# City of Murray

AI#76203

# Stormwater Quality Management Plan

2018-2023

KPDES Copermittees:

Murray State University

Partners: Kentucky Transportation Cabinet

Contact Information:

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**AI#76203**

(Plan revised October 2018)

# Table of Contents

# City of Murray

*SWQMP 2018-2023*

# Section 1

## Community Background Information

## KPDES Permitted MS4 Community

# City of Murray Kentucky

500 Main Street
Murray, KY 42071
(270)762-0330

Copermittee: Murray State University

Partners: Kentucky Transportation Cabinet

## About Murray, KY and Calloway County

With easy access to the interstate highway system, Calloway County's central location is within a day's drive from most of the eastern United States. Calloway County, part of the Jackson Purchase Region, has an area of 384 square miles and is 550 feet above sea level. The terrain is rolling wooded countryside with corn, soybeans, wheat and tobacco as the primary crops.

Murray, the county seat, is situated in extreme southwest Kentucky, Murray is only eight miles from the Tennessee state line, 15 miles west of Kentucky Lake (and the Land Between the Lakes), and 125 miles northwest of Nashville. Murray Calloway County is located in the Central Time Zone.

## Highway Transportation Corridors

### US Highway 641 North

This four-lane highway (five lanes in the city) provides access to the Purchase Parkway in Marshall County, about 18 miles north of Murray. The Purchase Parkway intersects with Interstate 24 about 26 miles north of Murray. The highway links Murray with Benton, Kentucky Dam, and Marion.

### Kentucky 80

Calloway County's newest highway, Kentucky 80 is the southern east-west four-lane corridor for the state. The highway was recently completed to US 641 from Aurora. Currently construction is underway for the western portion, from US 641 to Mayfield. The highway provides a partial (and eventual) four-lane route to Interstate 24 East (to Nashville, TN).

### US Highway 641 South

The southern end of US 641 is a two-lane highway, linking Murray with Paris and Camden, TN, eventually reaching Interstate 40. It travels through Calloway County's only other incorporated city, Hazel, about 8 miles south of Murray. Plans are in the works to four-lane this highway.

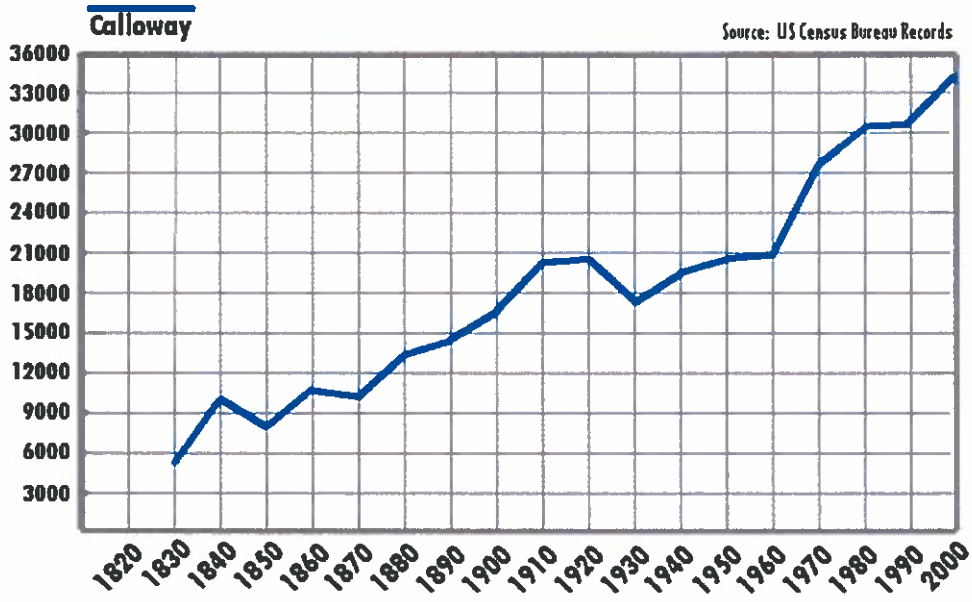
### Kentucky 121

Kentucky 121 North is a vital link between Murray and Mayfield. Perhaps the most traveled two-lane highway in Calloway County, many commuters jam the roadway every day traveling to MSU or from Murray to Mayfield for work. The new, four-lane Kentucky 80 has replaced the traffic flow on Kentucky 121 North since its completion in late 2008. Kentucky 121 South goes into Tennessee, and intersects US 79 in Henry County near Kentucky Lake.

### Kentucky 94

Kentucky 94 runs from KY 80 in Aurora to the KY/TN border south of Hickman, KY. Kentucky 94 West is the link between Fulton and Murray, and is much less traveled than the eastern highway. The new, four-lane Kentucky 80 has replaced the traffic flow on Kentucky 94 East. This roadway is primarily for local traffic into Murray.

## Murray, Hazel, and Calloway County Current & Historical Population




Murray & Calloway County saw an explosion in population from 1930-1980 mostly because of Murray State University.

**Calloway County**
Estimate 2007: 36,189
Census 2000: 34,117
Census 1990: 30,735
Census 1980: 30,031
Census 1960: 20,972
Census 1900: 17,633

**Murray**
Estimate 2006: 15,725
Census 2000: 14,950
Census 1990: 14,439
Census 1980: 14,248
Census 1960: 9,303
Census 1940: 6,011
Census 1930: 2,891
Census 1900: 1,822

**Hazel**
Estimate 2006: 449
Census 2000: 440
Census 1990: 460
Census 1980: 465
Census 1960: 342
Census 1900: 362

# City of Murray
## *SWQMP 2018-2023*

# Section 2
## Existing Land Use

**Table LU-4 Murray Land Use Classification System**

| Color | Developed Land Use Categories | Map Code |
|---|---|---|
| | Single Family Residential | SF |
| | Two Family Residential (Duplex) | 2F |
| | Multi-Family Residential (3 or more units in structure) | MF |
| | Congregate Living Facility (Group Quarters) | GQ |
| | Manufactured Housing (1 Unit on chassis) | MH |
| | Commercial – Office/Retail/Business/Medical/Lodging | CR |
| | Warehousing | WH |
| | Industrial | IN |
| | Public Use (Government) | PU |
| | Semi-Public Use (Institutional) | SP |
| | Education | ED |
| | Utilities | UT |
| | Agriculture | AG |
| | Transportation | TR |
| **Pattern** | **Vacant Land Use Categories** | **Map Code** |
| | Single Family Residential (Detached – 1 unit in structure) | V-SF |
| | Two Family Residential (Duplex – 2 units in structure) | V-2F |
| | Multi-Family Residential (3 or more units in structure) | V-MF |
| | Commercial | V-CR |
| | Industrial | V-IN |
| | Agriculture | V-AG |

Data was added to the base by the consultant to aerial photographs during a land use survey of the city in August 2002. The survey provided detailed information on existing land uses, using the new land use categories. The field survey was used to inventory parcel-specific uses within the general land use categories. These revisions brought the data in the existing database to a new level of detail, and updated the previous information from 1989.

The Existing Land Use Map Series was developed from the inventory database and verified by city staff and Planning Commission members. The Existing Land Use Map Series and associated area coverages contained within each land use category are provided on the following pages.

**Existing Land Use Summary**

During the summer of 2002, a land use inventory was completed for Murray. The total area within the incorporated city boundary encompassed 10.1 square miles, or 47.1 percent of the Urban Services Area. There are 21.4 square miles within the Urban Services Area. The land use inventory identified present uses within the city, and does not necessarily reflect ownership or zoning designations.

Table LU-5 shows the distribution, location, and extent of existing land uses in Murray. The Existing Land Use Map (Map LU-3) on the following page illustrates existing uses in color as an overlay of a city base map. The survey of existing land use in the city has been summarized in the table. There are approximately 6,461.1 acres of land and water area in the city. Developed land comprises about 5,405.1 acres, or 83.6 percent of the total area of the city, including land in active agriculture. Urban uses, including roads and rights-of-way, comprise 4,255.6 acres, or 65.9 percent of the total area of the city. Agriculture covers 1,149.5 acres, and the remaining vacant land area occupies about 1,056 acres.

**Table LU-5**
**Existing Land Use Summary, 2002**

| Developed Land Use | Acres | | Vacant/Land Use | Acres |
|---|---|---|---|---|
| Roads, Rights-of-Way | 540.6 | | Vacant Single Family Residential | 271.8 |
| Single Family Residential | 1,657.9 | | Vacant Two Family Residential | 17.2 |
| Two Family Residential | 116.4 | | Vacant Multi-Family Residential | 84.2 |
| Multi-Family Residential | 162.0 | | Vacant Commercial | 188.0 |
| Manufactured Housing | 72.5 | | Vacant Warehousing | 1.0 |
| Congregate Living Facilities | 32.7 | | Vacant Industrial | 175.7 |
| Commercial | 457.5 | | Vacant Public | 29.9 |
| Warehousing | 53.3 | | Vacant Agriculture | 288.2 |
| Industrial | 220.1 | | **Vacant Land Area** | **1,056.0** |
| Public | 401.4 | | **Urban Land Area** | **4,255.6** |
| Semi-Public (Institutional) | 214.8 | | **Total Incorporated Area (incl. Ag.)** | **6,461.1** |
| Education | 276.9 | | Unincorporated Enclaves (5) | 43.8* |
| Utilities | 49.5 | | Unincorporated Urban Services Area | 7,245.4 |
| Agriculture | 1,149.5 | | **Total Urban Services Area** | **13,706.5** |

Notes: Figures rounded to nearest 0.1 acre.
* Unincorporated Enclaves area is included in Unincorporated Urban Services Area.
Source: GRW, Inc., 2002.

*Land Use Change, 1978-2002*

Changes in existing land uses between 1978 and 2002 are summarized in Table LU-6. To provide comparable categories for this analysis, it was necessary to combine the 2002 land use categories to match the 1978 categories. All 2002 residential categories were combined into a single category. The 2002 industrial and warehousing categories were combined to match the 1978 industrial category. The 2002 Public, Semi-Public, Education, and Utilities categories were combined to match the 1978 Public/ Semi-Public category. The resulting combined classifications for 2002 may not precisely match the uses encompassed in the 1978 categories, but are deemed to be sufficiently valid for comparison purposes.

**Map LU-3: Existing Land Use Map**

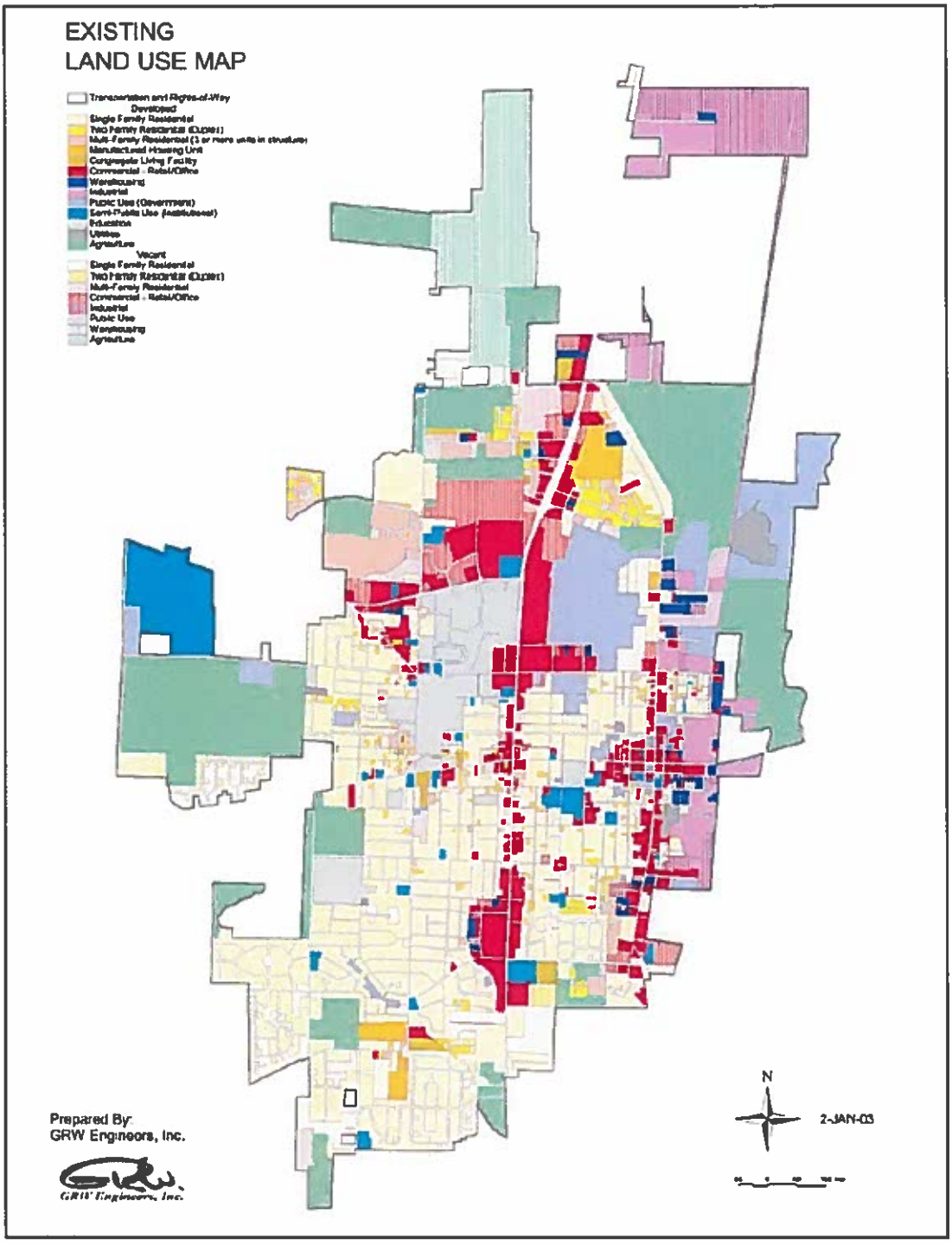


**Table LU-6**
**Land Use Change, Murray, KY, 1978 and 2002**

| Land Use | 1978 | | | 2002 | | | Change Acres, 1978-2002 |
|---|---|---|---|---|---|---|---|
| | Acres | % of Total Land | % of Developed Land | Acres | % of Total Land | % of Developed Land | |
| Residential | 1,506.0 | 35.7 | 57.6 | 2,041.5 | 31.6 | 48.0 | 535.5 |
| Commercial | 345.0 | 8.2 | 13.2 | 457.5 | 7.1 | 10.8 | 112.5 |
| Industrial | 40.0 | 0.9 | 1.5 | 273.4 | 4.2 | 6.4 | 233.4 |
| Public, Semi-Public | 498.0 | 11.8 | 18.3 | 942.6 | 14.6 | 22.1 | 444.6 |
| Streets | 247.0 | 5.9 | 9.4 | 540.6 | 8.4 | 12.7 | 293.6 |
| Developed Land | 2,616.0 | 62.0 | 100.0 | 4,255.6 | 65.9 | 100.0 | 1,639.6 |
| Vacant | 435.0 | 10.3 | --- | 1,056.0 | 16.3 | --- | 621.0 |
| Agriculture | 1,151.0 | 27.3 | --- | 1,149.5 | 17.8 | --- | -1.5 |
| TOTAL | 4,222.0 | 100.0 | --- | 6,461.1 | 100.0 | --- | 2,239.1 |

Note: Figures rounded to nearest 0.1 acre.
Sources: City of Murray, 1978; GRW, Inc., 2002.

The area of the city increased by 2,239.1 acres, or 52.9 percent, due to annexations during this time period. Land developed in urban uses increased from 2,616 acres to 4,255.6 acres, adding 1,639.6 acres for an increase of 65.9 percent. Industrial land uses increased notably as a percentage of developed land during this 25-year period, from 0.9 percent to 4.2 percent. This change from 40 to 273.4 acres is a 584 percent increase. Residential land uses decreased as a percentage of developed land from 57.6 percent to 48.0 percent, although the actual increase in residentially developed land was 535.5 acres.

# City of Murray
## *SWQMP 2018-2023*

# Section 3
## Future Land Use

**Map LU-9**
**Future Land Use Map**

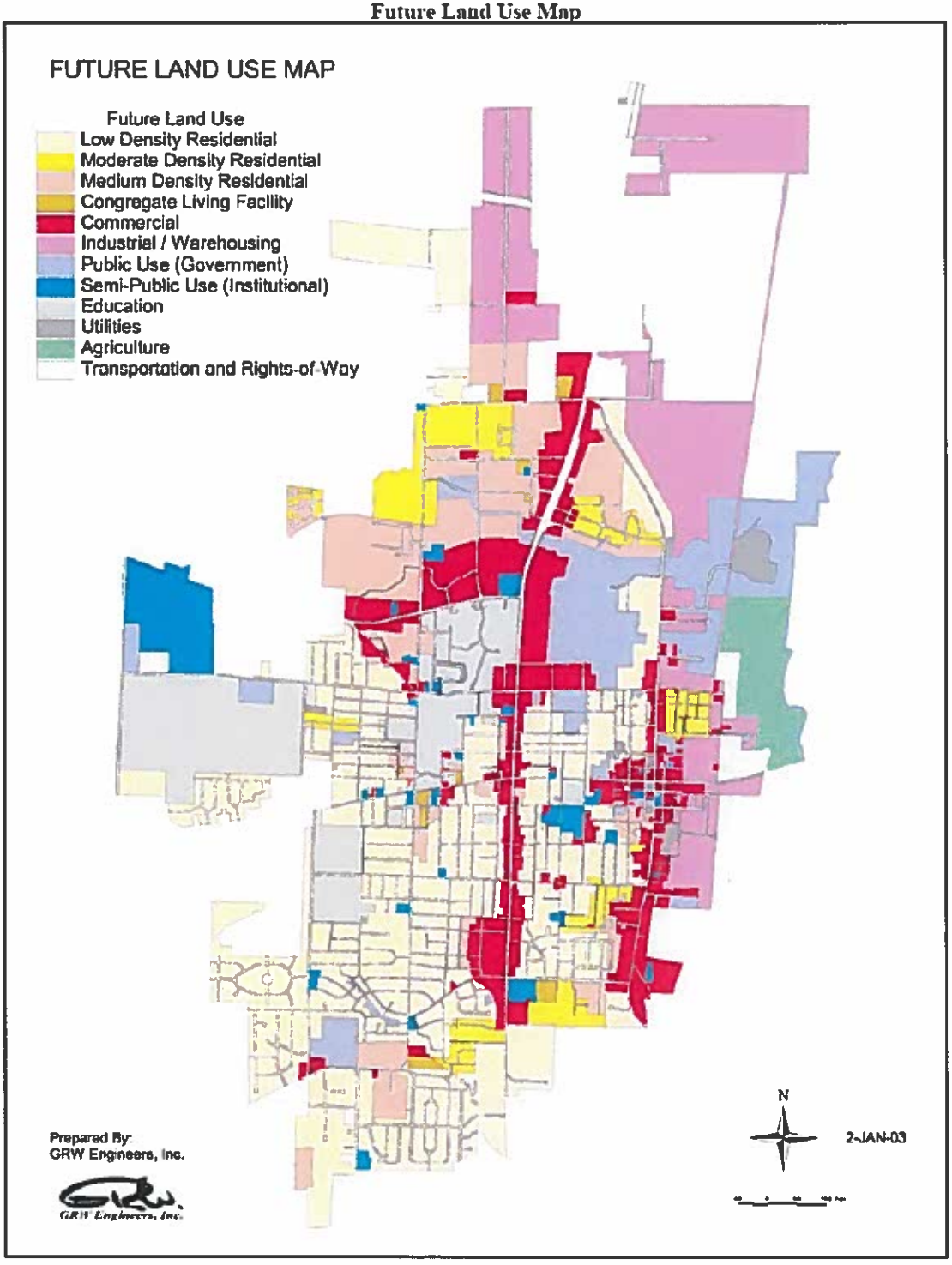


**Table LU-12**
**Proposed Future Land Use Summary**

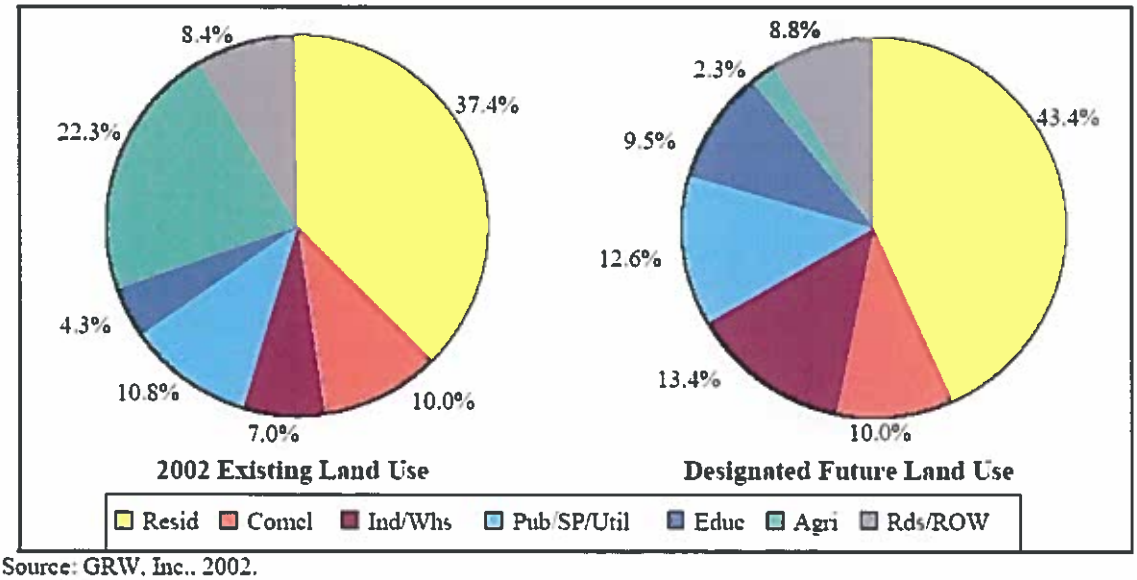
| EXISTING LAND USE | dev | vac | sum | FUTURE LAND USE | acres | dif |
|---|---|---|---|---|---|---|
| Single Family Residential | 1,657.9 | 271.8 | 1,929.7 | Low Density Residential | 1,889.1 | (40.6) |
| Two Family Residential | 116.4 | 17.2 | 133.6 | Moderate Density Residential | 297.1 | 163.5 |
| Multi-Family Residential | 162.0 | 84.2 | 246.2 | Medium Density Residential | 582.3 | 336.1 |
| Manufactured Housing | 72.5 | | 72.5 | | | (72.5) |
| Congregate Living Facilities | 32.7 | | 32.7 | Congregate Living Facility | 37.0 | 4.3 |
| Commercial | 457.5 | 188.0 | 645.5 | Commercial | 644.9 | (0.6) |
| Industrial / Warehousing | 273.4 | 176.7 | 450.1 | Industrial / Warehousing | 865.1 | 415.0 |
| Public | 401.4 | 29.9 | 431.3 | Public | 547.3 | 116.0 |
| Semi-Public (Institutional) | 214.8 | | 214.8 | Semi-Public | 214.7 | (0.1) |
| Education | 276.9 | | 276.9 | Education | 614.5 | 337.6 |
| Utilities | 49.5 | | 49.5 | Utilities | 52.0 | 2.5 |
| Agriculture | 1,149.5 | 288.2 | 1,437.7 | Agriculture | 148.0 | (1,289.7) |
| Roads, Rights-of-Way | 540.6 | | 540.6 | Roads, Rights-of-Ways | 569.1 | 28.5 |
| Developed Land Area | 5,405.1 | 1,056.0 | 6,461.1 | Total Municipal Land Area | 6,461.1 | (0.0) |

Note: Figures rounded to nearest 0.1 acre.
Source: GRW, Inc., 2002.

The four columns on the left side of the table present the 2002 existing land use detailed in the previous section. The first column lists the land use categories, the second column shows the acres of developed land (dev), the third column shows the acres of vacant land (vac), and the fourth column summarizes the land area in acres by land use category. The three columns on the right side of the table present the designated future land use, showing area in acres of the various categories and difference (dif) in acres from the 2002 land use. The Manufactured Housing category is included in the Medium Density Residential category under the future land use.

There are 6,461.1 acres of land and water area within the existing city boundary. Existing land with developed uses comprises about 5,405.1 acres, or about 83.7 percent of the total area of the city, including land in active agriculture. Urban uses, including roads and rights-of-way, comprise 4,255.6 acres, or 65.9 percent of the total area of the city. The remaining vacant area covers 1,056 acres. The Future Land Use Map does not designate vacant land areas. Vacant land is an existing condition that will change over time; it is not a land use classification. Future uses are designated for the entire area within the existing city boundary.

**Figure LU-3**
**Comparison of 2002 Existing and Designated Future Land Uses by Percentage of Area**




Source: GRW, Inc., 2002.

# City of Murray

*SWQMP 2018-2023*

# Section 4

## Local Water Resources

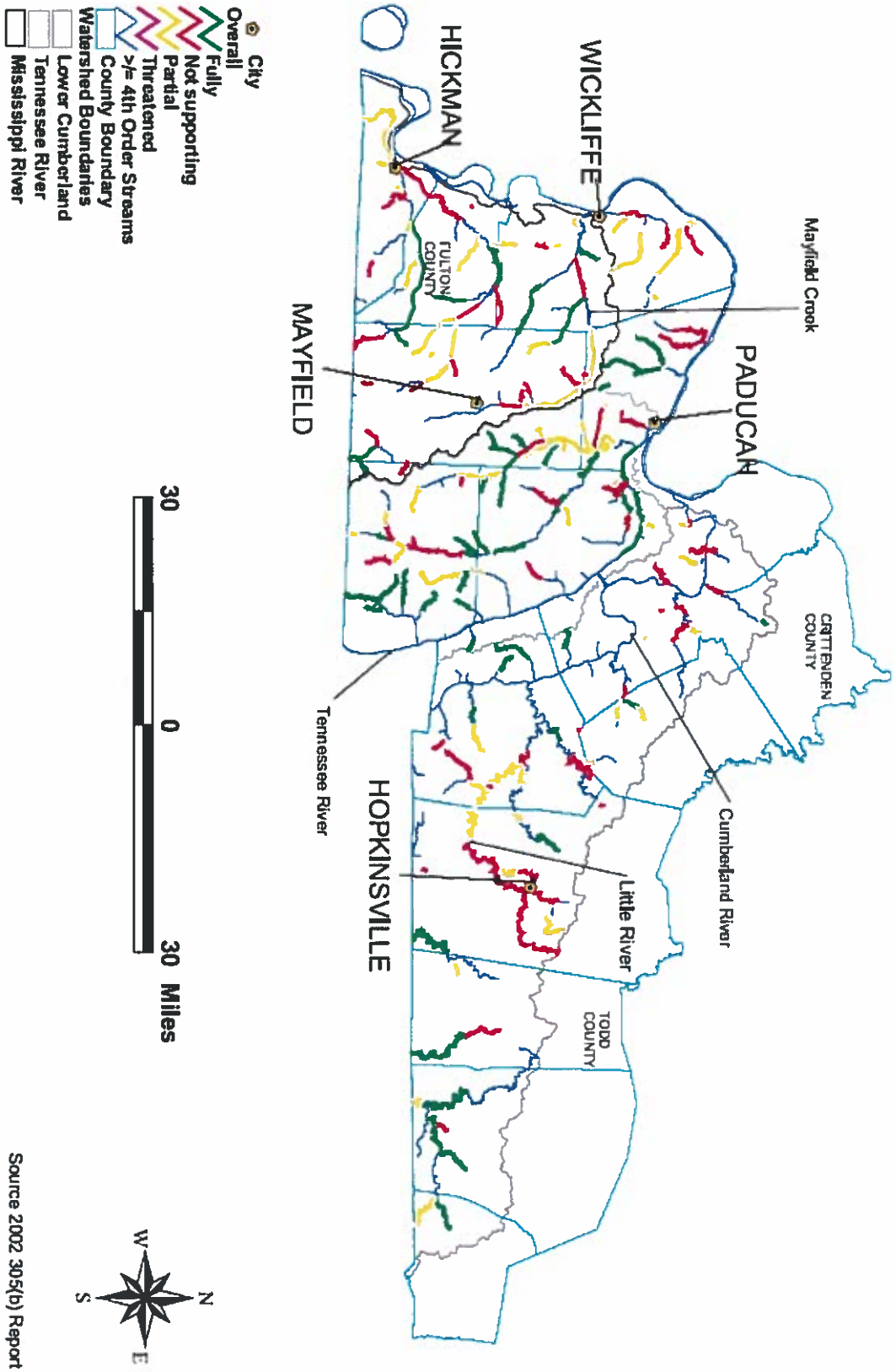
## Surface Water Resources

The main surface water bodies in Murray, Calloway Co. are the Clarks River, Bee Creek, and the Kentucky Lake. The Kentucky Lake is the largest body of water in the county, but it is located on the east border of Calloway Co., outside of the permitted MS4 area. Clarks River and Bee Creek reside within the East Fork Clarks River and Middle Fork Clarks River watersheds which are located within the Tennessee River Basin in southwest Kentucky.

## Clarks River Watershed Impaired Waterbodies with TMDL Under Development

| Stream Name | County | River Miles | Pollutant |
|---|---|---|---|
| Bee Creek into Clarks River | Calloway | 0.0 to 0.7 | Fecal Coliform |
| Bee Creek into Clarks River | Calloway | 0.7 to 2.0 | Fecal Coliform |
| Blizzard Pond into W. Fk. Clarks R. | McCracken | 0.0 to 3.7 | Fecal Coliform |
| Camp Creek into W. Fk. Clarks R. | McCracken | 0.0 to 5.4 | Fecal Coliform |
| Chestnut Creek into Clarks River | Marshall | 0.0 to 3.0 | Fecal Coliform |
| Clarks River into Tennessee River | Calloway | 50.9 to 55.6 | Fecal Coliform |
| Clarks River into Tennessee River | Calloway | 50.9 to 55.6 | Organic Enrichment (Sewage) Biological Indicators |
| Clarks River into Tennessee River | Calloway | 50.9 to 55.6 | Nutrient/Eutrophication Biological Indicators |
| Clarks River into Tennessee River | Calloway | 55.6 to 64.7 | Fecal Coliform |
| Clayton Creek into Clarks River | Calloway | 3.3 to 7.7 | Fecal Coliform |
| Damon Creek into W. Fk. Clarks R. | Calloway | 0.0 to 1.8 | Fecal Coliform |
| Middle Fork Creek into Clarks R. | Marshall | 0.2 to 6.0 | Fecal Coliform |
| Middle Fork into Clarks River | Calloway | 0.0 to 2.7 | Fecal Coliform |
| Middle Fork into Clarks River | Calloway | 0.0 to 2.7 | Nutrient/Eutrophication Biological Indicators |
| Middle Fork into Clarks River | Calloway | 2.7 to 4.8 | Nutrient/Eutrophication Biological Indicators |

## 305 b list Streams of the Four Rivers Watershed Basin




Combined overview of stream reach indexing for the four assessed uses (Aquatic Life Support, Drinking Water, Fish Consumption and Primary Contact Recreation) in the Four Rivers Basins.

Source 2002 305(b) Report

## Special Use Waters in the Tennessee River Basin

| WATERBODY NAME* | BASIN | COUNTY | ZONE | UMP | DMP | Length | Acres | CAH | ONRW | EXCW | R_RCH | OSRW | SWR | F_WILD | F_SCENIC | FET_SP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blood River | Tennessee | Calloway | McCullough Fork to Tennessee State line | 15.65 | 12.2 | 3.45 | 0 | | | Y | Y | | | | | |
| Clarks River | Tennessee | Marshall | Persimmon Slough to Middle Fork Creek | 28.4 | 26.6 | 1.8 | 0 | | | Y | | | | | | |
| Grindstone Creek | Tennessee | Calloway | Mouth to Headwaters | 2.3 | 0 | 2.3 | 0 | | | Y | Y | | | | | |
| Panther Creek | Tennessee | Graves | Channelization to Impoundment | 6 | 1.1 | 5.9 | 0 | | | Y | Y | | | | | |
| Panther Creek | Tennessee | Calloway | Mouth to Headwaters | 5.1 | 0 | 5.1 | 0 | | | Y | Y | | | | | |
| Panther Creek Unidentified Tributary | Tennessee | Graves | Mouth to Headwaters | 2.1 | 0 | 2.1 | 0 | | | Y | Y | | | | | |
| Soldier Creek | Tennessee | Marshall | Mouth to South Fork Soldier | 5.3 | 0 | 5.3 | 0 | | | Y | Y | | | | | |
| Sugar Creek | Tennessee | Calloway | Kentucky Lake Backwaters to Buzzards | 3.3 | 2.1 | 1.2 | 0 | | | Y | | | | | | |

**Special Use Waters in the Tennessee River Basin**

| WATERBODY NAME* | BASIN | COUNTY | ZONE | UMP | DMP | Length | Acres | CAH | ONRW | EXCW | R_RCH | OSRW | SWR | F_WILD | F_SCENIC | FET_SP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Roost Road | | | | | | | | | | | | | |
| Sugar Creek | Tennessee | Graves | Mouth to Unnamed Reservoir | 4 | 0 | 4 | 0 | | | Y | | | | | | |
| Tennessee River | Tennessee | Livingston, McCracken, Marshall | River Mile 22.4 (Kentucky Lake dam) to River Mile 12.0 | 22.4 | 12 | 10.4 | 0 | | | | | Y | | | | Plethobasus cooperianus,Obovaria retusa,Lampsilis abrupta |
| Trace Creek | Tennessee | Graves | Mouth to Neely Branch | 3 | 0 | 3 | 0 | | | Y | Y | | | | | |
| West Fork of Clarks River | Tennessee | Graves, Marshall | Soldier Creek to Duncan Creek | 22.7 | 19.7 | 3 | 0 | | | Y | Y | | | | | |
| Wildcat Creek | Tennessee | Calloway | Ralph Wright Road Crossing to Headwaters | 6.7 | 3.5 | 3.2 | 0 | | | Y | Y | | | | | |

| | | |
|---|---|---|
| *HEADER ABBREVIATIONS | UMP | UPSTREAM MILEPOINT |
| | DMP | DOWNSTREAM MILEPOINT |
| | CAH | COLD WATER HABITAT |
| | ONRW | OUTSTANDING NATIONAL RESOURCE WATER |
| | EXCW | EXCEPTIONAL WATERS |
| | R_RCH | REFERENCE REACH STREAM |
| | OSRW | OUTSTANDING STATE RESOURCE WATER |

| | | |
|---|---|---|
| | SWR | STATE WILD RIVER |
| | F_WILD | FEDERALLY DESIGNATED AS A WILD RIVER |
| | F_SCENIC | FEDERALLY DESIGNATED AS A SCENIC RIVER |
| | FET_SP | FEDERALLY ENDANGERED AND THREATENED SPECIES |

**319(h) Nonpoint Source Implementation Grants**

The Four Rivers Basin Team, comprised of representatives from non-profit organizations, local governments, private corporations, and state and federal agencies, have developed a Watershed Based Plan for the East and Middle Forks of Clarks River. Funding for the Watershed Based Plan has been provided by 319(h) grant funds.

The purpose of this Watershed Based Plan is to address sources of pollution identified within the watershed, develop solutions, and install Best Management Practices in both impaired and threatened stream reaches within the watershed. The East Fork Clarks River and Middle Fork Clarks River Watersheds are located east and south of Murray, KY. The focus area is the sub-watershed beginning where Bee Creek joins the Clarks River and upstream (south).

This activity is to be considered supplement information. This 319 (h) grant funded Watershed Based Plan is not being used to implement requirements for the City of Murray Stormwater Quality Management Plan.

**Drinking Water Facilities and Intakes**

The Murray Water System provides potable water to the City of Murray and portions of Calloway County. The water system serves approximately 7,000 customers, including several outlying water districts. The water treatment plant processes an average of 3.33 MGD (million gallons per day). Groundwater is used as the raw water source.

A well field, consisting of five wells, pumps water to the plant for treatment. The McNairy Limestone Geologic Formation is the source of raw water. The existing treatment facility was completed in 1992 as a nominally rated 7 MGD plant. The water system is known for providing very good quality of water: soft, and free of taste and odor.

| Quick Facts | |
|---|---|
| Fire Hydrants in City | 799 |
| Miles of Water Main Piping | 105 |
| Millions of Gallons Treated Per Day | 3.6 |
| Thousands of customers | 7+ |

There are three storage facilities located through out the city. Under normal operating conditions, they are capable of delivering adequate capacity and water pressure.

## KPDES Permitted Facilities

| County | KPDES # | Facility Name | SIC Code Description | Location City |
|---|---|---|---|---|
| CALLOWAY | KYR105301 | BAILEY RD-BEE CRK SEWER INTERC | GEN CONTRACT, NON-RES BLDGS. | MURRAY |
| CALLOWAY | KYR106133 | BRIGGS & STRATTON FUEL SYS PLT | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR107457 | CLARK RESIDENTAL COLLEGE | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR104200 | CREEKWOOD SHOPPING CENTER | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR106864 | FAIRFIELD SUBD | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR106469 | GETTYSBURG ESTATES | GEN CONTRACT-RES, NOT SINFA | MURRAY |
| CALLOWAY | KYR106460 | HAL ESTATES | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR101990 | HALE DEVELOPMENT CO | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR107357 | HERITAGE BANK ADDITION | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR106468 | HUNTERS POINT SUBD | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR107934 | KYTCPCN061216 | HWY & ST CONST., EXC. ELEV HWY | GRAND RIVERS |
| CALLOWAY | KYR107933 | KYTCPCN061220 | HWY & ST CONST., EXC. ELEV HWY | GRAND RIVERS |
| CALLOWAY | KYR108136 | LAKEVIEW RV PARK | HWY & ST CONST., EXC. ELEV HWY | NEW COCCORD |
| CALLOWAY | KYR107060 | MORNINGSTAR FOODS | EXCAVATION WORK | MURRAY |
| CALLOWAY | KYR106779 | MURRAY STATE UNIVERSITY | EXCAVATION WORK | MURRAY |
| CALLOWAY | KYR107014 | NORTH POINT PROFESSIONAL PARK | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR107465 | POOR FARM RD PUMPMING STATION | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR108462 | PRIMARY CARE MEDICAL CENTER | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR105264 | REG CENTER FOR EMERGING TECH | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR108586 | RIVERFIELD ESTATES U-I, II | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR108347 | SCIECCE COMPLEX PHASE 2 | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR106076 | TIMBER WOLF ESTATES | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR107019 | UNIVERSITY SHOPS | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR106315 | WEBASTO ROOF SYSTEMS INC | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR105262 | WELLNESS CENTER ROADWAY IMPROV | MANAGEMENT SERVICES | MURRAY |
| CALLOWAY | KYR107573 | WESTERN SHORE SUBD PHASE III | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR107441 | WESTERN SHORES SUBD PHASE I | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR107572 | WESTERN SHORES SUBD PHASE IV | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR107818 | WESTERN SHORES SUBD PHASE V | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR107819 | WESTERN SHORES SUBD PHASE VI | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR107920 | WESTERN SHORES SUBD PHASE VII | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR107921 | WESTERN SHORES SUBD PHASE VIII | HWY & ST CONST., EXC. ELEV HWY | MURRAY |
| CALLOWAY | KYR106938 | WESTVIEW NURSING HOME | MANAGEMENT SERVICES | MURRAY |

# City of Murray
***SWQMP 2018-2023***

# Section 5
## MCM 1

## Public Education and Outreach

## MCM 1 Public Education and Outreach

*City of Murray Requirements for MCM 1*

a. Implement a public education program to raise awareness about the impacts of stormwater discharges on local waterbodies and the steps that can be taken to reduce stormwater pollution.

b. Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

Since starting the Public Education and Outreach Program in 2003 the City of Murray has crafted a very thorough program with several different media sources in use; (TV, Radio, and Print Ads). We have joined a partnership with Murray State University, and the Kentucky Transportation Cabinet. The only challenges we have faced with this particular control measure is how to rate the increase in our citizens knowledge of stormwater quality. This issue will be addressed during the new permit cycle with several phone surveys within our MS4 aimed at rating increased awareness. We will continue to produce new and interesting ways to spread the awareness of stormwater quality issues within our community.

**City of Murray (Best Management Practices)**

1. Installation of "NO DUMPING DRAINS TO RIVER" signage along creek crossings and bridges. With 60 in place at this time our goal is to have over 120 installed by the next permit cycle.
2. Distribute stormwater inserts "The Solution to Stormwater Pollution" through utility bill to the citizens of Murray. Volunteer opportunities will also be sent out through our utility bills such as the $ Rivers Watershed Watch sampling opportunities for the public. Over 6400 are sent out per year or bi-annually and will be throughout the permit cycle.
3. Continue to update the stormwater section of the City of Murray website.
4. Utilize the partnership that the city has with Murray State University, the 4 Rivers Basin Team, NRCS and the County Cooperative to produce at least one activity or event per year with the public and students to promote the message.
5. Stormwater Television Advertisements will continue to play and be updated throughout this permit cycle. These ads are shown on two different cable information stations, approximately 5 times a day, 7 days a week.
6. Stormwater radio PSA's will continue to run important information concerning stormwater quality. The PSA is a 60 second spot. The spot runs 56 times a month over a period of 6 months. The station focuses on the 25 to 54 year old adult listener. The station reaches 76% of listeners every day, and 95% of area listeners every week.

7. The City of Murray will continue to host "Make a Difference Day" event throughout each year. The events are held quarterly and allow citizens to dispose of materials in a safe manner.
8. The City Stormwater Official will continue to be a member of the board of the Jackson Purchase Foundation which is dedicated to the wise use of our natural and human resources. This is done through environmental projects.

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Contributing Parties | Year 1 PY 18-19 | Year 2 PY 19-20 | Year 3 PY 20-21 | Year 4 PY 21-22 | Year 5 PY 22-23 |
|---|---|---|---|---|---|---|---|---|---|
| **1. MCM1 PUBLIC EDUCATION AND OUTREACH** | | | | | | | | | |
| | A. Local MS4 Activities | | | | | | | | |
| (1) | Installation of "No Dumping Drains To River" street signage | 60 in place at this time 120 by permit end | All citizens | City of Murray | X | X | X | X | X |
| (2) | Send out stormwater environmental information along with volunteer opportunities in utility bills | 6400 billing accounts total city and county. | All citizens | City of Murray | X | | X | | X |
| (3) | Co-host the Four Rivers Sustainability Summit with MSU and the 4 Rivers Basin Team | Once a year on campus with additions booths set up from 20 agencies. | Students All Citizens | COM 4RBT MSU | X | X | X | X | X |
| (4) | Make a Difference Day events | Quarterly for normal materials, once a year for Hazardous waste and tires | All Citizens | City of Murray | X | X | X | X | X |
| (5) | Stormwater Television Advertisements | 2 ads running, 5 times a day every day | All citizens | City of Murray | X | X | X | X | X |
| | B. Cooperative Efforts with Murray State University | | | | | | | | |
| (1) | MSU Watershed Institute | Provide research and educate the public. | Citizens Teachers Students | City of Murray MSU | X | X | X | X | X |
| (2) | MSU Environmental Students Society | Environments student awareness campaign | Teachers and Students | MSU | X | X | X | X | X |
| (3) | MSU EDU 404 Requirements | Requirement to teach Environmental Education to EDU undergrads | Students | MSU | X | X | X | X | X |

# City of Murray
## *SWQMP 2018-2023*

# Section 6
## MCM 2

## Public Involvement And Participation

## MCM 2 Public Involvement and Participation

*City of Murray Requirements for MCM2*

The City of Murray must comply with the state and local public notice requirements; and determine the appropriate best management practices and measurable goals for this minimum control measure.

The City of Murray Public Involvement and Participation program has been very successful through the measures that have been taken to ensure its productivity. The addressing of our city council throughout the year gives us an avenue to discuss matters of stormwater pollution with the local government, while allowing the citizens of Murray to voice their opinions and concerns over these matters. Being a member of the Four Rivers Basin Team allows the city to work with several volunteers that sample the surrounding watersheds. This supplies the city with valuable information about the pollutants that are in streams and waterways. The use of our Stormwater Utility to fund our Stormwater Quality Management Plan and minimum control measures has also been a great asset for feedback concerning the support our citizens have for what we are trying to accomplish. The Stormwater Hotline that is in place, judging by the number of calls that are received, shows much improvement in the awareness of our citizens to recognize stormwater quality problems. The City of Murray will continue to partner with the 4RBT, NRCS, MSU, and the County Cooperative to put on events for all citizens to attend for volunteer and educational purposes.

**City of Murray (Best Management Practices)**

1. The City partners with the 4 Rivers Basin Team and Murray State University to put on the Four Rivers Sustainability Summit each year at MSU Curris Center. Seminars are scheduled throughout the event along with approximately 20 to 25 booths set up by environmental agencies from around the region.
2. The City of Murray Stormwater Hotline has been very successful and will continue to be. This allows the citizens to report problems and to voice their opinions on stormwater related issues. We average approximately 1-5 calls per week. All calls are responded to within 24 hours depending on the urgency of the matter.
3. The Stormwater and Drainage Engineer for the City of Murray addresses and will continue to address the city council and the citizens of Murray on a regular basis to inform city official and the public with updates dealing with our SWQMP, planned water quality events, and any other related issues.
4. The City partners with NRCS and the 4RBT to bring presentations and classroom activities to students in the city and county school systems. Environmental essay competitions are encouraged.
5. Stormwater Television Advertisements will continue to play and be updated throughout this permit cycle. These ads are shown on two different cable information stations, approximately 5 times a day, 7 days a week. The ads provide the public with the Stormwater Hotline, and the city slogan for pollution prevention. By doing so this allows the public to become serious advocates against stormwater pollution, and a vital partner in our goal of clean water.

6. The City of Murray will continue to be a member of The Four Rivers Watershed Watch Basin Team. Along with several representatives from surrounding state and city entities, volunteers from the community perform onsite activities and testing of the watersheds within our area. This information is vital to the reduction of pollutants, and in the improvement of water quality in our area.
7. The city will continue to have an annual "Clean Stream Team" campaign. This will include volunteers from the area to clean all neighborhood creeks and streams throughout the city. We will continue to expand our stenciling program to all community organizations. The City of Murray will continue to develop and organize these campaigns during the next permit cycle. We anticipate having 25 to 50 people turnout to the creek cleanings. We will be trying to clean 2 stream segments per year.
8. Implementation of a public involvement / participation program has begun. The City of Murray advertises annually volunteer opportunities by sending approximately 6400 4 Rivers Basin team and Watershed Watch brochures to citizens within our area and Calloway Co. This allows us to re-cruet citizens to sample sites along Bee Creek and Clarks River. The data collected help the city adjust BMP's to ensure the program is targeting all of the right pollutants. Citizens are also able to sponsor sampling sites by giving a donation to the Watershed Watch Team. All volunteer opportunities are listed on the City of Murray web site.

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Responsible Parties | Year 1 PY 10-11 | Year 2 PY 11-12 | Year 3 PY 12-13 | Year 4 PY 13-14 | Year 5 PY 14-15 |
|---|---|---|---|---|---|---|---|---|---|
| **2. MCM2 PUBLIC INVOLVEMENT / PARTICIPATION** | | | | | | | | | |
| | A. Local MS4 Activities | | | | | | | | |
| (1) | Stormwater Hotline | 1 - 5 calls per week Respond to 1 - 5 calls | Full Response | City of Murray | X | X | X | X | X |
| (2) | Addressing of the City Council and the public | Quarterly | All Citizens Local Government | City of Murray | X | X | X | X | X |
| (3) | Stormwater Television Advertisements | 2 ads running, 5 times a day every day | All citizens | City of Murray | X | X | X | X | X |
| (4) | Stormwater Utility | 10,000 - 20,000 per year Toward MCM's | All Citizens | City of Murray | X | X | X | X | X |
| (5) | Four Rivers Watershed Watch Basin Team | Bi-Monthly meetings 14 Test sites along Clarks River | All Citizens Volunteers Agencies | City of Murray | X | X | X | X | X |
| (6) | Four Rivers Sustainability Summit. Cooperative efforts with NRCS for school presentations. | 1 summit per year. 2 school presentations approx.. 320 students from two school districts. | Teachers Students | City of Murray, NRCS, 4RBT, MSU | X | X | X | X | X |
| | B. Cooperative Efforts with Murray State University | | | | | | | | |
| (1) | MSU Environmental Students Society | Environmental awareness campaign | Teachers Students | MSU | X | X | X | X | X |
| (2) | MSU EDU 404 Requirements | Environmental education requirement for teachers and students | Teachers Students | MSU | X | X | X | X | X |

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Responsible Parties | Year 1 PY 10-11 | Year 2 PY 11-12 | Year 3 PY 12-13 | Year 4 PY 13-14 | Year 5 PY 14-15 |
|---|---|---|---|---|---|---|---|---|---|
| **6. MCM2** | **Public Involvement and Participation** | | | | | | | | |
| | A. Local MS4 Activities | | | | | | | | |
| (7) | City of Murray Public Involvement Participation Program | 6,400 brochures sent out with volunteer info city Partners with 4 RBT | Volunteers Citizens | 4RBT City of Murray | X | | X | | X |

# City of Murray
***SWQMP 2018-2023***

# Section 7
## MCM 3

## Illicit Discharge Detection & Elimination

## MCM 3 Illicit Discharge Detection & Elimination

*City of Murray Requirements for MCM3*

a. Continue to implement and enforce an ordinance or other regulatory mechanism that prohibits illicit discharge to the small MS4. Include a copy of the ordinance that you will utilize to prohibit discharges into the MS4.

b. Develop and maintain a storm sewer system map showing the location of all known major outfalls and the names and locations of all surface waters that receive discharges from those outfalls.
   - The storm sewer system wide map shall also include the permittee's small MS4 system, including catch basins, pipes, ditches, flood control facilities (retention/detention ponds), post-construction water quality BMPs.
   - Depict stormwater infrastructures such as inlets, outfalls, conveyance, detention basins, retrofits, etc. Include citations and references for all data shown on the map.
   - Map Format: If mapping is completed using GIS or CAD software, provide at a minimum the MS4 boundary and the mapped storm sewer infrastructure (please consult DOW about an acceptable format for maps.)

c. Develop and implement a written plan to address illicit discharges including illegal dumping into the MS4.

d. Educational outreach targeting public employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste must be implemented.

e. Appropriate BMP's and measurable goals for this measure must be determined.

**Other Important Measures**

a. Include stormwater infrastructures such as inlets, conveyances, detention basins, retrofits, etc. in your mapping efforts.

b. Describe procedures which will be used to verify the location of outfalls and other stormwater infrastructures.

c. Describe how the illicit discharge prohibition ordinance or other regulatory mechanism will be/has been implemented and enforced.

d. A plan to detect and address illicit discharges is the central component of this minimum control measure. The plan is dependent upon several factors, including the permittees and partners available resources, size of staff, and degree and character of its illicit discharges, and may include responding to complaints, targeted priority inspection and enforcement, targeted water quality monitoring, etc.

e. Reporting of inappropriate discharges is significantly increased when public employees, citizens and businesses have been educated in their identification, and a mechanism for notifying authorities is in place.

The City of Murray is in the process of digitally mapping the complete storm sewer system inside the city limits. At this time we do have the system conveyance structures and outfalls inventoried in hard copy form. The City consists of 13 sub-watersheds. We have completed 8 sub-watersheds basin studies which are now in digital format. All structures are manually inspected, information is compiled, pictures of the structures are taken, and all structures are inspected for illicit discharges. The city will continue to do these studies each year of the permit cycle until the digital storm sewer system mapping is complete.

An ordinance is in place that institutes prohibition on non- stormwater discharges and appropriate enforcement procedures and actions.

The City of Murray is using several ways to detect illicit discharges and educate the public on identifying possible illicit discharges in to the system. "No Dumping Signage" at all creek crossings has been put in place. Stormwater ads on TV and radio give the public hotline numbers to call if something has been spotted. The city has a policy of immediate response for illicit discharges that have been detected. The Four Rivers Watershed Watch Basin team sample 14 sites around the city. This information allows us to keep a very close eye of the outfalls surrounding the City of Murray. "Let's Make a Difference Day" is an event that is put on every quarter that allows citizens to dispose of wastes. Everything from cardboard to used motor oil is taken and properly disposed of.

**City of Murray (Best Management Practices)**

1. Installation of "NO DUMPING DRAINS TO RIVER" signage along creek crossings and bridges. With 60 in place at this time our goal is to have over 120 installed by the next permit cycle.
2. Distribute stormwater inserts "The Solution to Stormwater Pollution" through utility bill to the citizens of Murray. Over 6400 are sent out per year and will be sent out at least bi-annually throughout the permit cycle.
3. Continue to update the stormwater section of the City of Murray website.
4. Stormwater Television Advertisements will continue to play and be updated throughout this permit cycle. These ads are shown on two different cable information stations, approximately 5 times a day, 7 days a week.
5. Stormwater radio PSA's will continue to run important information concerning stormwater quality. The PSA is a 60 second spot. The spot runs 56 times a month over a period of 6 months. The station focuses on the 25 to 54 year old adult listener. The station reaches 76% of listeners every day and 95% of area listeners every week that they are aired.
6. The City of Murray will continue to be a member of The Four Rivers Watershed Watch Basin Team. Along with several representatives from surrounding state and city entities, volunteers from the community perform onsite activities and testing of the watersheds within our area. This information is vital to the reduction of pollutants, and in the improvement of water quality in our area. The city pays for the sampling of 16 sites within Murray and the outlying area.
7. The city is conducting Watershed Basin studies on the sub-basins throughout the City of Murray. We have already completed an existing inventory of the sub-basins in hard copy format. The purpose of the new studies is to update new structures that have been added since the last study, digitize the new and existing information, and check for illicit discharges along with infrastructure problems. Eight sub-basins are in digital format at this time. We will continue to digitize at least one sub-basin per year until all have been completed.

8. Murray State University Groundwater Protection Plan is in place. This plan prohibits illicit discharges onto Murray State University property. This plan is currently being maintained and will continue to be during the entire permit cycle.
9. An ordinance prohibiting illicit discharges in the City of Murray MS4 system is currently in effect.
10. "Let's make A Difference Day's" is a day that people can bring their waste material for proper disposal. Material such as cardboard, glass, plastic, and used motor oil can be brought to this event to ensure proper disposal. This event takes place 3 to 4 times a year.
11. Stormwater Management has a Visual Assessment Monitoring Program. 24 stormwater outfalls are monitored for many different criteria. These outfalls are thoroughly checked once a year with all visual assessments noted.
12. Stormwater Management has also selected 45 separate locations that lie within 12 of the cities sub-watershed basins to inspect for illicit discharges. These 45 sites are wet and dry screened twice a year.

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Responsible Parties | Year 1 PY 10-11 | Year 2 PY 11-12 | Year 3 PY 12-13 | Year 4 PY 13-14 | Year 5 PY 14-15 |
|---|---|---|---|---|---|---|---|---|---|
| **3. MCM3 ILLICIT DISCHARGE DETECTION & ELIMIN.** | | | | | | | | | |
| | A. Local MS4 Activities | | | | | | | | |
| (1) | Installation of "No Dumping Drains To River" street signage | 60 in place at this time 120 by permit end | All citizens | City of Murray | X | X | X | X | X |
| (2) | Distribute stormwater inserts "The Solution to Pollution" | 6400 sent out in utility bills per year or bi-annually for 5 years | Adults All Citizens | City of Murray | X | | X | | X |
| (3) | Update and enhance City of Murray website that is dedicated to stormwater | Update yearly for 5 years | Track # of visits All citizens | City of Murray | X | X | X | X | X |
| (4) | Stormwater Television Advertisements | 2 ads running, 5 times a day every day | All citizens | City of Murray | X | X | X | X | X |
| (5) | Stormwater Radio PSA's | 60 second spot, 56 spots per month for 6 months | Adult age 25 - 54 | City of Murray | X | | X | | X |
| (6) | Four Rivers Watershed Watch Basin Team | Bi-Monthly meetings 16 Test sites along Clarks River paid for by City | All Citizens Volunteers Agencies | City of Murray | X | X | X | X | X |
| (7) | Storm sewer system mapping Watershed basin studies Sub-basin studies | Entire system on hard copy Digitally mapped 8 out of 13 Map new basin each year when funded. | Location of Illicit Discharges | City of Murray | X | X | X | X | X |
| (8) | Ordinance: Prohibition of Illicit Discharges Into MS4 storm sewer system | Ordinance in place and Being enforced. | Enforcement & prevention | City of Murray | X | X | X | X | X |
| (9) | "Let's Make A Difference Day" | Quarterly 3 - 4 times per year | All citizens | City of Murray | X | X | X | X | X |

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Responsible Parties | Year 1 PY 10-11 | Year 2 PY 11-12 | Year 3 PY 12-13 | Year 4 PY 13-14 | Year 5 PY 14-15 |
|---|---|---|---|---|---|---|---|---|---|
| **3. MCM3 ILLICIT DISCHARGE DETECTION & ELIMIN.** | | | | | | | | | |
| | B. Cooperative Efforts with Murray State University | | | | | | | | |
| (1) | Murray State University Groundwater Protection Plan | Prohibition of illicit discharges of Murray State University property | Employees Students | MSU | X | X | X | X | X |

# City of Murray

***SWQMP 2018-2023***

# Section 8

## MCM 4

## Construction Site Stormwater Runoff Control

## MCM 4 Construction Site Stormwater Runoff Control

*City of Murray Requirements for MCM 4*

As a requirement of the MS4 program regulations, all communities were required to adopt ordinances or other legal mechanisms to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under State, Tribal, or local law. Sediment remains the primary cause of water quality impairments in Kentucky. Sources of sedimentation include agriculture, urban runoff, construction, and forestry. Sediment runoff rates from construction sites, however, are typically 10 to 20 times greater than those of agricultural lands, and 1,000 to 2,000 times greater than those of forest lands. The EPA fact sheet located at https://www.epa.gov/sites/production/files/2015-11/documents/fact2-6.pdf provides additional details.

MS4s shall implement and enforce a program that reduces pollutants in any stormwater runoff to the small MS4 from construction activities that disturb one acre or more, and active construction sites less than one acre in size that are part of a larger common plan of development or sale, located within the small MS4 upon issuance of this permit. Program shall include, at a minimum:

1) Enforcement of an ordinance or other regulatory mechanism to require erosion and sediment controls and sanctions to ensure compliance. Include a copy of the regulatory mechanism used to require the implementation of sediment and erosion controls on a construction site.

2) Requirements for construction site operators to implement erosion and sediment control best management practices (BMPs) that shall be as protective as Kentucky's General Permit for Stormwater Discharges Associated with Construction Activities (KYR100000).

3) Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality.

4) Establishment of authority for site-plan review which incorporates consideration of potential water-quality impacts.

5) Establishment of authority for receipt and consideration of information submitted by the public.

6) Establishment of authority for site inspections and enforcement of control measures.

7) Implement sanctions to ensure compliance (established in the ordinance or other regulatory mechanism). Procedures could include steps to identify priority sites for inspection and enforcement based on the nature and extent of the construction activity, topography, and the characteristics of soils and receiving water quality.

8) Develop procedures for the receipt and consideration of public inquiries, concerns, and information submitted regarding local construction activities. This provision is intended to further reinforce the public participation component of the MS4 stormwater program and to recognize the crucial role that the public can play in identifying instances of noncompliance.

The objective of the City of Murray concerning this measure is to reduce the impact of Construction Site Stormwater Runoff on the waters surrounding the City of Murray by using the appropriate program and BMP's to control runoff. The city's stormwater conveyance, erosion control and pollution prevention ordinance is the regulatory means of erosion and sediment controls. The ordinance also contains sanctions to ensure compliance.

Construction cannot begin within the city limits until a Notice of Intent has been filled and approved by the Division of Water. Submitted plans are reviewed to ensure that they address city requirements and address water quality. After construction begins the City of Murray Stormwater and Drainage Engineer conducts periodic site inspections to protect water quality in the area. Inspections are conducted bi-weekly. Hard copies of inspection reports are filled out at least once a month on each construction site. The city site inspector is a Certified Professional in Municipal Stormwater Management. The city works well with public inquiries and their concerns of construction within their area.

**City of Murray (Best Management Practices)**

1. Thorough procedures for site plan review will continue as a priority along with identifying potential water quality impacts. Specific sediment and erosion control BMP's must be included on construction site plans prior to approval.
2. Construction site inspections are being made once every 2 to 4 weeks. Thorough written inspections are being conducted by the city inspector at least once a month.
3. The City of Murray website will be provided with fresh material for developers and contractors concerning permit requirements that KPDES and the City of Murray has in place.
4. The city maintains a one-on-one training system for contractors operating within the city limits. This training system deals with notification concerning (NOI) Notice of Intents and (NOT) Notice of Termination for construction site submittals erosion control plans, and stormwater pollution prevention plans. Contractors are required to have trained professionals on site to inspect BMP's. Contactors operating in this area are urged to complete KEPSC training for certification.
5. Erosion and Sediment Control Workshops for contractor and other MS4's will be held by the City of Murray in the next permit cycle. Field trips to surrounding construction sites will be attempted to promote hands on training while increasing the knowledge of erosion and sediment control issues.
6. City employee erosion and sediment control training consists of multiple certifications, participation is seminars, web casts, conferences, and MS4 Workgroup meetings. These avenues further our training in erosion and sediment control, BMP implementation, and KPDES compliance measures. The city employees will continue to participate in theses trainings throughout the new permit cycle
7. The City of Murray will continue to update the stormwater management website throughout the new permit cycle. This site includes information about our Stormwater Management Plan, our stormwater conveyance and erosion control section of the ordinance, and information about all KPDES construction KYR10 permit requirements.

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Responsible Parties | Year 1 PY 10-11 | Year 2 PY 11-12 | Year 3 PY 12-13 | Year 4 PY 13-14 | Year 5 PY 14-15 |
|---|---|---|---|---|---|---|---|---|---|
| **4. MCM4 CONSTRUCTION SITE STORMWATER RUNO FF CONTROL** | | | | | | | | | |
| | A. Local MS4 Activities | | | | | | | | |
| (1) | Construction Site Plan Review which includes city Land Disturbance Permit application process. | All site plans, erosion control, SWPPP plans and LDP permit apps. reviewed | MSU Facilities Developers Contractors | City of Murray | X | X | X | X | X |
| (2) | Construction site inspections. Inventory of all sites kept and prioritized. | Bi-weekly site visits with Monthly written inspection | Developers Contractors | City of Murray | X | X | X | X | X |
| (3) | Update and enhance City of Murray website that is dedicated to stormwater | Update yearly for 5 years | Track # of visits Contractors | City of Murray | X | X | X | X | X |
| (4) | Contractor / Developer training | One-on-one with contractors Multiple sessions each year. | Developers Contractors | City of Murray | X | X | X | X | X |
| (5) | Contractor reference material | 5 - 10 copies per year | Developers Contractors | City of Murray | X | X | X | X | X |
| (6) | Erosion and Sediment Control Workshops | Bi-Annual | Employees Developers Contractors | City of Murray | | X | | X | |
| (7) | City Employee Erosion and sediment control training | MS4 workgroup meetings - 1 Conferences - 1 per year Web-casts – 12 per year | City Employees | City of Murray | X | X | X | X | X |

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Responsible Parties | Year 1 PY 10-11 | Year 2 PY 11-12 | Year 3 PY 12-13 | Year 4 PY 13-14 | Year 5 PY 14-15 |
|---|---|---|---|---|---|---|---|---|---|
| **4. MCM4 CONSTRUCTION SITE STORMWATER RUNOFF CONTROL** | | **FF CONTROL** | | | | | | | |
| | A. Cooperative efforts with Murray State University | | | | | | | | |
| (1) | City of Murray and MSU qualified inspector Contractor and employee training for MSU property construction. | All construction within city must have qualified inspector | Employees Contractors | MSU City of Murray | | X | X | X | X |

# City of Murray

***SWQMP 2018-2023***

# Section 9

## MCM 5

## Post Construction Stormwater Management

## MCM 5 Post-Construction Stormwater Management in New and Re-Development

*City of Murray Requirements for MCM5*

1) Small MS4s shall develop, implement, and enforce a program to address stormwater runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into the small MS4. The program must ensure that controls are in place that would prevent or minimize water quality impacts. Newly-designated small MS4s must complete these requirements within twenty-four (24) months from permit coverage. The program must:
    a. Include development and implementation of strategies that include a combination of structural and/or non-structural BMPs appropriate for the community;
    b. Enforcement of an ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under Kentucky and local law. Include a copy of the ordinance or other regulatory mechanism used to require the implementation of post-construction water quality BMP's on new development or redevelopment where the common plan of development or sale disturbs 1 or more acre; and
    c. Ensure adequate long-term operation and maintenance of BMPs.

2) Post-Construction Stormwater Management refers to the practices implemented to control runoff from the site after construction is complete, and includes structural and non-structural BMPs to obtain permanent stormwater management over the life of the property's use, with the goal of minimizing water quality impacts by attempting to maintain stream stability and pre-development runoff conditions. Additionally, adherence to design specifications, proper operation and maintenance of BMPs, and enforcement procedures are integral parts of stormwater management. The post-construction BMPs chosen should be site specific and take into consideration the condition of the receiving waterbody, and designed to contribute to the goal of minimizing the impact of stormwater discharges on the water quality and stability of local receiving streams.
    a. Permittees shall develop, adopt, and implement an ordinance or other regulatory mechanism that addresses post-construction stormwater runoff from new and redevelopment projects that disturb at least one acre, and projects less than one acre that are part of a larger common plan of development or sale, located within the small MS4.
    b. Current small MS4 programs should review and update, if necessary, local requirements for post- construction controls for all new and redevelopment projects. Post-construction control requirements should include an on-site stormwater runoff standard as part of the ordinance.

c. The local standard should require, in combination or alone, management measures that are designed,

built, and maintained to treat, filter, flocculate, infiltrate, screen, evapotranspire, harvest, and/or reuse stormwater runoff, or otherwise manage stormwater runoff quality. The locally-based water quality standard should specify design parameters (e.g. a design storm) for the sizing of post-construction controls that will require, at a minimum, that the 80th percentile of the annual runoff occurring in a typical year from the site is managed through water quality control practices. Additionally, the permittee should develop an appropriate water quality-based standard for redevelopment projects that reflect local community issues, including water quality impairments.

d. For those areas of development and re-development that result in a new or expanded discharge from the small MS4 to high-quality waters, the ordinance or other regulatory mechanism should include standards for runoff control that are considered sufficient to protect existing designated water uses.

3) The permittee should develop and implement project review, approval, and enforcement procedures for new development and redevelopment projects that disturb greater than one acre, and projects less than one acre that are part of a larger common plan of development or sale. Requirements for project review and approval include:

a. Procedures for the site-plan review and approval process, and a required re-approval process when changes to stormwater management measures are required.
b. Procedures for a post-construction process to demonstrate and document that post-construction stormwater measures have been installed per design specifications, including enforceable procedures for bringing noncompliant projects into compliance.

The City of Murray Engineering Department has had in place since 2001 a Stormwater Conveyance Facilities Ordinance. This section of the ordinance requires that any development within the city and its area of jurisdiction shall provide properly sized stormwater conveyance facilities and shall contain on-site, or provide off-site stormwater management facilities capable of controlling increased stormwater runoff relative to its pre-developed condition. These post-construction BMP's are vital in the reduction of stormwater runoff.

The ordinance was updated in 2014 to add water quality management and a treatment standard for water quality. All development and re-development of 1 acre or above must treat the first 0.7 inches of rainfall. As more cities try to promote green ways to help the environment, the engineering department along with our planning department have taken steps toward promoting rain gardens, alternative pavements, treatment trains and low impact development strategies that will further our program development.

Such things as brush pickups and leaf and debris pickup around the city help us keep large amounts of sediment and debris from entering our streams. Although selling this to developers has been hard, the individual residents within the city seem to be getting on board with these green ideas.

**City of Murray (Best Management Practices)**

1. All development occurring within the city and its area of jurisdiction that impervious area measures 7,500 square feet or more shall provide properly sized stormwater conveyance facilities and shall contain on-site, or provide off-site stormwater management facilities capable of controlling increased stormwater runoff relative to its pre-developed condition. No application for a preliminary of final plan of subdivision shall be approved unless it includes either a plan describing the manner in which stormwater erosion and sediment resulting from the development will be controlled or managed. No building permit shall be issued for any parcel or lot until an adequate stormwater management plan addressing sediment and erosion control has been approved by the city.
2. The City of Murray will provide and install stormwater signage "No Dumping Drains To River" throughout the community. Signs will continue to be placed at all areas to promote water quality. These signs will also be placed in all new development and re-development subdivisions and new construction areas. We have already in place 60 of these signs across the area. We hope to have at least 80 by this permits end.
3. Leaf and debris pickups have been a wonderful asset in the reduction of sediment that accumulates in our stream system. The leaf and debris pickups will continue throughout the new permit cycle with pickups of one to two times per year.
4. The city has and will continue to conduct brush pickups during the new permit cycle. All new developments are added to our route schedule. Special pickups will continue to be available.
5. Post construction and re-development water quality and conveyance structure inspections are a policy of the City of Murray and will continue through the new permit cycle. All development with either or both of these systems are inspected once per year to ensure proper function.
6. City employee stormwater management and green infrastructure training consists of seminars, web casts, conferences, and MS4 Workgroup meetings. These avenues further our training in green infrastructure, BMP implementation, and KPDES guidance. The city employees will continue to participate in theses trainings throughout the new permit cycle.
7. The City of Murray Street Sweeping Plan is in place. All streets located in new and re-developments within the city limits will be swept for sediment and road debris. This has become a vital part of our post construction management plan. Specific measures for proper removal of sweepings have been put in place. The streets of Murray are swept approximately 52 times a year.
8. The City of Murray has in place a locally derived water quality treatment standard that requires new development projects to implement controls to manage the runoff associated with 80$^{th}$ percentile storm for this area which is 0.7 inches of rainfall. This local standard requires, in combination or alone, management measure that are designed, built and maintained to treat, filter, flocculate, infiltrate, screen, evapotranspire, harvest and reuse stormwater runoff, or otherwise manage the stormwater runoff quality. The City of Murray will during this permit time frame will develop an appropriate water quality based standard for re-development projects that reflect local community issues.
9. The City of Murray requires Stormwater BMP Operation and Maintenance agreements that show ownership and maintenance responsibilities for all stormwater management

and water quality control structure BMP's during and after development. The identity of the responsible individual, corporation, association or other specific entity and the specific maintenance must be outlined on the plan and in agreement form. Stormwater detention facilities and water quality BMP's that are not maintained in proper working condition will be subject to corrective action by city forces along with appropriate fees and fines. The property owner shall be responsible for inspection and maintenance of the stormwater management and water quality control structure BMP's unless an owners association assumes responsibility.

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Responsible Parties | Year 1 PY 10-11 | Year 2 PY 11-12 | Year 3 PY 12-13 | Year 4 PY 13-14 | Year 5 PY 14-15 |
|---|---|---|---|---|---|---|---|---|---|
| **5. MCM5 POST-CONSTRUCTION STWR. MNGMT.** | | | | | | | | | |
| | A. Local MS4 Activities | | | | | | | | |
| (1) | Stormwater Conveyance Facilities | Require all new development and re-development adding 7,500 sq. ft. impervious area to control post-construction stormwater runoff | Developers Contractors | City of Murray | X | X | X | X | X |
| (2) | Installation of "No Dumping Drains To River" street signage | 60 in place at this time 120 by permit end | All citizens | City of Murray | X | X | X | X | X |
| (3) | Leaf and Debris Pickup | 1 - 2 pickups per year | All citizens | City of Murray | X | X | X | X | X |
| (4) | Brush Pickup | 1 pickup per year covers the entire city | All citizens | City of Murray | X | X | X | X | X |
| (5) | Post Construction Water Quality and conveyance structure Inspections for all developments | At least 1 inspection per year per development | Developers Contractors | City of Murray | X | X | X | X | X |
| (6) | City Employee Stormwater Management, Green infrastructure and water quality based training | 12 hours of training per year. | City Employees | City of Murray | X | X | X | X | X |
| (7) | Street Sweeping Plan | All city streets<br>All new and re-developments<br>52 times per year | All citizens<br>Developers Contractors | City of Murray | X | X | X | X | X |
| (8) | Enforce 80th percentile water quality standard for development and re-development of 1 acre or above | Site plan review and approval process for post-construction | City of Murray Engineers | City of Murray | X | X | X | X | X |

# City of Murray

*SWQMP 2018-2023*

# Section 10

## MCM 6

## Pollution Prevention and Good Housekeeping for Municipal Operations

## MCM 6 Pollution Prevention and Good Housekeeping for Municipal Operations

*City of Murray requirements for MCM6*

a. Develop and implement an operation and maintenance plan that shall include an inventory of municipally-owned facilities with the ultimate goal of preventing or reducing pollutant runoff from municipal operations into the storm sewer system.

b. Include employee training on how to incorporate pollution prevention/good housekeeping techniques into municipal operations such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, stormwater system maintenance, and green infrastructure maintenance.

c. Determine the appropriate BMPs and measurable goals for this minimum control measure.

The City of Murray Pollution Prevention and Good Housekeeping Plan is a key element of our MS4 Stormwater Quality Management Plan. The education that the city has brought to its employees is vital in keeping many pollutants from entering our storm sewer system. Inspections on vehicles are conducted weekly, while buildings and storage areas are conducted yearly to ensure proper containment and disposal of any material that might be harmful to the environment. The awareness of our employees is a very critical thing that makes for a successful program. Constant training, fleet management, and good housekeeping by municipal employees will ensure the success of this minimum control measure.

## City of Murray (Best Management Practices)

1. In house training for municipal employees will continue to be conducted on a yearly basis throughout the permit cycle. Groundwater Protection Plan inspection process is in place for all municipal operations. This inspection process is conducted by the stormwater engineer, and is integrated with existing pollution prevention and good housekeeping procedures. Inspections are conducted every year throughout every department of the city.
2. The city has developed an Operation and Maintenance Plan for municipal operations. This plan is in service at this time and is located within every department except police and fire.
3. City employee training consists of participation is seminars, web casts, conferences, and MS4 Workgroup meetings. These avenues further our training in water quality, green infrastructure, erosion and sediment control, BMP implementation, and KPDES guidance. One employees is required to have at least 12 hours of training each year. The city employees will continue to participate in theses trainings throughout the new permit cycle.
4. The City of Murray Street Sweeping Plan is in place. All streets located in new and re-developments within the city limits will be swept for sediment and road debris. This has become a vital part of our post construction management plan. Specific measures for proper removal of sweepings have been put in place. The streets of Murray are swept approximately 52 times a year.

5. Leaf and debris pickups have been a wonderful asset in the reduction of sediment that accumulates in our stream system. The leaf and debris pickups will continue throughout the new permit cycle with pickups of one to two times per year.
6. The city has and will continue to conduct brush pickups during the new permit cycle. All new developments are added to our route schedule. Special pickups will continue to be available.
7. The City of Murray plan for annual creek cleaning of trash and leafy debris has become a must for proper outfall operation. This is pursued by our stormwater and drainage engineer to ensure proper cleaning times, procedures, and debris evacuation. The cleaning is performed by the city street department employees. Creeks and outfalls are cleaned of debris throughout the year when needed.
8. The Fleet Management Program consists of weekly inspections of all city vehicles for possible fluid loss and automotive waste materials. The inspections are carried out by the initial driver of his or her vehicle. In the event any environmental hazards are detected, the employee must report the findings to the fleet supervisor for repair. There are approximately 52 inspections on each vehicle per year.

# SWQMP Measurable Goals Table

| Task | BMP- Activity Description | Measurable Goal/ Quantifiable Products | Targets/ Measures of Success | Responsible Parties | Year 1 PY 10-11 | Year 2 PY 11-12 | Year 3 PY 12-13 | Year 4 PY 13-14 | Year 5 PY 14-15 |
|---|---|---|---|---|---|---|---|---|---|
| **6. MCM6 Pollution Prevention / Good Housekeeping for Municipal Operations** | | | | | | | | | |
| | A. Local MS4 Activities | | | | | | | | |
| (1) | Municipal Stormwater Pollution Prevention Training | 15 - 25 employees per year. 1 training session per year | City Employees | City of Murray | X | X | X | X | X |
| (2) | Groundwater Protection Plan and Inspection Process | All Departments buildings are inspected yearly, (except fire and police) | City Employees | City of Murray | X | X | X | X | X |
| (3) | City Employee Erosion and sediment control training | MS4 workgroup meetings – 1, Conferences - 1 per year, Web-casts – 12to16 per year | City Employees | City of Murray | X | X | X | X | X |
| (4) | Street Sweeping Plan | All city streets All new and re-developments 52 times per year | All citizens Developers Contractors | City of Murray | X | X | X | X | X |
| (5) | Leaf and Debris Pickup | 1 - 2 pickups per year | All citizens | City of Murray | X | X | X | X | X |
| (6) | Brush Pickup | 1 pickup per year covers the entire city | All citizens | City of Murray | X | X | X | X | X |
| (7) | City of Murray Annual Creek and Outfall Cleaning | Cleaning yearly. Creeks and outfalls when needed | City Employees | City of Murray | X | X | X | X | X |
| (8) | Fleet Management | Every vehicle inspected 52 inspections per year | City Employees | City of Murray | X | X | X | X | X |
| | B. Cooperative Efforts with Murray State University | | | | | | | | |
| (1) | MSU Groundwater Protection Plan for MSU property. | All Departments inspected yearly | MSU Employees | MSU | X | X | X | X | X |

# MS4 Program Monitoring Plan

The City of Murray has developed multiple stream and outfall monitoring plans that help us evaluate the health of our streams. The city partners with the Four rivers Basin Team for the purpose of using professional and volunteer samplers to monitor streams for pollutants. 15 sites in and around the city are sampled; 13 sites sampled 3 times a year, and 2 sites sampled twice a year. The sites are sampled for E coli, turbidity, dissolved oxygen, pH, temperature, and conductivity.

The city has its own Visual Assessment Monitoring Program; (VAMP), that samples stream and outfalls throughout the city. The visual markers looked for are color of water, smell, sedimentation markers, and water surface makers such as oily sheen or foam. 25 site are screened once each year.

# Appendix 1

## References

**References:**


U.S. Census Bureau, (2000), Murray, Hazel, Calloway Co. Historical Information

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The City of Murray Comprehensive Plan

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Jackson Purchase
RC & D Foundation, (2008) Watershed Based Plan for Upper East Fork
Clarks River

# SWQMP 2018-2023

## *Certification*

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Executed on the day of October 18, 2018.

**(Title)** Mayor

**(Signature)**