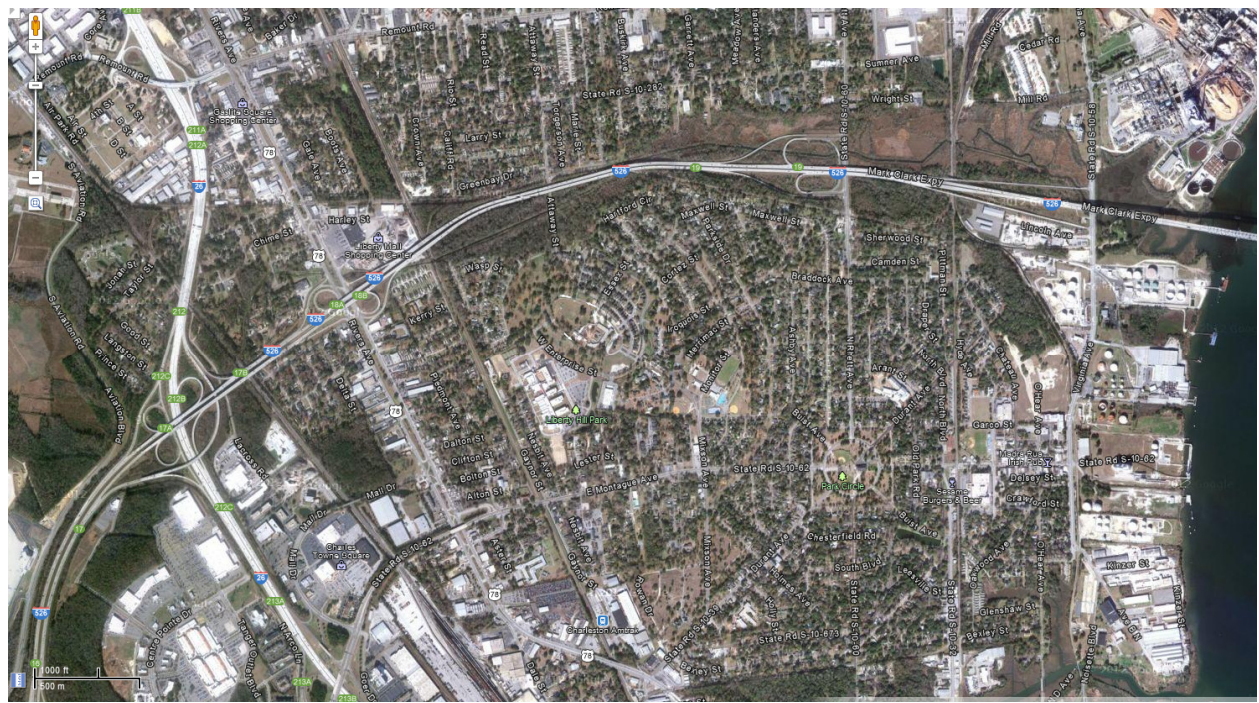
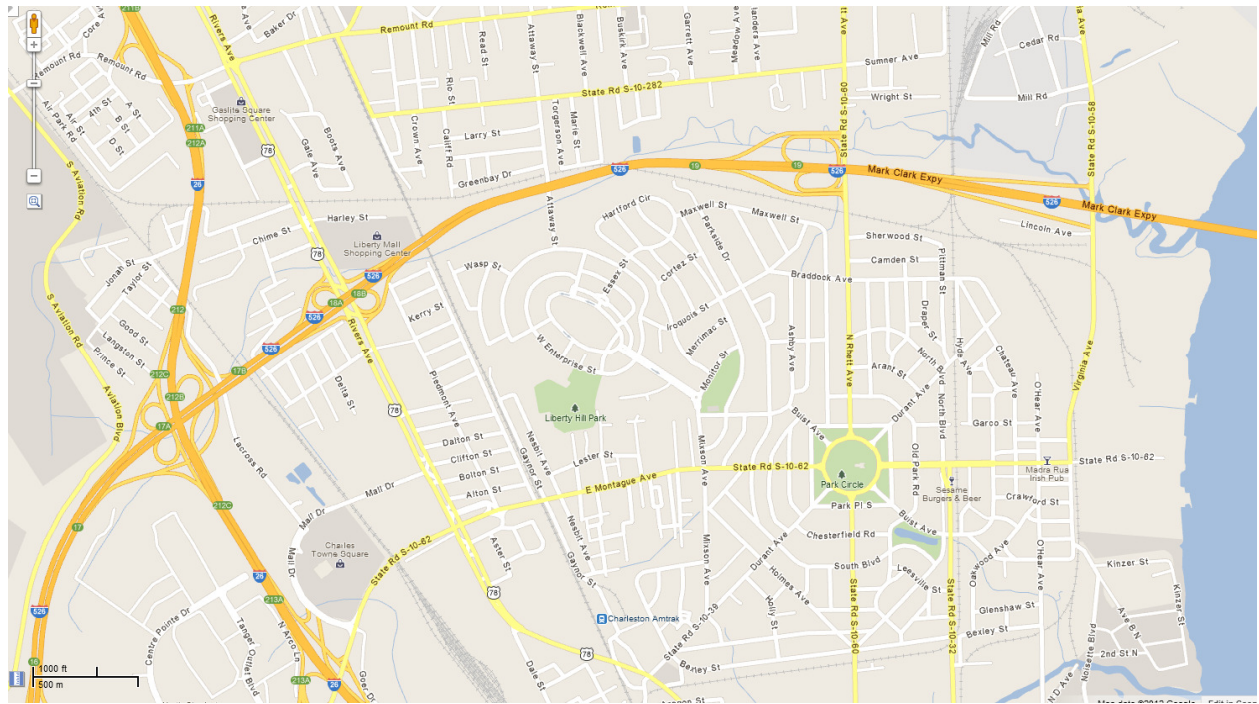


Figure 1: Map of Filbin Creek in Charleston, SC. (Source: Google Maps)