

City of Arnold MS4 Stormwater Management Plan 2013-2018

As required by the Municipal Separate Storm Sewer System (MS4) Permit regulated by the Missouri Department of Natural Resources (DNR) and the United States Environmental Protection Agency (EPA).

DNR Assigned Permit Number: MO-R040043

Table of Contents

Acronyms	4
Introduction	5
Impaired Waters	6
Discharges to Impaired Waters – Section 3.1.1.1	6
Total Maximum Daily Load Reports – Section 3.1.1.2	6
Water Quality Controls – Section 3.1.2.....	7
Minimum Control Measures (MCM) Updates	8
MCM #1: Public Education and Outreach.....	9
1A. Distribution of Educational Materials.....	9
1B. Stormwater Webpage.....	9
1C. Press Releases.....	9
1D. Stormwater Questionnaire.....	9
MCM #2: Public Involvement/Participation	10
2A. Clean Stream Activities.....	10
2B. Complaint Hotline	10
2C. Stenciling Program.....	10
2D. Citizen Advisory Board.....	10
2E. Volunteer Speaker.....	11
MCM #3: Illicit Discharge Detection and Elimination	12
3A. Storm Sewer System Mapping.....	12
3B. Dry-weather Screening	12
3C. Tracking Complaints.....	12
3D. Illicit Discharge Ordinance.....	12
MCM #4: Construction Site Runoff Control	13
4A. Construction Site Ordinance Update.....	13
4B. Construction Permit Training.....	13
4C. BMP Guide and Design Manual	13
MCM #5: Post-construction Stormwater Management.....	14
5A. Post-construction Ordinance Update.....	14
5B. Green Infrastructure Reward.....	14
5C. BMP Guide and Design Manual	14

5D. Post-Construction and Green Infrastructure Training.....	14
MCM #6: Pollution Prevention/Good Housekeeping for Municipal Operations.....	15
6A. Facility Operations and Stormwater Pollution Prevention Plans (SWPPPs).....	15
6B. Maintenance of Stormwater System.....	15
6C. Training of Municipal Employees.....	15

Appendix A: Stormwater Outfall Table

Appendix B: Outfall Map

Appendix C: Designated Areas

Appendix D: Sinkhole and Losing Stream Map

Appendix E: Land Disturbance and Post-construction Ordinance

Acronyms

BMP	Best Management Practice
CWA	Clean Water Act
DNR	Department of Natural Resources
EPA	Environmental Protection Agency
GIS	Geographic Information System
MCM	Minimum Control Measure
MS4	Municipal Separate Storm Sewer System
MSD	Metropolitan Sewer District
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyls
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load

Introduction

The City of Arnold submits the Stormwater Management Plan (SWMP) in order to comply with the state and federal regulations: Missouri Clean Water Law and the Federal Water Pollution Control Act (Clean Water Act).

The MS4 permit governing the City's requirements is located at the following DNR link:
<http://www.dnr.mo.gov/env/wpp/permits/issued/R040000.pdf>.

The City has been part of the program since 2003. The MS4 permit is set up in 5 year cycles with permit years set up from June 13 to June 12. The 2013-2018 permit represents the third cycle of the Phase 2 MS4 program. The permit is broken up into six different areas known as Minimum Control Measures (MCM). As such, the City is expected to follow the permit by completing tasks, either annually or throughout the 5 year cycle.

Impaired Waters

The following is a description of the impaired waterways as required by the MS4 permit with permit sections noted.

Discharges to Impaired Waters – Section 3.1.1.1

The City of Arnold is located in watersheds that discharge into two waterways that are impaired according to the DNR 2012 303(d) List. The Mississippi River is impaired for lead and zinc but was removed from the 2010 list. It is also not listed in the 2012 list. According to the 2012 list, the Meramec River is impaired for E. coli (Escherichia coli) bacteria and lead.

For more information on Missouri impaired lakes and streams, please refer to the DNR link:

<http://www.dnr.mo.gov/env/wpp/waterquality/303d.htm>

The source of lead pollution is listed as the nearby mines and smelters, particularly the Herculaneum smelter located downstream of the City. Lead is hazardous to humans, especially children and pregnant women. Lead from surface water may not reach homes and businesses because of regulations to filter water at drinking water intake locations. However, lead may enter the drinking water system from lead pipes normally found in older homes.

For more information on lead, please refer to the EPA link: <http://www.epa.gov/lead/>

Bacteria, as a pollutant, are associated with the following activities: runoff of pet waste and wildlife waste, such as from geese, illegal sewer connections and illicit discharges, sewer overflows, and improper septic system maintenance. These activities are addressed by the City's MS4 program, primarily through public education. Bacteria could pose a threat to humans through contact during water recreation such as swimming.

For more information on bacteria such as E. coli, please refer to the EPA link:

<http://water.epa.gov/scitech/swguidance/standards/criteria/health/microbial/index.cfm>

Total Maximum Daily Load Reports – Section 3.1.1.2

The Mississippi River has two EPA-approved TMDLs. The first report, approved November 3, 2006, is on chlordane and polychlorinated biphenyls (PCBs) along the entire eastern Missouri border including the City.

The report is available at the following DNR link: <http://www.dnr.mo.gov/env/wpp/tmdl/0001-1707-3152-mississippi-r-tmdl.pdf>. According to the US EPA, chlordane was a type of pesticide used in the country from 1948 up until banning in 1988. It can cause health hazards to humans and animals. Chlordane may be concentrated in fish as a result of runoff from farm fields that used the pesticide. It may also exist in the soils near manufacturing facilities that once produced or used the pesticide.

For more information on chlordane, please refer to the EPA link:

<http://www.epa.gov/opptintr/pbt/pubs/chlordane.htm>

PCBs were manufactured and used in the United States from 1929 up until banning in 1979. PCBs can be found in a variety of sources, most notably in electrical transformers and capacitors and caulking. PCBs may cause cancer and other health effects. PCBs present in waterways may have bioaccumulated in fish, causing hazards to people who ingest fish.

Lead and zinc along the border of Jefferson County is addressed in the second report, approved December 9, 2010. Neither of these pollutants is commonly associated with municipal stormwater and the reports list no additional requirement for the City of Arnold. Therefore, the tasks listed in the MCM sections do not address lead and zinc explicitly.

The second report can be found at the following DNR link:

<http://www.dnr.mo.gov/env/wpp/tmdl/1707-miss-r-tmdl.pdf>

Water Quality Controls – Section 3.1.2

In 2011, the City of Arnold performed a sanitary sewer assessment to reduce inflow and infiltration. The report is to provide a plan to maximize benefits to cost when repairing the sewer system. The assessment included locating septic systems and illegal connections into the separate storm sewer system. The City does not own a wastewater treatment plant; sanitary flow goes to a plant owned by St. Louis Metropolitan Sewer District (MSD).

The City educates residents through stormwater brochures targeting residents, school children, and businesses. The brochures address common stormwater pollutants including pet waste, a possible cause of the E. coli impairment in the Meramec River. The stormwater education program also includes best management practices such as press releases, signage, a webpage, and a questionnaire.

Minimum Control Measures (MCM) Updates

The following six MCMs are planned according to requirements in the MS4 permit and recommendations from the DNR. These recommendations may have originated from correspondence, conferences, and the MS4 audit performed by DNR representatives in September 2010. If a task is not completed by the listed month and year or falls short of MS4 requirements and recommendations, changes will be made to the plan. Changes, when needed, will be submitted in the form of an updated MS4 Stormwater Management Plan with annual reports due July of each year. Please visit the City of Arnold's website, <http://arnoldmo.org> under Stormwater Department, for the most recent plan.

The MCMs are outlined according to requirements in section 4.1 of the MS4 permit. A copy of the permit and more information on the MS4 program may be found on the DNR website: <http://www.dnr.mo.gov/env/wpp/stormwater/sw-local-gov-programs.htm>

In order to document requirements in the MS4 permit, a stormwater binder was created and is kept at the Public Works Director's office. This binder contains past Stormwater Management Plans, Annual Reports, related documents, and permits related to the NPDES program.

MCM #1: Public Education and Outreach

Target Audience: Residents, Businesses (commercial and industrial), and School children

Target Pollutants: Bacteria, Nutrients/Fertilizer, Oil and Grease, Household Hazardous Waste, and Pesticides

Responsibility: Director of Public Works

1A. Distribution of Educational Materials

Description: Brochures for residents, businesses, and school children on stormwater pollution and green infrastructure information are available at public facilities. Brochures will be distributed to residents and businesses with the sewer/stormwater bill.

Date of Completion: Distribution once every permit year.

Brochures are posted year round.

Measure of Success: Track the number of brochures printed and number of locations where available.

1B. Stormwater Webpage

Description: Webpage on stormwater activities is currently online (<http://arnoldmo.org>, under City Departments/Public Works/Stormwater Dept/MS4 Stormwater Information). Items posted include the SWMP, stormwater hotline, brochures, questionnaire, and yearly stormwater reports to the City Council. Press releases are also posted.

Date of Completion: Future items will be posted and updated when developed.

Measure of Success: Track page views for webpage and documents available.

1C. Press Releases

Description: The City will develop two articles and send to local newspapers and online sites for publishing. The articles will incorporate the following topics to educate residents and businesses to minimize stormwater pollution and on stormwater activities by the City:

Year 1 – Lawn care and stream clean event

Year 2 – Auto care and current regulations

Year 3 – MS4 program and illegal dumping

Year 4 – Questionnaire and green infrastructure reward

Year 5 – Land disturbance permit training and citizen advisory board

Date of Completion: Two articles each permit year.

Measure of Success: Track article subjects, dates released, and where published.

1D. Stormwater Questionnaire

Description: A questionnaire on the City's stormwater work including the MS4 program has been developed and posted on the stormwater website. Questions on topics such as water quality, flooding, and regulatory programs (including MS4, construction and industrial sites) are included to assess public knowledge. The questionnaire will stay posted on the website so that residents and businesses can fill them out anytime. Copies will be distributed with sewer bills once during the five year cycle.

Date of Completion: Mail to residents and businesses in March 2017.

Develop report by September 2017.

Measure of Success: A summary report of all surveys completed will be included in the Annual Report. Major issues identified, such as repeated flooding, will be addressed after receipt of the questionnaire.

MCM #2: Public Involvement/Participation

Target Audience: Residents, Businesses (commercial and industrial), and School children.

Target Pollutants: Bacteria, Trash, Log Jams, Nutrients/Fertilizer, Oil and Grease, Household Hazardous Waste, and Pesticides.

Responsibility: Director of Public Works

2A. Clean Stream Activities

Description: The City will support through manpower and equipment City-sponsored stream clean events. Volunteer-sponsored events will be supported by the City through notification and posting at public facilities.

Date of Completion: Two volunteer- or City-sponsored events will be supported annually.

Measure of Success: Documentation of the number of participants at each event and description of trash, tires, and limbs cleaned out of waterways. Information will be included in subsequent Annual Reports.

2B. Complaint Hotline

Description: City will utilize the "Mayor's Hotline" as a means for citizen notification of stormwater issues. Reports on each complaint by telephone or email will be documented and addressed by the appropriate City department. The City also offers an "Online Nuisance Reporting Form" (available at <http://www.arnoldmo.org/index.asp?Type=DYNAFORM&SEC={A391E29D-26FD-4A04-835C-17F94A660677}>). The form is available residents to report for non-emergency stormwater issues.

Date of Completion: Hotline and nuisance form are ongoing each permit year.

Measure of Success: Track number and nature of stormwater complaints, responses and follow-ups.

2C. Stenciling Program

Description: The City will check on previously marked inlets for missing or damaged markers and faded paint. The City will then solicit volunteers and volunteer organizations to re-stencil or mark storm drain inlets. The markings may consist of text such as "only rain down the drain" or "no dumping, drains to river." The purpose will be to educate residents and advise them that only water should go down the storm drain.

Date of Completion: All inlets will be re-stenciled or re-marked by June 2018.

Measure of Success: Track number of inlets marked and volunteers.

2D. Citizen Advisory Board

Description: The City will continue the citizen advisory board to address stormwater issues. Topics will clarify MS4 program requirements and may include flooding, NPDES regulations, and budgetary concerns. Suggest addressing topics in line with deadlines for the various MCMs. Members of the board may include citizens, community groups, City employees, and consultants.

Date of Completion: Meetings will be held throughout the permit cycle.

Measure of Success: Meeting agendas and notes will be posted on the stormwater webpage and documented in the MS4 stormwater binder.

2E. Volunteer Speaker

Description: The City will support one presentation or workshop conducted by a volunteer. The goal for the volunteer will be to increase awareness of stormwater pollution and to present in front of a group of citizens not normally involved in the stormwater planning. Examples of workshop locations are schools or City Hall during public meetings. The City will solicit volunteers and provide notification of meetings by posting in public facilities.

Date of Completion: One presentation will be organized each permit year.

Measure of Success: Topic, volunteer organization (if any), and number of attendees will be documented.

MCM #3: Illicit Discharge Detection and Elimination

Target Audience: Public employees, Businesses (commercial and industrial), Residents.

Target Pollutants: Bacteria from pet waste and illegal sewer connections; Oil and Grease, Trash, Paint, and Chlorinated Pool Water illegally discharged to the storm drainage system.

Priority Areas: Industries, residences/neighborhoods, business parking lots.

Responsibility: Director of Public Works

3A. Storm Sewer System Mapping

Description: The storm sewer outfall system was last updated during the 2012-2013 permit year. 265 outfalls (148 pipes and 117 ditches) were discovered. A list is provided in Appendix A and a map in Appendix B. During this 5-year cycle, the City will update the storm sewer system map of ditches and pipes discharging into the City's waterways. Outfalls will be located and attributes will be noted using a GPS device during a field survey. Pictures will also be taken of the outfalls.

Date of Completion: June 2018

Measure of Success: Track number of new outfalls mapped and include in next SWMP. Completed map will be verified by City staff.

3B. Dry-weather Screening

Description: City will continue dry-weather screening for potential illicit discharges by inspecting outfalls and stormwater facilities. Screening includes visual observations to include flow, color, odor, and distressed vegetation. Reports will be kept of all findings (and their nature), responses and follow-up in the stormwater binder.

Date of Completion: 20% of outfalls will be analyzed each permit year. 100% of the outfalls will be screened during the 5-year cycle by June 2018.

Measure of Success: Track number of potential findings and follow-ups. Findings will be addressed within three months of filing of the report.

3C. Tracking Complaints

Description: City will track stormwater complaints, nature of complaints, response and follow-up from City workers and residents by mapping locations on a GIS map. Complaints may include reports of illegal dumping or storm drain maintenance needed. Complaints will be mapped using a database or GPS receiver and associated attributes.

Date of Completion: The map will be updated each permit year.

Measure of Success: A database or printed map will be kept in the stormwater binder.

3D. Illicit Discharge Ordinance

Description: The City is finalizing an ordinance to enforce illegal dumping. The ordinance is based on a model ordinance developed by the EPA. The City will report on the number of enforcement measures taken and review the ordinance for possible deficiencies. After a period of five years, the City will review the ordinance and note changes needed.

Date of Completion: Ordinance review completed by June 2018.

Measure of Success: Track number and type of enforcement measures.

MCM #4: Construction Site Runoff Control

Target Audience: Public employees, Engineers/Developers, Construction site operators

Target Pollutants: Sediment, Trash and Debris, Portable Toilet Waste and Concrete Wash

Responsibility: Director of Community Development and Director of Public Works

4A. Construction Site Ordinance Update

Description: The City is finalizing an ordinance update to enforce runoff for land disturbance over one acre. The ordinance is based regulations from Jefferson County and other nearby communities. The City will report on the number of enforcement measures taken and review the ordinance for possible deficiencies.

Date of Completion: Ordinance review completed by June 2018.

Measure of Success: Track number and type of enforcement measures.

4B. Construction Permit Training

Description: City will host training presentations to educate staff and contractors on DNR construction permits. The training will cover the proper procedures of applying for land disturbance permits with the City and DNR. Inspections, documentation and BMP installation and maintenance tips will also be covered. A quiz for attendees will be given after the event to determine how much information was comprehended by the group.

Date of Completion: Training presented in 2015 and 2018.

Measure of Success: Track date of training and number of attendees.

4C. BMP Guide and Design Manual

Description: The City has adopted a set of design standards for construction site BMPs. The design manual is based on manuals developed by Jefferson County and St. Louis County. These design standards are required for all land disturbance over one acre. To provide further guidance for construction site operators, the City will adopt DNR's field guide: Protecting Water Quality. The guide, available at <http://dnr.mo.gov/env/wpp/wpcp-guide.htm>, will educate and provide recommendations on planning a site, inspection, installation and maintenance of BMPs.

Date of Completion: Manual adopted by August 2014.

Measure of Success: Design manual and guide links posted to stormwater website. Copies for public viewing will be available in City Hall and Public Works Building.

MCM #5: Post-construction Stormwater Management

Target Audience: Public employees, Engineers/Developers, Construction site operators, Homeowner associations

Priority Areas: Residential and commercial development, Drainage area to impaired waters

Target Pollutants: Bacteria, Fertilizer, Sediment, Trash, and Volume

Responsibility: Director of Community Development and Director of Public Works

5A. Post-construction Ordinance Update

Description: The City is finalizing an ordinance update to enforce maintenance and operation of post-construction BMPs. The ordinance is based regulations from Jefferson County and other nearby communities. The City will report on the number of enforcement measures taken and review the ordinance for possible deficiencies.

Date of Completion: Ordinance review completed by June 2018.

Measure of Success: Track number and type of enforcement measures.

5B. Green Infrastructure Reward

Description: A system is currently in place to credit residents and businesses, in the form of public recognition, that implement green infrastructure practices such as rain barrels, rain gardens or pervious pavement. The City will continue the reward and review it after a period of 5 years.

Date of Completion: Review completed by April 2018.

Measure of Success: Number of rewards and types of practices instituted will be tracked.

5C. BMP Guide and Design Manual

Description: The City has adopted a set of design standards for post-construction BMPs. The design manual is based on manuals developed by Jefferson County and St. Louis County. These design standards are required for all land disturbance over one acre. To provide further guidance for construction site operators, the City will adopt the following DNR publications: Protecting Water Quality (available at <http://dnr.mo.gov/env/wpp/wpcp-guide.htm>) and Missouri Guide to Green Infrastructure (available at <http://dnr.mo.gov/env/wpp/stormwater/mo-gi-guide.htm>). The guides will educate operators on permanent stormwater runoff management including green infrastructure practices.

Date of Completion: Manual adopted by August 2014.

Measure of Success: Links for design manual and guides posted to stormwater website. Copies for public viewing will be available in City Hall and Public Works Building.

5D. Post-Construction and Green Infrastructure Training

Description: The City will host training presentations to educate staff and contractors on post-construction BMPs, including green infrastructure. The training will cover types of post-construction BMPs, ordinances and other regulations in place, advantages of green infrastructure, the reward system, and the Missouri Guide to Green Infrastructure.

Date of Completion: Training presented in 2014 and 2017.

Measure of Success: Track date of training and number of attendees.

MCM #6: Pollution Prevention/Good Housekeeping for Municipal Operations

Target Audience: City Employees

Priority Areas: City-owned facilities including but not limited to City Hall, Public Works Yard, and Pomme Creek Golf Course facilities.

Responsibility: Director of Public Works

6A. Facility Operations and Stormwater Pollution Prevention Plans (SWPPPs)

Description: Inventory storage, use and disposal methods of goods and materials used by the City operations. The inventory will include chemical, paints, fuels, oils, fertilizers, deicing materials, aggregate, and other materials purchased regularly. SWPPPs detail City operations and controls and methods to reduce or eliminate stormwater pollution. SWPPPs also include a map of facilities and an area for emergency contacts. Contracted work, including street sweeping, follows an O&M plan to minimize stormwater impacts.

Date of Completion: Inventory completed June 2015

SWPPPs and contracted O&M plans reviewed once a year and modified if needed.

Measure of Success: Track knowledge of SWPPPs during annual stormwater operations training.

6B. Maintenance of Stormwater System

Description: Utilize City's Storm Water Department employees for on-going maintenance. Workers will repair and upgrade existing storm sewer system. Repairs will include coordination of Mayor's Hotline to resolve residents' concerns and to locate high-priority projects.

Date of Completion: On-going

Measure of Success: Track maintenance activities to include type, location, and overall number of projects.

6C. Training of Municipal Employees

Description: Develop an operations training program for City employees addressing pollution prevention. The presentation will cover the history of the MS4 and CWA programs, impaired waterways, MS4 permit requirements, stormwater impacts of municipal activities, and steps to reduce their impacts. Training will be delivered to employees on an annual basis.

Date of Completion: Training given annually.

Measure of Success: Track number of attendees and date of training.

Appendix A – Stormwater Outfall Table

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
1	Tributary #1	11/19/2012	24	Metal	Pipe	38.438826	-90.402475	
2	Tributary #1	11/19/2012	18	Plastic	Pipe	38.439431	-90.402153	
3	Tributary #1	11/19/2012	48	Metal	Pipe	38.440090	-90.401835	
4	Tributary #1	11/19/2012	24	Plastic	Pipe	38.440839	-90.401842	
5	Tributary #1	11/19/2012	48	Metal	Pipe	38.441130	-90.401890	
6	Tributary #1	11/19/2012	36	Metal	Pipe	38.441625	-90.401634	
7	Tributary #1	11/19/2012	12	Concrete	Ditch	38.442735	-90.400816	
8	Tributary #1	11/19/2012	36	Concrete	Pipe	38.442706	-90.400404	
9	Tributary #1	11/19/2012	18	Plastic	Pipe	38.443304	-90.400200	
10	Tributary #1	11/19/2012	18	Plastic	Pipe	38.443422	-90.400112	
11	Tributary #1	11/19/2012	18	Plastic	Pipe	38.443455	-90.400064	
12	Tributary #1	11/19/2012	96	Concrete	Ditch	38.443714	-90.399806	
13	Tributary #1	11/19/2012	60	Grass	Ditch	38.443724	-90.399236	
14	Tributary #1	11/19/2012	60	Metal	Pipe	38.442909	-90.397382	
15	Tributary #1	11/19/2012	8	Plastic	Pipe	38.443742	-90.394931	
16	Tributary #1	11/19/2012	48	Concrete	Ditch	38.443825	-90.394769	
17	Tributary #1	11/19/2012	72	Concrete	Ditch	38.444327	-90.393784	
18	Tributary #1	11/19/2012	72	Grass	Ditch	38.444266	-90.392433	
19	Tributary #1	11/19/2012	36	Grass	Ditch	38.444172	-90.391391	
20	Tributary #1	11/19/2012	24	Metal	Pipe	38.443661	-90.390424	
21	Tributary #1	11/19/2012	24	Concrete	Pipe	38.443108	-90.389689	
22	Tributary #1	11/19/2012	48	Grass	Ditch	38.443080	-90.389756	
23	Tributary #1	11/19/2012	60	Grass	Ditch	38.442606	-90.389214	
24	Tributary #1	11/19/2012	18	Concrete	Pipe	38.442482	-90.387781	
25	Tributary #1	11/19/2012	8	Plastic	Pipe	38.442680	-90.387166	
26	Tributary #1	11/19/2012	36	Plastic	Pipe	38.442940	-90.386305	
27	Tributary #1	11/19/2012	36	Concrete	Pipe	38.443444	-90.385095	
28	Tributary #1	11/19/2012	36	Metal	Pipe	38.443632	-90.384522	
29	Tributary #1	11/19/2012	36	Grass	Ditch	38.445114	-90.381580	
30	Tributary #1	11/19/2012	36	Metal	Pipe	38.445380	-90.381249	

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
31	Tributary #1	11/19/2012	30	Metal	Pipe	38.446483	-90.379398	
32	Tributary #1	11/19/2012	48	Plastic	Pipe	38.446613	-90.379285	
33	Tributary #1	11/19/2012	48	Metal	Pipe	38.446796	-90.379397	
34	Tributary #1	11/19/2012	72	Grass	Ditch	38.447184	-90.379597	
35	Tributary #1	11/19/2012	36	Concrete	Pipe	38.447359	-90.379338	
36	Tributary #1	11/19/2012	8	Plastic	Pipe	38.447454	-90.379315	
37	Tributary #1	11/19/2012	24	Metal	Pipe	38.447545	-90.379222	
38	Tributary #1	11/19/2012	72	Grass	Ditch	38.447790	-90.378947	
39	Tributary #1	11/19/2012	36	Grass	Ditch	38.448644	-90.377443	
40	Tributary #1	11/19/2012	120	Concrete	Ditch	38.449088	-90.376816	
41	Tributary #1	11/19/2012	12	Concrete	Pipe	38.449364	-90.376398	
42	Tributary #1	11/19/2012	36	Concrete	Pipe	38.449363	-90.376323	
43	Tributary #1	11/20/2012	36	Metal	Pipe	38.441093	-90.385462	
44	Tributary #1	11/20/2012	12	Plastic	Pipe	38.441082	-90.385487	
45	Tributary #1	11/20/2012	18	Concrete	Pipe	38.441872	-90.384991	
46	Tributary #1	11/20/2012	2	Metal	Pipe	38.442363	-90.385123	
47	Tributary #1	11/20/2012	6	Plastic	Pipe	38.442669	-90.384974	
48	Tributary #1	11/20/2012	12	Concrete	Pipe	38.442941	-90.384667	
49	Tributary #1	11/20/2012	96	Concrete	Ditch	38.443490	-90.380652	
50	Tributary #1	11/20/2012	96	Concrete	Ditch	38.443458	-90.380687	
51	Tributary #1	11/20/2012	36	Concrete	Pipe	38.449367	-90.373385	
52	Tributary #1	11/20/2012	36	Concrete	Pipe	38.449323	-90.373230	
53	Tributary #1	11/20/2012	36	Concrete	Ditch	38.449213	-90.372668	
54	Tributary #1	11/20/2012	10	Metal	Pipe	38.449184	-90.372756	
55	Tributary #1	11/20/2012	48	Grass	Ditch	38.449093	-90.372614	
56	Tributary #1	11/20/2012	12	Metal	Pipe	38.448998	-90.372065	
57	Tributary #1	11/20/2012	15	Clay	Pipe	38.448372	-90.371806	
58	Tributary #1	11/20/2012	18	Concrete	Pipe	38.448539	-90.371768	
59	Tributary #1	11/20/2012	10	Metal	Pipe	38.448728	-90.371652	
60	Tributary #1	11/20/2012	12	Concrete	Pipe	38.448636	-90.371374	
61	Tributary #1	11/20/2012	12	Concrete	Pipe	38.448331	-90.370766	
62	Tributary #1	11/20/2012	36	Grass	Ditch	38.448153	-90.369952	

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
63	Tributary #1	11/20/2012	12	Metal	Pipe	38.448088	-90.368965	
64	Tributary #1	11/20/2012	15	Metal	Pipe	38.447849	-90.368273	
65	Tributary #1	11/20/2012	96	Concrete	Pipe	38.447749	-90.368101	
66	Tributary #1	11/20/2012	24	Concrete	Pipe	38.447521	-90.367842	
67	Tributary #1	11/20/2012	18	Concrete	Pipe	38.447429	-90.366274	
68	Tributary #1	11/20/2012	15	Concrete	Pipe	38.447296	-90.365644	
69	Tributary #1	11/20/2012	18	Metal	Pipe	38.446878	-90.364355	
70	Tributary #1	11/20/2012	12	Metal	Pipe	38.446370	-90.364031	
71	Tributary #1	11/20/2012	36	Grass	Ditch	38.446889	-90.363204	
72	Tributary #1	11/20/2012	36	Grass	Ditch	38.446963	-90.362872	
73	Tributary #1	11/20/2012	36	Grass	Ditch	38.447147	-90.362458	
74	Tributary #1	11/20/2012	12	Concrete	Pipe	38.447251	-90.362104	
75	Tributary #1	11/20/2012	12	Concrete	Pipe	38.447462	-90.361532	
76	Tributary #1	11/20/2012	72	Grass	Ditch	38.448444	-90.361122	
77	Tributary #1	11/20/2012	24	Metal	Pipe	38.448846	-90.360918	
79	Tributary #1	11/20/2012	24	Metal	Pipe	38.449222	-90.359595	
80	Tributary #1	11/21/2012	24	Concrete	Pipe	38.449200	-90.357819	
81	Tributary #1	11/21/2012	24	Concrete	Pipe	38.449261	-90.357794	
82	Tributary #1	11/21/2012	8	Metal	Pipe	38.449159	-90.357031	
83	Tributary #1	11/21/2012	60	Grass	Ditch	38.448180	-90.355505	
84	Tributary #1	11/21/2012	12	Metal	Pipe	38.447785	-90.354836	
85	Tributary #1	11/21/2012	36	Metal	Pipe	38.447356	-90.354440	
86	Tributary #1	11/21/2012	96	Grass	Ditch	38.447347	-90.353290	
87	Tributary #1	11/21/2012	48	Grass	Ditch	38.447899	-90.351104	
88	Tributary #1	11/21/2012	3	Plastic	Pipe	38.447747	-90.350082	
89	Tributary #1	11/21/2012	36	Grass	Ditch	38.447220	-90.348587	
90	Tributary #1	11/21/2012	96	Grass	Ditch	38.446902	-90.347783	
91	Tributary #4	11/27/2012	36	Concrete	Pipe	38.437958	-90.366097	
92	Tributary #4	11/27/2012	30	Metal	Pipe	38.437970	-90.366071	
93	Tributary #4	11/27/2012	12	Plastic	Pipe	38.438363	-90.364266	
94	Tributary #4	11/27/2012	2	Plastic	Pipe	38.438360	-90.364267	
95	Tributary #4	11/27/2012	12	Plastic	Pipe	38.438590	-90.363717	

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
96	Tributary #4	11/27/2012	12	Metal	Pipe	38.438584	-90.363718	
97	Tributary #4	11/27/2012	72	Grass	Ditch	38.438320	-90.363279	
99	Tributary #4	11/27/2012	30	Concrete	Pipe	38.434838	-90.358241	
100	Tributary #4	11/27/2012	24	Concrete	Pipe	38.439252	-90.361819	
101	Tributary #4	11/27/2012	36	Concrete	Pipe	38.440101	-90.360998	
102	Tributary #4	11/27/2012	36	Concrete	Pipe	38.440147	-90.360837	
103	Tributary #4	11/27/2012	24	Concrete	Pipe	38.440423	-90.359836	
104	Tributary #4	11/27/2012	18	Plastic	Pipe	38.440934	-90.356580	
105	Tributary #5	11/27/2012	48	Grass	Ditch	38.440787	-90.354845	
106	Tributary #5	11/27/2012	24	Plastic	Pipe	38.441386	-90.355145	
107	Tributary #5	11/27/2012	12	Metal	Pipe	38.441861	-90.352277	
108	Tributary #5	11/27/2012	48	Grass	Ditch	38.441413	-90.351970	
109	Tributary #5	11/27/2012	12	Concrete	Pipe	38.440297	-90.350712	
110	Tributary #5	11/27/2012	120	Grass	Ditch	38.438304	-90.349085	
111	Tributary #5	11/27/2012	96	Grass	Ditch	38.437968	-90.348838	
112	Tributary #5	11/27/2012	36	Metal	Pipe	38.434820	-90.356844	
113	Tributary #5	11/27/2012	6	Plastic	Pipe	38.435242	-90.356784	
114	Tributary #5	11/27/2012	120	Grass	Ditch	38.435583	-90.356591	
115	Tributary #5	11/27/2012	24	Metal	Pipe	38.435774	-90.356471	
116	Tributary #5	11/27/2012	60	Grass	Ditch	38.438310	-90.355601	
117	Tributary #5	11/27/2012	60	Grass	Ditch	38.438761	-90.355454	
118	Tributary #5	11/28/2012	36	Concrete	Pipe	38.439863	-90.354870	
119	Pomme Creek	11/28/2012	120	Grass	Ditch	38.423856	-90.411707	MO Fifth T43N R5E S36
120	Pomme Creek	11/28/2012	60	Grass	Ditch	38.427078	-90.406803	
121	Pomme Creek	11/28/2012	60	Grass	Ditch	38.427627	-90.405967	
122	Pomme Creek	11/28/2012	120	Grass	Ditch	38.428202	-90.404869	
123	Pomme Creek	11/28/2012	60	Grass	Ditch	38.428183	-90.404634	
124	Pomme Creek	11/28/2012	36	Grass	Ditch	38.429034	-90.402765	
125	Pomme Creek	11/28/2012	60	Grass	Ditch	38.428942	-90.401454	
126	Pomme Creek	11/28/2012	24	Metal	Pipe	38.428973	-90.401284	
127	Pomme Creek	11/28/2012	4	Plastic	Pipe	38.429071	-90.400580	
128	Pomme Creek	11/28/2012	12	Concrete	Pipe	38.429164	-90.399545	

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
129	Pomme Creek	11/28/2012	18	Concrete	Pipe	38.429233	-90.399326	
130	Pomme Creek	11/28/2012	60	Grass	Ditch	38.429276	-90.398956	
131	Pomme Creek	11/28/2012	12	Concrete	Pipe	38.429093	-90.398319	
132	Pomme Creek	11/28/2012	120	Grass	Ditch	38.428574	-90.396769	
133	Pomme Creek	11/28/2012	24	Concrete	Pipe	38.428779	-90.396225	
134	Pomme Creek	11/28/2012	24	Concrete	Pipe	38.429007	-90.395877	
135	Pomme Creek	11/28/2012	36	Concrete	Pipe	38.429785	-90.394341	
136	Pomme Creek	11/28/2012	24	Concrete	Pipe	38.429755	-90.394224	
137	Pomme Creek	11/28/2012	18	Concrete	Pipe	38.429675	-90.394285	
138	Pomme Creek	11/28/2012	18	Concrete	Pipe	38.429580	-90.394122	
139	Pomme Creek	11/28/2012	18	Concrete	Pipe	38.429558	-90.393969	
140	Pomme Creek	11/28/2012	12	Concrete	Pipe	38.429210	-90.393574	
141	Pomme Creek	11/28/2012	12	Concrete	Pipe	38.429028	-90.393320	
142	Pomme Creek	11/28/2012	18	Concrete	Pipe	38.428909	-90.393069	
143	Pomme Creek	11/28/2012	24	Concrete	Pipe	38.421221	-90.376460	
144	Pomme Creek	11/28/2012	36	Grass	Ditch	38.422791	-90.379748	
145	Pomme Creek	11/28/2012	36	Concrete	Pipe	38.423370	-90.380144	
146	Pomme Creek	11/28/2012	36	Grass	Ditch	38.423912	-90.382190	
147	Pomme Creek	11/28/2012	42	Concrete	Pipe	38.424464	-90.382595	
148	Pomme Creek	11/28/2012	60	Grass	Ditch	38.425732	-90.385961	
149	Pomme Creek	11/28/2012	72	Grass	Ditch	38.427941	-90.387913	
150	Pomme Creek	11/28/2012	120	Grass	Ditch	38.430984	-90.388903	
151	Pomme Creek	11/29/2012	36	Concrete	Ditch	38.420168	-90.374976	
152	Pomme Creek	11/29/2012	48	Grass	Ditch	38.419719	-90.374605	
153	Pomme Creek	11/29/2012	36	Grass	Ditch	38.419660	-90.374540	
154	Pomme Creek	11/29/2012	24	Grass	Ditch	38.419676	-90.373380	
155	Pomme Creek	11/29/2012	36	Grass	Ditch	38.419983	-90.372082	
156	Pomme Creek	11/29/2012	8	Plastic	Pipe	38.420793	-90.370096	
157	Pomme Creek	11/29/2012	12	Metal	Pipe	38.421382	-90.369095	
158	Pomme Creek	11/29/2012	72	Grass	Ditch	38.422029	-90.367492	
159	Pomme Creek	11/29/2012	6	Plastic	Pipe	38.422415	-90.366237	
160	Pomme Creek	11/29/2012	72	Grass	Ditch	38.423338	-90.365154	

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
161	Pomme Creek	11/29/2012	8	Plastic	Pipe	38.422995	-90.364403	
162	Pomme Creek	11/29/2012	6	Plastic	Pipe	38.422999	-90.364389	
163	Pomme Creek	11/29/2012	2	Plastic	Pipe	38.423050	-90.363933	
164	Pomme Creek	11/29/2012	6	Plastic	Pipe	38.422987	-90.363949	
165	Pomme Creek	11/29/2012	96	Grass	Ditch	38.422835	-90.363274	
166	Pomme Creek	11/29/2012	30	Concrete	Pipe	38.419338	-90.349137	
167	Pomme Creek	11/29/2012	36	Grass	Ditch	38.420343	-90.352176	
168	Pomme Creek	11/29/2012	120	Grass	Ditch	38.422406	-90.352754	
169	Pomme Creek	11/29/2012	72	Grass	Ditch	38.423253	-90.353561	
170	Pomme Creek	11/29/2012	36	Grass	Ditch	38.422595	-90.354513	
171	Pomme Creek	11/29/2012	24	Grass	Ditch	38.421991	-90.355493	
172	Pomme Creek	11/29/2012	36	Grass	Ditch	38.420327	-90.357792	
173	Pomme Creek	11/29/2012	60	Grass	Ditch	38.421105	-90.360316	
174	Pomme Creek	11/29/2012	24	Grass	Ditch	38.422189	-90.361333	
175	Black Creek	11/30/2012	120	Grass	Ditch	38.408850	-90.389004	
176	Black Creek	11/30/2012	30	Concrete	Pipe	38.409573	-90.389828	MO Fifth T42N R6E S6
177	Black Creek	11/30/2012	24	Concrete	Pipe	38.409957	-90.389985	
178	Black Creek	11/30/2012	15	Plastic	Pipe	38.409966	-90.389920	
179	Black Creek	11/30/2012	18	Concrete	Pipe	38.412017	-90.391467	
180	Black Creek	11/30/2012	96	Grass	Ditch	38.412567	-90.392496	
181	Black Creek	11/30/2012	12	Concrete	Pipe	38.412562	-90.392898	MO Fifth T43N R6E S31
182	Black Creek	11/30/2012	48	Grass	Ditch	38.411564	-90.397450	MO Fifth T42N R6E S6
183	Black Creek	11/30/2012	12	Concrete	Pipe	38.411883	-90.397867	MO Fifth T42N R6E S6
184	Black Creek	11/30/2012	72	Grass	Ditch	38.412101	-90.398680	MO Fifth T42N R6E S6
185	Black Creek	11/30/2012	24	Grass	Ditch	38.412192	-90.399098	MO Fifth T42N R6E S6
186	Black Creek	11/30/2012	36	Grass	Ditch	38.412481	-90.399935	MO Fifth T43N R6E S31
187	Tributary #15	11/30/2012	24	Concrete	Pipe	38.409970	-90.360131	
188	Tributary #15	11/30/2012	6	Plastic	Pipe	38.409877	-90.359772	
189	Tributary #15	11/30/2012	36	Concrete	Pipe	38.410676	-90.355135	
190	Tributary #15	11/30/2012	18	Metal	Pipe	38.410863	-90.354419	
191	Tributary #15	11/30/2012	36	Concrete	Pipe	38.410929	-90.354170	
192	Tributary #3	11/30/2012	72	Grass	Ditch	38.404008	-90.356739	

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
193	Tributary #3	11/30/2012	36	Grass	Ditch	38.405675	-90.357696	
194	Tributary #3	11/30/2012	48	Grass	Ditch	38.406402	-90.358665	
195	Tributary #7	12/3/2012	36	Metal	Pipe	38.435325	-90.410942	
196	Tributary #7	12/3/2012	15	Concrete	Pipe	38.433467	-90.410564	
197	Tributary #7	12/3/2012	4	Plastic	Pipe	38.433338	-90.410524	
198	Tributary #7	12/3/2012	8	Plastic	Pipe	38.433338	-90.410517	
199	Tributary #7	12/3/2012	48	Grass	Ditch	38.432872	-90.410484	
200	Tributary #7	12/3/2012	12	Plastic	Pipe	38.432477	-90.409460	
201	Tributary #7	12/3/2012	36	Grass	Ditch	38.431352	-90.408199	
202	Tributary #7	12/3/2012	48	Grass	Ditch	38.431384	-90.408034	
203	Tributary #7	12/3/2012	15	Plastic	Pipe	38.429316	-90.405705	
204	Tributary #8	12/3/2012	42	Concrete	Pipe	38.422864	-90.402008	
205	Tributary #8	12/3/2012	18	Concrete	Pipe	38.425686	-90.400336	
206	Tributary #8	12/3/2012	24	Concrete	Ditch	38.426270	-90.399263	
207	Tributary #8	12/3/2012	15	Metal	Pipe	38.426415	-90.399228	
208	Tributary #8	12/3/2012	15	Metal	Pipe	38.427296	-90.398055	
209	Tributary #9	12/3/2012	24	Grass	Ditch	38.436468	-90.394402	
210	Tributary #9	12/3/2012	24	Grass	Ditch	38.435630	-90.393675	
211	Tributary #9	12/3/2012	24	Grass	Ditch	38.435126	-90.393037	
212	Tributary #9	12/3/2012	30	Concrete	Pipe	38.434640	-90.392377	
213	Tributary #9	12/3/2012	30	Concrete	Pipe	38.434633	-90.392320	
214	Tributary #9	12/3/2012	8	Metal	Pipe	38.434619	-90.392332	
215	Tributary #9	12/3/2012	24	Plastic	Pipe	38.433870	-90.391382	
216	Tributary #9	12/3/2012	24	Grass	Ditch	38.433540	-90.391120	
217	Tributary #9	12/3/2012	24	Concrete	Ditch	38.432893	-90.390550	
218	Tributary #9	12/3/2012	18	Metal	Pipe	38.432813	-90.390496	
219	Tributary #9	12/3/2012	72	Grass	Ditch	38.431973	-90.388880	
220	Tributary #9	12/3/2012	36	Grass	Ditch	38.431594	-90.388603	
221	Tributary #10	12/5/2012	48	Grass	Ditch	38.424015	-90.383332	
222	Tributary #10	12/5/2012	24	Grass	Ditch	38.421827	-90.385669	
223	Tributary #10	12/5/2012	72	Concrete	Ditch	38.420987	-90.387857	
224	Tributary #10	12/5/2012	72	Concrete	Ditch	38.420926	-90.387913	

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
225	Tributary #10	12/5/2012	24	Grass	Ditch	38.420613	-90.388460	
226	Tributary #10	12/5/2012	48	Grass	Ditch	38.420808	-90.389826	
227	Tributary #10	12/5/2012	48	Grass	Ditch	38.421300	-90.391979	
228	Tributary #12	12/5/2012	24	Concrete	Pipe	38.430731	-90.371051	
229	Tributary #12	12/5/2012	4	Plastic	Pipe	38.429892	-90.369615	
230	Tributary #12	12/5/2012	48	Grass	Ditch	38.429665	-90.368988	
231	Tributary #12	12/5/2012	4	Plastic	Pipe	38.428809	-90.368653	
232	Tributary #12	12/5/2012	4	Plastic	Pipe	38.428770	-90.368704	
233	Tributary #12	12/5/2012	15	Metal	Pipe	38.427812	-90.368768	
234	Tributary #12	12/5/2012	24	Concrete	Ditch	38.426537	-90.369253	
235	Tributary #12	12/5/2012	72	Grass	Ditch	38.426160	-90.368961	
236	Tributary #11	12/5/2012	12	Concrete	Pipe	38.422701	-90.369456	
237	Tributary #11	12/5/2012	36	Grass	Ditch	38.425088	-90.370995	
238	Tributary #11	12/5/2012	42	Concrete	Ditch	38.425635	-90.373282	
239	Tributary #13	12/6/2012	30	Concrete	Pipe	38.410322	-90.376779	
240	Tributary #13	12/6/2012	12	Concrete	Ditch	38.410462	-90.376702	
241	Tributary #13	12/6/2012	4	Plastic	Pipe	38.410905	-90.376378	
242	Tributary #13	12/6/2012	96	Grass	Ditch	38.411602	-90.376102	
243	Tributary #13	12/6/2012	72	Grass	Ditch	38.412352	-90.374390	
244	Tributary #13	12/6/2012	72	Grass	Ditch	38.412470	-90.371062	
245	Tributary #13	12/6/2012	48	Grass	Ditch	38.412939	-90.369691	
246	Tributary #13	12/6/2012	72	Grass	Ditch	38.413086	-90.369135	
247	Tributary #13	12/6/2012	48	Grass	Ditch	38.413677	-90.368881	
248	Tributary #14	12/6/2012	48	Grass	Ditch	38.410292	-90.364274	
249	Tributary #14	12/6/2012	72	Grass	Ditch	38.411324	-90.367277	
250	Tributary #14	12/6/2012	30	Concrete	Pipe	38.414664	-90.368965	
251	Tributary #14	12/6/2012	24	Plastic	Pipe	38.416049	-90.369484	
252	Tributary #14	12/6/2012	24	Grass	Ditch	38.416229	-90.369460	
253	Tributary #14	12/6/2012	8	Plastic	Pipe	38.416915	-90.369188	
254	Tributary #14	12/6/2012	48	Grass	Ditch	38.418328	-90.368733	
255	Tributary #14	12/6/2012	8	Plastic	Pipe	38.419507	-90.368670	
256	Tributary #14	12/6/2012	4	Plastic	Pipe	38.420010	-90.367676	

Outlet Number	Receiving Water	Date Surveyed	Size (inches)	Type	Material	Latitude	Longitude	Public Land Survey System
257	Tributary #14	12/6/2012	4	Plastic	Pipe	38.420191	-90.366391	
258	Tributary #14	12/6/2012	24	Grass	Ditch	38.420456	-90.365224	
259	Tributary #14	12/6/2012	4	Plastic	Pipe	38.421384	-90.363220	
260	Meramec River	4/11/2013	120	Grass	Ditch	38.394114	-90.345324	
261	Meramec River	4/11/2013	120	Grass	Ditch	38.411194	-90.348908	
262	Meramec River	4/11/2013	120	Grass	Ditch	38.418111	-90.347621	
263	Meramec River	4/11/2013	120	Grass	Ditch	38.437470	-90.346254	
264	Meramec River	4/11/2013	120	Grass	Ditch	38.441761	-90.341231	MO Fifth Principal T43N R6E
265	Meramec River	4/11/2013	36	Metal	Pipe	38.454794	-90.365314	
266	Meramec River	4/11/2013	48	Grass	Ditch	38.454051	-90.368726	

Appendix C – Designated Areas

Information supplied in this appendix is derived from the Missouri DNR website, especially the following links:

2012 303(d) List

<http://www.dnr.mo.gov/env/wpp/waterquality/303d/2012-epa-approved-list.pdf>

2012 305(b) Report

<http://www.dnr.mo.gov/env/wpp/waterquality/305b/2012-305b.pdf>

Table H – Stream Classifications and Use Designations

<http://www.dnr.mo.gov/env/wpp/rules/10CSR20-7.031-Table%20H-103111.pdf>

Public Drinking Water Supply Lakes

The City does not discharge into drinking water supply lakes (L1 designations). However, a drinking water intake for the Missouri American Water Meramec Plant is located near the border of the City and St. Louis County on the Meramec River. The City has received education on proper permits to use for industry and land disturbance when near the intake.

Outstanding National or State Resource Waters

The City is not near, nor discharges into, an “outstanding resource water” as defined on a state or national level. The Meramec River is on the list upstream of the City, but not along the City border.

Cold-water Fishery

The City does not discharge into a designated cold-water fishery.

Critical Habitat for Endangered Species

Jefferson County, of which the City is located in, is listed as a habitat for many endangered species. The list includes the gray bat, Indiana bat, pallid sturgeon, and the pink mucket mussel. In order to determine if a site will discharge to a critical habitat, City employees have been educated to contact the United States Fish and Wildlife Service before applying for a land disturbance or industrial permit.

Major Reservoirs

The City does not discharge into a designated major reservoir (L2). None are listed in Jefferson or St. Louis County.

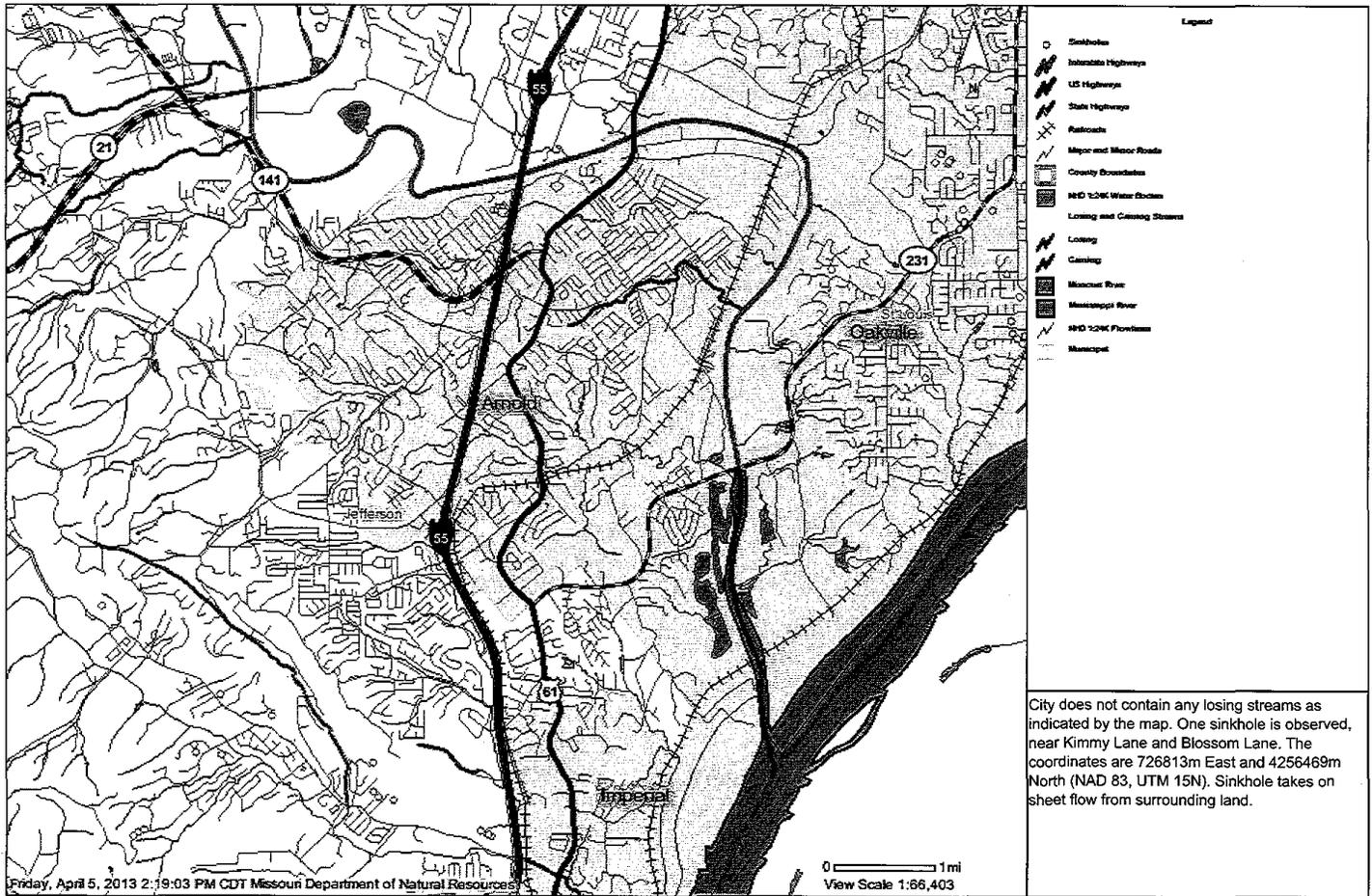
Permanent Flow Streams

Besides the Mississippi River, the City discharges into two permanent streams: Pomme Creek and Meramec River. City employees have been educated on additional requirements when discharging near a permanent stream.

Biocriteria Reference Locations

Jefferson County and St. Louis County do not contain biocriteria reference areas. The City does not discharge within two miles of the areas.

Appendix D - Sinkhole and Losing Stream Map



Disclaimer: Although this map has been compiled by the Missouri Department of Natural Resources, no warranty, expressed or implied, is made by the department as to the accuracy of the data and related materials. The act of distribution shall not constitute any such warranty, and no responsibility is assumed by the department in the use of these data or related materials.

Appendix E – Land Disturbance and Post-construction Ordinance

PLAN SHOULD FULFILL GENERAL PRINCIPLES:

There are certain basic general principles of erosion control that the developer and design engineer should be aware of, including:

- (a) Clearing, grading and excavating should be performed on ground on which construction will commence within three (3) months. Should construction be delayed beyond three (3) months, all disturbed lands shall be revegetated as described herein. All distributed ground shall be vegetated within three (3) months of the disturbance of the land. Disturbed ground shall not lie fallow during the normal growing season.
- (b) Cut or fill slopes should not be left steeper than 3 horizontal to 1 vertical unless slope stabilization, design by a geotechnical engineer, is described on the approved plans.
- (c) Excavations and fills within fifteen (15) feet of adjoining property boundaries shall be supported to protect the adjoining property from erosion, sliding or settling.
- (d) Fill shall not be placed where sediment may erode upon the premises of another or placed adjacent to the bank of a channel as to create bank failure or reduce the natural capacity of the stream. All erosion control measures, including but not limited to straw bales and silt fences, shall be installed no closer than fifteen (15) feet distant from top of bank of a drainage course or property line unless otherwise approved by the public works director.
- (e) Provisions shall be made to effectively accommodate the increased runoff caused by changed surface conditions during development by designing and providing for storm water detention facilities.
- (f) Once grading has been completed in accordance with the grading plan, all disturbed areas shall be seeded and mulched in accordance with the provisions of this article.

PLAN SHOULD USE COMBINATION OF THE FOLLOWING:

Erosion control practices must be incorporated within all grading plans. These practices may include any of the following or others submitted by the developer as necessary.

(a) *When controls are required.* Standard vegetative and structural practices, as specified below, that filter, divert, or promote the settlement of sediment particles from storm runoff shall be provided in the following situations:

To prevent sediment-laden runoff from leaving disturbed areas.

To isolate disturbed areas from erosive surface runoff associated with significant undisturbed areas.

To protect storm drainage conveyance systems at operable inlets.

(b) *Types of controls.* Acceptable sediment and erosion controls shall be either vegetative or structural as described below:

(1) *Vegetative practices:*

Topsoiling--Stockpiling of topsoil to enhance final site stabilization with vegetation shall be done in such a manner that natural drainage is not obstructed and no off-site sediment damage results.

Seeding--Of the rate and type to produce a dense vegetation. Refer to appendix A entitled "Vegetative Establishment" for seeding rates and periods.

Sodding--Sod strips shall be laid on the contour, not up and down the slope. Sod should be place from bottom up the slope. Sod should be laid snug with even joints to retard erosion and rutting.

Mulching--Is the application of grass, hay, wood chips, wood fibers, straw, gravel or other suitable material to the soil surface. Seeded and planted areas where slopes are steeper than 3:1, three (3) horizontal to one (1) vertical, shall be stabilized with mulch. Minimum application rates for various types of mulch are:

TABLE INSET:

Mulch type	Application rate
Hay	1.5 tons per acre
Straw	2.5 tons per acre
Wood chips	6 to 9 tons per acre

(2) *Structural practices.*

(3) *Construction entrance.* A rock stabilized pad shall be located at points of vehicular ingress and egress on a construction site and shall be shown on the approved grading plan.

(4) *Straw bale barrier,* may be placed on downslope areas to intercept sediment or to reduce flow velocity. Straw bale barriers shall not be constructed in streams or swales where there is a possibility of a washout.

(5) *Silt fence,* may be placed on downslope areas to intercept sediment or to reduce flow velocity. Silt fences shall not be constructed in streams or swales where there is a possibility of washout. Sediment shall be removed when it reaches one-half (1/2) the height of the filter fence. Following the removal of sediment, the silt fence shall be restored or replaced as necessary.

(6) *Storm drain inlet protection,* may consist of filter fabric, sand bags, excavated gravel, straw bale, block and gravel or any combination of the above.

(7) *Diversion swale or dike.* These may be used to intercept runoff and divert to a sediment control device around a disturbed area where it can be safely released.

(8) *Sediment trap.* Small storage or detention area used to detain construction runoff long enough to allow the larger sized sediment particles to settle out before the runoff is released to downstream areas.

(9) *Temporary sediment basin,* performs and same function as a sediment trap, although it has greater volume and is located below disturbed areas generally greater than five (5) acres. Temporary sediment basins shall be sized to provide a minimum volume of three thousand six hundred (3,600) cubic feet per disturbed acre draining to the facility.

(10) *Temporary slope drain,* may be plastic sheets, metal or flexible pipe, stone, gutter, fiber mats, concrete or asphalt ditches or half round pipe to carry runoff to a lower elevation without excessive erosion of the slope.

(11) *Check dam,* may be constructed of logs or stone across a swale or drainage ditch to reduce the velocity of the runoff and to trap small amounts of sediment.

(12) *Level spreader,* is an excavated depression to convert a concentrated flow, allowing water to be released at less erosive levels.

(13) *Proprietary products.* Proprietary erosion control products are available for a variety of applications including channel liners, erosion control blankets, cellular confinement systems, reinforced erosion control matting, subsurface drainage matting, geotextiles and others any of which must be used for the proper application and installed in accordance with manufacturers recommendations.

Further description, application and construction of erosion control practices can be found in the publication "Protecting Water Quality," prepared by the Missouri Department Resources and is available from the Natural Resources Conservation Service.