

IOWA STATE UNIVERSITY

MUNICIPAL SEPARATE STORM SEWER SYSTEM
2015 ANNUAL REPORT

Permit Number 85-03-0-04

March 2016

Prepared by
Department of Environmental Health and Safety
and
Facilities Planning and Management
2408 Wanda Daley Drive
Ames, Iowa 50011-3602

IOWA STATE UNIVERSITY

Storm Water 2015 - Just the Facts

“Land, then, is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants, and animals.” - Aldo Leopold

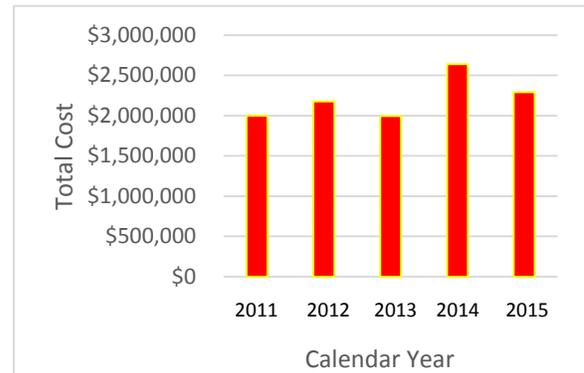
KEEPING SOIL IN ITS PLACE

In 2015, EH&S completed **303** storm water inspections at **11** construction sites, preventing **61** tons of soil from entering our waterways. Keeping soil on site and out of our local creeks and streams improves water quality. Streams play a critical role in maintaining the quality and supply of our drinking water.



THE SCOOP ON SOIL

Storm water management expenditures are funded on a per-project basis including project design, implementation, inspection, and maintenance.



STUDENTS GETTING INVOLVED



Undergraduates in the Environmental Science program are gaining practical experience by collecting water quality data from **3** creeks flowing through the ISU campus. Students in 2015 completed **25** sampling events that are gauging the campus' impact on water quality.

A CLEAN SWEEP

In 2015, Iowa State University collected **389** tons of sweepings from our **50.5** miles of streets, **177** acres of parking lots, and **34** miles of sidewalks. The material is sifted and repurposed saving **\$23,340** in landfill disposal fees.



INTRODUCTION

The 2015 Annual Storm Water Report for Iowa State University (ISU) was prepared by Environmental Health and Safety (EH&S) in accordance with Part III of the facility's Municipal Separate Storm Water System (MS4) permit, number 85-03-0-04. This report summarizes storm water compliance activities within the boundaries of ISU and outlying farm properties, including Central Campus, North Campus, South Campus, Applied Science Complex, Arboretum, Southwest Athletic Complex, College of Veterinary Medicine, Dairy Teaching Farm, and the BioCentury Research Farm.

STATUS OF IMPLEMENTING THE COMPONENTS OF THE STORM WATER POLLUTION PREVENTION AND MANAGEMENT PROGRAM

ISU was issued a National Pollutant Discharge Elimination System (NPDES) permit on February 6, 2004. The permit was renewed in 2009 and in 2014. The current permit expires on January 31, 2019.

STATUS OF COMPLIANCE WITH ANY COMPLIANCE SCHEDULE ESTABLISHED BY THIS PERMIT OR BY ANY MODIFICATIONS TO THIS PERMIT

Active and Discontinued Sites

During the 2015 calendar year, 11 construction sites operated under NPDES General Permit No. 2 authorizations. The status of these permits is summarized in Table 1.

Table 1 – Status of Permits

<u>Facility</u>	<u>Permit</u>	<u>Status</u>
Ames Lab Sensitive Instr. Facility	IA-25490-25245	Discontinued June 4, 2015
Davidson Hall Demolition	IA-26357-26107	Discontinued September 10, 2015
East Haber Road Substation	IA-21352-21118	Discontinued May 21, 2015
Jack Trice South End Zone Improvements	IA-25627-25385	Discontinued August 21, 2015
Northwest Campus Substation	IA-15189-15026	Discontinued May 21, 2015
Stoker Boiler Replacement	IA-25790-25541	Discontinued September 24, 2015
University Village Patios Projects	IA-26981-26719	Discontinued November 4, 2015
Farm House Lane Road	IA-26980-26718	Discontinued October 1, 2015
Marston Hall Renovations	IA-25789-25540	Active
Buchanan Hall 2	IA-27005-26737	Active
ATRB- Industrial Ed II Demolition	IA-28103-27854	Active

Eight sites reached final stabilization, as defined in the permits, and Notices of Discontinuation were submitted to the Iowa Department of Natural Resources (IDNR). Three permitted sites were still active as of December 31, 2015 (See Attachments A and B).

Storm Water Web Page (<https://www-ehs.sws.iastate.edu/environmental/stormwater>)

The storm water web page consists of storm water facts and information, Storm Water Management Policy statements, storm water hotline telephone number, publications and forms, links to pre- and post-construction activities, and a storm water survey. In 2015, the storm water web page was viewed 575 times.

Storm Water Hotline (515-294-7229)

The storm water hotline received five calls related to storm water activities on campus. EH&S staff responded to each of the calls and a summary of each is below:

- One call (4/6/15) reported the dumping of soil on Haber Road near Transportation Service. EH&S responded and identified the source as top soil spilling from a Campus Services truck delivering amended soil to a campus property. The soil spilled near a storm water street intake. EH&S staff shoveled and spread the approximate 1.5 cubic yards of soil to an adjacent grass area and broomed the street clean.
- One call (4/16/15) reported storm water drainage on the ISU Golf Course along Stange Road being milky/cloudy. EH&S staff responded and immediately recognized the upstream activity creating the pollutant in the storm water flow. City of Ames street crews were cutting concrete on Stange Road and the rinse water was entering the street intakes. The City had street intake protection in place; however, the amount of rinse water was such that it bypassed to the next intake, entering the storm water drainage on the Golf Course. EH&S staff worked in cooperation with the City of Ames and developed a plan to utilize the City's street sweeper in conjunction with saw cutting operations to collect the rinsate waters.
- One call (6/4/15) referenced a contractor dumping a concrete paste from saw cuttings at the rendering dock at Vet Med. EH&S staff responded and quickly identified the responsible party. EH&S turned the matter over to ISU FP&M to remediate the damage that occurred to the University's MS4 system.
- One call (6/29/15) from an ISU building contractor reported an oil product spill at two locations near his NPDES General Permit No. 2 permitted site. The contractor met EH&S staff at the gate to his project and explained the situation. A box containing oil and oil-contaminated material was abandoned at the gate entrance and was collected by EH&S, and an investigation into a nearby oil dumping to a street intake was conducted. EH&S staff enlightened a student group (operating in an adjacent building with race cars) on storm water best-management practices.
- One call (10/11/15) was from a student group teacher identifying an illicit discharge near the Memorial Union Pedestrian Bridge. Ironically, the student group was conducting a weekend water quality event along College Creek. The reporting events and subsequent illicit discharge investigation will be covered in detail as a highlighted topic in this annual report.

Inspection of the MS4 System

Courtesy of Michael M. Murray
FP&M Utilities Chief Mechanical Engineer

Facilities Planning and Management (FP&M) is required to inspect the entire MS4 system every five years. FP&M tracks areas inspected and records dates, inspection methods, observations, and corrective actions. There are approximately 2000 manhole structures (junctions and intakes) covered under the ISU permit. These structures are labelled on our campus utility maps based on map grade and a sequential number. To date the exact location of 1,340 of these structures has been confirmed and corrected on campus maps using a global positioning system surveying device. FP&M plans to continue to survey manholes to improve our inventory. To inspect each manhole once every 5 years implies that we need to average 400 inspections per year.

FP&M uses a facilities management program (FAMIS) to store all maintenance records. These records include the date, person making repairs or doing cleaning, manhole number, cost, and items/services purchased. The system works well to document repairs, but is not effective in documenting that inspections were completed. To document that once every 5 years inspections of manholes are being completed, FP&M has begun to implement a separate data collection process. FP&M is systematically inspecting our system based on our campus-map grid sheets and in 2015 inspected 556 structures. The combination of systematic inspection and paper records meets our requirements. Other methods to collect and store this information electronically are being evaluated.

As part of maintenance, FP&M rehabilitated a crumbling brick manhole using a cement mortar lining process. While not new technology, this was the first time this has been used at ISU. FP&M was pleased with the structural integrity of the manhole after the repair and will likely use this process on more manholes in the future.

Storm Water Management Committee

In 2015, ISU's Storm Water Management Committee held three formal meetings (March 3rd, July 14th, and November 3rd). Further communications with team members occurred periodically, via e-mail and telephone, concerning storm water policies and project sites.

In addition, EH&S and FP&M staff meet biannually (March and September) to discuss storm water management on all ISU construction projects. EH&S invited the City of Ames Storm Water Coordinator Jake Moore to the March meeting as a special guest speaker. Mr. Moore spoke to 28 ISU staff members detailing the City's MS4 permit and sharing details of their storm water program. A shared governance philosophy and common challenges were also discussed.

TRAINING AND DEVELOPMENT

Members of the Storm Water Committee, Environmental Health and Safety, and Facilities Planning and Management's Design and Operations group participated in programs to improve storm water management knowledge. Professional development included

- EH&S staff trained FP&M Project Managers and Construction Managers regarding changes to General Permit No. 2.

In 2015, one EH&S staff member became an Iowa Certified Construction Site Pollution Prevention Inspector (ICCSPPPI). Currently, five EH&S staff are ICCSPPI certified. Training opportunities are continuously reviewed and will be used as time and budgets allow.

AN ESTIMATE OF THE PREVIOUS FISCAL YEAR EXPENDITURES FOR IMPLEMENTATION OF THE MANAGEMENT PROGRAM AND THE BUDGET FOR THE CURRENT FISCAL YEAR

The storm water management budget for calendar year 2015 was funded "as needed" by several campus entities:

- EH&S dedicated ½ fulltime equivalent (FTE) staff time to storm water activities. Salary and benefit expenses are estimated at \$55,000.
- EH&S staff conducted inspections of all permitted construction sites. EH&S conducted 303 weekly site inspections in 2015 at a total expenditure of \$28,785.
- EH&S staff maintained and evaluated upgrades to the storm water website, maintained a quarterly storm water hotline advertisement in the student newspaper, attended storm water training, and developed ISU staff training programs.
- Construction of new storm water management projects and design fees associated with capital site, parking and building projects is estimated at \$750,000.
- FP&M expenditures associated with storm water project design/BMPs, project support, implementation, maintenance, MS4 televising and cleaning, and seeding/sodding were approximately \$1,177,000.
- FP&M maintains 50.5 miles of paved institutional roads, 177 acres of parking lots, and 34 miles of sidewalks and bike paths. To ensure safe passage of all vehicles, sweeping of pedestrian and cyclist roadways, parking lots, and bike paths created a total expenditure of \$280,000. The 389 tons of sweepings included 332 tons from parking lots and streets and 57 tons from sidewalks.

Total estimated storm water management expenditures were \$2,290,785. No annual amounts are appropriated by ISU, as storm water expenses are funded on a per-project basis.

SUMMARY DESCRIBING THE NUMBER AND NATURE OF INSPECTIONS, ENFORCEMENT ACTIONS AND PUBLIC EDUCATION PROGRAMS CONDUCTED DURING THE REPORTING PERIOD

Permitted Site Inspections by ISU Staff

Inspections were conducted by Environmental Health and Safety on all Iowa State University construction sites requiring a National Pollutant Discharge Elimination System Permit General Permit No. 2. The inspections determined if contractors were following BMPs as described on the site-specific Storm Water Pollution Prevention Plan (SWPPP). EH&S and FP&M staff coordinated mitigation efforts with site contractors when deficiencies were noted. EH&S conducted 303 site inspections. Using the Revised Universal Soil-Loss Equation shows a soil-loss savings of 61 tons of soil on ISU permitted construction sites.

Outfall Inspections by ISU Staff

MS4 Permit Section F.4 Inspection and Maintenance Program requires inspection of the entire storm water system every five years. FP&M tracks inspection dates, methods, observations, and corrective actions. ISU has approximately 2,000 service structures consisting of junctions and intakes. Structures are identified on campus utility maps with updated locations of 1,340 structures utilizing global positioning survey (GPS). During 2015, FP&M inspected 556 MS4 structures. ISU continues to inspect and GPS structures at an average rate of 400 per year.

EH&S conducted annual dry flow inspections of MS4 campus storm water outfalls during November and December 2015. EH&S staff visually inspected storm water outfalls to public waterways and dry land with no illicit discharges detected. A review of the annual outfall inspection process was conducted; no changes were administered to the inspection program.

Notices of Discontinuation

Eight construction projects reached final stabilization as defined in General Permit. (Refer to Active and Discontinued Sites section on page 2).

IDNR Inspections

ISU received no Notice of Violations (NOV's) associated with NPDES General Permit No. 2 construction activities for 2015.

Storm Water Education Program

EH&S staff trained 76 employees during calendar year 2015. Training topics included storm water regulatory compliance, construction site BMPs, storm water hotline, NPDES General Permit No 2, and SWPPP compliance and review.

Iowa State Students Help Eliminate Illicit Discharge on Campus

Courtesy of Hannah Carroll

Doctoral Student, Iowa State Limnology Laboratory

Environmental Science Graduate Student Organization President



Junior Josh Cinnamon (left) and Sophomore Travon Valverde (right) collect aquatic insects from College Creek to assess water and habitat quality.

Environmental Science undergraduates are at home in Iowa State University's three streams. Teams of students collect water quality and habitat data at several locations along College Creek, Clear Creek, and Squaw Creek throughout the ice-free season. They know when these now-familiar streams look right, and they also know when problems arise.

On Sunday October 11, 2015, Environmental Science students enrolled in the Science of the Environment and Sustainable Systems Learning Community (SESS LC) were receiving routine training in water quality assessment when they noticed something unusual. An outfall pipe that carries storm water from the Memorial Union parking ramp to the edge of College Creek during rain events began to discharge a milky, foul-smelling liquid. During dry weather, the pipe should not flow, and the students knew from their training that something was amiss. They immediately alerted their instructor, PhD student Hannah Carroll, and together they documented the discharge.

Hannah placed a call to Steven Mayberry, an Environmental Specialist with EH&S, to report the discharge and e-mailed several pictures she and her students had taken of the incident. On Monday morning, Mayberry passed the information to FP&M Chief Mechanical Engineer Mike Murray, who launched an intensive investigation the same day.



A milky liquid can be seen discharging into College Creek from an outfall pipe near the Memorial Union Parking Ramp.

Working with dozens of digitized maps of the Memorial Union’s floorplan spanning multiple additions and remodels over its 89-year history, Murray painstakingly traced all potential sources of the discharge.

Hannah and her students were kept abreast of the investigation process and were invited to participate in a dry weather inspection of a portion of the university’s MS4 storm water system that runs along College Creek. Regular inspections are crucial for ensuring that the system is functioning properly and to address any maintenance issues before they become major problems. The students had the opportunity to see how the MS4 system helps move water away from campus during rain events and the measures that are taken to ensure that streams running through campus are not negatively impacted by discharges from University grounds.

The tour led students back to the spot in which they observed the illicit discharge just a week earlier. Mike Murray explained the process by which he had narrowed down the possible source of the discharge to a small section of the interior of Memorial Union. The next step, he said, was a dye test to confirm the exact location from which the discharge originated.

Chief Mechanical Engineer Mike Murray shows students a map of the Memorial Union’s drainage system and explains the process by which he tracks down sources of contamination.

Clockwise from bottom left: Environmental Programs Manager Dr. Clay Miller; Chief Mechanical Engineer Mike Murray; Senior Patrick McPartlan; Junior Josh Cinnamon; Sophomore Travon Valverde; Sophomore Kathryn Holmes; Senior Eric Taqatz.



Dye tests employ harmless biodegradable dyes, much like food coloring, to track the path of contaminants in the environment. Murray and his team pinpointed a long-forgotten floor drain in the Memorial Union’s warren of mechanical rooms as the likely culprit. They introduced a tracer dye and visually inspected all outfall pipes in the area around the MU. Sure enough, the same pipe that the students had spotted discharging milky liquid began releasing dye. Murray ordered the floor drain sealed. The process took just two weeks and resolved an issue that had gone unrecognized, potentially for decades.

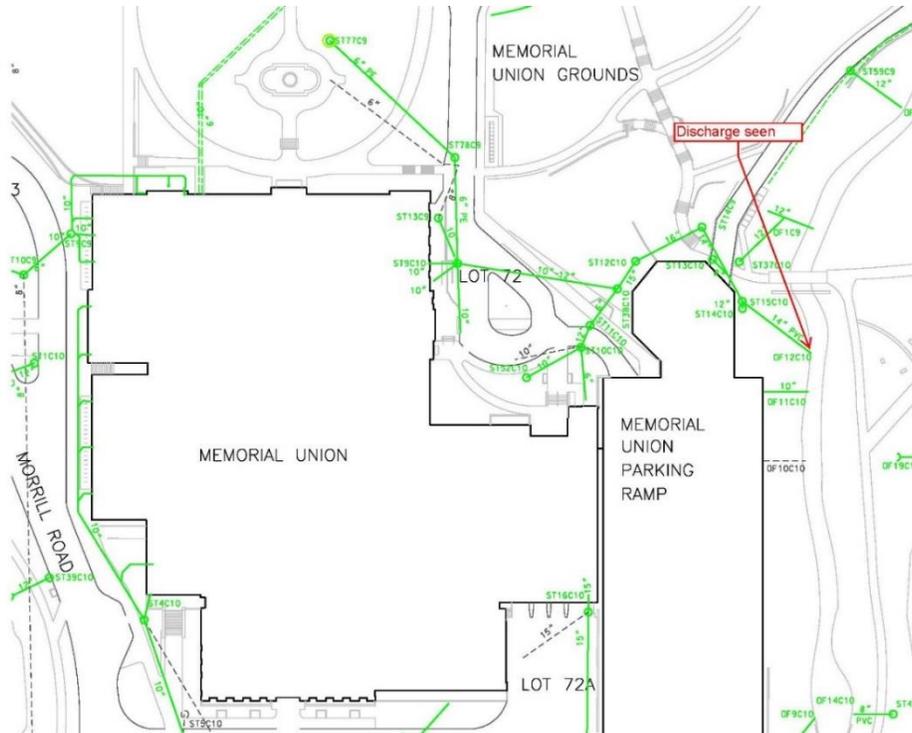
Follow-up to Memorial Union Illicit Discharge Investigation

Courtesy of Michael M. Murray
FP&M Utilities Chief Mechanical Engineer

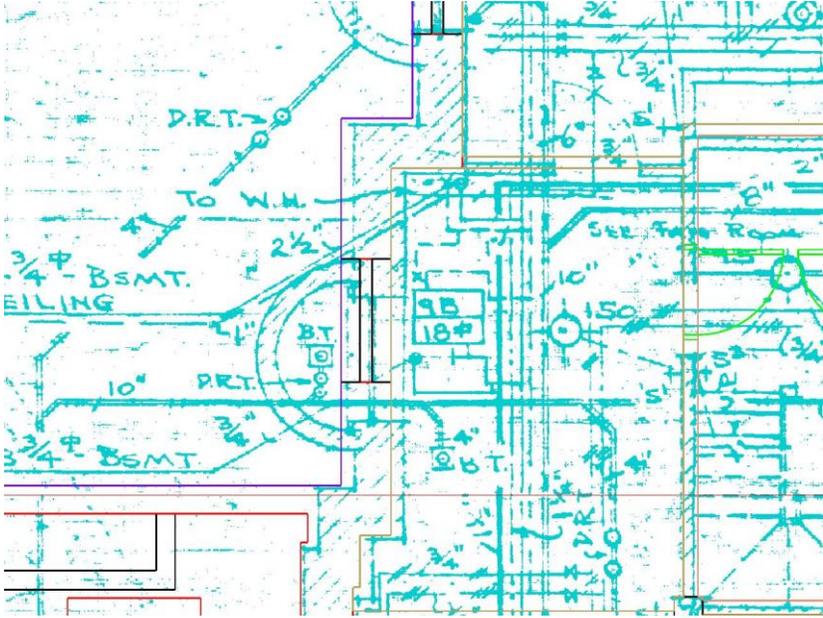
On Sunday October 11, 2015, students doing creek investigations led by graduate student Hannah Carroll discovered discolored discharge entering College Creek by the Memorial Union. She reported it to Steve Mayberry (ISU Environmental Health and Safety) and followed up on Monday with photos. Steve contacted Mike Murray of ISU Utilities to aid in tracking the source.



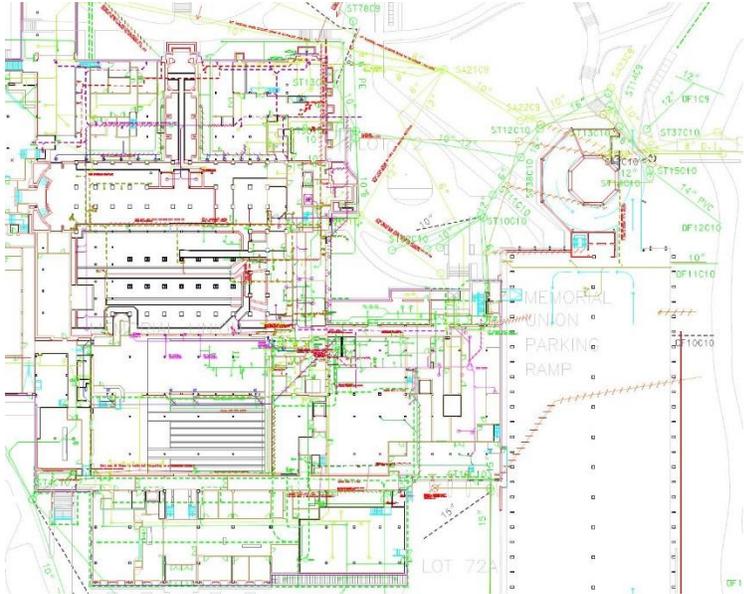
Mike used the photo to identify the pipe emitting the discharge, and came up with a list of potential upstream sources based on campus mapping. The first step was to check for signs of dumping. Mike followed the map back to all surface intakes that may have been impacted. Surface dumping is typically concrete cutting waste or paint, both of which leave obvious surface signs for many days. Mike looked for residue on a grate and signs grates had been lifted. There was no sign of surface dumping. The only remaining source appeared to be from the inside of the Memorial Union. Our main campus map clearly shows intakes, but does not show how building storm and sanitary piping runs inside the building. This meant that Mike had to create a drawing showing how all the piping inside the building ran.



The Memorial Union has had a dozen major additions and multiple interior remodeling projects over the last 90 years; many of these affected the drainage system. Mike took scans of the original design plans and overlaid them on the building outline. He started with the original 1928 plans:



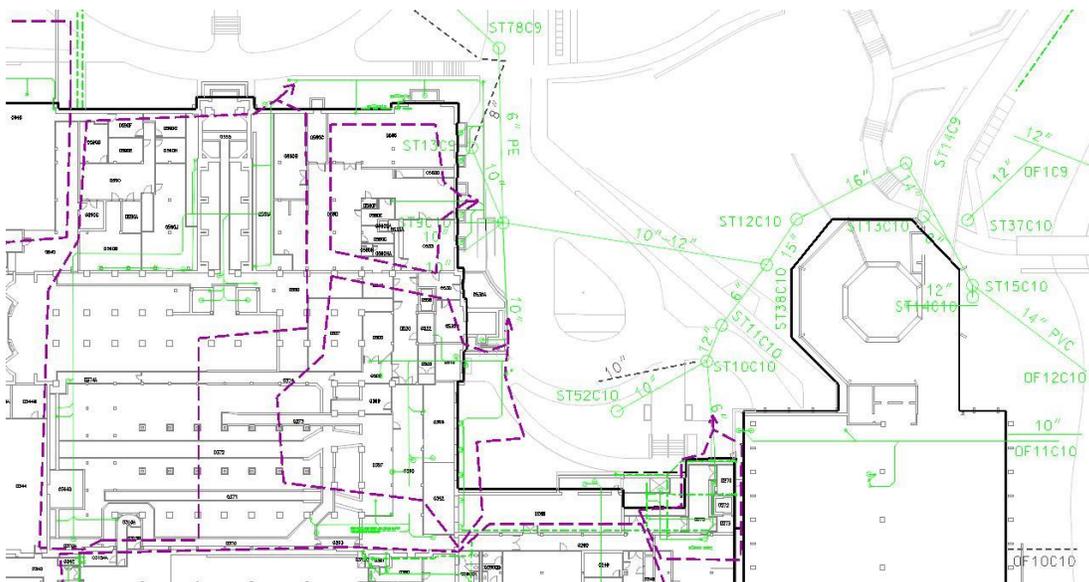
Mike then added in the rest of the additions, and ended up with a complex maze of possible piping routing laid out in fuzzy lines. In a multiple-day task Mike transcribed these lines into CAD to end up with a map that showed all possible lines sitting on top of each other, with different colors differentiating between age of pipe and whether it was called storm or sanitary originally.



Using judgment, field knowledge, logic, and guesses based on experience, Mike ended up with a final likely collection of piping for the storm and sanitary lines.



The last step was to identify the likely areas of the building that has piping called storm that drain in the proper direction.



Working with Memorial Union staff, Mike was able to find a floor drain shown as storm on the 1928 plans that still appeared to be used (See photo on next page, it's under the pallet).

FINAL RESOLUTION – SUCCESS!

ISU Utility staff dye-tested the suspect drain and found the dye emptied into the creek. On October 23, 2015, ISU Utilities notified Memorial Union staff of the results of the investigation. Once we were able to show the floor drain did not flow to the sanitary system, Memorial Union staff decided they no longer needed that floor drain and plugged it with concrete.



Iowa State Students Help Measure Campus Water Quality

Courtesy of Hannah Carroll, Doctoral Student, Iowa State Limnology Laboratory
Environmental Science Graduate Student Organization President

Iowa State University undergraduates in the Environmental Science program are gaining practical experience while contributing to our understanding of campus' impact on water quality. The students are participating in an ongoing experiential learning project through the Science of the Environment and Sustainable Systems Learning Community (SESS LC) in partnership with Environmental Health and Safety (EH&S), the Office of Sustainability, Learning Communities, and Environmental Programs.



Each fall, incoming Environmental Science majors are trained and certified through IOWATER, the volunteer water quality monitoring program administered by Iowa's Department of Natural Resources (IDNR). Teams of students collect data at six sites (see Figure 1) chosen to gauge the impact of Iowa State University on the water quality of the three streams flowing through campus. Monitoring on Clear Creek, College Creek, and Squaw Creek continues as late in the fall as weather conditions permit and begins again in the spring semester as soon as sites are accessible. Some students elect to return in summer and collect water quality data in return for independent study credits. This ensures that data are collected throughout the ice-free season.

Environmental Science undergraduates collect water quality data in College Creek near the Memorial Union.

Students are given the opportunity to engage in real-world science early in their training, and the data they generate help EH&S ensure that the University is meeting its obligation to have no negative impact on water quality. All data are entered into the IOWATER database and are freely available to the public at <https://programs.iowadnr.gov/iowater>.

Paired upstream and downstream sites were chosen to measure the chemical and physical properties of each of the streams before they enter campus and again as they leave. In this way, it is possible to determine whether campus grounds are discharging excessive nutrients. Nitrate and phosphorous are typically regarded as the two most biologically relevant measures of eutrophication (elevated nutrient levels) in aquatic systems. Although both are elevated in general across Iowa, including on campus, there is currently no evidence of a difference between upstream and downstream concentrations of either nutrient ($p > 0.05$ for all upstream-downstream pairs of sites for both nitrogen and phosphorous). This means that on average, there is no evidence that campus is having a measurable impact on the water quality of streams passing through it. Data collected thus far provide an important baseline; future classes of students will be able to compare the data they generate to past conditions to gauge whether any changes to water quality have occurred.

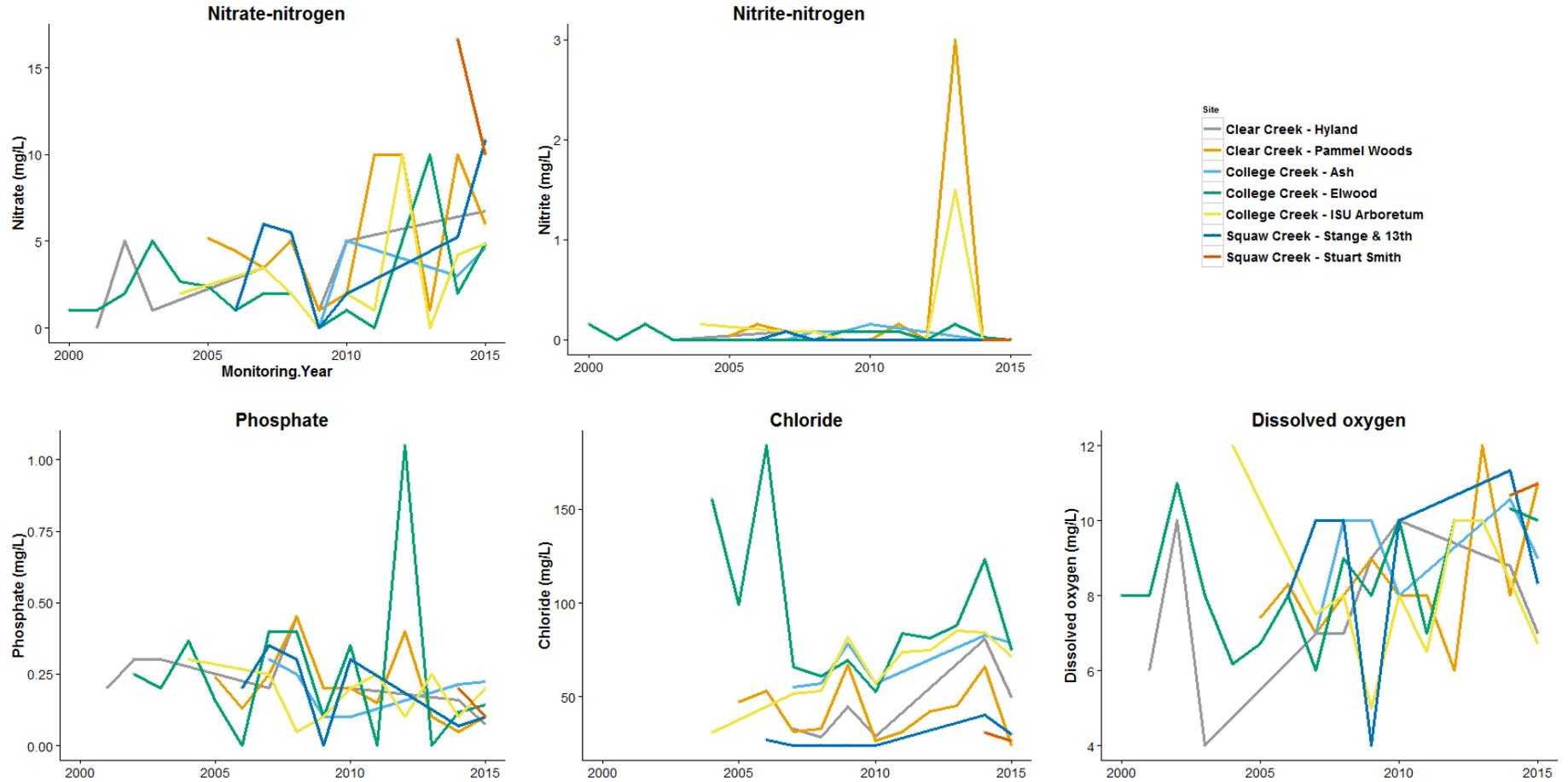


Figure 1: All available data for select water quality parameters, averaged by monitoring year to reduce noise. Squaw Creek - Stuart Smith Park is a new site created by the SESS LC in 2013 to gauge water quality downstream of campus and thus has very limited data available. These data should be considered a *baseline* to which we can compare water quality moving forward. Clear Creek – Pammel Woods is not monitored by the SESS LC due to safety concerns, but has a long monitoring record available and provides an idea of Clear Creek’s water quality upstream of the main campus.

Two Teams, One Clean Creek

Courtesy of *Inside Iowa State*

By Diana Pounds

July 30, 2015

College Creek is looking especially good this summer, thanks to the recent kindly attention of nearly 80 volunteers. It's the time of year when volunteers put on old shoes, grab trash bags and lend a hand at the College Creek cleanup. However, this year, the small creek got extra enhancement when students visiting campus as part of the College of Agriculture and Life Sciences' Carver Internship program waded in to assist.

The Carver interns got there first. Unable to attend the scheduled July 25 event, they hit the creek July 11. More than 40 volunteers, including 32 students, CALS administrators, professors and family members, tackled the portion of the stream that traverses the ISU cross country course, roughly from State Street to South Sheldon Avenue. Wading the creek and patrolling its banks, the crew picked up hundreds of pounds of trash ranging from bottles and metal fence posts to an 8-foot, 150-pound plastic drainage tube.

Last weekend, 36 volunteers focused on the portion of the creek that meanders through the southeast portion of campus, from the Memorial Union parking ramp to University Boulevard. The group netted several hundred more pounds of the usual trash (plastic bags, cans, bottles and hubcaps) and the more exotic (folding chair and hammer).

It's the seventh year for the College Creek cleanup, Director of Sustainability Merry Rankin said. The program was the brainchild of Shannon Sanders, a former political science student and intern in the Office of Sustainability's program, *Live Green!*



Carver Interns Anya Priyanka Bonifaz and Zachary Brown took some time off from research activities to help clean College Creek. Photo by Arlyssia Sells.

"What a wonderful difference this community-engaged-and-supported event makes," Rankin said of the annual program. "I'm so impressed with the volunteers who, year after year, come out to make our campus creek and its watershed cleaner."

The annual cleanup is sponsored by the *Live Green!* program and *Keep Iowa State Beautiful* campaign in partnership with Facilities Planning and Management.

SUMMARY

All permit-required activities for the 2015 reporting period were completed on or before specified deadlines. It is estimated that the cost of compliance activities completed during calendar year 2015 was \$2,290,785. ISU will continue to evaluate opportunities to improve storm water quality. Individuals with questions, comments or concerns about storm water quality issues at ISU are encouraged to contact Steve Mayberry, swmaybe@iastate.edu, Environmental Specialist III, Iowa State University, Department of Environmental Health and Safety, 2408 Wanda Daley Drive, Ames, Iowa 50011-3602.

Attachment A
Iowa State University Active Permitted Sites as of December 31, 2015



Key:

1) Ames Lab Sensitive Instrument Facility	IA-25490-25245
2) Northwest Campus Substation Construction	IA-15189-15026
3) Davidson Hall Demolition	IA-26357-26107
4) East Haber Road Substation Construction	IA-21352-21118
5) Stoker Boiler Replacement Project	IA-25790-25541
6) Marston Hall Renovations	IA-25789-25540
7) Jack Trice South End Zone Phase 3	IA-25627-25385
8) University Village Patios	IA-26981-26719
9) Farm House Lane South Connection	IA-26980-26718
10) Buchanan Residence Bldg. 2	IA-27005-26737
11) Advanced Teaching Research Bldg.	IA-28103-27854

Attachment B Campus Storm Water Management Projects

