

# Storm Water Management Plan

For:  
City of Moberly, Missouri

Prepared by:

City of

*Moberly!*

101 West Reed Street  
Moberly, MO 65270

WATER PROTECTION DISTRICT

3

FAX

For City



## **1.0 Introduction**

The City of Moberly, after careful consideration, has developed a list of Best Management Practices for each of the six (6) minimum control measures as set forth by the United States Environmental Protection Agency and the Missouri Department of Natural Resources. The City has also established the measurable goals needed to evaluate each of the Best Management Practices.

The City of Moberly has received a grant from Mark Twain Solid Waste Management and MoDNR for the purpose of constructing a permanent household hazardous waste facility. Household hazardous waste is usually considered a solid waste issue but the City of Moberly sees it as an opportunity to protect area water ways from illegal/illicit disposal of these products. The City has also developed the program to give useable product back to the public. The City provides this program free of charge both to those bringing HHW into the facility and those taking it out. The calendar year 2012 saw over 8,000 pounds paints, stains, varnishes etc. given back to area residents for use. Also, the City does not draw the line at the city limits or even the county line but allows any individual wishing to bring in HHW or take out usable product to do so. Local groups and organizations will be utilized to continue the storm drain stenciling program and to promote the use of rain gardens and rain barrels for the purpose of storm water pollution prevention. The City will continue to educate the public concerning storm water impacts on the environment and what can be done to minimize the harm associated with urbanization.

The City maintains one (1) staff member who will dedicate 75% of time to the Storm Water Management Program. This staff member has the option of calling in help from the local juvenile office. The Department of Public Works (Street Department) carries the responsibility for various areas of the program such as street sweeping and storm drain inspections, cleaning and mapping along with the yard waste collection program. The Distribution and Collection crew from the Department of Public Utilities is responsible for the sewer-jetting and root saw programs. They also assist in many of the storm water drainage revitalization projects. The Waste Water Treatment Facility is responsible for monitoring lift stations and CSOs.

The present funding for this program is appropriated through the current water and sewer revenues and is included as a line item in the general budget. The City of Moberly is looking into establishing a Storm Water Utility that will be self-supportive for the program.

## **2.0 General Information**

### **2.1 Location**

The City of Moberly, Missouri is located approximately 30 miles north of the Highway 63 and Interstate 70 interchange. The City has a population of 13,000, more or less, and covers just over 11 square miles. The City operates a wastewater treatment plant that receives wastewater from almost 10 square miles with a few of those miles still a combined sewer system. The City has worked for several years to separate the storm water out of the sanitary system. This will be an on-going process. Several creeks and their tributaries flow through and around the City. They include Sweet Springs Creek, Sugar Creek, Coon Creek and the Elk Fork of the Salt River.

### **2.2 Storm Water Drainage Area Improvement Projects**

The following is a list of storm water drainage improvement projects the City has completed:

- Mallory Drainage
- Drainage on S Morley across from Storage
- E Logan Drainage
- Union Ave Drainage
- Wendel Ln Drainage
- McKinsey Drainage
- Oak Terrace Drainage
- East Urbandale Drainage

The following is a list of current storm water drainage projects the City is undertaking:

- Circle Dr Stormwater
- Woodland Drainage
- Grimes Drainage
- City Hall Stormwater Demonstration
- Farror Street Drainage

The following is a list of proposed storm water drainage projects the City plans to complete in the near future:

- Grand Channel
- Grimes Channel
- Chrisman Drainage
- Wicker Outfall
- Winding Way
- Possum Holler
- Cedar Ridge Drainage

### 3.0 Drainage

#### 3.1 Drainage Characteristics

The following is a general overview of the storm water drainage characteristics within the City of Moberly.

There are four major streams that receive storm water from the City. These include:

1. Coon Creek and its tributaries.
  2. Sweet Springs Creek and its Tributaries.
  3. Sugar Creek and its tributaries.
  4. Elk Fork of the Salt River and its tributaries.
- Storm water from the southeastern part of the City flows into Coon Creek through its tributaries. This includes areas east of the Norfolk Southern Railroad and most of the areas south of Sinnock Avenue.
  - Storm water from the northeastern part of the City flows into the Elk Fork of the Salt River and its tributaries. This includes areas east of the Norfolk Southern Railroad and north of Highway 24.
  - Storm water from the northwestern part of the City flows to Sugar Creek and its tributaries. This is the area west of the Norfolk Southern Railroad and north of Highway 24.
  - Storm water from the southwestern part of the City flows into Sweet Springs Creek and its tributaries. This is the area west of the Norfolk Southern Railroad and South of Highway 24.

#### 3.2 Outfall Descriptions

The main outfalls of the City are shown on Table 3-1 and listed in the tables below. No new outfalls have been added at this time.

**Table 3-1  
Outfall Location**

Outfall #	1/4	1/4	Section	Township	Range
1	NW	NE	25	54N	14W
2	SE	NW	31	54N	13W
3	SE	SW	31	54N	13W
4	NW	NE	6	53N	13W
5	NW	NE	7	53N	13W
6	SW	NE	18	53N	13W
7	SE	SW	2	53N	14W
8	SE	NW	35	54N	14W

**Table 3-1 (cont.)**

Outfall #	County	Latitude	Longitude	Receiving Water
1	Randolph	39° 27' 06"	92° 25' 46"	Elk Fork of the Salt River
2	Randolph	39° 26' 05"	92° 25' 04"	Elk Fork of the Salt River
3	Randolph	39° 25' 38"	92° 24' 46"	Coon Creek
4	Randolph	39° 25' 12"	92° 24' 42"	Coon Creek
5	Randolph	39° 24' 24"	92° 24' 44"	Coy Branch of Coon Creek
6	Randolph	39° 23' 25"	92° 24' 46"	Coon Creek
7	Randolph	39° 24' 32"	92° 27' 30"	Sweet Springs Creek
8	Randolph	39° 26' 11"	92° 27' 22"	Sugar Creek

**3.3 Site Map**

The City has included a site map that shows where the main outfalls are located. The main outfalls have been defined as the point where the receiving tributaries leave the city limits of Moberly.

## **4.0 Best Management Practices**

### **4.1 Public Education and Outreach**

**Responsible person(s):**

Director of Public Utilities

Water Quality Coordinator

**Target Pollutants:**

1. Household Hazardous Waste
2. Litter
3. Pesticides
4. Herbicides
5. Pet Wastes

**Target audiences:**

1. Home Owners
2. Elementary/Jr. High/Senior High School Students
3. Local College Students
4. City Council

<b>4.1 Public Education and Outreach.</b>						
<b>Activity</b>	<b>Currently in place</b>	<b>First year 2014</b>	<b>Second year 2015</b>	<b>Third year 2016</b>	<b>Fourth year 2017</b>	<b>Fifth year 2018</b>
1. Publish six (6) informational articles in the local newspaper.	X					
2. Master Gardeners' Annual Rain Garden Tour and Plant Sale	X					
3. Local Craft Fair	X					
4. Household Hazardous Waste Program	X					
5. Storm Drain Stenciling Program Utilize area volunteers to stencil five (5) storm drains each year.	X					
6. Post signs to label storm water outfalls.						X
7. Utilize the City's web site. (Links to EPA and MoDNR web sites)	X					
8. Keep city council members and local government leaders informed and aware of all issues related to storm water management.	X					
9. Provide area schools with educational materials concerning storm water pollution and prevention.						X

**Goals:**

1. Publish six (6) informational articles in the local newspaper.
2. Master Gardeners' Annual Rain Garden Tour and Plant Sale
3. Local Craft Fair
4. Household Hazardous Waste Program
5. Storm drain stenciling program. Utilize area volunteers to stencil five (5) storm drains each year.
6. Post signs to label storm water outfalls.
7. Utilize the City's web site. (Links to EPA and MoDNR web sites)
8. Keep city council members and local government leaders informed and aware of all issues related to storm water management.
9. Provide area schools, kindergarten through 12<sup>th</sup> grade, with educational materials concerning storm water pollution and prevention. Target two (2) different grade levels once per school year.

**Measurements**

1. The number of articles tracked and any response to the articles through phone calls or the City's website.
2. Master Gardeners' Annual Rain Garden Tour and Plant Sale is a City sponsored activity. The city donates a rain barrel as a door prize and collects names of area residents for rain barrel distribution. Educational brochures are available on how-to subjects including composting, rain gardens, rain barrels and the HHW facility.
3. The City maintains a booth at the local Craft Fair and distributes educational on how-to subjects including composting, rain gardens, rain barrels and the HHW facility. City staff is available to answer questions.
4. While HHW is usually a solid waste subject the City sees it as an opportunity to keep these pollutants out of storm drains, ditches and ultimately local waterways. The City collects these materials and then redistributes usable product to area residents. The HHW facility is also used as a distribution point for storm water BMP brochures. The amount of HHW redistributed is weighed and recorded. The unusable materials are hauled off site by a licensed waste hauler.
5. Enlist area schools and organizations for storm drain stenciling. Count volunteers and track storm drains stenciled.
6. Post signs to label storm water outfalls.
7. Visitors to the web site can be counted via phone calls and inquiries.
8. Issues brought before the council can be tracked via meeting agendas.
9. The amount of educational materials distributed and used can be tracked. Teacher evaluation forms can be sent as a follow up activity.

## **4.2 Public Participation/Involvement**

### **Responsible person(s):**

Director of Public Utilities  
Water Quality Coordinator

### **Target Pollutants:**

1. Household Hazardous Waste
2. Litter
3. Pesticides
4. Herbicides
5. Pet Wastes
6. Prescription Drugs
7. Mercury

### **Target audiences:**

1. Area Residents
2. Elementary/Jr. High/Senior High School Students
3. Local College Students
4. City Council

<b>4.2 Public Involvement/Participation</b>						
<b>Activity</b>	<b>Currently in place</b>	<b>First year 2014</b>	<b>Second year 2015</b>	<b>Third year 2016</b>	<b>Fourth year 2017</b>	<b>Fifth year 2018</b>
1. Household Hazardous Waste Program	X					
2. Rechargeable Battery and Cell Phone Recycling Program.	X					
3. Compact Fluorescent Light Bulb Recycling with AmerenMo	X					
4. Yard Waste Collection Program.	X					
5. Master Gardeners' Annual Rain Garden Tour and Plant Sale	X					
6. Rain Barrel Program.			X			
7. Storm Drain Stenciling Program.	X					
8. Mercury Collection Program with MoDNR	X					
9. Drug Take Back Program with DEA.	X					

**Goals:**

1. Household hazardous waste program is a catalyst for public involvement as there are a large number of people in and out of the facility. Starting a demonstration rain garden at the facility and a demonstration compost bin. Provide facility patrons with brochures on a variety of storm water BMPs.
2. Rechargeable battery/cell phone recycling program. These are collected at the HHW facility and at City Hall.
3. CFL recycling with AmerenMo. These are collected at the HHW facility and at the Fire Station.
4. Yard waste collection program. Area residents are encouraged to bring their yard wastes such as tree limbs and yard clippings to be ground into mulch. The mulch is then made available to area residents for free.
5. Master Gardeners' Annual Rain Garden Tour and Plant Sale
6. Rain Barrel Program is used to encourage the use of rainwater at the source.
7. Storm drain stenciling program. Utilize area volunteers to stencil five (5) storm drains each year.
8. Mercury Collection Program with MoDNR prevents contamination of ground/surface water.
9. Drug Take Back Program with DEA provides safe disposal of unused medications, discourages flushing to prevent entering waste stream.

**Measurements**

1. The HHW facility allows area residents to take out useable product free of charge. All products taken out are weighed and recorded. Storm water BMP brochures taken by the HHW facility patrons will be counted.
2. The amount of rechargeable batteries and cell phone collected for recycling will be weighed and recorded.
3. The amount of CFLs collected for recycling will be counted and recorded.
4. The loads of mulch taken out by area residents will be counted and recorded.
5. The Master Gardeners' Annual Rain Garden Tour and Plant Sale is in its 4<sup>th</sup> year. It is sponsored by the City and advertised in the local newspaper and on the radio. Brochures on how to build a rain barrel, start a rain garden and composting are available to attendees. Attendees are encouraged to sign up for the rain barrel door prize with those not winning put on a list for a barrel as they become available.
6. 33 gallon barrels are obtained by the City through a local car wash, thoroughly rinsed, and then given to area residents for use as rain barrels. The plan is to take pictures of residents and their rain barrels and put them on the City's website to encourage others to use a rain barrel.
7. Enlist area schools and organizations for storm drain stenciling. Count volunteers and track storm drains stenciled.
8. The City Fire Department collects mercury in conjunction with MoDNR mercury collection program. Collected product is weighed and recorded.
9. The City Police Department collects unwanted prescription and over the counter drugs in conjunction with the DEA. Collected product is weighed and recorded.

### **4.3 Illicit Discharge Detection and Elimination**

**Responsible person(s):**

Director of Public Utilities  
Water Quality Coordinator

**Target Pollutants:**

1. Household Hazardous Waste
2. SSO/CSO
3. Pesticides
4. Herbicides
5. Used Oil/Antifreeze/Automotive Fluids

**Target audience:**

1. City Employees
2. Area Residents
3. Contractors
4. DIY/Homeowners

<b>4.3 Illicit Discharge Detection and Elimination</b>						
<b>Activity</b>	<b>Currently in place</b>	<b>First year 2014</b>	<b>Second year 2015</b>	<b>Third year 2016</b>	<b>Fourth year 2017</b>	<b>Fifth year 2018</b>
1. Map storm sewer system	In progress					X
2. Establish an Emergency Response Plan for accidental spills and/or illicit dumping.	In progress		X			
3. Establish an ordinance addressing illicit discharges and illegal connections.	X					
4. Establish illicit discharge detection training for city employees i.e. police and fire departments				X		
5. Identify names of all receiving streams and locations of outfalls		X				
6. Provide Department Heads and Supervisors with a copy of the SWMP plan.		X				
7. Household Hazardous Waste Program	X					

**Goals:**

1. Continue mapping storm sewer system
2. Establish an Emergency Response Plan for accidental spills and/or illicit dumping.
3. Enforce the ordinance addressing illicit discharges and illegal connections.
4. Establish illicit discharge detection training for city employees i.e. police and fire departments
5. Identify names of all receiving streams and locations of outfalls
6. Provide Department Heads and Supervisors with a copy of the SWMP plan.
7. Household Hazardous Waste Program

**Measurements**

1. Mapping the storm water conveyance system is an ongoing effort.
2. Once ERP is established it will be documented as such.
3. The illicit discharge ordinance is on file for review as needed.
4. Once illicit discharge training is established, all training can be documented.
5. Can be documented as located and identified.
6. Providing Department Heads and Supervisors with a copy of the SWMP plan will inform them of our goals and raise awareness of storm water issues.
7. While HHW is usually considered a solid waste issue the City sees it as an opportunity to keep these pollutants out of storm drains, ditches and ultimately local waterways. All HHW coming into the facility is weighed and recorded. This program provides a free service to residents to dispose of HHW and discourages illicit dumping of these products.

#### **4.4 Construction site stormwater runoff control**

**Responsible person(s):**

Director of Public Utilities  
Water Quality Coordinator

**Target Pollutants:**

1. Sediment
2. Litter
3. Concrete Truck Washout
4. Vehicle Track-out
5. Vehicle/Equipment Fluids

**Target audience:**

1. Developers
2. Engineers
3. Contractors
4. Do-it-yourselfers

<b>4.4 Construction Site Storm Water Runoff Control</b>						
<b>Activity</b>	<b>Currently in place</b>	<b>First year 2014</b>	<b>Second year 2015</b>	<b>Third year 2016</b>	<b>Fourth year 2017</b>	<b>Fifth year 2018</b>
1. Establish BMP brochures for individual homeowners.	X					
2. Monitor streams near construction projects for sediment, color, oil, litter, etc.	X					
3. Develop inspection forms for stream monitoring procedures.		X				
4. Establish an ordinance addressing construction site storm water runoff.	X					
5. Establish written construction site plan review procedures.		X				
6. Respond to and track information submitted by the public concerning active construction sites.		X				
7. Require a storm water permit for all construction sites over one (1) acre via ordinance.	X					
8. Develop written construction site storm water inspection forms		X				

**Goals:**

1. Establish BMP brochures for individual homeowners. Make them available at the HHW facility  
(Many homeowners are unaware of the impacts home improvements and/or remodeling can have on the environment or what they can do to make it better.)
2. Monitor streams near construction projects for sediment, color, oil, litter, etc.
3. Develop inspection forms for stream monitoring procedures.
4. Establish an ordinance addressing construction site storm water runoff.
5. Establish written construction site plan review procedures.
6. Respond to and track information submitted by the public concerning active construction sites.
7. Require a storm water permit for all construction sites over one (1) acre via ordinance.
8. Develop written construction site storm water inspection forms

**Measurements**

1. Document number and type of brochures taken by HHW facility patrons.
2. Document all streams monitored and track monitoring results.
3. When inspection forms for stream monitoring procedures are developed it will be documented.
4. The construction site storm water ordinance is on file and available for review as needed.
5. When written construction site plan review procedures are established it can be documented along with the number of construction plans reviewed using them.
6. Track the number of calls from concerned residents and all follow up inspection generated by the calls.
7. The number of construction site permits issued can be documented.
8. When the construction site inspection forms are developed it can be documented and the number of inspection performed.

#### **4.5 Post-Construction Storm Water Management in New Development and Redevelopment.**

**Responsible person(s):**  
Director of Public Utilities  
Water Quality Coordinator

**Target pollutants:**

1. Runoff Volumes
2. Sediment
3. Oil and Grease

**Target audiences:**

1. Developers
2. Engineers
3. Contractors
4. Homeowners

**4.5 Post-Construction Storm Water Management in New Development and Redevelopment.**

Activity	Currently in place	First year 2014	Second year 2015	Third year 2016	Fourth year 2017	Fifth year 2018
1. Develop an ordinance that will address post-construction storm water issues.	X					
2. Relax zoning requirements to allow for grassy swales and native grasses that can be left un-manicured.		X				
3. Insure preconstruction review for post construction BMPs and require protection of these sensitive areas.		X				
4. Inspect construction sites to insure sensitive areas are left undisturbed.			X			
5. Increase the use of rain gardens through demonstration projects in conjunction with the local public schools.				X		
6. Rain Barrel Program			X			
7. Use the Household Hazardous Waste Facility as distribution point for BMPs for home owners and DIYs.	X					
8. Retro fit a rain garden and various BMPs at the City Hall parking lot area as a demonstration project.			X			

**Goals:**

1. Develop an ordinance that will address post-construction storm water issues.
2. Relax zoning requirements to allow for grassy swales and native grasses that can be left un-manicured.
3. Insure preconstruction review of post construction BMPs and require protection of these sensitive areas.
4. Inspect construction sites to insure sensitive areas are left undisturbed.
5. Increase the use of rain gardens as post construction or retro fit BMPs through demonstration projects in conjunction with the local public schools. The City can use the School Board meetings and PTA meetings to introduce the rain garden and offer tours and question/answer sessions.
6. Rain Barrel Program can encourage the use of rain barrels as a post construction BMP or as a retro fit BMP.
7. Use the Household Hazardous Waste Facility as distribution point for BMP brochures for home owners and DIYs.
8. Retro fit a rain garden at the City Hall parking lot area as a demonstration project for local businesses.

**Measurements**

1. The Post-Construction Storm Water ordinance is on file and available for review as needed.
2. Document the number of grassy swales, native grasses etc that are installed.
3. Document preconstruction reviews and required protection in sensitive areas.
4. Document construction site inspections.
5. All inquiries made concerning the rain garden can be counted as well as rain gardens that are installed.
6. Number of barrels given away through the rain barrel program can be documented.
7. Number of BMP brochures can be counted and documented.
8. The number of inquiries concerning the City Hall rain garden retro fit can be documented along with area businesses that install their own. Developer/engineer inquiries can also be tracked.

#### **4.6 Pollution Prevention/Good Housekeeping**

**Responsible person(s):**

Director of Public Utilities  
Water Quality Coordinator

**Target Pollutants:**

1. SSOs/CSOs
2. Sediment
3. Litter
4. Household Hazardous Wastes
5. Automotive/Equipment Fuels/Fluids
6. Street Salts/Sand
7. Chlorine

**Target audiences:**

1. City Employees
2. City Council Members/Officials

<b>4.6 Pollution Prevention/Good Housekeeping for Municipal Operation</b>						
<b>Activity</b>	<b>Currently in place</b>	<b>First year 2014</b>	<b>Second year 2015</b>	<b>Third year 2016</b>	<b>Fourth year 2017</b>	<b>Fifth year 2018</b>
1. Conduct annual department headquarters site inspections.	X					
2. Develop/perform training specific to each City department.		X				
3. Continue "Pride in Moberly" city wide clean up days	X					
4 Refurbish 5 open channel storm water drainage conveyances.						X
5. Continue with street sweeping activities and storm drain inspections and cleaning.	X					
6. Develop written procedures concerning where street sweepings are disposed.			X			
7. Develop written procedures concerning where storm drain cleanings are disposed.	X					
8. Continue sewer rehabilitation program to reduce inflow and infiltration.	X					
9. Continue with sewer jetting and root saw programs.	X					

**Goals:**

1. Conduct annual department headquarters site inspections.
2. Develop/perform training specific to each City department.
3. Continue "Pride in Moberly" city wide clean up days
4. Refurbish 5 open channel storm water drainage conveyances using rock, matting, seeding and mulch. This will stabilize the areas and reduce erosion and settlement.
5. Continue with street sweeping and storm drain inspections, cleaning activities.
6. Develop written procedures concerning where street sweepings are disposed.
7. Develop written procedures concerning where storm drain cleanings are disposed.
8. Continue sewer rehabilitation program to reduce Inflow and Infiltration.
9. Continue with sewer jetting and root saw programs.

**Measurements**

1. Track number of inspections performed and problems corrected.
2. Track number of training sessions/materials distributed.
3. The amount of litter collected on "Pride in Moberly Days" can be measured and tracked.
4. Open channel refurbishing can be documented and tracked..
5. The amount of street sweepings collected will continue to be measured.
6. Where street sweepings are disposed and amount can be tracked.
7. Where "street cleanings" are taken and the amount can be tracked.
8. The number of sewers rehabilitated and what measures were used ,i.e. slip-lined, CIPP, replaced, can be documented and tracked.
9. Number of sewers jetted can be tracked along with records of root sawing.