

## Chapter 6

### Minimum Control Measure: Item 5

#### Post-Construction Stormwater Management in New Development and Redevelopment

##### A. Permit Requirements

##### **4.5 MCM 5. Post-Construction Stormwater Management in New Development and Redevelopment**

The MS4 Operator shall continue or develop, implement, and enforce a program to address the quality of long-term stormwater runoff from new development and redevelopment projects that disturb equal to and greater than one acre, including projects less than one acre that are part of a larger common plan of development or sale.

The MS4's program shall ensure that controls are in place that have been designed and implemented to prevent or minimize water quality impacts

**4.5.A** The MS4 Operator shall maintain and utilize an ordinance(s) or other regulatory mechanism(s) to address post-construction runoff from new development and redevelopment projects to the extent allowable under state or local law for sites equal to or greater than one acre including projects less than one acre that are part of a larger common plan of development or sale.

The MS4's program shall ensure that controls are in place that have been designed and implemented to prevent or minimize water quality impacts from stormwater, after construction.

1. If adopting a set of standards from another MS4 or other established standards, the MS4's ordinance may incorporate by reference, therefore the MS4 does not need to incorporate the entire guidance into their codes.
2. This program may be accomplished through one or multiple ordinances or regulatory mechanisms.

*See Post Construction Ordinance. This ordinance has been drafted however has never been adopted and implemented. It is goal of City staff to have this ordinance reviewed by the city attorney, adopted by the city council and implemented in 2022.*

**4.5.B** The MS4 Operator shall continue or develop a strategy to minimize water quality

impacts. This shall include a combination of structural and/or non-structural controls (BMPs) appropriate for the permittee's community.

1. Structural controls include but are not limited to; extended detention basins, grass swales, bio-retention, permeable surfaces, sand filter basins, stormwater planters, proprietary BMPs.

The ordinance or regulatory mechanism for structural post-construction controls, or water quality facilities, shall include:

a) Adoption or development of numeric or technical performance and/or design standards to control post-construction stormwater discharges.

These post-construction stormwater standards are for designing, installing, implementing, and maintaining stormwater control measures which include BMPs that infiltrate, evapo-transpire, harvest, detain, and/or reuse stormwater.

The MS4 Operator must adopt or maintain local stormwater discharge design standards that consider parameters such as site discharge volume, rate, duration, and frequency for new development and redevelopment sites with the intent to minimize the impact of stormwater runoff on water quality.

*These regulations are found within the City's Land Development Code as a part of the Technical Specifications; See Section 81 Stormwater Planning and Design, Section 82 Stormwater Runoff Calculations, Section 125 detention Facilities and Section 126 Detention design Criteria: at the following link.*

*<https://www.nixa.com/home/showpublisheddocument/1710/635954599619270000>. Starting on page 122 - 129 and page 182 - 186.*

2. Non-structural controls include but are not limited to; stream buffers, no mow zones, preservation of open spaces, tree preservation, impervious cover reduction, land use planning, and low impact development.

The ordinance(s) or regulatory mechanism(s) for non-structural Post-Construction controls, shall include:

Adoption or development of preventative actions that involve management and source controls such as, but not limited to:

- \* Policies and ordinances that provide requirements and standards to direct development to identified areas.
- \* Protection of sensitive areas such as wetlands and riparian areas.
- \* Maintain and/or increase open space (which may include a dedicated funding source for open space acquisition).
- \* Maintain requirements for buffer zones along water bodies.
- \* Require minimizing impervious surfaces.
- \* Require minimizing disturbance of soils and vegetation.
- \* Policies or ordinances that encourage infill development in higher density urban areas, and areas with existing infrastructure.
- \* Requirements for minimization of directly connected impervious areas; and
- \* Tree preservation ordinances.
- \* Other

**4.5.C** Pre-construction plan review shall be conducted by the MS4 Operator to assess site characteristics at the beginning of the construction site design phase to ensure adequate planning for stormwater program compliance. The structural or non-structural controls chosen shall; protect sensitive areas, minimize the creation of stormwater pollution, and effectively reduce stormwater pollution. This can be achieved by reasonably mimicking pre-construction runoff conditions on all affected new development projects, or the permittee may achieve this goal through a method more appropriate for its community.

1. The plan review process shall use a checklist. This may be part of the same plan review in MCM 4.
2. The plan review process shall evaluate non-structural BMP selection first, such as comprehensive plans, zoning ordinances, buffer strips, and/or maximization of open space.

*See Chapter 5, MCM 4, BMP #3, Development and Commercial Plan Review Process.*

*See Addendum MCM #4-9 Sample Departmental Plan Review Routing Sheet.*

**4.5.D** The MS4 Operator shall have methods to ensure adequate long-term operation and maintenance (O&M) of the selected BMPs, including, as appropriate, agreements

between the MS4 Operator and other parties such as post-development landowners or regional authorities.

1. Long term O&M shall be addressed during the plan review and approval process.
2. Copies of O&M manuals shall be retained by the party responsible for the post-construction BMP, and with the MS4 Operator. This may be done electronically.

*See proposed Post Construction Stormwater Ordinance.*

*We have this Post Construction Ordinance, processes and procedures drawn up; however, they have never been adopted and implemented. With a full time, City attorney on staff and a renewed push by staff toward informing administration and council to insure they understand more about these MS4 requirements, it is our goal to have this all adopted and implemented within one (1) year of this permit issuance.*

**4.5.E** The MS4 Operator shall inspect, or require inspection of, each water quality structural and non-structural water post-construction BMP according to the following at minimum:

1. A minimum of one (1) inspection shall be conducted during construction, and one (1) inspection before the site is finalized, to verify water quality facilities are built as designed and any applicable boundaries or practices for non-structural BMPs are being observed.  
This may be conducted in combination with MCM 4 inspections.
  - a) The MS4 inspector shall have access to the approved plans to ensure proper installation.
2. A minimum of once in the first three years after the installation by, the MS4 Operator.
3. Annually by the owner or operator of the post-construction BMP, or by the MS4 Operator. If completed by the BMP owner or operator, this inspection report shall be submitted to the MS4 Operator for evaluation and review.
4. The MS4 Operator shall inspect a minimum of 70% of all water quality post-construction BMPs within the five-year permit cycle of this permit.

*See proposed Post Construction Stormwater Ordinance.*

*We have this Post Construction Ordinance, processes and procedures drawn up; however, they have never been adopted and implemented. With a full time, City attorney on staff and a renewed push by staff*



*toward informing administration and council to insure they understand more about these MS4 requirements, it is our goal to have this all adopted and implemented within the first two (2) years of this permit issuance.*

**4.5.F** The MS4 Operator must maintain a plan designed to ensure compliance with the MS4's post-construction water quality regulatory mechanism. This plan shall include escalating enforcement mechanisms the MS4 Operator will use to ensure compliance.

The MS4 Operator must have the authority to initiate a range of enforcement actions to address the variability and severity of noncompliance.

1. Enforcement responses to violations must consider at minimum:
  - a) Degree and duration of the violation.
  - b) Effect the violation has on the receiving water.
  - c) Compliance history of the post-construction BMP owner or operator; and
  - d) Cooperation of the owner or operator with compliance efforts.

*See description of enforcement mechanism as outlined under item 4.5.G on the following page of this document.*

**4.5.G** Enforcement actions shall be timely in order to ensure the actions are effective. The MS4 Operator shall begin enforcement actions within thirty (30) days of discovering a violation. The MS4 Operator shall maintain a minimum of two possible sanctions. These include, but are not limited to:

1. Education regarding the BMP and verbal warnings.
2. Written warnings or notice of violation (this includes email notification);
3. Property lien; and
4. Fines.

*Once a Stormwater violation/illicit discharge issue has been discovered by Inspection discovery or, in some way brought to our attention: the procedures are the same. We make initial contact, point out the violation, explain why it's a violation and a verbal warning against creating the opportunity for this violation to reoccur. The responsible person is asked to have the violation*

*abated within 3 calendar days. If the violation abatement has not occurred within those initial 3 days, they are given a written warning to have it abated within another 3 days or they will receive a citation. If abatement of the violation has still not happened within those 3 days, a citation is issued, and depending on the overall circumstances, a citation may be issued for each day the violation is still unabated. Once the responsible party appears in court on the citation(s), along with a fine, city staff will request of the judge, to order the abatement of the violation or, order the responsible party to reimburse the city for cost of the cleanup if the city is forced to use city staff, equipment, and other resources to abate the violation.*

**4.5.H** The MS4 Operator shall maintain an inventory tracking the water quality post-construction BMPs. This inventory must contain, at a minimum:

1. Relevant contact information for the responsible person(s) or entity (e.g., tracking number, name, address, phone, etc.);
2. The type of post-construction BMP.
3. Applicable operations and maintenance documents.
4. Date the permittee approved the construction site plan; and,
5. If the water quality facility is owned or operated by the MS4, the tracking shall also include any maintenance, such as sediment clean-out or replanting.

**4.5.I** The MS4 Operator shall also track the inspections. This may be done by retaining copies of records such as inspection checklists and email correspondence. The MS4 Operator must make these inventories available to the Department upon request. The MS4 Operator shall track at a minimum:

1. Inspection dates.
2. inspectors Name.
3. Inspection findings; and,
4. Follow up actions including all enforcement actions.

*This has been and will continue to be done by retaining digital copies of all records such as inspection checklists and email correspondence, etc.*

**4.5.J Existing permittees:** Annually, shall evaluate the ordinances, permitting procedures, review procedures, inspection procedures and enforcement procedures to ensure compliance with these requirements and determine if changes are needed. Any changes necessary to be in compliance with this permit shall be completed within the first two (2) years of permit issuance.

*We have this Post Construction Ordinance, processes and procedures drawn up; however, they have never been adopted and implemented. With a new City attorney in place and a renewed push by staff toward administration and council to understand more about these MS4 requirements, it is our goal to have this all adopted and implemented within the first two (2) years of this permit issuance.*

The inventory of water quality facilities must be updated as new facilities are added and projects are completed. If the MS4 Operator needs to develop this inventory, it shall be completed within two (2) years of this permit issuance.

*As of November 2021, we do not have this list completed. However, it is the goal of the stormwater staff to have this completed within two (2) years of permit issuance.*

**4.5.K Newly regulated permittees:** Shall develop the ordinance or regulatory mechanism. Development of this program shall be completed within the first five (5) years of the permit issuance. For new permittees, the inventories of public and private post-construction water quality BMPs must be completed within two (2) years of permit issuance and then updated as new projects are permitted and projects are completed.

**4.5.L** The MS4 Operator shall provide appropriate training for MS4 inspectors at minimum once every permit cycle. This may include Green Infrastructure training, or specific operation of proprietary post-construction BMPs. The MS4 shall provide overall training to explain the function of both structural and non-structural post-construction water quality BMPs.

Unless maintained in a separate document:			
STAFF & DEPARTMENT	DATE	TOPIC(S)	TRAINING PROVIDER/METHOD
TBD	TBD	TBD	TBD

*Since the annual training date(s), exact topics and Trainer/Provider(s) for the entire permit cycle have not been determined at this time, that information will be included when preparing the annual MS4 Stormwater Management Program Report(s) for submittal to the Department annually. [See Addendum MCM #3-11 Municipal Stormwater Pollution Prevention.](#)*

Addendum MCM #3-12 One & Two Family Construction Sediment & Erosion Control.

Addendum MCM #3-13 After The Storm Training Presentation with EPA Material for past training topics.

**4.5.M** Using adaptive management, all MS4 Operators shall review, at minimum annually, their Post-Construction Site Stormwater Management in New Development and Redevelopment Program and evaluate the ordinances, review procedures, inspection procedures, enforcement procedures, and education procedures to ensure compliance with these requirements and determine if changes are needed. Any additional BMPs shall be acknowledged in the annual report.

Year being reviewed	Date of review	Reviewer(s)	Were changes made and noted above?
2021	TBD	TBD	TBD
2022	TBD	TBD	TBD
2023	TBD	TBD	TBD
2024	TBD	TBD	TBD
2025	TBD	TBD	TBD

This annual review may include but is not limited to the following.

- Reviewing the number and types of developments.
- How many BMPs were installed/inspected.
- The amount of watershed area being treated.
- The types of violations found and how frequently; and
- Evaluating how education could improve the effectiveness of the program.

*Since the annual review date(s) for MCM 5 have yet to be determined, that information will be included when preparing the annual MS4 Stormwater Management Program Report for submittal to the Department.*

**B. Benefits of a Post-Construction Stormwater Program**

Post-Construction stormwater management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly affect receiving water bodies. Studies indicate that prior planning and design for the control of pollutants, peak discharge,

disbursement, and volume in post-construction stormwater discharges is the most cost-effective approach to stormwater quality management.

There are generally two forms of substantial impacts from post-construction runoff. The first is caused by an increase in the type and quantity of pollutants in stormwater runoff. As runoff occurs over areas altered by development, it picks up harmful sediment and chemicals such as oil and grease, pesticides, heavy metals, and nutrients (e.g., nitrogen and phosphorus).

These pollutants often become suspended in runoff and are carried to receiving waters, such as lakes, ponds, and streams. Once deposited, these pollutants can enter the food chain through small aquatic life, eventually entering the tissues of fish and humans.

The second kind of post-construction runoff impact occurs by increasing the quantity of water delivered to the water body during storms. Increased impervious surfaces interrupt the natural cycle of gradual percolation of water through vegetation and soil.

Instead, water is collected from surfaces such as asphalt and concrete and routed drainage systems where large volumes of runoff quickly flow to the nearest receiving body of water. The effects of the process include stream bank scouring and downstream flooding, which often lead to a loss of aquatic life and damage to property.

### **C. Program Intent**

As with most communities, the City of Nixa's regulations and requirements for stormwater management have traditionally focused on stormwater facilities for conveyance of stormwater runoff and flood control. The city has adopted requirements for the design and construction of storm drainage systems, i.e. drainage channels and stormwater detention basins to serve new developments.

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The intent of this minimum control measure is to improve stormwater quality and reduce total stormwater amount by using structural and non-structural best management practices for proposed commercial, industrial and residential developments.

For the purposes of the stormwater management plan, we define Post-Construction Stormwater Management as a combination of non-structural and structural BMP's which control both the planning of new developments and the design, construction, operation and maintenance for *permanent* stormwater management facilities in those developments.

**Non-structural BMPs** include practices which affect stormwater quality by activities and requirements which do not include construction of stormwater facilities per se. Examples of non-structural BMP's are public education, standards for land use planning and design, etc.

The City has adopted a number of regulations and policies which are very effective non-structural BMPs with regard to water quality protection. These include:

- Comprehensive Plan
- Zoning Regulations
- Subdivision Regulations
- Floodplain Management Regulations
- Stormwater Design Standards

**Structural BMPs** (temporary and permanent) are those which result in the actual construction of a stormwater management facility. Permanent structural BMP's included riprap, concrete trickle channels, detention basins, etc., which will remain in place through the life of the development.

#### **D. Maximum Extent Practicable (MEP)**

The term Maximum Extent Practicable shall be defined as the capture of runoff from the 90<sup>th</sup> percentile rainfall for the City as well as to capture the first flush of pollutants from directly connected impervious areas. The first flush is generally considered to be the first one-half inch (1/2") of runoff. The owner/developer must submit plans, specifications, and calculations signed and sealed by a professional engineer licensed in the state of Missouri.

#### **E. Program BMPs**

##### ***BMP #1. Citizen Stormwater Advisory Committee***

**Description:** COVID UPDATE: The City of Nixa has, in the past, utilized a Citizen Stormwater Advisory Committee. This committee has historically met quarterly, to discuss MS4 stormwater pollution issues. This committee was paused in 2020 and to date in 2021 due to Covid 19 issues. Starting in the spring of 2022 the city will attempt to resume utilization of this committee in person twice annually. However, if there are still lingering Covid concerns, the meetings will be twice annually by video chat until further notice.

The City of Nixa will again develop a panel of diverse individuals to make up a Stormwater advisory committee. The city will solicit committee participation from all target groups that are potentially affected stakeholders as listed above in the “Target Groups” heading in Chapter 4 MCM #2.

*See addendum MCM #2-2, example of Stormwater Advisory Committee Application.*

Measurable Goals: In January of years 2 – 5 (2022 – 2026), the city will solicit volunteers to participate in the Stormwater committee. The City will maintain this Stormwater advisory committee annually throughout the permit term if there are enough volunteers to convene a viable committee.

An application process has been established. Interested individuals from all target groups can either go online to fill out the application or pick up a paper copy at Nixa City Hall or at either of the two Public Works Campuses. From these completed applications, City staff will make recommendations to City Council for appointment to committee.

The city will continue to record the number of attendees (whether committee member or public), an outline of topics discussed, their comments and suggestions from each meeting. Once compiled, City staff takes these comments under advisement toward updating the SWMP and the Post-Construction Plan.

The participants of the Committee are requested to meet quarterly for one year after which the city will advertise for new committee members within the target groups. Any committee member wishing to remain on the committee from year to year will be allowed to do so.

Starting in the spring of 2022 the city will resume utilization of this committee in person twice annually. However, if there are still lingering Covid concerns, the meetings will be twice annually by video chat until further notice.

Annually, each Stormwater committee member will be given the opportunity to complete an online and/or printed survey. This will allow the City to evaluate the effectiveness of this BMP.

Rational for BMP: The public can provide valuable input and assistance to a municipal Stormwater Management Program. It is imperative that the public be given every opportunity to play an active role in the development, implementation and ongoing evolution of the SWMP program as a whole. If there are no citizen volunteers available for this committee, available and qualified City staff (some of which are also citizens of Nixa) will make up this Stormwater committee.

Parties Key to Implementation: MS4 Coordinator, City Staff from various other departments, City Management, Public Information Officer.

## **BMP #2: Post-Construction Stormwater Management Ordinance**

Description: City staff has developed this ordinance to address post-Construction stormwater runoff from new development and redevelopment projects, as well as sanctions and penalties associated with non-compliance, to the extent allowable under State or local law.

Measurable Goal: The intent of this ordinance will be to meet the requirements of this permit. This draft ordinance will be submitted to the City Attorney for review and eventual approval. Once that has been completed, we will release the draft for public review and comment.

Once any changes have been made because of the public comments, staff will then send it on to City Council for review, direction and/or approval, with an anticipated implementation date of mid-2022.

*[See addendum MCM #5-3 a copy "Draft" of the Post-Construction Stormwater Management Ordinance.](#)*

Rational for BMP: Permit Requirement

Parties Key to Implementation: City Staff

## **BMP #3: Post-Construction Stormwater Management Plan**

Description: City staff has developed this Post-Construction Stormwater Management Plan, that outlines required periodic inspections of all post-construction stormwater BMPs; create an inventory list; record and track names of the responsible parties of all qualified projects.

Measurable Goal: This draft Post-Construction Stormwater Management Plan will be submitted to the City Attorney, be submitted to the City Attorney for his blessing. Once that has been completed, we will release the draft for public review and comment. Once any changes have been made because of the public comments, staff will then send it on to City Council for review, direction and/or approval, with an anticipated implementation date of mid-2022.

*[See addendum MCM #5-4 a "Draft copy of the Post-Construction Stormwater Management Plan.](#)*

The City will create an inventory list of qualifying Post-Construction BMPs. This inventory shall include:



- a. All Post-Construction BMPs that are installed to meet requirements of the NPDES Permits for stormwater discharges associated with construction activities where the projects preliminary plat was filed after January 15, 2017.
- b. The exact location of the Post Construction Stormwater Management (PCSM) BMP (e.g., street address, GPS coordinates);
- c. Information (e.g., name, address, phone number(s)) for BMP owner and entity responsible for BMP Operation and Maintenance (O&M), if different from BMP owner.
- d. The type of BMP and the year it was installed.
- e. Maintenance required for the BMP type.
- f. The actual inspection/maintenance activities for each BMP.
- g. An assessment by the permittee if proper maintenance occurred during the year and if not, what actions the permittee has taken, or shall take, to address compliance with O&M requirements. Along with this inventory, the City will develop maps, inspection procedures, enforcement procedures, and a tracking system to ensure that the requirements of the BMP are met.

Rational for BMP: To ensure adequate Operation and Maintenance (O&M) of all qualifying Post-Construction Stormwater Management BMPs.

Parties Key to Implementation: MS4 Coordinator, Stormwater committee member

#### **BMP #4: Homeowners Association (HOA) Involvement.**

Description: Develop and implement a program by which members of the City's Homeowners Associations participate in the inspection of the stormwater post-construction BMPs in their neighborhood.

Measurable Goal: Starting in year 2 (2022) and continuing in each year of permit cycle, utilizing a series of face-to-face semi-annual meetings (unless there is still a significant Covid threat, then these meeting will be held by video chat) and/or e-mail correspondence. The City hopes to encourage the various HOAs situated

around the different and diverse neighborhoods across the city, to get involved as a group, to help with the inspection and oversight of the post construction BMPs where they live. This BMP will work hand in hand with MCM 2 BMP #3 Adopt-A-Street program.

Rational for BMP: These HOA associations are likely responsible for the Operation and Maintenance of a large portion of these BMPs.

Parties Key to Implementation: City Staff, Homeowners Association members.

**F. Chapter Summary Table**

<b>BMP ID #</b>	<b>BMP</b>	<b>Activity</b>	<b>Measurable Goal</b>	<b>Due Date</b>	<b>Responsible Party</b>
1	Stormwater Advisory Committee	Solicit volunteers to participate in the Stormwater committee.	Maintain Stormwater Advisory Committee annually, as long as there are	2022 - 2026	City staff, Stormwater Advisory Committee members

			enough volunteers to convene a viable committee.		
<b>2</b>	Post-Construction Stormwater Management Ordinance	Draft ordinance to be submitted to City council for review, direction and/or approval.	Implement ordinance to address Post-Construction stormwater runoff.	Within the first two (2) years of this permit issuance.	City staff, Stormwater Advisory Committee members
<b>3</b>	Post-Construction Stormwater Management Plan	Develop and implement a Post-Construction Stormwater Management Plan	Implement Post-Construction Stormwater Management Plan	Within the first two (2) years of this permit issuance.	City staff, Stormwater Advisory Committee
<b>4</b>	Home Owners Association Involvement	Develop and implement a program where members of Home Owners Associations participate in the inspection of post-construction BMPs in their neighborhood.	Utilizing a face to face (if possible) biannual meetings and/or e-mail correspondence, the City hopes encourage participation.	2022 - 2026	City Staff, HOA members

## **PART IV- LAND DISTURBANCE, ILLICIT DISCHARGE & EROSION CONTROL**

### **Section 110 PURPOSE, GOALS AND OBJECTIVES**

A. **PURPOSE:** The purpose of this section is to protect the health, safety and general welfare of the citizens of Nixa and protect the Waters of the City and Waters of the State through the regulation to the maximum extent practicable of non-storm water discharges to the storm drainage system as required by federal and state law. This section establishes uniform requirements for land disturbance activities in order to control the introduction of pollutants into the municipal separate storm sewer system (MS4) in order to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process.

B. **GOALS AND OBJECTIVES:** The goal of the regulation is to effectively minimize erosion and discharge of sediment by application of Best Management Practices (BMP's).

This goal can be attained by meeting the following objectives:

1. Stabilize disturbed areas as soon as possible by re-establishing sod, other forms of landscaping, and completing proposed structures, pavements and storm drainage systems.
2. To regulate the contribution of pollutants to the MS4 by storm water discharges by any user.
3. To prohibit illicit connections and discharges to the MS4.
4. To establish legal authority to carry out all inspection, surveillance, monitoring, and enforcement procedures necessary to ensure compliance with this ordinance.

## Section 111 DEFINITIONS

For the purposes of this section, the following words shall have the definitions hereinafter set forth:

“Accepted” or “Acceptance” means a determination by the Director or designee that the documents under review meets the minimum applicable standards.

Authorized Enforcement Agency: City of Nixa.

Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to storm water, receiving waters, or storm water conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Clean Water Act: The federal Water Pollution Control Act (33 U.S.C. § 1251 et seq.), and any subsequent amendments thereto.

Construction Activity: Activities subject to NPDES Construction Permits. These include construction projects resulting in land disturbance of one acre or more. Such activities include but are not limited to clearing and grubbing, grading, excavating and demolition.

Director: Means the Director of Public Works of the City of Nixa, Missouri, or the Director’s authorized representative.

Discharge: means any substance disposed, deposited, spilled, poured, injected, seeped, leached, pumped, dumped, leaked, or placed by any means such that it can reasonably be expected to enter, intentionally or unintentionally, into the Waters of the City or Waters of the State, or on any area draining directly or indirectly into the MS4.

Erosion: The wearing away of land due to the action of gravity, wind, water or other mechanical forces.

Hazardous Materials: Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Discharge: Any direct or indirect non-storm water discharge to the storm drain system, except as exempted in Section 25-116 of this ordinance.

Illicit Connections: An illicit connection is defined as either of the following:

- Any drain or conveyance, whether on the surface or subsurface that allows an illegal discharge to enter the storm drain system including but not limited to any conveyances that allow any non-storm drain system and any connections to the storm drain system from indoor drains and sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved by an authorized enforcement agency or,
- Any drain or conveyance connected from a commercial or industrial land use to the storm drain system that has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Land Disturbance Permit: The document issued by Public Works approving the SWPPP and sediment erosion control plan thus authorizing land disturbance activity in accordance with the SWPPP.

Land Disturbance: Any activity that exposes soil including clearing, grubbing, grading, excavating, filling and other related activities.

MS4: Municipal Separate Storm Sewer System.

Municipal Separate Storm Sewer System (MS4): The system of conveyances (including sidewalks, roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, berms, stream beds, open fields, parking lots, impervious surfaces used for parking, man-made channels, or storm drains) owned and operated by the City of Nixa and designed or used for collecting or conveying storm water, and that is not used for collecting or conveying sewage.

National Pollutant Discharge Elimination System (NPDES) Storm Water Discharge Permit: A permit issued by EPA (or by the State of Missouri under authority delegated pursuant to 33 USC § 1342 (b)) that authorizes the discharge of pollutants to the waters of the United States, whether the permit is applicable on an individual, group or general area-wide basis.

Non-Storm Water Discharge: Any discharge to the storm drain system that is not composed entirely of storm water.

Person: Any individual, association, organization, partnership, firm, corporation or other entity recognized by law and acting as either the owner or as the owner's agent.

Pollutant: Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordinances, and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coli form and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing and building or structure; and noxious or offensive matter of any kind.

Premises: Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Responsible party: The property owner or person authorized to act on the property owner's behalf; or any person allowing, causing or contributing to a violation of the Code.

Sediment: Mineral or organic matter generated as a result of erosion.

Sediment & Erosion Control Plan: A written plan (including drawings or other graphic representations) that is designed to minimize the accelerated erosion and sediment runoff at a site during construction activities.

Storm Drainage System: Publicly-owned facilities by which storm water is collected and/or conveyed, including but not limited to any roads with drainage systems, municipal streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human-made or altered drainage channels, reservoirs, and other drainage structures.

Storm Water (stormwater): Any surface or shallow subsurface flow, runoff, or drainage consisting entirely of water from rainstorm or frozen precipitation events.

Storm Water Pollution Prevention Plan (SWPPP): A plan developed by a qualified professional engineer or person certified in erosion and sediment control to establish controls to limit erosion and transport of sediment and other pollutants from the site. The plan shall include BMPs in accordance with the City's Technical Specifications, Land Development Code and City code of ordinances.

SWPPP: Storm Water Pollution Prevention Plan.

Wastewater: Any water or other liquid, other than uncontaminated storm water, discharged from a facility.

Watercourse: Any body of water, including, but not limited to lakes, ponds, rivers, streams, and bodies of water which are delineated by the City of Nixa.

Water Quality Standards: The standards, required under the Clean Water Act, which Missouri has adopted to control and remedy water pollution (10 CSR 20-7.031). Water quality standards have three parts: water used classifications, water quality criteria, and an anti-degradation policy.



Waters of the City: Any and all rivers, streams, creeks, branches, lakes, reservoirs, ponds, sinkholes, springs, wetlands, wells and channels, and other bodies of surface or subsurface waters, natural or artificial, lying within the boundaries of the City of Nixa, Missouri.

Waters of the State: Any water, surface or underground, lying within the boundaries of the City of Nixa, Missouri over which the Missouri Department of Natural Resources has authority with respect to Clean Water Law.

### **Section 112 SCOPE AND AUTHORITY**

This section shall apply to all water entering the storm drain system generated on any developed and undeveloped lands unless specifically exempted. The provisions in this section shall be administered and enforced by the Director. The Director shall have the authority to develop and implement procedures, forms, policies, design and construction standards and interpretations for administering the provisions of this section.

### **Section 113 COMPATIBILITY WITH OTHER REGULATIONS**

This ordinance is not intended to modify or repeal any other ordinance, rule, regulation, or other provision of law. The requirements of this ordinance are in addition to the requirements of any other ordinance, rule, regulation, or other provision of law, and where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule, regulation, or other provision of law, whichever provision is more restrictive or imposes higher protective standards of human health or environment shall control.

### **Section 114 EROSION AND SEDIMENT CONTROL**

The Responsible Party shall control site erosion and the release of sediment and other pollutants resulting from land disturbance activities to the Maximum Extent Practicable (MEP) utilizing Best Management Practices (BMPs). The Responsible Party shall ensure that BMPs are designed, constructed and maintained during land disturbance activities.

## **Section 115 PERMIT REQUIRED**

A. PERMIT REQUIRED: A Land Disturbance Permit is required for all land disturbance activity affecting one (1) acre or greater, cumulatively, throughout the duration of the development. The Responsible Party shall obtain a Land Disturbance Permit from the Public Works Director prior to commencing land disturbance activity. A Land Disturbance Permit is not generally required for land disturbance activity of less than one (1) acre, cumulatively, throughout the duration of the development. However, a Land Disturbance Permit may be required if the Director determines that there is significant potential for deposition of sediment that is in violation of this section or the land disturbance activity is within close proximity to valuable resource waters. Regardless of land disturbance size, a Land Disturbance Permit is required if the land disturbance is located twenty-five feet (25') or less from the boundary of a spring, rim of a sinkhole, cave entrance, wetland, watercourse, stream buffer or one hundred (100) year FEMA identified floodplain. The Director shall provide written notice of the need for a permit to the Responsible Party or person conducting the land disturbance activities. The Responsible Party shall obtain a Land Disturbance Permit from the Public Works Department prior to commencing or resuming land disturbance activity.

B. PERMIT PROCEDURES: The following items must be received prior to issuance of a Land Disturbance Permit:

1. An approved grading, SWPPP, and sediment and erosion control plan.
2. A performance bond or other security.
3. A copy of the General Operating Permit

The submittal and approval procedure is as follows: Subdivisions, Commercial and Other Sites; The sediment and erosion control plan shall be submitted for review along with the plans for the proposed improvements: and Land Disturbance permit for subdivisions will be issued by the Director after approval of the plans for the subdivision improvements.

In addition, 10 CSR 20-6.200 requires land disturbance activities of one acre or more to obtain a Missouri State Operating Permit to discharge stormwater. The permit requires Best Management Practices sufficient to control runoff and sedimentation to protect waters of the state. Land disturbance permits may only be obtained by means of the Department of Natural Resources ePermitting system available online at [www.dnr.mo.gov/env/wpp/wpermit/help.htm](http://www.dnr.mo.gov/env/wpp/wpermit/help.htm). See [www.dnr.mo.gov/env/wpp/wtormwater/sw-land-disturb-permits.htm](http://www.dnr.mo.gov/env/wpp/wtormwater/sw-land-disturb-permits.htm) for more information.

C. PLAN REQUIREMENTS: Plans must be prepared by and bear the seal of an engineer registered to practice in the State of Missouri. Plan requirements are set forth in the Stormwater Planning and Design Section (page 123) and in this Section.

Plans will not be required in the following cases:

1. Grading associated solely with a single family residence and which is exempt from the permit requirement except as provided in Section 25-115
2. Grading or filling of less than 1 acre if located outside of allowable building areas and not located within 25 feet of a spring, sinkhole, wetland, or watercourse.

In these instances, a Land Disturbance permit can be issued following an inspection of the site by a representative of the Planning Department if it does not reveal any conditions which would warrant preparation of a detailed plan in the opinion of the Planning Department.

D. SECURITY REQUIREMENTS: Upon approval of the Land Disturbance Permit and prior to issuance of a Land Disturbance Permit, the Public Works Department shall require the developer to post a security in the form of a cash bond, cash or equivalent approved by the Director of Finance of not less than 150% of the value of all work to be done under the grading plan and SWPPP. For land disturbance permits which do not include the construction of public improvements related to subdividing land under the jurisdiction of the Subdivision Regulations, chapter 23 of the Nixa City code, or construction of permanent building or structures, under jurisdiction of the Land Development Code, chapter 23, (i.e. where only grading

work is included, such as a borrow pit or pond) the only type of security which will be accepted will be a cash bond. If the bond, letter or credit or other security document is placed in default, or the insurance is terminated or not maintained at a satisfactory level, then no further permits or approvals, including building permits, shall be issued for the developer's property located in the development for which the security was given, until the improvements are completed to the satisfaction of the City. Any portion of the deposit not expended or retained by the City hereunder shall be refunded when the land disturbance is completed and the soil and drainage conditions are stabilized to the satisfaction of the City.

### **Section 116 WORK EXEMPT FROM PERMIT**

A Land Disturbance Permit shall not be required in the following instances, provided that no change in drainage patterns or sedimentation onto adjacent properties will occur:

1. Grading of land for farming;
2. Nurseries;
3. Gardening or similar agricultural or horticultural use; and
4. Grading activities in quarries and permitted sanitary landfills.

No Land Disturbance Permit is required for the following activities, provided they are less than one (1) acre of cumulative land disturbance, are not located within twenty-five feet (25') of the boundary of a spring, rim of a sinkhole, cave entrance, wetland, watercourse, stream buffer or one hundred (100) year FEMA identified floodplain and do not cause a violation of the Missouri Clean Water Law or Water Quality Standards:

1. Grading and repair of existing roads or driveways;
2. Cleaning and routine maintenance of roadside ditches or utilities;
3. Utility construction where the width of the disturbed area for trench excavation and backfill is twenty feet (20') or less;
4. Emergency construction required to repair or replace roads, utilities, or other items affecting the general safety and well being of the public; and

5. Land disturbance for single family residences not part of an overall subdivision plan.

For emergency construction activities which would otherwise be required to obtain a permit and for which remedial construction will take more than fourteen (14) calendar days, application for the Land Disturbance Permit must be made within three (3) calendar days from the start of construction.

### **Section 117 GENERAL DESIGN GUIDELINES.**

The following items must be considered in preparing a sediment and erosion control plan.

A. TEMPORARY vs. PERMANENT CONTROLS: The greatest potential for soil erosion occurs during construction. Temporary controls are those which are provided for the purpose of controlling erosion and containing sediment until construction is completed. Temporary controls include straw or hay bale dikes, silt fences, erosion control blankets etc., which are not needed after the area is stabilized. Permanent controls consist of riprap, concrete trickle channels, detention basins, etc., which will remain in place through the life of the development. It is possible for the same facility to serve both a temporary and permanent purpose. The difference between temporary and permanent erosion control should be clearly recognized in preparing a sediment and erosion control plan.

B. SHEET FLOW vs. CONCENTRATED FLOW: In areas where runoff occurs primarily as sheet flow, containment of sediment is relatively simple. In these areas straw or hay bales, silt fences and vegetative filter areas can be very effective. Where concentrations of flow occur, containment of sediment becomes more difficult as the rate and volume of flow increases. In these areas more sophisticated controls such as sedimentation basins must be provided.

C. SLOPE: Control of erosion becomes progressively more difficult as the slope of the ground increases. Areas with steeply sloping topography, and cut and fill slopes must be given special consideration.

D. SOILS AND GEOLOGIC SETTING: Area soils and the geologic setting must be considered in preparing the plan and any special considerations deemed necessary for a particular site provided.

E. ENVIRONMENTALLY SENSITIVE AREAS: Where construction occurs within the vicinity of permanent streams, springs, sinkholes, lakes or wetland, special attention must be given to preventing discharge of sediment.

### **Section 118 DESIGN STANDARDS AND CRITERIA.**

#### **A. GRADING:**

1. Maximum Grades: Cut or fill slopes shall not exceed 3:1; 4:1 slopes are preferred where possible.
2. Maximum Height: Cut or fill slopes shall not exceed 15 feet in vertical height unless a horizontal bench area at least 5 feet in width is provided for each 15 feet in vertical height.
3. Minimum Slope: Slope in grassed areas shall not be less than 1 percent.
4. Construction Specifications: Construction for streets must comply with specifications set forth by the City of Nixa Planning Department. For all other areas, construction specifications stating requirements for stripping, materials, subgrade compaction, placement of fills, moisture and density control, preparation and maintenance of subgrade must be included or referenced on the plans, or accompanying specifications submitted.
5. Spoil Areas: Broken concrete, asphalt and other spoil materials may not be buried in fills within proposed building or pavement areas. Outside of proposed building and pavement areas, broken concrete or stone may be buried in fills, provided it is covered by a minimum of 2 feet of earth. Burying of other materials in fills is prohibited.
6. Stockpile Access: Location of proposed stockpile areas shall be outlined on the plans, and specifications for proper drainage included.

7. Borrow Areas: The proposed limits of temporary borrow areas shall be outlined in the plans and a proposed operating plan described on the grading plan. Temporary slopes in borrow areas may exceed the maximums set forth above. At the time that borrows operations are completed, the area shall be graded in accordance with the criteria set forth above, and reseeded.

## B. SEDIMENT CONTAINMENT:

1. Existing Vegetative Filter Area: Existing vegetative filter areas may be used where:

- \* Unconcentrated sheet flow occurs;
- \* An area of existing vegetation a minimum of 25 feet in width can be maintained between the area to be graded and a property line, watercourse, sinkhole, spring, wetland or classified lake;
- \* Existing ground slope is no greater than 5:1 (20 percent);
- \* The existing vegetative growth is of sufficient density and in sufficiently good condition to provide for filtration of sediment.

2. Containment areas constructed of hay or straw bales, or silt fence may be provided in areas where:

- \* Unconcentrated sheet flow occurs;
- \* An area of existing vegetation, a minimum of 25 feet in width cannot be maintained between the area to be graded and a property line, watercourse, sinkhole, spring, wetland or classified lake;
- \* Existing ground slope is no greater than 5:1 (20 percent);
- \* Concentration flow from an area no greater than 1 acre occurs and a minimum volume of 100 cubic feet per acre is contained behind the dike.

- \* Either cereal grain straw or hay may be used for bale dikes.
- \* Silt fence may be used in lieu of hay or straw bales.
- \* Straw/hay bale dikes and silt fences are temporary practices.

3. Temporary Containment Berms: Temporary containment berms may be provided for areas where concentrated flow from areas greater than 1 acre and less than 5 acres occurs. Temporary containment berms must contain a volume of 1000 cubic feet per acre of drainage area. Temporary containment berms and accumulated sediment may be completely removed after the tributary area is stabilized, and must be removed prior to final acceptance and release of escrow.

4. Sedimentation Basin: Sediment basins shall be provided for all areas where concentrated flow occurs from an area of 5 or more acres. Sediment basins shall be designed to detain the runoff from 1 inch of rainfall, for a period of at least 24 hours. Runoff shall be calculated using the methods contained in Chapter 2 of TR-55 (Reference 11), using the recommended curve number for newly graded areas from Table 2-2a.

Note: For construction sites in Nixa, an average value of runoff volume from 1 inch of rainfall is approximately 1000 cubic feet per acre, using a curve number of 90, as indicative of a Type B & C soils. This value may be used in sizing sediment basins or the runoff volume determined using the values from Figure 2-1 of TR-55.

a. Sediment basins shall be provided with: an outflow structure consisting of:

- \* A flow restriction device which provides for the required detention time,
- \* An outfall pipe sized to carry the maximum estimated outflow rate,
- \* Protective structures at the pipe outlet to prevent crushing or damage of the end of the pipe,



- \* Protective structures to prevent blockage of the pipe with debris,
- \* Erosion protection at the pipe outlet.

b. An overflow spillway capable of discharging the peak flow rate for the annual 4% annual probability (25-year) storm while maintaining a minimum freeboard of 1 foot. Overflow spillways may be sodded where the depth of flow at the crest is limited to no greater than 6" and outlet channel velocities do not exceed 5 feet per second for the minor (5- year) storm. Overflow spillways not meeting these restrictions must be constructed of riprap, concrete or other approved, non-erodible material.

### C. EROSION PROTECTION:

#### 1. Seeding and Mulching: (Also see "Seeding" in this Chapter)

a. Permanent Seeding: Permanent seeding fertilizer and mulch shall be applied at the rate set forth in Drawing G-1 or according to other specifications which are approved with the Grading Permit. Permanent seeding seasons are from March 1 to May 15, and August 15 to October 15.

b. Mulching: Where slopes are less than 4:1, cereal grain mulch is required at the rate of 100 pounds per 1000 square feet (4500 pounds per acre). Cereal grain mulch shall meet the requirements of Section 802 of the State Specifications (Reference 17) for Type 1 mulch. Where slopes are 4:1 or greater Type 3 mulch ("hydromulch") meeting the requirements of Section 802 of the State Specifications (Reference 17) shall be used.

c. Temporary Seeding: Whenever grading operations are suspended for more than 30 calendar days between permanent grass or seeding periods all disturbed areas must be reseeded with temporary cover according to Drawing G-1. Temporary seeding season runs from May 15 to November 15.

d. Overseeding: During the winter season (November 15 to March 1) temporary seed and mulch shall be placed on all completed areas or areas where grading is suspended for more than 30 days. During this period seed, mulch and soil amendments shall be applied at the following rates:

- \* Lime: 100% of specified quantity.
- \* Fertilizer: 75% of specified quantity.
- \* Seed: 50% of specified quantity.
- \* Mulch: 100% of specified quantity.
- \* Per Drawing G-1

e. Maintenance: Seeded areas must be maintained for one year following seeding.

2. Cut and Fill Slopes: Cut and fill slopes shall be protected from erosion by construction of straw bale dikes, silt fences, diversion berms, or swales along the top of the slope. Where drainage must be carried down the slopes, pipe drains, concrete flumes, riprap chutes, or other impervious areas must be provided. Suitable erosion control measures such as riprap stilling basins, must be provided at the bottom of the slope. Diversions shall be maintained until permanent growth is firmly established on the slopes.

3. Channels and Swales: Permanent channels and swales shall be provided with a stabilized invert consisting of one of the following materials:

a. Sod: Where the average velocity of flow is 5 feet per second or less and there is no base flow, the channel shall be lined with sod. The remainder of the channel slopes shall be seeded and mulched as provided above.

b. Erosion Control Blanket: Commercial erosion control blankets may be used in lieu of sod provided that samples are submitted and approved by the City Planner. The guaranteed maintenance period shall be one year.

c. Non-erosive lining: In grass channels where base flow occurs, a non-erosive low- flow channel of riprap or concrete must be provided. Low flow channels shall have a minimum capacity of 5 cubic feet per second. Other suitable non-erosive materials may be specified with approval of the City Planner. For channels which have an average velocity of 5 feet per second or greater a non- erosive lining of riprap concrete or other approved material must be provided.

4. Storm Sewer and Culvert Outlets: Erosion protection shall be provided at storm sewer and culvert outlets. Minimum erosion protection shall consist of a concrete toe wall and non-erosive lining. Flared end sections and headwalls are not required, but may be provided at the discretion of the designer to meet grading or aesthetic requirements. The required length of non- erosive lining will not be decreased where flared end sections or headwalls are provided unless calculations and data to support the decrease in length are submitted and approved. Non-erosive lining shall consist of riprap, unless otherwise specified and approved. Field stone, gabions, or Riprap shall extend to the point at which average channel velocity for the peak flow rate from the minor (5-year) storm has decreased to 5 feet per second maximum The length of riprap to be provided shall be as follows:

Average outlet velocity less than 5 feet per second:  $L = 3$  times the pipe diameter or culvert width.

Average outlet velocity less than 5-10 feet per second:  $L = 5$  times the pipe diameter or culvert width.

Average outlet velocity greater than 10 feet per second: Use MHTD standard energy dissipater headwall (Reference 17) or approved equal.

5. Curb Openings: Where drainage flows from paved areas to grass areas through curb openings erosion protection shall be provided.

6. Ditch Checks and Drop Structures: In grass channels, grades and velocities may be controlled by use of ditch checks and drop structures. Riprap ditch checks may be required in natural channels where average velocity for the peak flow rate from the minor storm exceeds 5 feet per second for post-development conditions.

7. Spillways: Erosion protection must be provided at spillways and outlet structures for detention ponds. Erosion protection shall extend to the point where flow has stabilized and average velocity in the outlet channel is 5 feet per second or less.

D. TEMPORARY VEHICLE TRACKING PAD: A minimum of one temporary vehicle tracking pad is required at each site. Additional tracking pad's may be provided if approved. The location of each tracking pad shall be shown on the plan. Only tracking pads designated on the sediment and erosion control plan may be used. Barricades shall be maintained if necessary to prevent access at other points until construction is complete. Temporary Vehicle Tracking Pad's shall be constructed of crushed limestone meeting the following specifications.

- \* Temporary vehicle tracking pad's shall be a minimum of 25 feet wide and 50 feet long.

- \* Minimum thickness of crushed limestone surface shall be 2" to 4" inch diameter rock (rocks 6" and larger shall be avoided because they can become lodged between dual tires on trucks) is to be used, with a minimum thickness of 12 inches. Additional 2 inch lifts of crushed limestone shall be added at the discretion of the City if the surface of the initial drive deteriorates or becomes too muddy to be effective.

E. CLEANING STREETS: Streets both interior and adjacent to the site shall be completely cleaned of sediment at the end of construction and prior to release of security.

F. DUST CONTROL: The contractor will be required to use water trucks to water haul roads and construction areas to minimize dust leaving the site when conditions warrant.

G. SEQUENCING AND SCHEDULING: Costs of sediment and erosion control can be minimized if proper consideration is given to sequencing and scheduling construction. Any special sequencing and scheduling considerations should be noted in the grading plan. A detailed schedule must be received from the contractor at the Pre-Construction Conference.

### **Section 119: INSPECTION**

A. By submitting a Land Disturbance permit the applicant consents to inspections of the proposed development site and all work in progress. The Director shall be allowed to enter the property of the responsible party as deemed necessary to make regular inspections.

B. A copy of the Land Disturbance permit and SWPPP must be available on site for inspection by the Director.

C. The Director shall make inspections as hereinafter required in Subsection D and shall either approve that portion of the work completed or shall notify the Responsible Party wherein the work fails to comply with the plan as approved.

D. In order to obtain required inspections, the responsible party shall notify the Director at least two (2) working days **before** the following required inspections:

1. Initial erosion and sediment control measures placement.
2. Site Clearing.
3. Rough Grading.
4. Removal or substantial modification of any erosion and sediment control measure or practice.
5. Final landscaping.

E. The Responsible Party shall provide a qualified inspector to conduct inspections on a weekly basis or within forty-eight (48) hours of a half inch (1/2") or greater rain event.

The log of such inspections shall be maintained on site and available for review by the City upon request. Prior to final acceptance of the project a copy of the inspection log must be provided to the Director for permanent record.

F. The purpose of inspections will be to determine the overall effectiveness of the SWPPP plan and shall be used to identify the need for additional control measures. The need for changes to the plan as identified by the inspections shall be provided to the Responsible Party in writing.

G. In the event work does not conform to the permit or conditions of approval or to the approved plan or to any instruction of the Director, notice to comply shall be given to the Responsible Party in writing. After a notice to comply is given, the Responsible Party shall be required to make the corrections within the time period determined by the Director. If an imminent hazard exists, the Director shall require that the corrective work begin immediately.

## **Section 120 ENFORCEMENT AND PENALTIES**

### **A. Stop-Work Order; Revocation of Permit**

1. In the event that the Responsible Party holding a Land Disturbance Permit pursuant to this ordinance violates the terms of the permit, or implements site development in such a manner as to materially adversely affect the health, safety, welfare, or safety of persons residing or working in the neighborhood or development site, the Director may suspend or revoke the Land Disturbance Permit and issue a stop-work order.

2. For the purpose of this ordinance, a stop work order is validly posted by posting a copy of the stop work order on the site of the land disturbance activity in reasonable proximity to a location where the land disturbance activity is taking place. A copy of the order, in the case of work for which there is a permit, shall be mailed to the address listed by the Responsible Party on the permit. In the case of work for which there is no permit, a copy of the order shall be mailed to the person listed as the owner of the property on the tax records of Christian County Missouri.

3. No person is permitted to continue or permit the continuance of work in an area covered by a stop work order, except work required to correct deficiencies with respect to an erosion or sediment control measure and as authorized by the Director.

4. Forty-eight (48) hours after posting a stop work order, the Director, if the conditions specified in the stop work order to resume work have not been satisfied, may issue a notice to the Responsible Party that the City of Nixa will perform work necessary to comply with this regulation. The City of Nixa may go on the land and commence work after forty-eight (48) hours from issuing the notice of intent. The costs incurred by the City of Nixa to perform this work shall be charged against the performance security.

#### B. Violation and Penalties

1. No Responsible Party, owner, or land user shall construct, enlarge, alter, repair, or maintain any grading, excavation, or fill, or cause the same to be done, contrary to or in violation of the terms of this ordinance.

2. Any Responsible Party, owner or land user violating any of the provisions of this ordinance shall be deemed guilty of a misdemeanor and upon conviction thereof, shall be fined not more than one thousand dollars (\$500.00) for each offense, and each day during which any violation of any of the provisions of this ordinance is committed, continued or permitted, shall constitute a separate offense.

3. Any waiver of a violation of this ordinance by the Director shall not be deemed or construed by the Responsible Party to constitute a waiver of any prior or succeeding violation of this ordinance.

4. The City Attorney may seek any appropriate remedy to cause the removal of such sediment including, but not limited to, an injunction, revocation proceedings or any and all permits, licenses, and termination of utility services.

## **Section 121 DISCHARGE PROHIBITIONS**

A. Prohibition of Illegal Discharges: No person shall throw, drain, or otherwise discharge, cause, or allow others under its control to throw, drain, or otherwise discharge into the MS4 any pollutants or waters containing any pollutants, other than storm water. The commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited except as described as follows:

1. The following discharges are exempt from discharge prohibitions established by this ordinance: water line flushing, landscape irrigation, diverted stream flows, rising ground waters, uncontaminated ground water infiltration, uncontaminated pumped ground water, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl spaces pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, dechlorinated swimming pool discharges, and street wash water.
2. Discharges or flow from firefighting, and other discharges specified in writing by the City of Nixa as being necessary to protect public health and safety.
3. Discharges associated with dye testing, however this activity requires a verbal notification to the City of Nixa Public Works Director prior to the time of the test.
4. The prohibition shall not apply to any non-storm water discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the United States Environmental Protection Agency (EPA), provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.



## B. Prohibition of Illicit Connections:

1. The construction, use, maintenance or continued existence of illicit connections to the storm drain system is prohibited.
2. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.
3. A person is considered to be in violation of this ordinance if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.
4. Improper connections in violation of this ordinance must be disconnected and redirected, if necessary, to an approved onsite wastewater management system or the sanitary sewer system upon approval of the City of Nixa.
5. Any drain or conveyance that has not been documented in plans, maps or equivalent, and which may be connected to the storm sewer system, shall be located by the owner or occupant of that property upon receipt of written notice of violation from the City of Nixa Public Works Director requiring that such locating be completed. Such notice will specify a reasonable time period within which the location of the drain or conveyance is to be determined, that the drain or conveyance be identified as storm sewer, sanitary sewer or other, and that the outfall location or point of connection to the storm sewer system, sanitary sewer system or other discharge point be identified. Results of these investigations are to be documented and provided to the City of Nixa Public Works Director.

## **Section 81. Stormwater Planning and Design:**

A. STORMWATER MANAGEMENT GOALS: In order to ensure protection of the general health and welfare of the citizens of the City of Nixa, planning and design of stormwater management measures shall meet the following:

1. Prevent damage to residential dwellings and other building structures from flood waters.
2. Maintain emergency vehicle access to all areas during periods of high water.
3. Prevent damage to roads, bridges, utilities, and other valuable components of the community's infrastructure from damage due to flood waters and erosion.
4. Prevent degradation of surface and ground water quality from stormwater runoff; preserve and protect quality of the environment; and promote conservation of the City's natural resources.
5. Minimize flood water and erosion damage to lawns, recreational facilities, and other outdoor improvements.
6. Minimize traffic hazards from runoff carried in streets and roads.
7. Comply with applicable State and Federal laws and regulations.
8. Meet the foregoing goals in a manner which is cost effective and which minimizes the cost of housing and development while encouraging sound development.
9. Encourage innovative and cost effective planning and design of stormwater management facilities.
10. Encourage multiple purpose design of stormwater management facilities, to provide opportunities for recreational use, and other benefits to the community wherever possible.

The standards and criteria set forth herein provide the minimum standards for planning and design of stormwater facilities. Where a particular plan or design may be found to be in conflict with a specific standard, achievement of the goals set forth above will have precedence.

B. GENERAL PLANNING AND DESIGN PRINCIPLES: The City of Nixa recognizes that stormwater management is an important component of overall land use planning.

The City of Nixa further recognizes that proper stormwater planning significantly reduces the long term costs to the community both in terms of infrastructure cost and property losses due to flood damage. It is much more cost effective to prevent flood damage by proper design and construction, than to repair and remediate problems which have occurred through poor planning and design.

The following general principles must be followed in preparing the grading and storm drainage plans for all development sites.

1. Recognize the existing drainage systems. The storm drainage system differs from other utility systems in very important ways:
  - a. There is an existing natural drainage system.
  - b. It is only needed when runoff occurs.
  - c. The capacity of the system varies greatly depending on the amount of rains.
  - d. The system does not have to be constructed of man-made components in order to function.

Because of these characteristics, there has been a historic inclination for fragmented planning and design of storm drainage facilities. Proper planning of storm drainage facilities must begin with the recognition of the existing system, and include necessary provisions for preserving or altering the existing system to meet the needs of proposed development or construction. Methods of delineating existing watercourses are outlined under Stormwater Runoff Calculations.

2. Allow for increase in runoff rates due to future urbanization: As areas urbanize, peak rates of runoff increase significantly. The City of Nixa may require temporary detention and storage of increased volumes of urban runoff in order to minimize increases in flow rates as urbanization occurs. However, the cumulative effects of on-site detention are difficult to predict and control, and development of comprehensive basin-wide runoff models to determine these effects does not appear likely in the foreseeable future.

For this reason, design of storm drainage improvements must be based upon the assumption of fully urbanized conditions in the area under consideration. No reduction allowed in peak flow rates due to detention, unless an approved runoff model has been developed for the drainage basin under consideration. Any detention storage facilities, whose effects are considered, must be located within approved drainage easements.

3. Provide for acceptance of runoff from upstream drainage areas: It is critical that provisions must be made to receive runoff from upstream drainage areas. Drainage easements or public right-of-way must extend to a point where the upstream drainage area is no greater than 5 acres. Drainage easements or public right-of-way must extend to the point where existing watercourses enter the site. Where the upstream drainage area is 5 acres or greater, but does not discharge onto the site through a defined watercourse, the drainage easement shall extend to the point of lowest elevation.

4. Provide a means to convey runoff across the site: Stormwater shall be conveyed across the site in a system of overland drainageways and storm sewers. Overland drainageways consists of streets, open channels, swales, and overland flow within drainage easements.

5. Discharge of runoff to downstream properties: Concentrated runoff shall be discharged only into existing watercourses, drainage easements, or public road rights-of-way. Where none of these exist, a drainage easement which extends to the nearest watercourse, drainage easement or public road right-of-way must be obtained from the downstream property owner, and proper provisions made for conveyance of the peak flow from the 4 percent Annual Probability storm within the drainage easement.

One of the typical results of urbanization is that diffuse surface flow or "sheet flow" is replaced with concentrated points of discharge. Where concentrated flows are discharged to downstream properties proper provisions must be made to:

- a. Allow the flow to spread over the same area as would have occurred for the same rate of flow prior to the development, and
- b. Reduce the rate of velocity to rates at least equal to the predevelopment values at the same rate of flow.

6. Assess potential downstream flooding problems: It is important that a determination be made of conditions in the watershed downstream of each development site to determine whether there are existing structures which are subject to an unacceptable flooding hazard (10 percent annual probability or greater).

If areas having an unacceptable flooding hazard occur downstream of a development site, either on-site detention for peak flow control, or mutually agreed off-site improvements will be required, as set forth in Part V Detention.

7. Assess potential water quality impacts on receiving water: Sediment, erosion and other water quality controls are required as set forth in the Detention Section.

8. Provide for operation and maintenance of drainage facilities.

C. THE MAJOR-MINOR STORM APPROACH: The amount of water that the storm drainage system must carry varies greatly depending upon the amount of precipitation which may occur. The degree of flooding protection desired and the cost of providing that level of protection must be balanced against the risk and potential costs to life and property. The City of Nixa recognizes that it is neither cost effective nor necessary to require construction of a conveyance system for large infrequent floods in all cases.

Design of storm drainage systems can be made much more cost effective while providing desired levels of property protection by taking a major-minor storm approach to design of drainage facilities.

1. Major storm: The major storm is defined as a storm with an annual probability of 4 percent (a "25-year storm"). The combination of all overland and underground conveyance systems shall have sufficient capacity to convey the peak flow from the major storm without resulting in flooding of any new building structures, and without exceeding maximum flooding depths in streets necessary to allow passage of emergency vehicles.

It is recommended that the floor elevations of all new structures be located at least 1 foot above the estimated high water elevation resulting from the peak flow from the 4 percent annual probability storm.

2. Minor storm: The minor storm is defined as a storm with an annual probability of 20 percent (a "5-year storm"). Inlets and storm sewers must have sufficient capacity to maintain acceptable flooding depths in street and road rights-of-way during the minor storm as required in "Drainage of Streets & Roadway" Section.

D. DRAINAGE EASEMENTS: All areas subject to inundation during the major storm must be included in drainage easements, Specific standards for drainage easements to be provided for storm sewers, open channels, and detention facilities are set forth under Storm Sewers; Open Channels; and Detention Facilities respectively.

## Section 82. Storm Water Runoff Calculations.

This section outlines acceptable methods of determining storm water runoff.

A. GENERAL GUIDELINES: For watersheds with a total tributary area less than 200 acres and a one percent annual probability fully developed discharge less than 300 cfs, the design storm runoff may be analyzed using the rational formula. For watersheds with a total tributary area greater than 200 acres or with a one percent annual probability fully developed discharge greater than 300 cfs, the design storm runoff shall be analyzed using an approved hydrographic method.

B. RATIONAL FORMULA: The rational formula, when properly understood and applied, can produce satisfactory results for urban storm sewer design. The rational formula is as follows:

$$Q = CIA$$

Where: Q = Peak discharge in cubic feet per second

C = Runoff coefficient which is the ratio of the maximum rate of runoff from the area to the average rate of rainfall intensity for the time of concentration.

I = Average rainfall intensity in inches per hour for a duration equal to the time of concentration.

A = Contributing watershed area in acres.

The basic assumptions made when applying the rational formula are:

1. The rainfall intensity is uniform over the basin during the entire storm duration
2. The maximum runoff rate occurs when the rainfall lasts as long or longer than the basin time of concentration.
3. Runoff response characteristics are relatively uniform over the entire basin.
4. The time of concentration is the time required for the runoff from the most hydraulically remote part of the basin to reach the point of interest.

The drainage basin should be divided into sub-basins of a size where all of the basic assumptions apply.

### C. TIME OF CONCENTRATION:

Time of concentration,  $t_c$ , is calculated by:

$t_c$  =  $t_i$  where  
 $t_i$  = initial, inlet or overland flow times in minutes,  
 $t_t$  = shallow channel and open channel flow time in minutes

Overland flow (sheet flow) time shall be calculated as:

$$t_i = \frac{(n \times L)^{0.8}}{4.64 \times S^{0.4}} \quad \text{where}$$

$t_i$  = initial, inlet or overland flow times in minutes,  
 $n$  = Manning's n for sheet flow (from the following table)  
 $L$  = Overland flow length in feet, (maximum 300 feet)  
 $S$  = Slope of feet per foot  
 Roughness coefficients (Manning's n for sheet flow)

#### D. SURFACE DESCRIPTION:

Smooth surfaces (concrete, asphalt, gravel or bare soil).....	0.011
Fallow (no residue).....	0.05
Cultivated soils:	
Residue cover less than or equal to 20 percent.....	0.06
Residue cover greater than or equal to 20 percent.....	0.10
Grass:	
Short grass prairie.....	0.15
Dense Grasses*.....	0.24
Bermuda Grass.....	0.41
Range (natural).....	0.13
Woods: **	
Light underbrush.....	0.40
Dense underbrush.....	0.80

\* Includes species such as weeping lovegrass, blue grass, buffalo grass, glue grama grass and native grass mixtures.

\*\* When selecting n, consider cover to a height of about 0.1 feet. This is the only part of the plant cover that will obstruct sheet flow.

Shallow channel velocities may be estimated from Figure 3-1 in Reference 11.

Open channel flow velocities may be estimated from Manning's equation. Open channel velocities are generally estimated under bank full conditions.



The basin time of concentration calculation techniques are described in detail in TR-55, Chapter 3 (Reference 11).

#### E. HYDROGRAPHIC METHODS:

Methodologies. The most common hydrographic techniques are those developed by Corps of Engineers and the Soil Conservation Service. These methods are preferred; however other proven techniques will be accepted.

The Corps of Engineers HEC-1 Flood Hydrographic Package (Reference 18) and Soil Conservation Service TR-55 computer models (Reference 11) are the preferred runoff models. Other models may be used with approval from the City Planner.

The runoff model must include the entire drainage basin upstream of the proposed development. The model shall be prepared in sufficient detail to ensure that peak runoff rates are reasonably accurate.

The runoff model shall be developed for the following cases:

Case 1: Existing conditions in the drainage basin prior to development of the applicant's property.

Case 2: Existing conditions in the drainage basin with developed conditions on the applicant's property.

Case 3: Fully developed conditions in the entire drainage basin.

F. RAINFALL: Rainfall depth-duration-frequency and intensity-duration-frequency curves for the Nixa area are included in the Standard Drawing Section of this document. The design rainfall intensities were developed from the U.S. Department of Commerce, National Weather Service, Technical Paper 40 (Reference 19) and the National Oceanic and Atmospheric Administration Publication "HYDRO-35" (Reference 9).

Rainfall shall be distributed in time using the SCS Type II distribution (Reference 11) or the Pilgrim-Cordery Distribution adapted to local rainfall data (References 20 and 21) as shown in the following table. Other distributions may be used upon approval from the City Planner.

# PILGRIM-CORDERY METHOD SYNTHETIC RAINFALL MASS CURVES

Cumulative  
Fraction of

Storm Duration Cumulative Fraction of Storm Duration

	1-Hour	2-Hour	3-Hour	4-hour	6-Hour
.00	.00	.00	.00	.00	.00
.05	.03	.03	.03	.02	.05
.10	.07	.05	.05	.03	.09
.15	.11	.10	.06	.05	.14
.20	.14	.17	.09	.06	.20
.25	.17	.22	.11	.08	.28
.30	.23	.25	.13	.14	.35
.35	.29	.27	.19	.20	.41
.40	.35	.29	.31	.27	.43
.45	.41	.30	.39	.33	.46
.50	.47	.31	.44	.38	.49

## **Section 122 POST-CONSTRUCTION STORMWATER MANAGEMENT**

122-1 AUTHORITY.

122-2 FINDINGS OF FACT.

122-3 PURPOSE AND INTENT.

122-4 APPLICABILITY AND JURISDICTION.

122-5 TECHNICAL STANDARDS AND DESIGN METHODS.

122-6 PERFORMANCE STANDARDS.

122-7 PERMITTING REQUIREMENTS, PROCEDURES AND FEES.

122-8 STORMWATER MANAGEMENT PLAN.

122-9 MAINTENANCE AGREEMENT.

122-10 FINANCIAL GUARANTEE.

122-11 FEE SCHEDULE.

122-12 ENFORCEMENT; VIOLATIONS AND PENALTIES.

122-13 APPEALS.

122-14 SEVERABILITY.

122-15 EFFECTIVE DATE.

**Section 122-1 AUTHORITY.**

**A.** This section (122) is adopted by the City of Nixa (heretofore known as the City), the Governing body deemed the Authority Having Jurisdiction (AHJ).

**B.** The provisions of this section are deemed not to limit any other lawful regulatory powers of the same governing body.

**C.** This City hereby designates the Director of Public Works of the City of Nixa, or the Director’s authorized representative to enforce the provisions of this section, herein after referred to as the “Director”.

**D.** The requirements of this section do not preempt more stringent stormwater management requirements that may be imposed by the following:

**(1)** Missouri Department of Natural Resources administrative rules, permits or as authorized under State Statute.

**(2)** Environmental Protection Agency regulations

**Section 122-2 FINDINGS OF FACT.**

The city finds that uncontrolled, post-construction runoff has a significant impact upon water resources and the health, safety and general welfare of the community and diminishes the public enjoyment and use of natural resources. Specifically, uncontrolled post-construction runoff can:

**A.** Degrade physical stream habitat by increasing stream bank erosion, increasing streambed scour, diminishing groundwater recharge, diminishing stream base flows, and increasing stream temperature.

**B.** Diminish the capacity of lakes and streams to support fish, aquatic life, recreational and water supply uses by increasing pollutant loading of sediment, suspended solids, nutrients, heavy metals, bacteria, pathogens, and other urban pollutants.

**C.** Reduce the quality of groundwater by increasing pollutant loading.

**D.** Threaten public health, safety, property, and general welfare by overtaxing the storm drainage system.

**E.** Threaten public health, safety, property, and general welfare by increasing major flood peaks and volumes.

**F.** Undermine floodplain management efforts by increasing the incidence frequency and levels of flooding.

### **Section 122-3 PURPOSE AND INTENT.**

**A. Purpose.** The general purpose of this section is to establish long-term post-construction runoff management requirements that will diminish the threats to public health, safety, welfare, and the aquatic environment. Specific purposes are to:

**(1)** Further the maintenance of safe and healthful conditions.

**(2)** Prevent and control the adverse effects of stormwater; prevent and control soil erosion; prevent and control water pollution; protect fish and aquatic life; control building sites, placement of structures and land uses; preserve ground cover and scenic beauty; and promote sound economic growth.

**(3)** Control the safe capacity of existing storm drainage facilities and receiving water bodies; prevent undue channel erosion; control increases in the scouring and transportation of particulate matter; and prevent conditions that endanger downstream property.

**B. Intent.** It is the intent of the city that this section regulates post-construction stormwater discharges to waters of the city and the State.

The preferred method of achieving the stormwater performance standards set forth in this section is through the preparation and implementation of comprehensive, systems-level Post Construction Stormwater Management Plans that cover hydrologic units, such as watersheds, on a municipal and regional scale.

Such plans may prescribe regional stormwater devices, practices, or systems, any of which may be designed to treat runoff from more than one site prior to discharge to waters of the state. It is the intent of this section that the approved plan be used to identify Post-Construction Stormwater Management Practices (PCBMPs) acceptable for the community.

## **Section 122-4 APPLICABILITY AND JURISDICTION.**

### **A. Applicability.**

- (1)** Where not otherwise limited by law, this section applies after final stabilization to a site of land disturbance construction activities of one or more acres of land disturbance.
- (2)** A site that meets any of the criteria in this subsection is exempt from the requirements of this section:
  - (a)** A redevelopment post-construction site with no increase in impervious surface.
  - (b)** Nonpoint discharges from agricultural facilities and practices.
  - (c)** Emergency maintenance/repair of any underground utility such as water, sewer, electric, cable, fiber optic, etc. whether City owned or owned by a private utility.
- (3)** Notwithstanding the applicability requirements in Subsection **A (1)**, this section applies to post-construction sites of any size that, in the opinion of the Director, is likely to result in runoff that exceeds the safe capacity of the existing storm drainage facilities or receiving body of water; that causes undue channel erosion, that increases water pollution by scouring or the transportation of particulate matter or that endangers property or public safety.

**B. Jurisdiction.** This section applies to post-construction sites within the corporate City boundaries and jurisdiction of the City of Nixa, Missouri.

**C. Exclusions.** This section is not applicable to activities conducted by a Missouri state agency or federal agency.

### **Section 122-5 TECHNICAL STANDARDS AND DESIGN METHODS.**

**A. Design criteria, standards, and specifications.** All Post Construction Best Management Practices required to comply with this section shall incorporate technical standards and design methods specified in the City's Technical Specification Manual, and the City's MS4 Stormwater Management Plan.

**B.** Where not superseded by stricter requirements in the City's, Erosion Control and Stormwater Management Requirements, the following standards are also incorporated for reference:

(1) Design guidance and technical standards identified or developed by the Missouri Department of Natural Resources.

(3) Other standards. Other technical standards not already identified may be used, provided that the methods have been approved by the Director.

### **Section 122-6 PERFORMANCE STANDARDS.**

**A. Responsible party.** The entity holding title to the property shall be responsible for either developing and implementing a post-construction stormwater management plan or causing such plan to be developed and implemented through contract or other agreement. This plan shall be developed in accordance with 122-8, which incorporates the requirements of this section.

**B. Plan.** A written Post Construction Stormwater Management Plan in accordance with 122-8 shall be developed and implemented for each post-construction site.

**C. Stormwater management performance standards.** All PCBMP(s) are required to comply with this section shall meet performance standards specified in this ordinance, the City's Technical Specification Manual, the City's MS4 Stormwater Management Plan, and/or the Best Management Practices (BMP) Manual for Land Disturbance Activities (2016).

#### **D. Location and regional treatment option.**

**(1)** Post Construction Stormwater management facilities required to meet this section may be located on-site or off-site as part of a regional stormwater device, practice, or system.

**(2)** The Director may approve off-site management measures, provided that all of the following conditions are met:

**(a)** The Director determines that the post-construction runoff is covered by a post construction stormwater management plan that is approved by the city and that contains BMP requirements consistent with the purpose and intent of this section.

**(b)** The off-site facility meets all of the following conditions:

**[1]** The facility will be in place before the need for the facility arises as a result of on-site construction activities.

**[2]** The facility is designed and adequately sized to provide a level of stormwater control equal to or greater than that which would be afforded by on-site practices meeting the performance standards of this section.

**[3]** The facility has a legally obligated entity responsible for its long-term operation and maintenance.

**[4]** Where a regional treatment option exists such that the Director may exempt the applicant from all or part of the minimum on-site stormwater management requirements, the applicant shall be required to pay a fee in an amount determined by approved formula. In determining the fee for post-construction runoff, the Director shall consider an equitable distribution of the cost for land, engineering design, construction, and maintenance of the regional treatment option.



## **Section 122-7 PERMITTING REQUIREMENTS AND PROCEDURES.**

**A. Permit required.** No person(s) may undertake a land-disturbing construction activity without first obtaining a MODNR General Operating Permit and a City of Nixa Land Disturbance Permit.

**B. Permit application.** Unless specifically excluded by this section, any responsible party desiring a City Land Disturbance Permit(s) shall submit to the Director a permit application(s) made on a form provided by the City for that purpose.

**(1)** Unless otherwise excepted by this section, a permit application must be accompanied by a Post Construction Stormwater Management Plan and a Post Construction Maintenance Agreement (where required).

**(2)** The Post Construction Stormwater Management Plan shall be prepared to meet the requirements of 122-6 and 122-8, the Post Construction Maintenance Agreement shall be prepared to meet the requirements of 122-9 and the financial guarantee shall meet the requirements of 122-10.

**C. Review and approval of permit application.** The Director shall review any permit application that is submitted with a Post Construction Stormwater Management Plan and a Post Construction Maintenance Agreement. The following approval procedure shall be used:

**(1)** The Director may request additional information if required for a complete application. Upon receipt of a complete permit application, including all items as required by Subsection **B**, the Director of Public Works shall inform the applicant whether the application, plan and maintenance agreement are approved or disapproved based on the requirements of this section.

**(2)** If the post-construction stormwater permit application, plan, and maintenance agreement are approved, the Director shall issue the permit.

**(3)** If the stormwater permit application, plan, or maintenance agreement is disapproved, the Director shall detail in writing the reasons for disapproval.

**(4)** The Director may request additional information from the applicant. Upon receipt and review of the additional information, the applicant shall be informed that the plan and maintenance agreement are either approved or disapproved.

**(5)** Prior to commencing the land development activity, the project may be subject to additional approvals as required by City ordinance.

**D. Permit requirements.** All permits issued under this section shall be subject to the following conditions, and holders of permits issued under this section shall be deemed to have accepted these conditions. The Director may suspend or revoke a permit for violation of a permit condition, following written notification of the responsible party. An action by the Director to suspend or revoke this permit may be appealed in accordance with 122-13.

**(1)** Compliance with this permit does not relieve the responsible party of the responsibility to comply with other applicable federal, state, and local laws and regulations.

**(2)** The responsible party shall design and install all structural and nonstructural stormwater best management practices in accordance with the approved Post Construction Stormwater Management Plan and this permit.

**(3)** The responsible party shall notify the Director at least two business days before commencing any work in conjunction with the Post Construction Stormwater Management Plan, and within three business days upon completion of the installation of all stormwater BMPs.

If required as a special condition under Subsection E, the responsible party shall make additional notification according to a schedule set forth in the permit so that BMP installations can be inspected during construction.

**(4)** Completed BMPs must pass a final inspection to determine if they are in compliance with the approved Post Construction Stormwater Management Plan and this section. Inspection results shall be provided in writing. If any

changes are required, inspection results shall identify the changes required to bring the BMP into compliance with the conditions of this permit.

**(5)** The responsible party shall notify the city of any significant modifications they intend to make to an approved Post Construction Stormwater Management Plan. The city may require that the proposed modifications be submitted for approval prior to incorporation into the Post Construction Stormwater Management Plan and execution by the responsible party.

**(6)** The responsible party shall maintain all stormwater BMPs in accordance with the Post Construction Stormwater Management Plan until the practices either become the responsibility of the city or are transferred to subsequent private owners as specified in the approved maintenance agreement.

**(7)** If so instructed by the Director, the responsible party shall repair, at their own expense, all damage to adjoining municipal facilities and drainage ways caused by runoff; where such damage is caused by activities that are not in compliance with the approved Post Construction Stormwater Management Plan.

**(8)** The responsible party shall permit property access to the Director for the purpose of inspecting the property for compliance with the approved Post Construction Stormwater Management Plan and this permit.

**(9)** Where site development or redevelopment involves increases in peak rate and/or total volume of runoff from a site, the Director may require the responsible party to make appropriate legal arrangements with affected property owners concerning the prevention of endangerment to property or public safety.

**(10)** The responsible party is subject to the enforcement actions and penalties detailed in 122-12, if the responsible party fails to comply with the terms of this permit.

**E. Permit conditions.** Permits issued under this subsection may include conditions established by the Director in addition to the requirements needed to meet the performance standards in 122-6 or a financial guarantee as provided for in 122-10.

**F. Permit duration.** Permits issued under this section shall be valid from the date of issuance through the date the Director notifies the responsible party that all stormwater BMPs have passed the final inspection required under Subsection **D (4)**. The permit shall be invalid if work is not commenced within 6 months of permit issuance.

### **Section 122-8 POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN.**

**A. Plan requirements.** A Post Construction Stormwater Management Plan shall be prepared and submitted to the Director. The Post Construction Stormwater Management Plan shall include, at a minimum: information required in the City's Technical Specifications Manual, previous sections of this Land Disturbance, Illicit Discharge & Erosion Control ordinance, the City's MS4 Stormwater Management Plan Requirements and a Stormwater Pollution Prevention Plan (SWPPP).

**B. Alternate requirements.** The Director may prescribe alternative submittal requirements for applicants seeking an exemption to on-site stormwater management performance standards under 122-6E.

### **Section 122-9 POST CONSTRUCTION MAINTENANCE AGREEMENT.**

**A. Maintenance agreement required.** The maintenance agreement required under 122-7B for stormwater BMPs shall be an agreement between the city and the responsible party to provide for maintenance of stormwater BMPs beyond the duration period of this permit.

The maintenance agreement shall be filed with the Christian County Recorder of Deeds as a property deed restriction so that it is binding upon all subsequent owners of the land served by the stormwater BMPs.

**B. Agreement provisions.** The maintenance agreement shall contain the following information and provisions and be consistent with the maintenance plan required by 122-7B:

- (1)** Identification of the stormwater facilities and designation of the drainage area served by the facilities.
- (2)** A schedule for regular maintenance of each aspect of the stormwater management system consistent with the Post Construction Stormwater Management Plan required under 122-6b.
- (3)** Identification of the responsible party(s), responsible for long-term maintenance of the stormwater BMPs identified in the Post Construction Stormwater Management Plan required under 122-6B.
- (4)** Requirement that the responsible party(s), shall maintain stormwater BMPs in accordance with the schedule included in Subsection **B (2)**.
- (5)** Authorization for the Director to access the property to conduct inspections of Post Construction Stormwater Best Management Practices as necessary to ascertain that the practices are being maintained and operated in accordance with the agreement.
- (6)** A requirement of the Director to maintain public records, the results of the site inspections, to inform the responsible party responsible for maintenance of the inspection results, and to specifically indicate any corrective actions required to bring the stormwater BMPs into proper working condition.
- (7)** Agreement that the party designated under Subsection **B (3)**, as responsible for long-term maintenance of the stormwater BMPs, shall be notified by the Director, of maintenance problems which require corrective action.
- (8)** Authorization of the Director to perform the corrected actions identified in the inspection report if the responsible party designated under Subsection **B (3)** does not make the required corrections in the specified time period.

## **Section 122-10 FINANCIAL GUARANTEE.**

**A. Establishment of the guarantee.** The City may require the submittal of a financial guarantee, **the form and type of which shall be acceptable to the Director. The financial guarantee shall be in an amount determined by the City to be the estimated cost of construction and the estimated cost of maintenance of the stormwater BMPs during the period which the designated party in the maintenance agreement has maintenance responsibility.**

The financial guarantee shall give the Director the authorization to use the funds to complete the stormwater BMPs if the responsible party defaults or does not properly implement the approved Post Construction Stormwater Management Plan, upon written notice to the responsible party by the Director that the requirements of this section have not been met.

**B. Conditions for release.** Conditions for the release of the financial guarantee are as follows:

**(1)** The City shall release the portion of the financial guarantee established under this section, less any costs incurred by the City to complete installation of practices as required by the approved Post Construction Stormwater Management Plan.

**(2)** The City shall release the portion of the financial guarantee established under this section to assure maintenance of stormwater BMPs, less any costs incurred by the City, at such time that the responsibility for BMP maintenance is passed on to another entity via an approved maintenance agreement.

## **Section 122-11 FEE SCHEDULE.**

**The fees referred to in other portions of this section shall be established by the City and may from time to time be modified as needed. A schedule of the fees established and approved by City council shall be available for review at the Public Works Offices and on-line at [www.nixa.com](http://www.nixa.com).**

## **Section 122-12 ENFORCEMENT: VIOLATIONS AND PENALTIES.**

**A.** Any land-disturbing construction activity or post-construction runoff initiated after the effective date of this section by any person, firm, association, or corporation subject to the section provisions shall be deemed a violation unless conducted in accordance with the requirements of this section.

**B.** The Director shall notify the responsible party by certified mail of any noncomplying land-disturbing construction activity or post-construction runoff. The notice shall describe the nature of the violation, remedial actions needed, a schedule for remedial action, and additional enforcement action which may be taken.

**C.** Upon receipt of written notification from the Director under Subsection **B**, the responsible party shall correct work that does not comply with the Post Construction Stormwater Management Plan or other provisions of this ordinance. The responsible party shall make corrections as necessary to meet the specifications and schedule set forth by the Director in the notice.

**D.** If the violations of a permit issued pursuant to this section are likely to result in damage to properties, public facilities, or waters of the state, the Director may enter the land and take emergency actions necessary to prevent such damage. The costs incurred by the City, plus interest and legal costs, shall be billed to the responsible party.

**E.** The Director is authorized to post a stop-work order on all land-disturbing construction activity that is in violation of this chapter.

**F.** The Director may revoke a permit issued under this section for noncompliance with chapter provisions.

**G.** Any permit revocation, stop-work order, or cease-and-desist order shall remain in effect unless retracted by the Director or until such time that all noted corrections have been made and approved.

**H.** The Director is authorized to refer any violation of this section, or of a stop-work order or cease-and-desist order issued pursuant to this section, to the City Attorney for the commencement of further legal proceedings.

**I.** Any person, firm, association, or corporation who does not comply with the provisions of this section shall be subject to citation, each day that the violation exists shall constitute a separate offense.

**J.** When the Director determines that the holder of a permit issued pursuant to this section has failed to follow practices set forth in the approved Post Construction Stormwater Management Plan, or has failed to comply with schedules set forth in said Post Construction Stormwater Management Plan, the Director may enter upon the land and perform the work or other operations necessary to bring the condition of said lands into conformance with requirements of the approved plan.

The Director shall keep a detailed accounting of the costs and expenses of performing this work. These costs and expenses shall be deducted from any financial security posted pursuant to 122-10. **Where such a security has not been established, or where such a security is insufficient to cover these costs, the costs and expenses shall be entered on the tax roll as a special charge against the property and collected with any other taxes levied thereon for the year in which the work is completed.**

### **Section 122-13 APPEALS.**

**A.** The Board of Adjustments, created pursuant to Article II, Division 3 of the city Code of Ordinance shall use the rules, procedures, duties, and powers authorized by City Ordinance to hear and decide appeals where it is alleged that there is error in any order, decision or determination made by the Director in administering this chapter.

Upon appeal, the Board may authorize variances from the provisions of this chapter that are not contrary to the public interest, and where, owing to special conditions, a literal enforcement of the chapter will result in unnecessary hardship.



**B. Who may appeal.** Appeals may be taken by any aggrieved person affected by any decision of the Director.

**Section 122-14 SEVERABILITY.**

If any sub-section, clause, provision or portion of this section is judged unconstitutional or invalid by a court of competent jurisdiction, the remainder of the section shall remain in force and not be affected by such judgment.

**Section 122-15 EFFECTIVE DATE.**

The above and foregoing chapter was duly adopted by the City Council on the \_\_\_\_\_ day of \_\_\_\_\_ 202\_.



**Post Construction  
Stormwater  
Management Plan  
Requirements**

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## **1.0 INTRODUCTION**

### **1.1 Purpose**

With new land development and urban redevelopment, stormwater management has become an issue of great importance. With increasing amounts of impervious cover, there is a corresponding increase in stormwater runoff volumes, and an increase in the quantity of pollutants carried by runoff. Therefore, post construction stormwater management is critical for protection of property and environmental quality. To mitigate stormwater issues related to land development, there are measures that can be taken to reduce the impacts of increased imperviousness.

The purpose of this document is to provide guidance and clarity for development of and submittal of a Post-Construction Stormwater Management Plan, to meet requirements set forth in Section 122 of the City's Land Disturbance, Illicit Discharge & Erosion Control Ordinance. These requirements mandate the incorporation of Post Construction Stormwater Best Management Practices (PCBMPs) in new developments and redevelopments for water quality control of stormwater runoff.

### **1.2 Applicability**

Stormwater requirements stated in Section 122 of the City's Land Disturbance, Illicit Discharge & Erosion Control Ordinance applies to new land development and significant redevelopment that discharge to the Municipal Separate Storm Sewer System (MS4). New land development includes areas not previously built to urban uses (including but not limited to farmland, pasture, woodland, and green space).

Significant redevelopment includes areas that are currently built to urban and suburban land uses, and are being revitalized with rehabilitation of existing structures, or demolition of existing structures and construction of new ones. Table 1 describes how the requirements are applied to different developments.

<b>Table 1: Post-Construction Stormwater Management Plan (PCSMP) Applicability</b>	
<b>Development</b>	<b>Requirement</b>
<p>(1) For all developments with a preliminary plat approved by City Council on or after <b>TBD</b></p> <p>(2) For any re-plat in a preliminarily platted subdivision approved by City Council before <b>TBD</b> that significantly increases the amount of impervious area.</p>	<p>PCSMP that includes BMPs, and where reasonably practical, provide water quality control of the first one-half inch of runoff from the site<sup>2</sup>.</p>
<p>(3) For all developments with a Preliminary Plat approved by City Council before <b>TBD</b> with a significant redevelopment that disturbs 1 acre or more and does not require preliminary platting.</p>	<p>PCSMP that includes BMPs, and where reasonably practical, provide water quality control of the first one-half inch of runoff from the site<sup>2</sup>.</p>
<p>(4) Significant redevelopment that adds or replaces less than 1 acre but more than 5,000 SF of impervious surface area<sup>1</sup></p> <p>Includes:</p> <ul style="list-style-type: none"> <li>(a) The expansion of a building footprint</li> <li>(b) Addition or replacement of a structure</li> <li>(c) Replacement of impervious surface that is not part of a routine maintenance activity</li> <li>(d) Grading of property where a building may not be built, such as parking lot</li> </ul>	<p>PCSMP that includes BMPs</p>

<sup>1</sup> Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health and safety. <sup>2</sup> In all cases where control of the first 0.5 inch of runoff cannot be achieved; the management plan should provide BMPs that maximize control and provide a calculation of amount of control that can be practicably attained.

## **2.0 POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN SUBMITTAL REQUIREMENTS**

Approval of a Post Construction Stormwater Management Plan (PCSMP) will be dependent on the type of development proposed. This criterion is defined in the following paragraphs along with more detailed information on the elements that make up a PCSMP submittal.

The PCSMP shall be prepared by or under the supervision of a licensed professional civil engineer registered in the State of Missouri. The responsible professional shall be listed as the Designer on the Application and will be required to provide a seal on PCSMP sheets and calculations.

### **2.1 Post Construction Stormwater Management Plan**

A PCSMP will be required with the submittal of 1 set of storm sewer construction plans for subdivisions that have an approved preliminary plat, a Land Disturbance Permit Application for projects that do not require a preliminary plat and disturb 1 acre or more of the site or; submittal of a Building Permit Application for projects that add or replace less than 1 acre but more than 5,000 SF of impervious surface area and shall include the following elements:

- a. Post-Construction Stormwater Management Plan Sheets
- b. BMP Calculations
- c. Drainage Study
- d. BMP Maintenance Requirements
- e. Maintenance Agreement (Maintenance Agreement will be required before Final Plat is approved)

### **2.2 Post-Construction Stormwater Management Plan Sheets**

At a minimum, the PCSMP plan set must include:

1. A Site Resources Plan of the development site showing existing natural and aquatic resources along with a description of area or length including:

- Existing topography (5' minimum contour interval)
- Open waterways or flood plains

- Ponds or lakes
- Green space corridors
- General types of vegetation on site, excluding crops (e.g. tree canopy, turf grass, native grasses or other buffer, wetlands, etc)
- Steep slopes
- Utility lines, easements, water supply wells, and sewage treatment systems

2. A Preliminary Drainage and Stormwater BMP Plan of the development site at scale showing:

- Location of proposed stormwater conveyance systems such as storm sewer, storm drains, grass channels, vegetated swales, basins and flow paths.
- Proposed areas of fill placement and limits of construction
- Proposed BMPs with an identifier that matches their drainage basin (if more than one)
- Proposed utility lines, easements, water supply wells, and sewage treatment systems

3. Final Construction Plans:

- a. Vicinity map
- b. Existing utilities and infrastructure
- c. Proposed stormwater BMPs including structural components
- d. Proposed storm sewer and stormwater conveyance systems
- e. Other proposed infrastructure as it relates to the construction of the stormwater BMPs
- f. Construction notes
- g. Design water surface elevations

h. Structural details of outlet structures, embankments, spillways, stilling basins, grade control structures, conveyance channels, etc.

i. Plan and profile sheets (if applicable)

### **2.3 Post Construction Best Management Practice(s) Maintenance Requirements**

The owners of lands on which Post Construction Best Management Practices have been installed to meet the requirements of this section, shall ensure the maintenance of these Post Construction BMPs and shall themselves maintain the Post Construction BMPs if other persons or entities who are also obligated to maintain them (by contract or covenant, or pursuant to this section) fail to do so. Post Construction BMPs shall be inspected at least once annually, and a written record of inspection results and any maintenance work shall be maintained. Furthermore, a copy of this inspection record shall be sent to the City.

Annual review and inspection of Post Construction BMPs shall be done by a person adequately trained or certified in stormwater BMP function and maintenance. Information on the Inspection should provide, annual review and inspection of the Post Construction BMPs and the holder of the annual inspection report shall be provided in the Post Construction Management Agreement.

To assure compliance with this section, maintenance requirements for PCBMPs must be documented as part of, or an addendum to, the Post Construction Maintenance Agreement to ensure that the system will function properly. The following elements are required:

Site information, BMP information, description and schedule of maintenance and repair tasks for each Post Construction BMP type.

### **2.4 Maintenance Agreement and Easement**

The applicant or owner is required to execute a Post Construction Maintenance Agreement (PCMA), to be filed on record, binding on all subsequent owners of land served by a private stormwater management facility. Such agreements shall provide for access to the facility, at reasonable times, for inspections by the City or its authorized representative to ensure that the facility is maintained in proper working condition to meet design standards.



Such agreements shall document the responsibilities of the owner, the Home Owner's Association or other responsible party. The PCMA shall be submitted to and approved by the City as part of the PCSMP, prior to recordation of the final plat with the County Recorder's Office. A sample copy of the Maintenance Agreement can be downloaded at [www.nixa.com/stormwater](http://www.nixa.com/stormwater).

Maintenance Agreement exhibits shall include the following:

Exhibit A – Real Property Depiction – Provide lot certificate or platted subdivision with legal description, or PCSMP plan sheet if that information is contained on a sheet already (11"x17")

Exhibit B – PCBMP Maintenance Requirements as described in Section 2.5 of this document.

## **2.5 BMP Final Inspection**

Upon construction completion, all stormwater Post Construction BMPs shall be subject to a final inspection to insure they are correctly installed and are in an effective working condition prior to release of an approved final inspection and the recordation of the final plat.

## **3.0 DEVELOPMENT OF A POST-CONSTRUCTION STORMWATER MANAGEMENT PLAN**

### **3.1 Site Evaluation**

The development of the PCSMP must be initiated in the early stages of site planning and design. However, before a PCSMP can be developed, defining site conditions must be completed by conducting a site assessment.

The data collected during the site assessment will be used for describing site conditions, including vegetation, soils and drainage patterns. When this information is obtained, appropriate stormwater BMPs can be selected, located, sized, and designed.

The following data should be collected, to the maximum extent practicable, during the development of the PCSMP:

Natural Resources: The development site's natural resources, including vegetative communities, soils and geology, and aquatic resources need to be determined to assist in stormwater management plan development and is part of the permit application. Important data includes wetlands, riparian (stream) corridors, native prairie and/or woodland, receiving stream(s), floodplain (if applicable). Natural resources should be assessed by trained professionals.

Site topography: Topography dictates how and where water will drain from a site. On steeper sites, stormwater will runoff more rapidly, with less infiltration and greater volume. Stormwater management requirements are substantially different than for more gently rolling or flat sites.

Aquatic Resources: The identification of streams, ponds, and lakes as receiving waters and as an integral part of the PCSMP plan is critical. Understanding the function of these water bodies, their current condition, and potential impacts from proposed development may influence your choice of stormwater BMPs. The identification of these resources may also be necessary to comply with local, State and Federal regulations.

*NOTE: Some or all of this information may already be part of the SWPPP, if that is the case, the PCSMP may simply reference the SWPPP (section and or page number to satisfy the above section requirements).*

### **3.2 BMP Selection**

Quality and properly installed BMPs emulate natural systems by integrating a variety of dispersed treatments at multiple scales, from backyard rain gardens to district-level bio-retention basins. They are widely applicable in both urban and rural environments. These treatments can be designed into new developments or retrofit into existing community open spaces, parks, road rights-of-way, side and rear areas of homes and commercial buildings, rooftops of structurally adequate buildings, below parking lots and in many other settings. All aspects of stormwater management can be integrated to contribute to positive community aesthetics and economics.

Stormwater BMPs include a variety of methods that are simple and practical in design, yet provide effective stormwater management as well as aesthetic enhancements for urban, suburban, and rural landscapes. These methods can be cost effective to build while providing long-term sustainability for City infrastructure and conservation of Nixa's water resources.

## BMP MAINTENANCE REQUIREMENTS

The project designer shall include the following information as Exhibit B as part of the Maintenance Agreement.

### **Name & Location**

Project Name: \_\_\_\_\_

Address: \_\_\_\_\_

### **Site Data**

Total Site Area: \_\_\_\_\_

Total Disturbed Area: \_\_\_\_\_

Total Undisturbed Area: \_\_\_\_\_

Impervious Area Before Construction: \_\_\_\_\_

Impervious Area After Construction: \_\_\_\_\_

### **BMP Information**

The designer shall provide, on the PCSMP plan set, the following information on post-construction stormwater BMPs:

BMP ID	TYPE OF BMP	LOCATION OF BMP

#### 4.0 Routine Maintenance and Tasks Schedule

The following tables outline recommended maintenance tasks and **suggested** frequencies for example BMPs. Delete the lists and tables that are not needed according to the types of BMPs within the development and edit the table according to your site specific conditions. BMPs may be added as well. Inspection Reports should be completed and kept on file with the Inspector, Owner or otherwise responsible person. At least one copy of each completed inspection report shall be given to the City for record retention.

BIORETENTION MAINTENANCE	
TASK	SCHEDULE
Remove trash and debris	As needed
Check and repair any eroded areas	As needed
Re-mulch any void areas	As needed
Check vegetation and replace any damaged plant materials	As needed
Inspect for ponding, washed out areas, soil conditions	Quarterly
Perimeter mowing	As needed
Inspect collection system for proper function	Quarterly
Reseed grass swales	As needed
Repair broken pipes	As needed
Replace filtration rip rap that is chocked with sediment	As needed
Removed any accumulated sediment	As needed

<b>Wet Detention Basin/Pond Maintenance</b>	
<b>TASK</b>	<b>SCHEDULE</b>
Remove trash and debris from side slopes	As needed
Outlet/inlet inspection and cleanout	As needed
Check pond side slopes and repair eroded areas	As needed
Basin inspection and cleanout	Inspect once Annually Remove sediment when 25% of permanent pool volume has been lost
Inspect for structural damage and leaks	Biannually
Replace filtration rip rap that is choked with sediment	As needed
Repair broken pipes	As needed

<b>Dry Detention Basin/Pond Maintenance</b>	
<b>TASK</b>	<b>SCHEDULE</b>
Remove trash and debris from side slopes	As needed
Outlet/Inlet inspection and cleanout	Inspect Quarterly Clean out as needed
Check pond side slopes and repair eroded areas	Inspect Quarterly Repair as needed
Basin inspection and cleanout	Inspect once annually Remove sediment when 25% of permanent pool volume has been lost
Inspect for structural damage and leaks	Annually
Replace filtration rip rap that is choked with sediment	As needed
Repair broken pipes	As needed

<b>Wetlands MAINTENANCE</b>	
<b>TASK</b>	<b>SCHEDULE</b>
Remove any invasive plants	As needed
Remove trash and debris from Outlet/inlet areas	Inspect Quarterly Clean out as needed
Check wetlands side slopes and repair eroded areas where vegetation has been lost	Inspect Quarterly Repair as needed
Inspect for structural damage and leaks	Annually
Replace filtration rip rap that is choked with sediment	As needed
Repair broken pipes or risers	As needed
Removed any accumulated sediment	As needed

<b>GRASSED SWALE/CHANNEL MAINTENANCE</b>	
<b>TASK</b>	<b>SCHEDULE</b>
Remove trash and debris	As needed
Stabilization of eroded areas	As needed
Mowing	Monthly or as needed
Check outlet pipes (if present) for clogging	Quarterly
Check flow dispersion device for accumulated sediment that can cause formation of sub-channels.	Quarterly
Re-seed	As needed
Removed any accumulated sediment	As needed

<b>Flow Level Spreader/Dissipater Blocks Maintenance Task and Schedule</b>	
<b>TASK</b>	<b>SCHEDULE</b>
Remove trash and debris	As needed
Inspect for undercutting	Quarterly
Inspect for settlement	Biannually
Inspect and replace degraded or eroded rip rap or stone	Monthly Repair-replace as needed
Check flow dispersion/dissipater device for accumulated sediment that can cause formation of sub-channels.	Monthly

<b>Permeable Pavers or Pavement Maintenance Task and Schedule</b>	
<b>TASK</b>	<b>SCHEDULE</b>
Inspect and remove accumulated sediment from pavement surface	Biannually As needed
Inspect and clean pavement of accumulated oil or grease	Biannually As needed
Spray vegetation and moss with herbicide	As needed during growing season
Vacuum/sweep surface	Annually, as needed
Inspect for deterioration	Annually
Verify surface infiltration after storms	Annually



**CITY OF NIXA MISSOURI POST CONSTRUCTION STORMWATER MANAGEMENT PLAN  
MAINTENANCE AGREEMENT AND EASEMENT**

WHEREAS, The Property Owner recognizes that Post Construction Stormwater Best Management Practices (hereinafter referred to as the PCBMPs) must be maintained for the development called \_\_\_\_\_, located in the jurisdiction of the City of Nixa, Missouri; and,

**WHEREAS**, the Property Owner (whether one or more) is the owner of real property described on Exhibit “A” (hereinafter referred to as “the Property”); and,

**WHEREAS**, the City of Nixa, Missouri, (hereinafter referred to as “the City”) requires the Property Owner, and its administrators, executors, successors, heirs, or assigns, agree that the health, safety and welfare of the citizens of the City require that the Post Construction BMPs be constructed and maintained on the property; according to guidelines set forth in the Post Construction Stormwater Management Plan, (hereinafter referred to as “PCSMP”).

**NOW, THEREFORE**, in consideration of the foregoing premises, the covenants contained herein, and the following terms and conditions, the Property Owner agrees as follows:

1. The Post Construction Best Management Practices (PCBMP) shall be constructed by the Property Owner in accordance with the Post Construction Stormwater Management Plan (PCSMP), which has been reviewed and approved by the City.
2. The Property Owner must develop and provide the “PCBMP Maintenance Requirements”, attached here to as Exhibit “B”, which have been reviewed and approved by the City. The BMP Maintenance Requirements shall describe the specific maintenance practices to be performed for the PCBMPs and include a schedule for implementation of these practices. The PCSMP and the BMP Maintenance Requirements shall indicate that the PCBMPs shall be inspected for function, condition and maintenance at least annually to ensure that it is operating properly. A written record of inspection results and any maintenance work shall be submitted by the Property Owner to the City on an annual basis.
3. The Property Owner, its administrators, executors, successors, heirs, or assigns, shall construct and perpetually operate and maintain, at its sole expense, the facilities in strict accordance with the attached BMP Maintenance Requirements as approved by the City.
4. The Property Owner, its administrators, executors, successors, heirs, or assigns hereby grants permission to the City, its authorized agents and employees, to enter upon the property and to inspect the facilities whenever the City deems necessary. The City shall provide the Property Owner copies of the inspection findings and a directive to commence with the repairs if necessary.

Property Owner will be required to provide, within seven (7) calendar days, a written response addressing what actions will be taken to correct any deficiencies and provide a schedule of repairs within a reasonable time frame. Whenever possible, The City shall provide notice prior to entry.

5. The Property Owner, its administrators, executors, successors, heirs, or assigns, agree that should it fail to correct any defects in the PCBMPs within a reasonable time frame agreed to in the response by the Property Owner for corrective actions, or shall fail to maintain the structure in accordance with the BMP Maintenance Requirements and with the law and applicable executive regulation or, in the event of an emergency as determined by the City or its designee in its sole discretion, the City or its designee is authorized to enter the property to make all repairs, and to perform all maintenance, construction and reconstruction as the City or its designee deems necessary.

The City or its designee shall have the right to recover from the Property Owner any and all reasonable costs the City expends to maintain or repair the PCBMP(s) or to correct any operational deficiencies subject to the provisions of the immediately preceding sentence relating to negligence or intentional acts of the City. Failure to pay the City or its designee all of its expended costs, after sixty days written notice, shall constitute a breach of the agreement. The City or its designee shall thereafter be entitled to bring an action against the Property Owner to pay, or foreclose upon the lien hereby authorized by this agreement, against the property, or both. Interest, collection costs, and reasonable attorney fees shall be added to the recovery to the successful party.

The Property Owner shall not obligate the City to maintain or repair the PCBMP(s), and the City shall not be liable to any person for the condition or operation of the PCBMP(s).

6. The Property Owner, its administrators, executors, successors, heirs, or assigns, hereby indemnify and hold harmless the City and its authorized agents and employees for any and all damages, accidents, casualties, occurrences or claims that may arise or be asserted against the City from the construction, presence, existence, repair or maintenance of the PCBMP(s). In the event a claim is asserted against the City, its authorized agents or employees, the City shall promptly notify the Property Owner and the Property Owner shall defend at its own expense, by an attorney of the choosing of the City, any suit based on such claim unless due solely to the negligence of the City in which event the City shall be required to defend any such suit at its own expense.

Notwithstanding the foregoing, if any claims are made against both the City and the Property Owner, each will be required to defend any such suit or claim against it at its own expense. Each shall be responsible for payment of any recovery to the extent determined in such suit.

If any judgment or claims against the City, its authorized agents or employees shall be allowed, the Property Owner shall pay for all costs and expenses in connection herewith except to the extent of the negligence or intentional act of the City.

7. The Property Owner shall not in any way diminish, limit, or restrict the right of the City to enforce any of its regulations or ordinances as authorized by law.

8. This Agreement shall be recorded at the Christian County’s Recorders office in Ozark, Missouri and shall constitute a covenant running with the land and shall be binding on the Property Owner, its administrators, executors, successors, heirs, or assigns, including any homeowners or business association and any other successors in interest.

IN WITNESS WHEREOF, the Property Owner(s) has/have executed this agreement this \_\_\_\_\_ day of \_\_\_\_\_, 201\_.

By: \_\_\_\_\_  
Its: \_\_\_\_\_

STATE OF MISSOURI }  
COUNTY OF CHRISTIAN }

I, the undersigned notary public in and for said county in said state, hereby certify that \_\_\_\_\_ whose name as \_\_\_\_\_ of \_\_\_\_\_, a corporation, is signed to the foregoing and who is known to me, acknowledged before me on this day that, being informed of the contents, he/she as such officer and with full authority, executed the same voluntarily for and as the act of said corporation.

Given under my hand this \_\_\_\_\_ day of \_\_\_\_\_, 201\_.

\_\_\_\_\_  
NOTARY PUBLIC

My commission Expires: \_\_\_\_\_

**Exhibit A**

Insert Real Property Description

**Exhibit B**

Insert PCBMP Maintenance Requirements



# Stormwater Advisory Committee Application

The following information will assist us in the selection process for appointment to the Stormwater Advisory Committee.

## Personal Information

Name:

Address:

Primary Phone:

Primary E-mail:

Occupation:\*

## General Information

Why are you interested in this committee appointment?

Have you ever served on any City of Nixa Board, Council, Committee, or Task Force in the past?

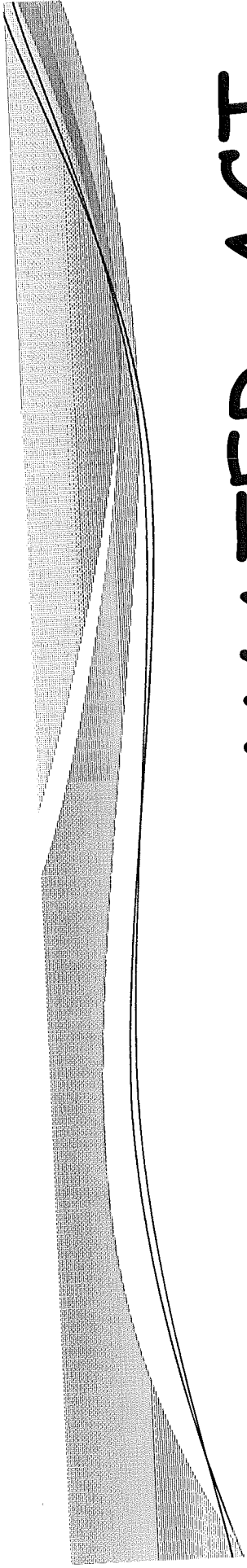
\* Optional Information.

Please print this form, complete and e-mail to [dnewell@nixa.com](mailto:dnewell@nixa.com), mail via the USPS to Danny Newell, City of Nixa, PO Box 395, Nixa Missouri 65714, or return in person to Danny Newell, City of Nixa Public Works Department, 1111 W. Kathryn St. Nixa Missouri.



# MUNICIPAL STORMWATER POLLUTION PREVENTION

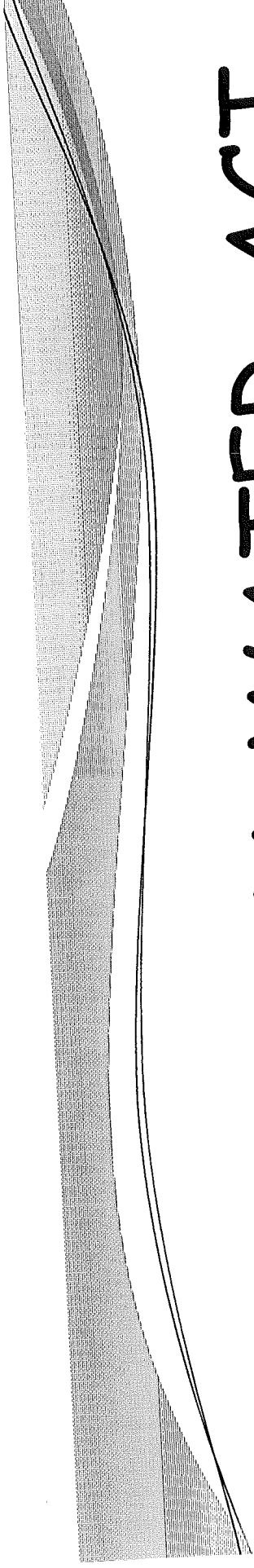
Danny Newell, CISEC, ACI



# THE CLEAN WATER ACT

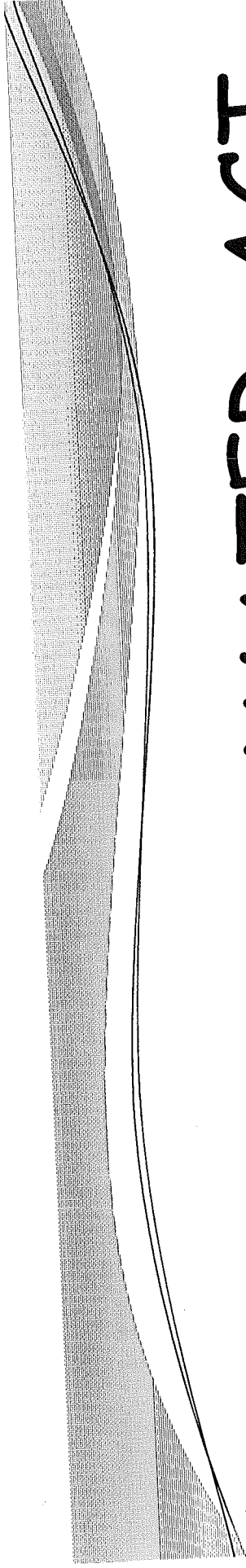
- The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but this Act was reorganized and expanded in 1972 at which time the "Clean Water Act" became it's official name.





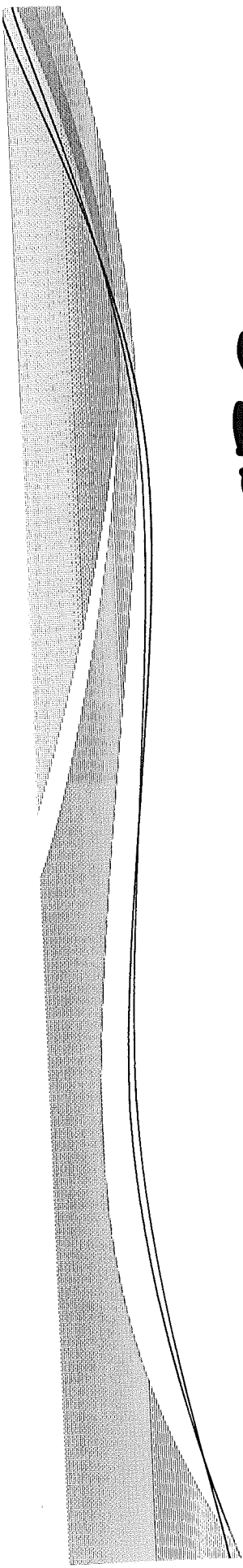
# THE CLEAN WATER ACT

- Under the CWA, the Environmental Protection Agency (EPA) has implemented pollution control programs such as setting wastewater standards for the industry. They have also set water quality standards for all contaminants in surface water.
- The CWA is the primary federal law in the United States governing water pollution.



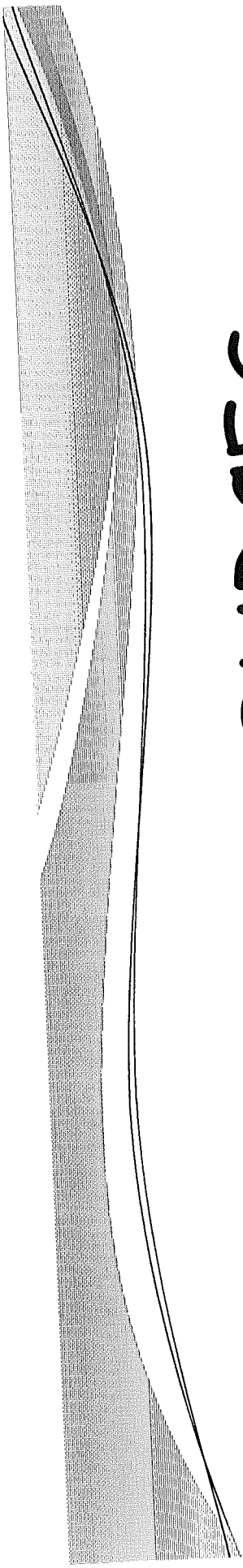
# THE CLEAN WATER ACT

- The Act established the goals of eliminating releases to water of high amounts of toxic substances, eliminating additional water pollution by 1983, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1985.
- Congress chose to define the waters covered by the Act broadly. Although the Act prohibits discharges into "navigable waters" the Act defines "navigable waters" as "the waters of the United States" and makes it clear that the term "navigable" is of limited importance.



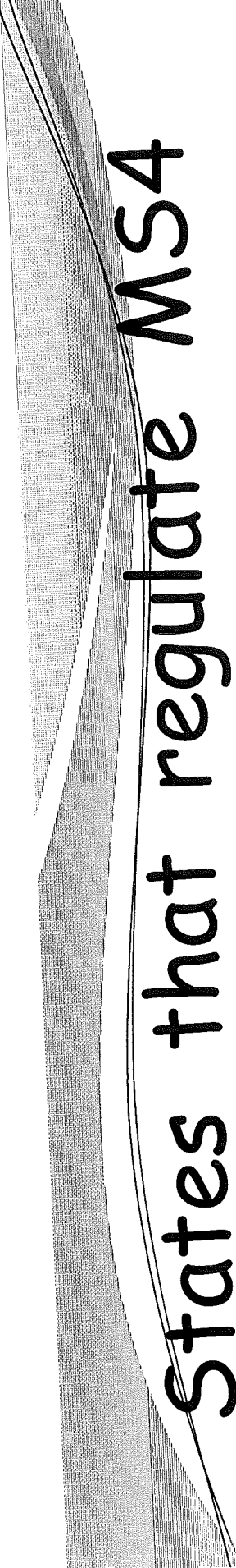
# POINT SOURCES

- The 1972 Act introduced a permit system for regulating point sources of pollution. Point sources include:
  - Industrial facilities (including manufacturing, mining, oil and gas extraction, and service industries).
  - Municipal governments and other government facilities (such as military bases).
  - Some agricultural facilities, (such as animal feed lots).



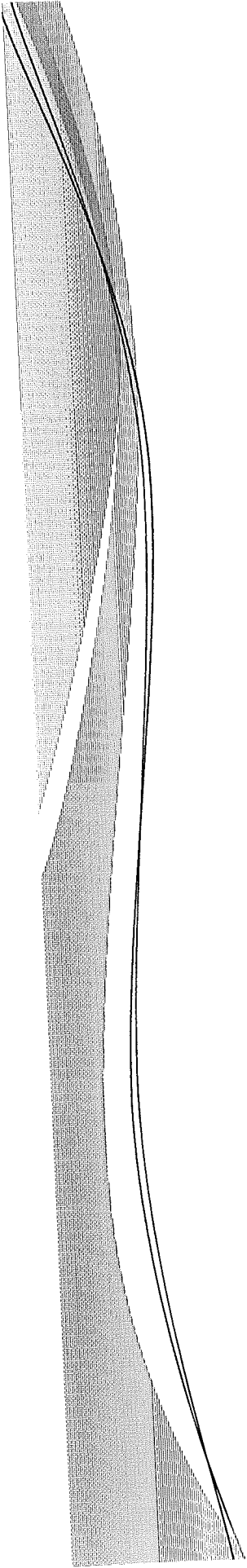
# POINT SOURCES

- Point sources may not discharge pollutants to surface waters without a permit from the National Pollution Discharge Elimination System (NPDES).
- This system is managed by the EPA in partnership with the state environmental agencies.
- Within this permit system the Municipal Separate Storm Sewer System (MS4) was developed as the result of amendments to the Act in 1987.

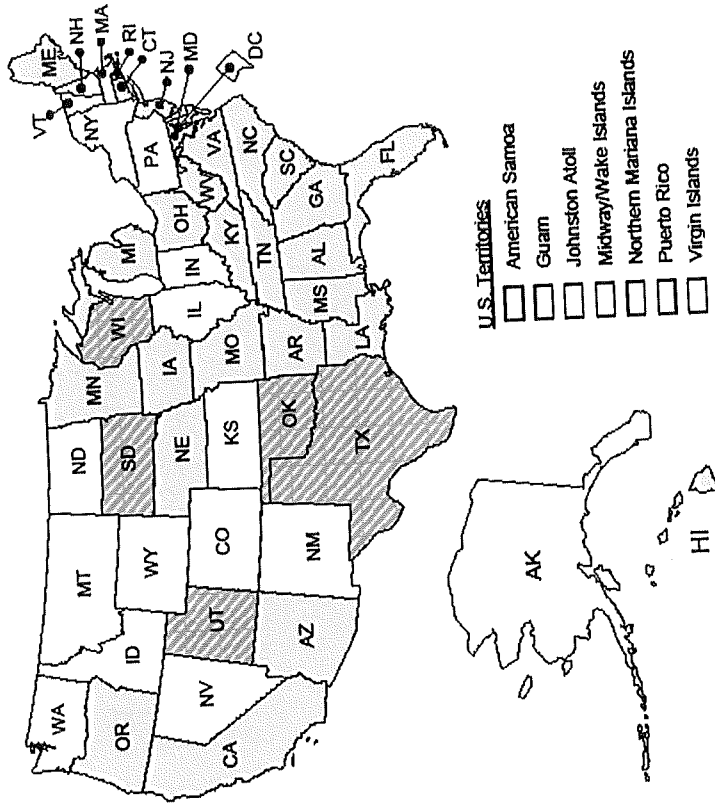


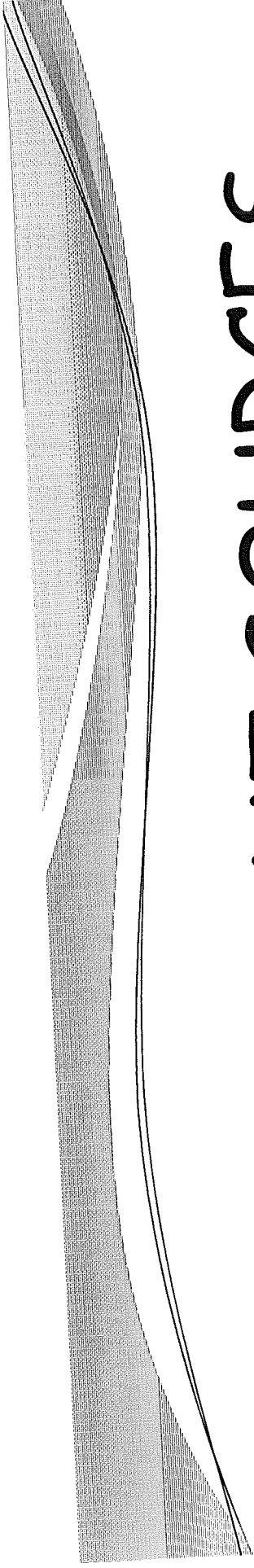
# States that regulate MS4 facilities

- The EPA has authorized 45 states (Missouri included) to issue permits, through the Department of Natural Resources directly to the discharging MS4 facility and to regulate the MS4 program.



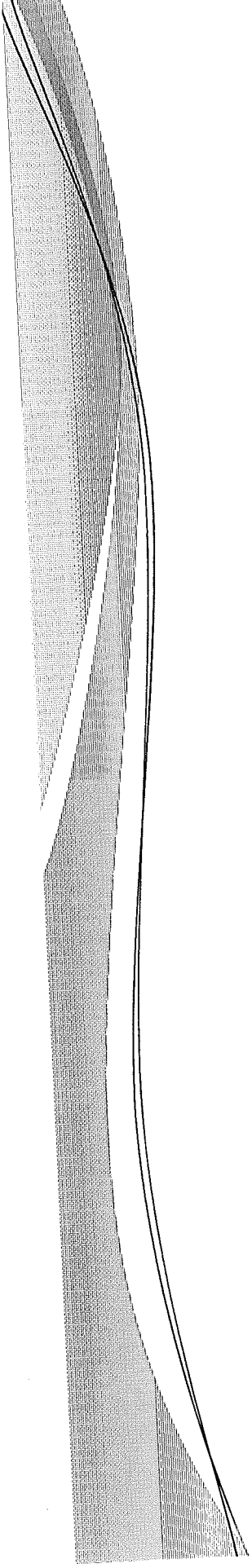
## State NPDES Program Authority





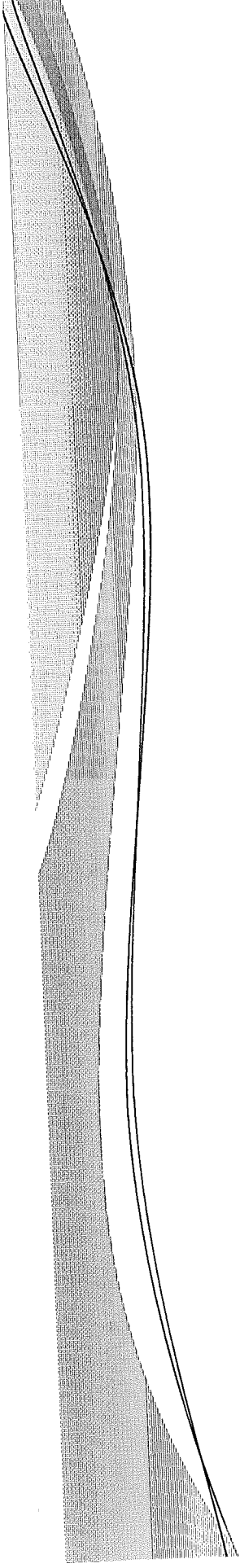
# NON-POINT SOURCES

- Congress exempted some water pollution sources from the point source definition in the 1972 CWA.
- These sources were therefore considered to be non-point sources that were not subject to the permit program.

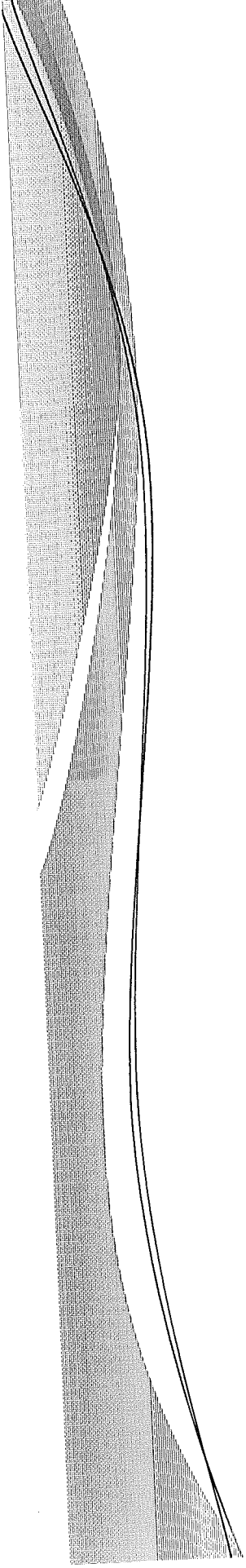


- Agricultural storm water discharges and irrigation return flows were specifically exempted from the permit requirements.
- Congress, however, provided support for research programs through the U.S. Department of Agriculture to improve runoff management practices on farms.

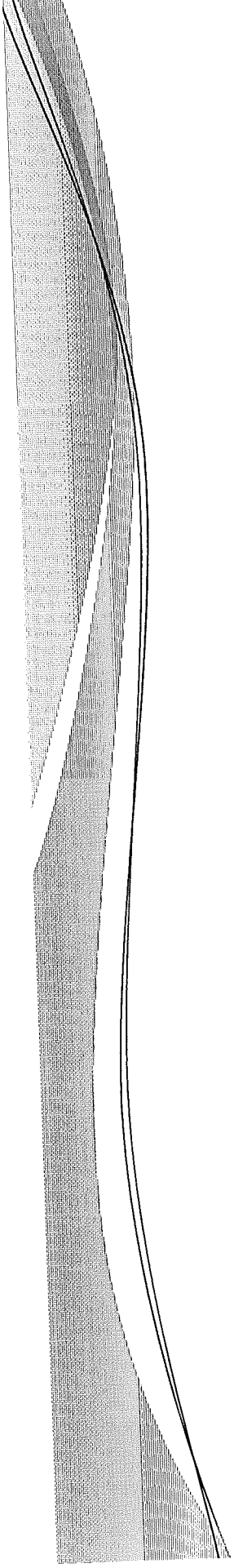




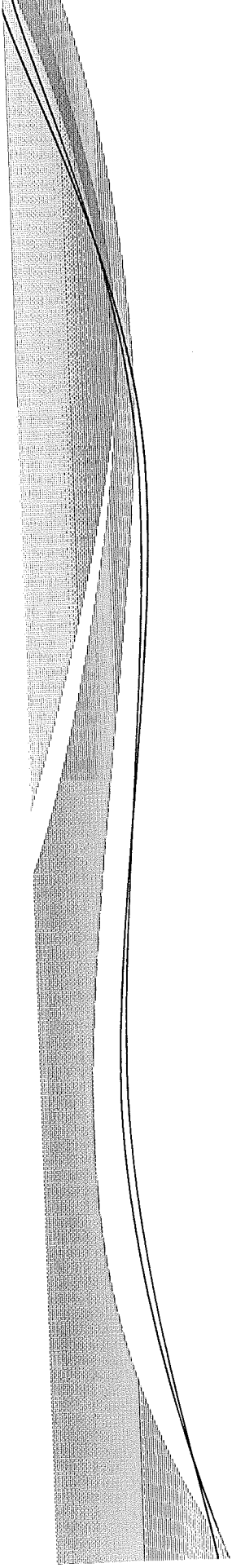
- Storm water runoff from industrial sources, municipal storm drains, and other sources were not specifically addressed in the 1972 CWA.
- EPA declined to include urban and industrial storm water discharges in the NPDES permit program and consequently were sued by an environmental group.
- The courts ruled that these storm water discharges must be covered by the permit program.



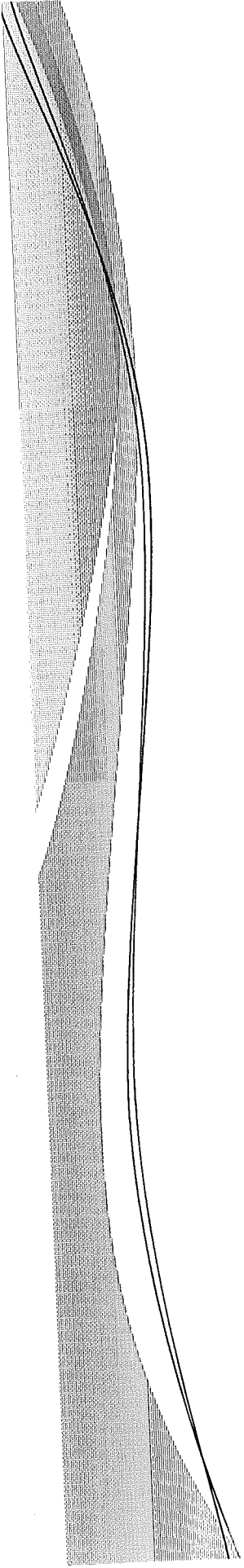
- In the Water Quality Act of 1987, Congress responded to the storm water problem by requiring that the industrial storm water discharges and the Municipal Separate Storm Sewer Systems obtain NPDES permits by specific deadlines.



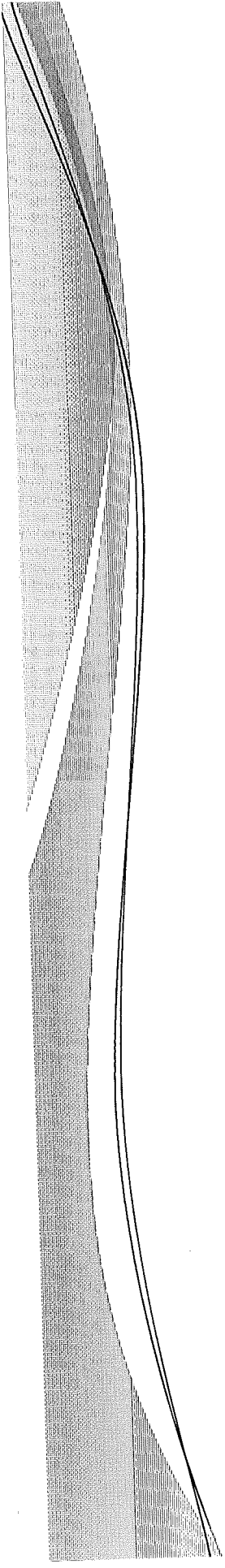
- This permit program has been implemented in phases. Phase I & Phase II.
- Phase I included the Large MS4's (systems that are located in an incorporated place or county with a population of 250,000 or more) and;
- Medium MS4's (systems that are located in an incorporated place or county with a population of 100,000 to 249,999).



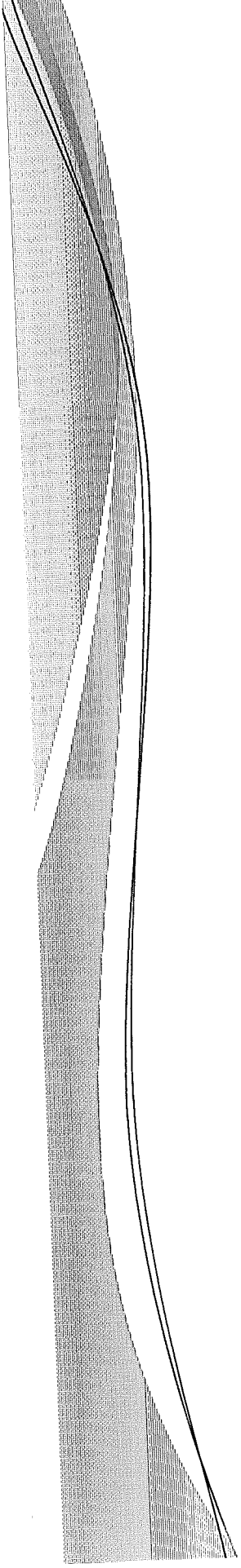
- The Phase I MS4's became regulated in 1990.
- There are 3 Phase I communities in Missouri: Springfield, K.C., and Independence.
- The Metropolitan St. Louis Sewer District successfully petitioned on behalf of the City of St. Louis to be regulated under Phase II.



- Phase II includes small MS4's (systems that are located in an incorporated place or county with a population of 10,000 or more) which of course, is where the City of Nixa falls.
- Phase II MS4's became regulated in March 2003, and required the small MS4's to have a storm water management program in place by March 10, 2008.
- Within these same permit regulations, the City of Nixa (being a regulated small MS4), is required to also develop Pollution Prevention Good Housekeeping procedures for our Municipal Operations and develop an Environmental Awareness, Annual Employee Training Program.



- There are 152 small MS4 programs in the state of Missouri.
- Having said all of that sets the stage for how we arrived at the training video that we are going to see today entitled: Storm Watch, Municipal Storm Water Pollution Prevention.
- This video is designed to show employees how to spot an Illicit Discharge within our own Municipal Operations and around town.



- An Illicit Discharge as defined is: a storm drain that has measurable flow during dry weather containing pollutants and/or pathogens (a bacterium or virus). A measurable flow without pollutants is simply a discharge.
- The other side of this two headed coin is Sediment and Erosion control, on which the video touches briefly, however, that's another day, another meeting, and another video.



**STORM SEWER, NO DUMPING,**

**DRAINS TO RIVER!**





The following questions all have multiple choice answers. Please check the best answer for each question.

1. If a piece of equipment has to be washed or steam cleaned outdoors, how should this be done?
  - a. on a fully contained impervious pad
  - b. over bare dirt so it will be absorbed
  - c. over a storm drain inlet
  - d. in or next to a drainage ditch
  
2. When using an outdoor solid waste receptacle, which of the following are required?
  - a. leave lids or covers closed while not in use
  - b. move the receptacle indoors
  - c. locate the receptacle on bare ground?
  - d. all of the above
  
3. Which of the following materials or operations outdoors can cause storm water pollution?
  - a. a spill or leak of diesel fuel
  - b. an open container of paint
  - c. a metal grinding operation
  - d. a broken hydraulic line
  - e. all of the above
  
4. Which of the following are **not** considered Good Housekeeping practices?
  - a. sweeping up outdoor work areas
  - b. keeping unused containers closed and sealed
  - c. protecting materials from exposure to the weather
  - d. secondary containment structures
  
5. If materials are stored outdoors, they may be temporarily covered with a waterproof tarp under what circumstances?
  - a. the tarp is regularly checked for tears or loosening
  - b. the tarp is at least twice as large as the material being covered
  - c. the material is stored as far as possible from vehicle traffic
  - d. the material is in open containers

6. Under what conditions is it OK to hose down a spill into a storm drain or ditch?
- if the material is non-hazardous
  - if it is raining
  - if your supervisor approves it
  - if it is done immediately after the spill
  - none of the above
7. If a lawn mower has to be greased outdoors, which of the following would help protect storm water?
- perform the operation during dry weather
  - spread a drop cloth underneath the equipment
  - wear safety glasses and rubber gloves
  - all of the above
8. If a dump truck has a leaking hydraulic line, what should be done?
- drain it immediately or move indoors
  - notify the storm water coordinator
  - put a water-proof tarp over it temporarily
  - lock and tag it out
9. Even if you cannot immediately clean up a spill due to the hazards involved, which of the following must be done to help protect storm water?
- notify the emergency coordinator or storm water coordinator
  - evacuate the facility
  - shut down all operations
  - locate the applicable MSDS for the spilled material
10. What are the practices that protect storm water called?
- EPAs
  - MSDSs
  - SOPs
  - BMPs
11. A spill or leak should be cleaned up promptly because....
- absorbents work better on fresh spills
  - spills can be spread by wind or vehicle traffic
  - it is usually more convenient to do the clean-up quickly
  - the spill will evaporate if not cleaned up quickly

12. Under what conditions can tools or equipment be cleaned over a storm drain inlet or in a drainage ditch?
- a. during dry weather
  - b. if your supervisor approves it
  - c. after consulting the Storm Water Pollution Prevention Plan
  - d. if the tool or equipment are cleaned with water only: no detergents or solvents
  - e. none of the above
13. Under what conditions should accumulated rainwater be drained from a secondary containment structure?
- a. the rain water is clean and uncontaminated
  - b. during dry weather only
  - c. it is less than half full
  - d. all of the above
14. If a vehicle had a ruptured hydraulic hose and was leaking fluid, which of the following would be most appropriate?
- a. cover it with a tarp
  - b. move it indoors
  - c. wash it down with soapy water
  - d. none of the above
15. If a fertilizer spreader caused some fertilizer to fall on a paved area, what would be the best way to deal with it?
- a. hose it into the storm drain
  - b. notify the EPA
  - c. sweep or blow it back onto a vegetated area
  - d. ignore it

# Storm Watch

# Municipal Storm Water POLLUTION PREVENTION

## Acknowledgment of Training

Signature(s) below are acknowledgment that on (date) \_\_\_\_\_,  
these individuals participated in a training session at the (location name) \_\_\_\_\_,  
(address) \_\_\_\_\_,  
given by (print trainer's name) \_\_\_\_\_,  
(print trainer's title) \_\_\_\_\_.

This training session presented information on Municipal Stormwater Pollution Prevention. During this session, I viewed the visual multimedia program:

**Storm Watch: Municipal Stormwater Pollution Prevention**

My signature below affirms that I was given adequate time to ask questions about my particular job activities and how I can best conduct these activities in compliance with the applicable regulations.

PRINT NAME HERE

SIGNATURE HERE

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## Untitled

Reduce Storm Water Pollution and Save Our Precious Resource!

Storm water pollution is undoubtedly a serious cause of concern. But very few of us realize that we contribute to this kind of pollution. There are several factors, such as tipping of litter, chemical pollution, and natural pollution that lead to storm water pollution. It is the duty of each one of us to take measures to keep our waters free from pollution.

Prevention of storm water pollution can be kicked off right from your garage. The most common of all pollutants that pollute storm water is oil spills and oil leaks. It is vital that you check your car or bike, machinery and other oil run equipment for leaks or oil spills often.

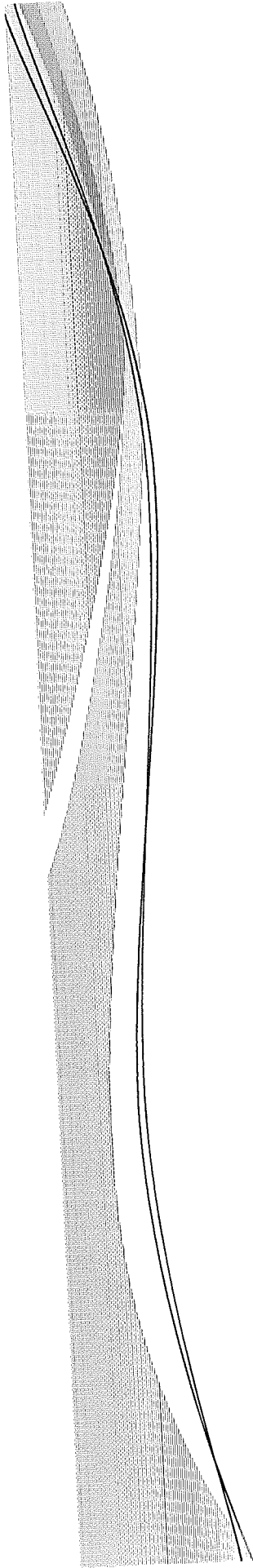
Also ensure that you avoid the use of harmful chemicals or detergents for cleaning up oil spill from your garage. Instead use environmentally friendly oil spill cleaners to remove oil spills from the driveway. Oil Gone Easy Home & Driveway S-200, an eco-friendly biodegradable product will help you with this tiring task of oil spill cleanup. Used oil or fluids can be recycled. So avoid dumping into trash or in the storm water drain.

When it comes to your lawn and garden, you have to be careful with the amount of pesticides and fertilizers that you use. Recycling your yard waste and avoiding over watering your plants can help reduce storm water pollution to some extent.

While you begin with your home repair, it is better that you take care of the disposal of the construction residual. There are possibilities of spills and leakages of liquids and oils on the

Untitled  
construction site. Making sure that the oil spills  
are cleaned up immediately is essential.

Storm water pollution by driveway oil spills and  
domestic fuel tank spills are increasingly high,  
thus efficient oil spill cleaner should always be at  
hand. Oil Gone Easy Home & Driveway S-200 is the  
perfect and safe solution to prevent the disastrous  
consequences of oil spills.



# **One & Two Family Residential Constriction Sediment & Erosion Control Guidelines**

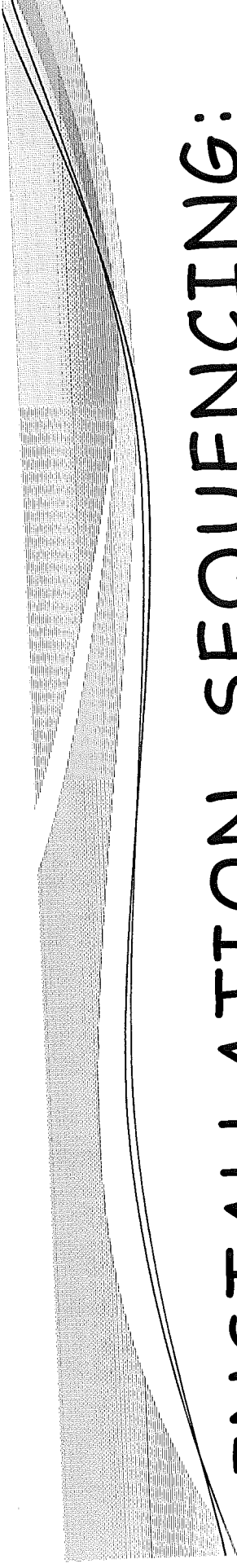
Danny Newell, CISEC, ACI



# Best Management Practices:

- Also known as BMP's, these include but are not limited to; temporary vehicle tracking pads, silt fence, soxx material, seeding, erosion control blankets, construction phasing or any other devise or procedure that helps reduce erosion and sediment loss.





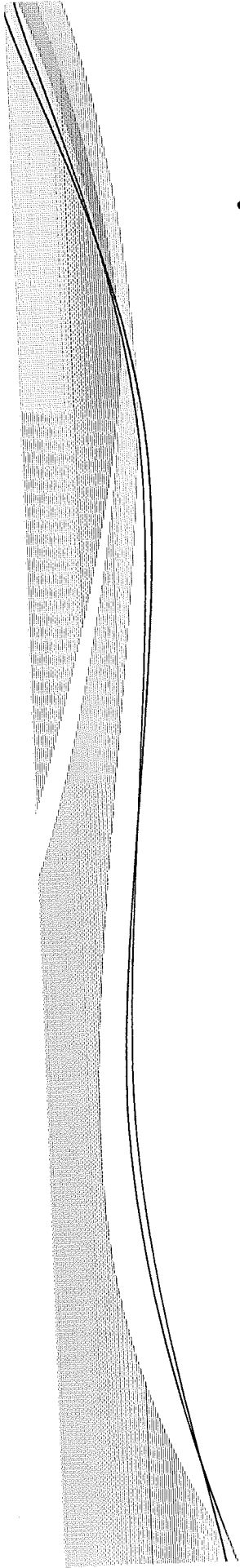
# INSTALLATION SEQUENCING:

- Grass buffer strips
- Inlet protection
- Perimeter control
- Grading & Excavating
- Stockpiles
- Maintenance
- Final grading
- Seeding or sod



## Permit holders responsibilities:

- Obtain & comply with NPDES Land Disturbance Permit
- Ensure BMP's are in place & maintained in an effective condition.
- Provide periodic inspection as outlined in the permit.



# Maintenance requirements:

- Maintain the grass buffer strip.
- Maintain perimeter control in an effective condition and remove accumulated sediment from installed BMP's once it has reached 1/3 the height of the device.
- Maintain inlet (curb or area) protection in an effective condition and remove sediment when it accumulates.



# Inspections city:

- Sediment and erosion control inspections will be done in conjunction with routine building inspections.
- First inspection will occur during the footing inspection.
- At all subsequent building inspections, the BMP's will be subject to inspection
- Final inspection, entire site must be stabilized.



# CONSTRUCTION BMP'S

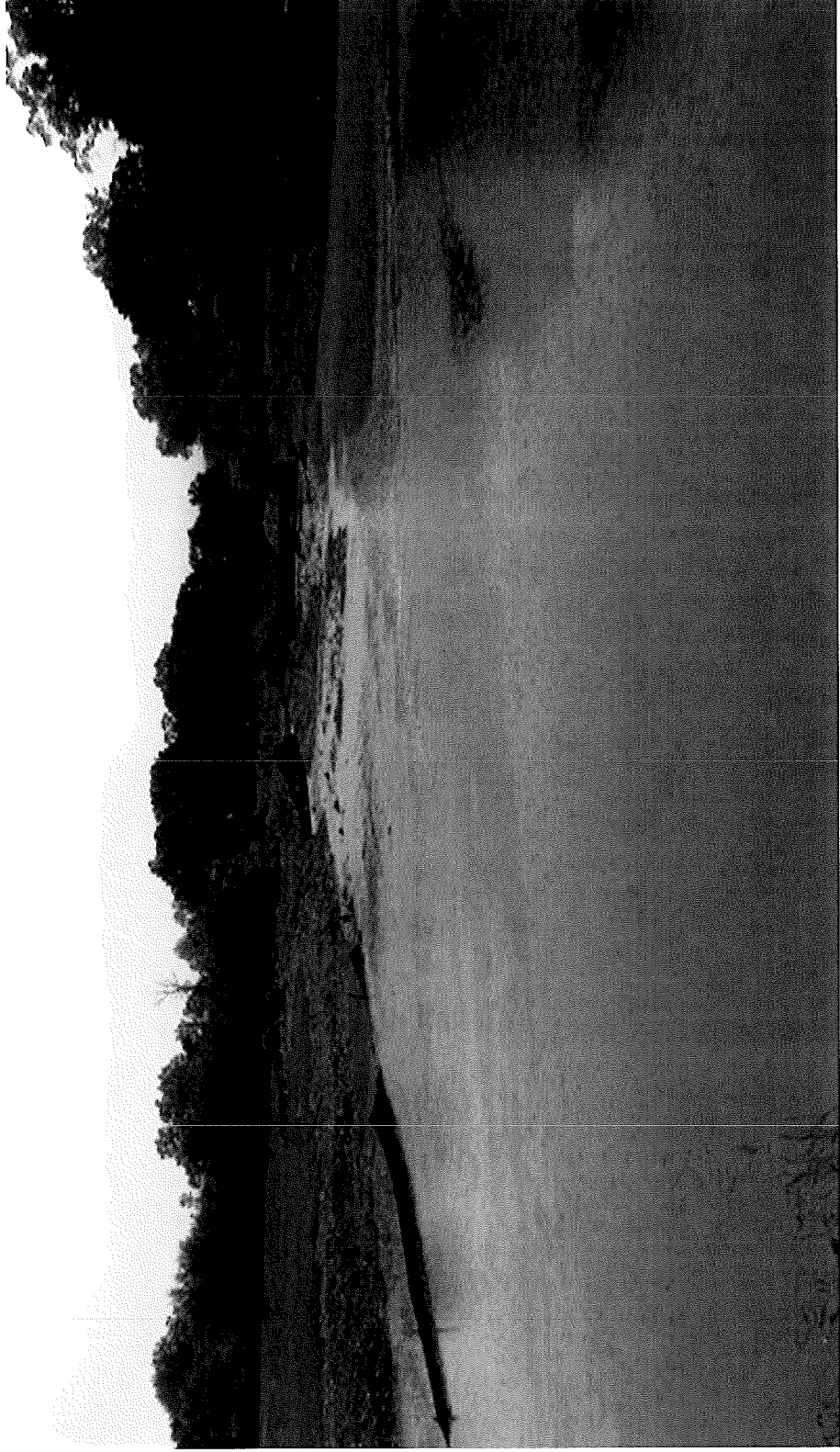
- Boulevard vegetation
- Perimeter control
- Inlet protection
- Miscellaneous items

# **AFTER THE STORM**

**City of Nixa**

**01/31/12**

# FLOODING!\*



# FLOODING!





# FLOODING!\*



# STORMWATER\*

- ▣ As important as flooding issues are, it's only a portion of the Stormwater story.
- ▣ “Rest of the story”, I/I and Stormwater pollution.

# INFLOW & INFILTRATION

(I/I)\*

▣ *Inflow:*

▣ *Infiltration:*

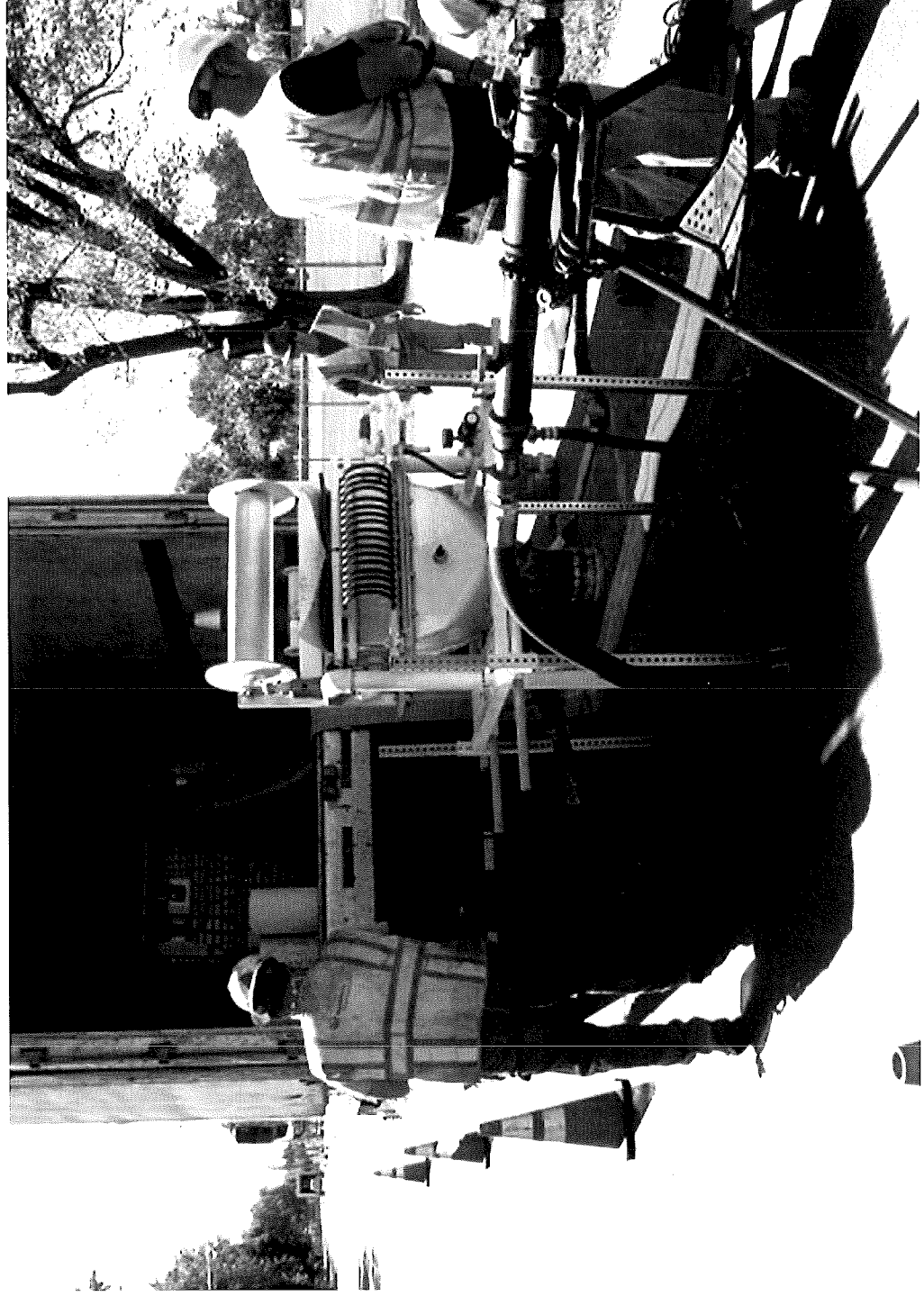
# INFLOW & INFILTRATION

- ▣ The average daily flow through the WWTP for the last 5 years is 1,334,000 gpd (24 hrs).
- ▣ On occasion we have received between 4 & 8,000,000 gallons due to I/I.
- ▣ 13” rainfall event in September 2010, we received 11,000,000 gallons due to I/I.
- ▣ The maximum capacity of our sewer treatment facility is 11,000,000 gpd.

# Recent Improvements\*

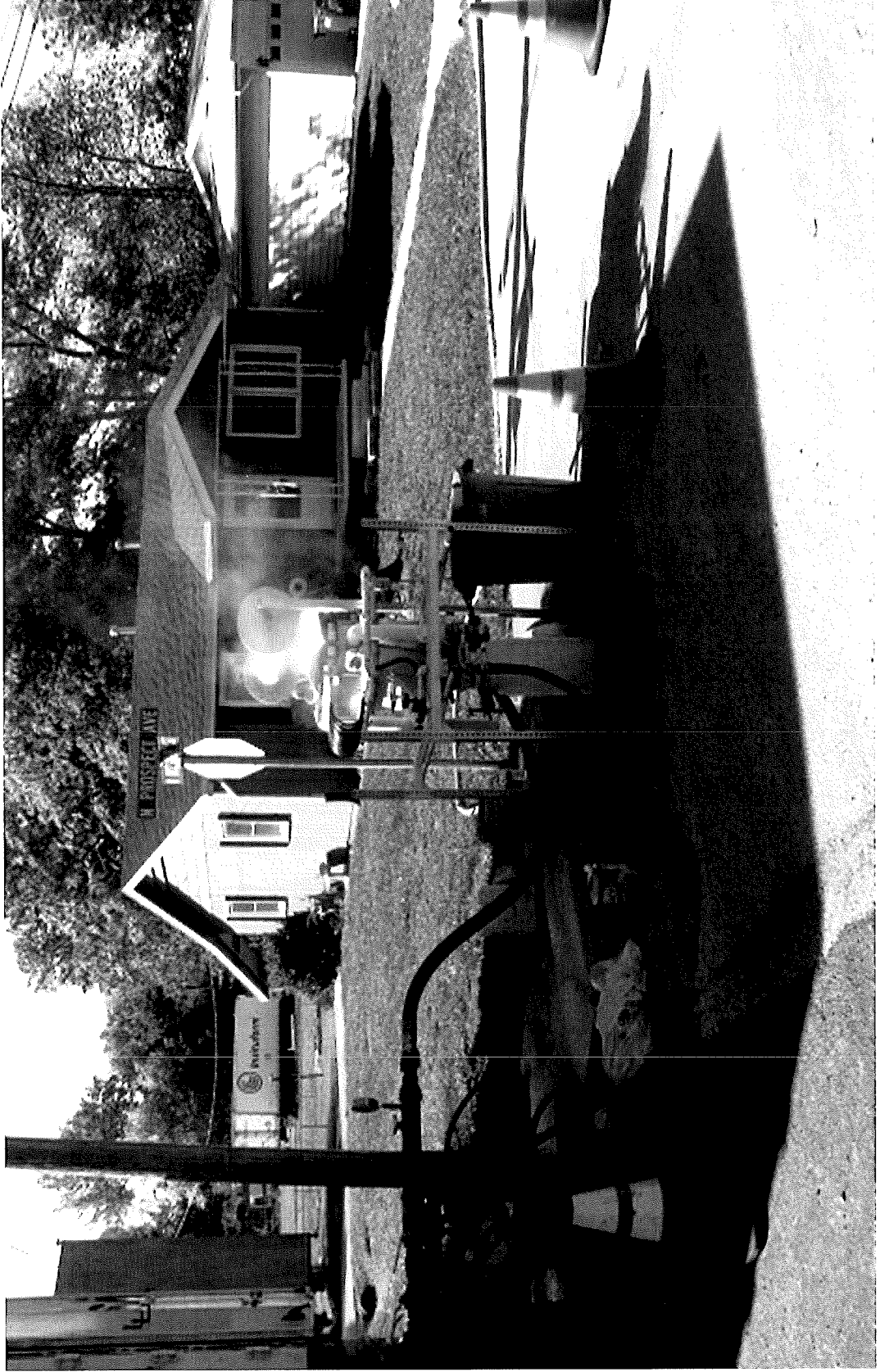
- ▣ ARRA “American Recovery and Reinvestment Act”
- ▣ Missouri Street and New Street.
- ▣ CIPP (Cure In Place Pipe)
- ▣ Ongoing routine maintenance and repair.

# Cure In Place Pipe\*





# Cure In Place Pipe\*





# Cure In Place Pipe\*



# Projected Improvements 2012\*

- ▣ CIPP
- ▣ New sewer video equipment to help identify these areas of INI.
- ▣ On going routine maintenance and repair.

# THE CLEAN WATER ACT\*

- ▣ 1948 The Federal Water Pollution Control Act (FWPCA)
- ▣ 1972 The Clean Water Act (CWA)
- ▣ The National Pollution Discharge Elimination System, (NPDES)

# MS4\*

- ▣ Municipal Separate Storm Sewer System (MS4).
- ▣ This MS4 permit program was implemented in 2 phases.
- ▣ Phase I (medium and large)
- ▣ Phase II (small)

# MS4

- ▣ Is a conveyance or system of conveyances, that:
- ▣ ARE: Used to collect and/or convey stormwater;
- ▣ ARE: Owned by an incorporated public entity that discharges stormwater to waters of the U.S.;
- ▣ ARE Not: a combined sewer; and not part of a publicly owned treatment facility (sewage treatment plant).

# **MS4 Permit Requirements:**

“The permittee shall develop, implement, and enforce a stormwater management program (SWMP) designed to reduce the discharge of pollutants from the permittee’s regulated small MS4 to the maximum extent practicable, to protect water quality, and to satisfy the appropriate water quality requirements of the Missouri Clean Water Law.”

# **MS4 Permit**

## **Requirements:\***

“The SWMP should include best management practices; control techniques and systems, design and engineering methods; and such other provisions as the permitting authority determines appropriate for the control of such pollutants.”

# Stormwater System Mapping\*

- ▣ Mapping of our entire stormwater system
- ▣ **OUTFALLS:** The City of Nixa currently has 51 discharge outfalls



# **SAMPLES\***

**OEWRI “Ozarks Environmental and Water  
Resources Institute”**

# 6 Minimum Control

## Measures\*

- 1: Public education and outreach on stormwater impacts;
- 2: Public involvement/participation;
- 3: Illicit discharge detection and elimination;
- 4: Construction site stormwater runoff control;
- 5: Post construction stormwater management in new development and redevelopment;
- 6: Pollution prevention/good housekeeping for municipal operations.

# **Monitoring, Recordkeeping, and Reporting**

**MONITORING:** “The permittee shall evaluate program compliance, the appropriateness of identified best management practices, and progress toward achieving measurable goals.”

# **Monitoring, Recording, and Reporting\***

**RECORDKEEPING:** “The permittee shall retain records of all activities requiring recordkeeping by the SWMP including monitoring instrumentation, copies of all reports required by the permit, discharge monitoring reports, NPDES permit, ordinances,” etc., etc., etc.

# **Monitoring, Recording, and Reporting\***

**REPORTING:** “The permittee shall submit annual reports, using the annual report form provided by the department (DNR), to the director by July 28 of each year of the permit term.”

# Inspections

- ▣ Commercial/Industrial Illicit Discharge Detection and Elimination, 731.

# Inspections

- ▣ Commercial/Industrial Illicit Discharge Detection and Elimination, 731.
- ▣ Construction site stormwater runoff control, 35.

# Inspections

- ▣ Commercial/Industrial Illicit Discharge Detection and Elimination, 731.
- ▣ Construction site stormwater runoff control, 35.
- ▣ Pollution prevention/good housekeeping for municipal operations, 52.



## After the Storm: Co-produced by EPA and The Weather Channel

All across America people live, work and play in watersheds, without knowing it. As this DVD shows, protecting the nation's water resources will take the awareness and effort of individual citizens. Three case studies focus on the interconnections between water supply, water quality and the economic vitality and quality of life in our communities.



*Santa Monica Bay, California*



*New York City*



*Gulf of Mexico*



*Watershed protection approaches*

This DVD is intended for educational and communication purposes in classrooms, at conferences, etc. It may be aired on cable or other TV stations. Stations may air all or a portion of the program. If a portion of the program is aired, please ensure that you include in your broadcast that the program was co-produced by EPA and The Weather Channel. For additional copies of this DVD call the National Service Center for Environmental Publications at (800) 490-9198, or e-mail [inscep@bps-lmtr.com](mailto:inscep@bps-lmtr.com).



United States Environmental Protection Agency  
Office of Water (4503T)  
1200 Pennsylvania Ave., NW  
Washington, DC 20460  
EPA 841-C-06-001  
December 2006  
Run Time: 22 minutes  
Includes closed captions

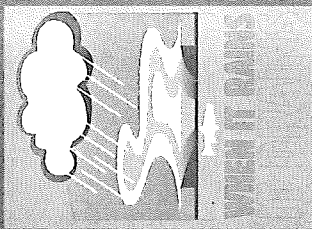
The program was co-produced by the United States Environmental Protection Agency and The Weather Channel, and was broadcast on The Weather Channel in 2004. For more information, please visit [www.epa.gov/weatherchannel](http://www.epa.gov/weatherchannel) or send questions to EPA at [weatherchannel@epa.gov](mailto:weatherchannel@epa.gov).

The material in this program has been subject to Agency technical and policy review, and has been approved by the Agency. The views expressed by individuals in the program, however, are their own, and do not necessarily reflect those of the U.S. Environmental Protection Agency. Mention of trade names, products, or services does not convey official EPA approval, endorsement, or recommendation.

# After the Storm

After the Storm: Co-produced by EPA and The Weather Channel

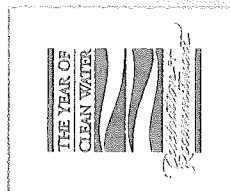




# After the Storm

For more information contact:

or visit  
[www.epa.gov/npdes/stormwater](http://www.epa.gov/npdes/stormwater)  
[www.epa.gov/nps](http://www.epa.gov/nps)

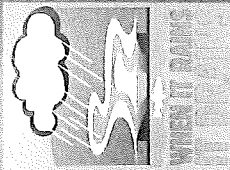


**EPA** United States Environmental Protection Agency

EPA 833-B-03-002

January 2003

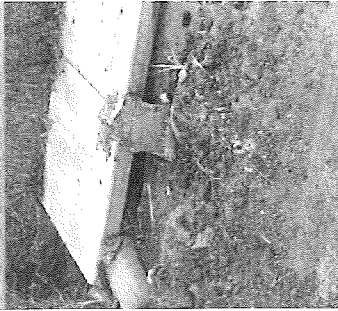
Internet Address (URL) • <http://www.epa.gov>  
For more information on this publication, contact the EPA Office of Public Affairs, (202) 566-0100.



## A Citizen's Guide to Understanding Stormwater

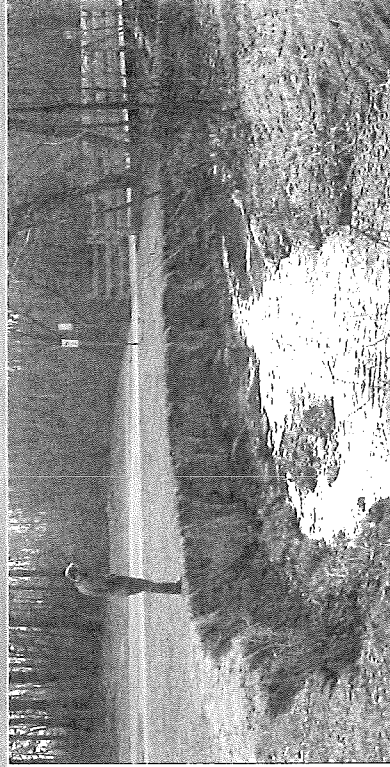


## What is stormwater runoff?



Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

## Why is stormwater runoff a problem?

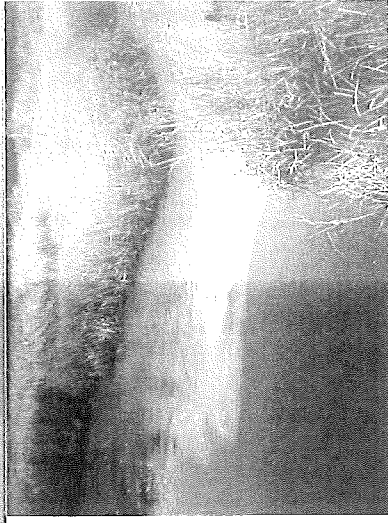


Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

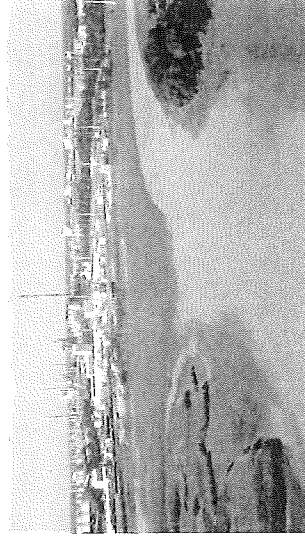
## The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- ◆ Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- ◆ Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- ◆ Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- ◆ Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- ◆ Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.

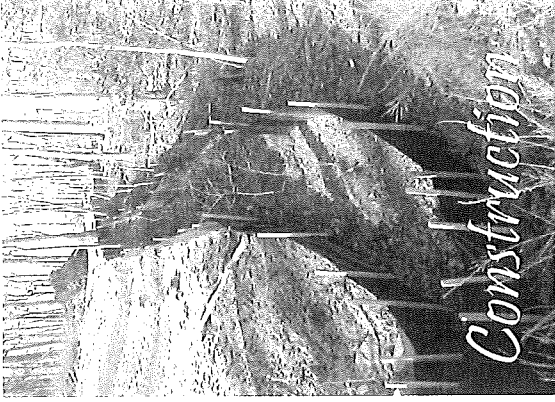


- ◆ Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.





- ◆ Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.
- ◆ Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- ◆ Cover grease storage and dumpsters and keep them clean to avoid leaks.
- ◆ Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

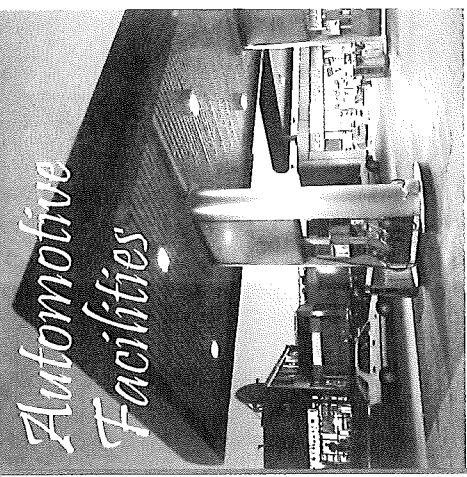
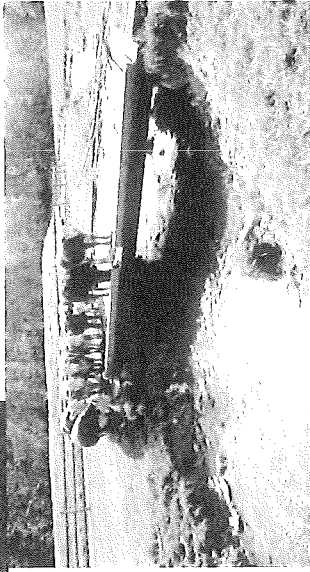


- ◆ Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.
- ◆ Divert stormwater away from disturbed or exposed areas of the construction site.
- ◆ Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- ◆ Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.



Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- ◆ Keep livestock away from streambanks and provide them a water source away from waterbodies.
- ◆ Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- ◆ Vegetate riparian areas along waterways.
- ◆ Rotate animal grazing to prevent soil erosion in fields.
- ◆ Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.



- ◆ Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.
- ◆ Clean up spills immediately and properly dispose of cleanup materials.
- ◆ Provide cover over fueling stations and design or retrofit facilities for spill containment.
- ◆ Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- ◆ Install and maintain oil/water separators.



- ◆ Improperly managed logging operations can result in erosion and sedimentation.
- ◆ Conduct preharvest planning to prevent erosion and lower costs.
- ◆ Use logging methods and equipment that minimize soil disturbance.
- ◆ Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- ◆ Construct stream crossings so that they minimize erosion and physical changes to streams.
- ◆ Expedite revegetation of cleared areas.

# Stormwater Pollution Solutions

## Residential



*Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.*

### Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.



- ◆ Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- ◆ Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- ◆ Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- ◆ Cover piles of dirt or mulch being used in landscaping projects.

### Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.



- ◆ Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- ◆ Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

### Septic systems

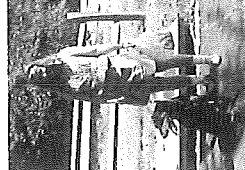
Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.



- ◆ Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- ◆ Don't dispose of household hazardous waste in sinks or toilets.

### Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.



- ◆ When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.



*Education is essential to changing people's behavior. Signs and workers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.*

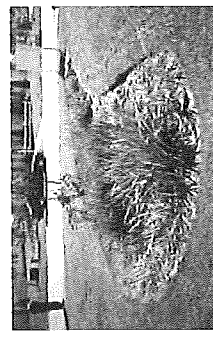
## Residential landscaping

**Permeable Pavement**—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.

**Rain Barrels**—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.



**Rain Gardens and Grassy Swales**—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.



**Vegetated Filter Strips**—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

# WORLD WIDE WEB

- ▣ <http://www.dnr.mo.gov/env/wpp/stormwater/sw-local-gov-programs.htm>
- ▣ <http://cfpub.epa.gov/npdes/>
- ▣ *Google: NPDES, MS4.*





Nixa Public Works  
1010 N. Eaglecrest  
Nixa, Missouri 65714  
417-725-2353  
www.nixa.com

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## MS4 COMPLIANCE PLAN REVIEW SHEET (SEDIMENT & EROSION CONTROL)

Project Name:

Date Plans Received:

Date Plans submitted to Department for review:

**Date Review Completed:** *(Sign and Date)*

Date comments submitted to Planning Department:

Date addendums or other reply received:

Date of second review (if needed):

---

MS4 Checklist, Evaluate threats to water quality:

- (X) Soil erosion potential.
- (X) Site slope.
- (X) Project size and type.
- (X) Sensitivity of receiving waterbodies.
- (X) Discharge flow type (pipe or sheet flow).
- (X) Location of discharge point in relation to receiving water.
- (X) Proximity of the site to receiving waterbodies; and
- (X) Other factors relevant to the MS4 service area.

## **Comments**

*Please include sheet numbers*

Please call for inspection of all stormwater BMP's as soon as they are installed.

As per the plans, these BMP's will need to be maintained in an effective condition throughout the duration of this project.

As per the MDNR Land Disturbance Permit, the weekly BMP inspections will need to be done on time and kept on site for occasional review.

Sediment and Erosion Control sheet should be updated to reflect any changes to the approved plans as they occur, i.e. location change for silt soxx, job trailer, dumpster, etc.







Nixa Public Works  
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Nixa, Missouri 65714  
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www.nixa.com

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## STREET DEPARTMENT PLAN REVIEW SHEET

**Project Name:**

**Date Plans Received:**

**Date Plans submitted to Department for review:**

**Date Review Completed:** *(Sign and Date)*

**Date comments submitted to Planning Department:**

**Date addendums or other reply received:**

**Date of second review (if needed):**

### Comments

<i>Comments</i>
<i>Please include sheet numbers</i>

---

Please include any separate comments or attachments, that need to be submitted with this sheet.



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Nixa, Missouri 65714  
417-725-2353  
www.nixa.com

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## WATER & WASTEWATER DEPARTMENTS PLAN REVIEW SHEET

**Project Name:**

**Date Plans Received:**

**Date Plans submitted to Department for review:**

**Date Review Completed:** *(Sign and Date)*

**Date comments submitted to Planning Department:**

**Date addendums or other reply received:**

**Date of second review (if needed):**

### Comments

<i>Comments</i>
<i>Please include sheet numbers</i>



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1010 N. Eaglecrest  
Nixa, Missouri 65714  
417-725-2353  
www.nixa.com

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## ELECTRIC DEPARTMENT PLAN REVIEW SHEET

Project Name:

Date Plans Received:

Date Plans submitted to Department for review:

**Date Review Completed:** *(Sign and Date)*

Date comments submitted to Planning Department:

Date addendums or other reply received:

Date of second review (if needed):

### Comments

Comments
<i>Please include sheet numbers</i>