KAYSVILLE CITY
RESOLUTION 25-09-02

A RESOLUTION UPDATING THE KAYSVILLE CITY STORM WATER MANAGEMENT PLAN (SWMP)

WHEREAS, City staff have completed a review of recent legislation from the State of Utah; and

WHEREAS, staff recommends an update to the Kaysville City Storm Water Management Plan (SWMP) in order to comply with new State regulations enacted in 2025 through SB 220; and

WHEREAS, additional Best Management Practices (BMPs) have been added, and the SWMP now reflects the new requirements for issuing compliance-based fines for Storm Water Pollution Prevention Plan (SWPPP) violations;

NOW, THEREFORE, BE IT RESOLVED by the City Council of Kaysville City, in the State of Utah, as follows:

1. The attached amended City Storm Water Management Plan (SWMP) is hereby approved.

PASSED AND ADOPTED by the City Council of Kaysville, Utah this **18th day of September, 2025.**

Tamara Tran, Mayor

ATTEST:

Annemarie Plaizier, City Recorder

Kaysville City
Utah's Hometown
FOUNDED IN 1850

KAYSVILLE CITY

STORM WATER

MANAGEMENT PROGRAM

Permit No. UTR090000

Updated July 2025

Assisted by J-U-B ENGINEERS, Inc.

INTRODUCTION

Polluted storm water runoff is often transported to municipal separate storm sewer systems (MS4s) and ultimately discharged into local streams without treatment. EPA's Storm Water Phase II Rule establishes an MS4 storm water management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that are introduced into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, roadway salts and deicing materials, pesticides and fertilizers from lawns, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways, thereby discouraging use of the resource, contaminating water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife.

In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) storm water program. The Phase I program for MS4s requires operators of "medium" and "large" MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a storm water management program as a means to control polluted discharges from these MS4s. The Storm Water Phase II Rule extends coverage of the NPDES storm water program to certain "small" MS4s but takes a slightly different approach to how the storm water management program is developed and implemented.

In the State of Utah, the EPA has granted primacy to the State of Utah to oversee and manage the storm water program. The State has adopted the Utah Pollutant Discharge Elimination System (UPDES) for that purpose. Kaysville City has prepared this Storm Water Management Program (SWMP) to meet the requirements of the UPDES Storm Water Discharge Permit for Small MS4s.

Storm Water Management Program

A Storm Water Management Program should:

- Reduce the discharge of pollutants from the MS4;
- Protect water quality;
- Satisfy the appropriate water quality requirements of the *Utah Water Quality Act*.

Storm water management programs must include:

- Ongoing documentation processes for gathering, maintaining, and using information to conduct planning, set priorities, track the development and implementation of the SWMP, evaluate Permit compliance/non-compliance, and evaluate the effectiveness of the SWMP implementation.

- Tracking the number of inspections performed, official enforcement actions taken, and types of public education activities implemented as required for each SWMP component.

- An annual analysis of capital and operation and maintenance expenditures needed, allocated, and spent as well as the necessary staff resources needed and allocated to meet the requirements of the permit.

- Best Management Practices (BMPs) for each of the six minimum control measures (MCMs);

    1. Public Education and Outreach on Storm Water Impacts

    2. Public Involvement/Participation

    3. Illicit Discharge Detection and Elimination (IDDE)

    4. Construction Site Storm Water Runoff Control

    5. Long-Term Storm Water Management in New Development and Redevelopment (Post-Construction Storm Water Management)

    6. Pollution Prevention and Good Housekeeping for Municipal Operations

- Measurable goals for each minimum control measure (i.e., narrative or numeric standards used to gauge program effectiveness);

- Estimated months and years in which actions to implement each measure will be undertaken, including interim milestones and frequency; and

- The person or persons responsible for implementing or coordinating the Storm Water Management Program (SWMP).

Permit Application and Notice of Intent

Phase II Rule encourages the development of a storm water management program by requiring a Notice of Intent (NOI) describing the storm water management program to be submitted to the NPDES permitting authority. The Notice of Intent becomes the permit application.

Cities required to permit under Phase II are allowed to cooperate and work together with neighboring cities in the application process. The Permittee may join with a Phase I City or another Phase II City in applying for a permit. The individual MS4s may share responsibility for program development with neighboring communities and/or take advantage of existing local or state programs.

Permit Requirements

The chosen measurable goals, submitted in the Notice of Intent as a permit application, become the required storm water management program; however, the NPDES permitting authority can require changes in the mix of chosen BMPs and measurable goals if all or some of them are found to be inconsistent with the provisions of the Phase II Final Rule. Likewise, the Permittee can change its mix of BMPs if it determines that the program is not effective as it could be.

Reports

The permit requires that the City review the SWMP annually, report on our activities and make any updates that might be required. The annual reports should use the form provided by the State. Generally, the annual report should include the following information:

- The status of compliance with permit conditions, including an assessment of the appropriateness of the selected BMPs and progress toward achieving the selected measurable goals for each minimum measure;
- Results of any information collected and analyzed, including monitoring data if any;
- A summary of the storm water activities planned for the next reporting cycle;
- A change in any identified BMP or measurable goals for any minimum measure; and
- Notice of relying on another governmental entity to satisfy some of the permit obligations (if applicable).

Record Keeping

Records required by the NPDES permitting authority must be kept for at least 5 years and made accessible to the Public at reasonable times during regular business hours. Records need not be submitted to the NPDES permitting authority unless the Permittee is requested to do so.

Shared Responsibilities

Kaysville City has participated in the Davis County Coalition since 2003. A breakdown of the budget and the activities the coalition will participate in is included with this document.

Budget

Kaysville City currently has a storm water utility and the fiscal year budget is included with this document.

Deadlines

The following deadlines are included in this permit

Date	Description
September 7, 2025	Submit Updated SWMP to DEQ
Annually	Submit Annual Report to DEQ

Penalties

The Permittee must comply with all conditions of the MS4 Permit. Any Permit noncompliance constitutes a violation of the Act and is grounds for enforcement action; for Permit termination; revocation and reissuance; modification; or for denial of Permit coverage. The Permittee shall give advance notice to the Director of any planned changes in the Permitted facility or activity, which may result in noncompliance with Permit requirements. The Utah Water Quality Act provides that any person who violates a Permit condition implementing provisions of the Act is subject to a civil penalty.

This document contains a description of the community-specific Storm Water Management Program for Kaysville City. The Program includes the following;

- Best Management Practices (BMPs) for each of the six minimum control measures;

    1. Public Education and Outreach on Storm Water

2. Public Participation and Involvement

3. Illicit Discharge Detection and Elimination

4. Construction Site Storm Water Runoff Control

5. Post-Construction Storm Water Management

6. Pollution Prevention and Good Housekeeping for Municipal Operations

- Measurable goals for each minimum control measure (i.e., narrative or numeric standards used to gauge program effectiveness);

- Estimated months and years in which actions to implement each measure will be undertaken, including interim milestones and frequency; and

- The person or persons responsible for implementing or coordinating the storm water program.

This document also contains the following information and documentation in its appendices:

- Appendix A – Supplemental Guide to Storm Water Management for Contractors and Developers

- Appendix B – Supplemental Guide to Storm Water Management for Public Works Departments

- Appendix C – General program documentation including inspection forms, enforcement logs, training logs, annual reports, maintenance records, observation reports, and other general documentation

- Appendix D – Copies of the most current city ordinances applicable to storm water

- Appendix E – Copies of State permits and documents regulating the Kaysville City storm water program

- Appendix F – System maps and inventories

KAYSVILLE CITY CHARACTERISTICS

General Information

The Kaysville City Storm Drain System falls under the Public Works Department for the City. A detailed organization chart can be found attached with this document. The Public Works Director can be contacted at the following address and phone number:

Mr. Josh Belnap
721 W. Old Mill Ln.
Kaysville, Utah 84037
(801) 544-8112

Some general information for Kaysville City follows:

Population:	Approximately 32,945
Size:	9.89 sq. miles; 112 miles of streets
Geographic Description:	25 miles north of Salt Lake City and 15 miles south of Ogden City with elevations varying between 4220 ft. to 4380 ft.
Receiving Waters:	Creeks that flow to the Great Salt Lake. Some of the western portion of the city drains directly through wetlands and into the Great Salt Lake.
Annual Precipitation:	15.83 inches per year
Type of Community:	A city with moderate rates of residential growth that are expected to continue for many years.
Latitude:	41.03° N
Longitude:	111.93° W

The Kaysville storm water system consists of curb and gutters, inlet boxes, piping, a few typical open channel sections, and swales. Most storm water facilities drain to local creeks. Said creeks drain into the Great Salt Lake. There are a few detention basins that exist within the system. Many of the streets use curb and gutter to collect storm water runoff with the remaining using swales or ditches. Swales and ditches are located in the ‘old town’ area and other areas not yet fully developed or street improvements completed. The City is served by a sanitary sewer system that is treated by the Central Davis Sewer District. The City has an ordinance requiring any new development within 300 feet of the existing sanitary sewer to connect. There are some existing septic tank

systems in the city, but all new developments are required to connect to the public sanitary sewer system.

History

The historical development of Kaysville is directly linked to water. Pioneer settlers in 1850 selected the area's lands to establish their farms. Many new residents have selected Kaysville City as a place to raise their families. Higher density housing, commercial development and industrial complexes are less common in Kaysville than in other areas, as the majority of development has been focused on single family homes.

Local Water Quality Concerns

The water quality within Kaysville is relatively good. There are three main streams running through town – Baer Creek, Holmes Creek and Kays Creek. According to the 2024 DWQ Beneficial Uses and Water Quality Assessment Map all three streams have been identified as impaired under Section 303(d) of the Clean Water Act with a TMDL required but not approved. Baer Creek is listed impaired for Copper and E. coli. Holmes Creek is listed impaired for copper, pH and E. coli. Kays Creek is listed impaired for copper, pH and E. coli.

The hope and intent of this Storm Water Management Program (SWMP) is to maintain that status and possibly even improve the current water quality.

The storm water in the city drains into creek channels, which in turn empty into the Great Salt Lake. At present the City hasn't encountered any major problems related to the storm drain system capacity, however there has been periodic localized flooding in major precipitation events.

Like most communities along the Wasatch Front, some of the biggest concerns involve sediment loads (coming primarily from disturbed sites), fertilizers and pesticides coming from lawns and farmlands, and oils and grease coming from the roadways, and improper disposal of household chemicals and waste materials. Kaysville City has several schools that have large impervious areas that can generate a lot of runoff and suspected larger than normal amounts of oil and/or grease. The downtown area has been well established for many years and contains large number of mature trees. Leaves coming from the trees create a minor problem during the Fall of the year. Kaysville's SWMP has been geared toward small city applications, targeting the pollutants mentioned.

Ongoing Documentation Process

Much of the documentation is or will be included in Appendix D. As part of this update, the existing BMPs and measureable goals have been reviewed and assessed for their effectiveness. We will complete evaluation worksheets to document our review and our assessment of the program. These evaluation sheets will be filed in Appendix D. This

evaluation combined with new permit requirements provided the foundation for this update. We have tried to build off of the positive things that have been accomplished and renewed our commitment to improve in areas where our program has been lacking. We feel the revised program is more focused.

Our plan is to document our activities and to keep better track of what is happening within our community. We will continue to use the forms, logs, evaluation forms and backup information from the last major update. In the coming months we will focus attention on updating city standards to meet the new retention requirements.

SWMP Focus

As discussion was held trying to understand the nature of the problems and how to accomplish the mission statement, it was determined that the first thing that needs to be done is to educate the people. This program has been developed with a heavy emphasis on education and public involvement. It is anticipated that the effectiveness and participation levels in various programs will be greatly enhanced if the Public is first made aware of the problems we face.

The emphasis should be on the positive aspects of our community. Programs and education materials should give ideas of what people can do, and not give long lists of things they can't do.

PUBLIC EDUCATION AND OUTREACH

Permit Requirements

The permit requirements for Public Education and Outreach on Storm Water Impacts can be found in Section 4.2.1 of the permit. A copy of the permit is included in Appendix F for reference. The permit outlines in general the following requirements.

1. The MS4 must promote behavior change by the Public to reduce water quality impacts associated with pollutants in storm water runoff and illicit discharges. This is a multimedia approach targeted to specific audiences. The four audiences are: (1) residents, (2) industrial, institutions, and commercial facilities, (3) developers and contractors (construction), and (4) MS4 owned and operated facilities.

2. Target pollutants and pollutant sources and their potential impacts relating to storm water quality.

3. Provide and document information given to the four focus audiences.

4. Provide documentation or rationale as to why particular BMPs were chosen for its public education and outreach program.

Summary of the Four Focus Audiences

Residents (General Public)

The City considered how to disseminate information and educate its residents. The demographics range from young kids to the aged. The City feels that with today's technology, the city website has been used more often to advertise or inform the general public on public works projects and happenings within the city. The web address is https://www.kaysville.gov/. A message board is also used on this website. Announcements and items of interest are posted periodically for the community. There is a specific link to storm water information under the Public Works Department webpage.

Another existing resource is the City monthly newsletter. A more focused effort to include an article or specific information that relates to storm water quality will aid the City in educating the general public without increasing their cost to send out such information. These newsletters are also posted on the website under "News". Kaysville City also mails out educational brochures annually to all residents with a pool or septic tank on their property to educate them on storm water BMP's associated with these systems.

The City makes annual visits to several elementary schools in Kaysville to educate students on Public Works and Storm Water. The City also actively participates in the Davis County Storm Water Coalition. Coalition efforts include 4th grade in classroom

storm water lessons, an annual water fair, movie theater/television advertising, and a PSA program with Jr high/High School students.

Industrial, Institutions, and Commercial Facilities
Kaysville City has reviewed its local businesses and commercial facilities. They have evaluated opportunities or means to educate them on storm water items. The City does have a business park that is owned by each individual business. Kaysville has several institutions, mostly school facilities. The City will work closely with the responsible parties to ensure they are complying with storm water practices, BMPs, and maintaining their facilities. The City also mails out educational brochures annually to specific audiences including: fueling stations, automotive shops, mobile cleaners, landscaping, pools, and septic systems.

Developers and Contractors (Construction)
The City interacts with developers, engineers, and contractors when new developments come into the City as well as on Public Works projects. This focus audience is where the City would like to make efforts in educating since the most potential for storm water impacts is typically by construction activities. Just an increase in awareness and permitting may result in greater perceived benefits. Kaysville City has adopted an LID handbook to aid developers in understanding storm water quality requirements. Contractor training is provided through an annual event put on by the Davis County and Golden Spike Stormwater Coalitions.

MS4 Industrial Facilities
The City facilities are spread out throughout the city, but the main Operations Center located on Old Mill Lane is where there is the most potential for storm water quality items. Below is a list of the MS4 owned and/or maintained facilities:

- Operations Center (721 W. Old Mill Lane)
- City Hall, Library, Police Station, Recreation Office (23 E. Center St.)
- Fire Station (175 S. Main St.)
- Kaysville Cemetery (500 E. Crestwood Dr.)
- Barnes Park (900 W. 200 North)
- Angel Street Park (200 S. Angel St.)
- Gailey Park (200 S. Larkin Ln.)
- Ponds Park (50 W. Burton Ln.)
- Hess Farms Park/Detention (600 E. 1625 South)
- DATC Detention Pond (550 S. Main St.)
- Pioneer Park (1285 S. Angel St.)
- Wilderness Park (1625 E. 650 N.)
- Bonneville Park (Bonneville & 200 N.)
- Bishop’s Field (349 N. 200 W.)
- Quail Crossing Park (166 E. 2300 S.)
- Heritage Park (250 N. Fairfield)
- Hods Hollow Park (400 E. 700 N.)

Target Pollutants and Pollutant Sources

Kaysville City has identified the following pollutants to target: fuels/oils, dirt/sediment, pesticides/fertilizers, pool chemicals, pet waste and soaps/detergents. These pollutants will be a focus however the City is mindful of other possible pollutants and will address them as needed.

Best Management Practices (BMPs)

In order to help meet the goals and objectives of this SWMP Kaysville City has chosen to adopt the following BMPs. Each BMP is cross referenced alphabetically by code in the indicated appendix to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness. Only those BMPs listed below will be utilized by Kaysville City as part of their SWMP at the present time.

BMP	Code	Appendix
Classroom Education On Storm Water	CESW	B
Educational Materials	EM	B
Employee Training	ET	B
Public Education/ Participation	PEP	B
Using Media	UM	B

Goals

In order to more fully realize the benefit of the BMP the City has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Final Storm Water Phase II Rule for Education and Outreach.

The following table includes the goals for MCM 1.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Associated BMPs	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
1	Selected pollutants	Residents and Businesses	4.2.1.1 To educate audiences about impacts from storm water discharge	Continue supporting DCSWC advertising & mailing brochures	Ongoing	PEP and UM	Advertising continues & Brochures are sent out
1	Selected pollutants	Residents (School Students)	4.2.1.1 To educate audiences on ways to avoid, minimize, and reduce impacts of storm water discharge	Continuing DCSWC storm water fair and in-school lessons/programs	Annually	PEP and CESW	Fair and School Lessons/programs occur annually
1	Selected pollutants	Residents and Businesses	4.2.1.1 To educate audiences on actions individuals can take to improve water quality	Continue supporting DCSWC advertising & mailing brochures	Ongoing	PEP and UM	Advertising continues & Brochures are sent out
1	See list in "desired result" column	General Public	4.2.1.2 – Provide and document information provided to target audience on prohibitions against illicit discharges and improper disposal of waste including, but not limited to: • maintenance of septic systems • effects of outdoor activities such as lawn care • benefits of on-site infiltration of storm water • effects of automotive work and car washing on water quality • proper disposal of swimming pool water • proper management of pet waste	Include information on the website and include information in utility bills or city newsletter. Continue mailing pollution prevention brochures annually.	Ongoing	PEP and UM	Information is current on website and included in utility bills or city newsletter. Brochures are mailed annually.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Associated BMPs	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
1	See list in "desired result" column	Industrial, Commercial and Institutions	4.2.1.3 – Provide and document information provided to target audience on prohibitions against illicit discharges and improper disposal of waste including, but not limited to: • proper lawn maintenance • benefits of appropriate on-site infiltration of storm water • building and equipment maintenance • use of salt or other deicing materials • proper storage of materials • proper management of waste materials and dumpsters • proper management of parking lot surfaces	Include information on the website and produce and distribute a brochure that is targeted to specific types of businesses.	Ongoing	PEP and UM	Information is current on the website and brochures are distributed.
1	Illicit discharge and waste	Engineers, Contractors, Developers and plan review staff	4.2.1.4 Provide and document information provided to target audience regarding reduction of adverse impacts from storm water runoff from development sites	Provide annual training to target audience through the DCSWC and in-house training for staff. Provide SWPPP information on City website.	Ongoing	EM	Annual training occurs and information on the website is current.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Associated BMPs	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
1	Illicit discharge and waste	Employees	4.2.1.5 - Provide and document information and training provided to target audience on prohibitions against illicit discharges and improper disposal of waste including, but not limited to: •equipment inspection to ensure timely maintenance •proper storage of industrial materials •proper management of waste materials, dumpsters and disposal sites •minimization of use of salt or other deicing materials •benefits of appropriate on-site infiltration •proper maintenance of parking lot surfaces	Provide annual IDDE training for all city employees. Provide annual training on SOP's for applicable employees.	Ongoing	ET	Training occurs annually (within 60 days for new hires) and is documented.
1	All pollutants	Permittee engineers, development and plan review staff, land use planners	4.2.1.6 – Provide and document information and training provided to target audience to learn about: • Low Impact Development (LID) practices • green infrastructure practices • post construction control and associated Best Management Practices (BMPs)	Provide annual training with all engineers, development and plan review staff and land use planners to review the city's LID goals.	Ongoing	ET	Training occurs annually and is documented.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Associated BMPs	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
1	All pollutants	All Audiences	4.2.1.7 Evaluate the effectiveness of the public education program by a defined method.	Once every permit cycle (5 years) resurvey the community. Annually survey school district after water fair.	Once per permit cycle (community) Annually (Water fair participants)	PEP	Surveys complete and results compared to initial surveys.
1	All pollutants	All Audiences	4.2.1.8 Document why certain BMPs were chosen for public education program (over others)	Documentation provided in annual report and SWMP.	Ongoing	PEP	Rationale documented in SWMP and annual report.

PUBLIC PARTICIPATION/ INVOLVEMENT

Permit Requirements

The permit requirements for Public Participation and Involvement on Storm Water Impacts can be found in Section 4.2.2 of the permit. A copy of the permit is included in Appendix F for reference. The permit outlines in general the following requirements.

1. Comply with applicable State, and local public notice requirements to involve interest groups and stakeholders for their input on the SWMP.

2. Make available to the public a current version of the SWMP document for review and input for the life of the permit. This should be posted on the City's website. A specific contact person and phone number or email address shall be identified for those wishing to comment.

3. The SWMP shall include ongoing opportunities for public involvement and participation, but at a minimum two (2) times annually. Permittees can meet this requirement through advisory panels, public hearings, watershed committees, stewardship programs, environmental activities, volunteer opportunities, or other similar activities.

Summary of Existing Efforts

Website

The website will be used for disseminating and advertising several storm water related information. They will include, but not limited to, the following:

- SWMP will be posted on the website for public review and comment
- Hotline number
- A list or link where citizens can recycle different materials
- Advertising green waste collection
- A list or link where citizens can see potential projects volunteers could do, for example, Eagle Scout Projects.
- Helpful links for developing a SWPPP.
- A specific contact person and contact information will be added to the website
- Storm Water requirements/LID

Storm Drain Labeling Program

The City has labeled approximately 90% of the storm drain catch basins in the past. Volunteers have assisted in the implementation of labeling catch basins. Often times, fliers were distributed in the neighboring area to educate residents about the marker and to make them aware of storm water quality. The City will suspend labeling until there is a sufficient number of catch basins that need to be labeled due to the cost of labels and the best use of volunteer efforts.

Used Oil Recycling

There are several locations within the city boundaries where used oils can be brought for recycling. Information is found on the City's website.

Green Waste Collection
Once a year the City conducts a curbside pickup of yard waste to facilitate the proper disposal of such materials.

Service Groups/Volunteers
There are local scout and church groups that have participated in street and channel cleanup and litter reduction as well as distributing fliers and installing markers.

Best Management Practices (BMPs)

In order to help meet the goals and objectives of this SWMP Kaysville City has chosen to adopt the following BMPs for use within our city as applicable. Each BMP is cross referenced by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness and can be found in the indicated appendix.

BMP	Code	Appendix
Public Education/ Participation	PEP	B

Goals

In order to more fully realize the benefit of the BMP the City has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Final Storm Water Phase II Rule for Public Involvement and Participation.

The following table summarizes the goals for MCM 2.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Associated BMPs	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
2	All pollutants	General public	4.2.2 Provide ongoing opportunities for Public Participation and Involvement but at a minimum of twice annually.	Notify and provide the public with involvement opportunities.	Twice Annually	PEP	Opportunities such as advisory panels, public hearings, watershed committees, stewardship programs, environmental activities, volunteer opportunities, etc. are provided at least twice annually.
2	All pollutants	General public	4.2.2.1 Have a program or policy in place that allows for the public to provide input	Notify the public of the city council meeting when SWMP updates will be reviewed.	SWMP updates will be made within 180 days of permit modifications	PEP	The program or policy is in place
2	All pollutants	General public	4.2.2.2 Have SWMP document available for public review before it's submitted to the state	Have a hard copy of the draft of the permit available at the city offices within a week of the public hearing	Week before city council meeting	PEP	SWMP document is available for public review a week before public hearing
2	All pollutants	General public	4.2.2.3 Have SWMP document available to the public at all times	Post the SWMP on the website	Ongoing	PEP	SWMP is posted on the website
2	All pollutants	General public	4.2.2.3 Make updated SWMP document available to the public annually	Post updated SWMP annually	Annually	PEP	SWMP is updated and posted on the website annually

ILLICIT DISCHARGE DETECTION AND ELIMINATION

Permit Requirements

The permit requirements for Illicit Discharge Detection and Elimination on Storm Water Impacts can be found in Section 4.2.3 of the permit. A copy of the permit is included in Appendix F for reference. The permit outlines in general the following requirements.

1. Maintain a storm sewer system map of the MS4, showing the location of all outfalls and the names and location of all State waters that receive discharges from those outfalls.

2. Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable under State, or local law) on non-storm water discharges into the MS4, and appropriate enforcement procedures and actions.

3. Develop and implement a plan to detect and address non-storm water discharges, including spills, illicit connections, and illegal dumping to the MS4. The plan should include:

    a. Procedures for locating and listing priority areas likely to have illicit discharges
    b. Annual field inspections of priority areas
    c. Dry weather screening
    d. Reporting of businesses that may require a separate industrial permit.

4. Develop and implement standard operating procedures (SOPs) for:

    a. tracing the source of an illicit discharge.
    b. characterizing the nature of, and the potential public or environmental threat posed by, any illicit discharges found or reported.
    c. ceasing the illicit discharge, including notification of appropriate authorities, property owners, and technical assistance for removing the source and follow-up inspections.

5. Inform public employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste.

6. Promote or provide services for the collection of household hazardous waste.

7. Publicly list and publicize a hotline or other local number for public reporting of spills and other illicit discharges.

8. Develop a written spill/dumping response procedure, and a flowchart for internal use, including various responsible agencies and their contacts.

9. Adopt and implement procedures for program evaluation and assessment.

10. Train employees, at a minimum, annually on the IDDE program.

Summary of Plan

Kaysville City's IDDE plan is to identify and eliminate illicit discharges in the storm drain system. The City has been reviewing and mapping their storm drain system in GIS for years. In the process of collecting data, routine cleaning of said facilities is completed. Through this process, the storm drain department assesses the status of the storm drain facility and can identify if an illicit discharge is present. Details on the IDDE program are found in Appendix C.

Mapping
The City has a fairly comprehensive, GPS based, storm drain map showing the storm drain system and its points of discharge. A copy of this map is included in Appendix G.

Ordinance
Kaysville City currently has an ordinance designed to specifically prohibit illicit discharges to the storm sewer system. The ordinance also gives authority to Kaysville City to take escalating enforcement actions depending on the severity of an incident.

Illicit Spills
Reports of spills are handled by the Public Works Department, Fire Department or Davis County Health Department. If a spill is reported or identified, the proper procedures will take place per the flowchart in the IDDE program.

Illicit Connections/Discharges
The City has not generally experienced problems with individuals or businesses illicitly connecting their sanitary waste water piping to storm drains. More common types of illicit discharges include natural runoff from sites with hazardous materials, spills from highway accidents, concrete truck washout water, residential yard waste and debris being washed into the gutters, and carpet cleaner waste.

Best Management Practices (BMPs)

In order to help meet the goals and objectives of this SWMP Kaysville City has chosen to adopt the following BMPs for use within our city as applicable. Each BMP is cross referenced by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness and can be found in the indicated appendix.

BMP	Code	Appendix
Community Hotline	CH	B,C
Employee Training	ET	B,C
Hazardous Waste Management	HWM	B,C

Illegal Dumping Control	IDC	B,C
Identify Illicit Connections	IIC	B,C
Illegal Solids Dumping Controls	ISDC	B,C
Map Storm Water Drains	MSWD	B,C
Non-Storm Water Discharge to Drains	NSWD	B,C
Ordinance Development	OD	B,C
Public Education/ Participation	PEP	B,C
Used Oil Recycling	UOR	B,C

Goals

In order to more fully realize the benefit of the BMP the City has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Final Storm Water Phase II Rule for Illicit Discharge Detection and Elimination.

The following table includes the goals for MCM 3.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Associated BMPs	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
3	All Pollutants	Contractors, Developers, City Council	4.2.3 Enforcement ability for storm water rules	Review and update the ordinance to conform with permit	Within 180 days of permit renewal	OD	If ordinance is in place and meets the permit requirements
3	N/A	Public Works	4.2.3.1 – Maintain a current storm water map that includes: • Outfall locations with names and location of all State waters that receive discharge from these outfalls • Storm drain pipe and other structures	Maintain policy to maintain a Current SD System Map on all new developments within 12 months	Ongoing	MSWD	If policy is in place and meets the permit requirements
3	"	"	"	Continue to update mapping system per Kaysville policy	Ongoing	MSWD	If map is reviewed and updated
3	All Pollutants	All Audiences	4.2.3.2 – Effectively prohibit, through ordinance or other regulatory mechanism, non-SW discharges. Permitee must have a variety of escalating enforcement options to use.	Have ordinances and an escalating enforcement plan in place	Ongoing	NSWD	If ordinance and enforcement plan is in place and meets the permit requirements
3	"	"	4.2.3.2.1 The IDDE program must have adequate legal authority to detect, investigate, eliminate and enforce against non-SW discharges.	Provide adequate legal authority through ordinance	Ongoing	NSWD	If ordinance is in place and meets the permit requirements
3	All Pollutants	All Audiences	4.2.3.3 Implement written plan to detect and address NSWD to MS4.	Follow SOPS and written plan provided in SWMP.	Ongoing	NSWD	If SOPS are in place and documented
3	All Pollutants	All Audiences	4.2.3.3.1 Written SOPS for locating and listing areas likely to have illicit discharges.	Follow SOPS and Update priority area list Annually	Annually	NSWD	If SOPS are in place and priority list updated annually

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Associated BMPs	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
3	All Pollutants	All Audiences	4.2.3.3.2 Field inspections of areas which are considered a priority shall be achieved by inspecting each priority area annually	Conduct field inspections of IDDE priority areas annually	Annually	IDC, ISDC	Successful if reports are complete and filed
3	All Pollutants	All Audiences	4.2.3.3.3 Dry Weather Screening	Conduct dry weather screening annually and inspect all outfalls once permit cycle	Annually	NSWD	If 20% of outfalls are inspected annually and documented as defined in SOPS.
3	All Pollutants	All Audiences	4.2.3.3.4 Permitee must notify director within 30 days if they suspect a discharger may need coverage under separate UPDES permit.	Notify Director within 30 days	As needed	NSWD	If director is notified within 30 days
3	All Pollutants	Employees	4.2.3.4 - Implement SOPS for tracing the source of an illicit discharge.	Review flow chart and SOP with staff and provide training annually.	Annually	ET, IDC, IIC	Successful if training is completed annually and SOPS are followed.
3	All Pollutants	Employees	4.2.3.5 – Implement SOPs for characterizing the nature of any illicit discharges found or reported to the Permittee by the hotline developed in 4.2.3.9.	Review flow chart and SOP with staff and provide training annually.	Ongoing	IIC, CH, ET	Successful if training is completed annually and SOPS are followed.
3	All Pollutants	Employees	4.2.3.5.1 - Inspection report detail requirements.	Review inspection form and SOPS annually.	Ongoing	ET,IDC, ISDC	Successful if training is completed annually and SOPS are followed.
3	All Pollutants	All Audiences	4.2.3.6 – Implement SOPs for ceasing the illicit discharge. All IDDE investigations must be thoroughly documented and may be requested at any time by the Division.	Review flow chart and SOP with staff and provide training annually.	Ongoing	ET, IDC, ISDC	Successful if training is completed annually and SOPS are followed.
3	All Pollutants	Public Employees, Businesses and Residents	4.2.3.7 Inform public employees, businesses, and general public of hazards associated with illicit discharges and improper disposal of waste	See MCM 1		PEP, ET	See MCM 1

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Associated BMPs	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
3	Household Hazardous Waste	Residents	4.2.3.8 Promote or provide services for the collection of household hazardous waste	Put the Household Hazardous Waste disposal site address and phone number on City Website	Ongoing	UOR, HWM	Successful if posted on website.
3	Household Hazardous Waste	Residents	4.2.3.9 Publicly list and publicize a hotline or other telephone number for public reporting of spills and other illicit discharges	Post the hotline number on city website	Ongoing	CH	Successful if posted on website.
3	Household Hazardous Waste	Residents	4.2.3.9.1 - Develop written SOPS and flow chart for spill response from public referrals of illicit discharges.	Review flow chart and SOP with staff and provide training annually.	Annually	ET, IIC, IDC	Successful if training is completed annually and SOPS are followed.
3	All Pollutants	All Audiences	4.2.3.10 Adopt and implement procedures for program evaluation and assessment. Include a database for mapping, tracking of the spills or illicit discharges identified and inspections conducted	Maintain a database for tracking Illicit Discharges	Ongoing	IIC, MSWD	Successful if database is used and maintained.
3	All Pollutants	Staff, Contracted Staff or other responsible entities	4.2.3.11 Receive minimum annual training in the IDDE program. Immediate training for the new hires along with follow-up training as needed to address change. A summary of such training shall be included in the annual report.	Provide annual training of all City employees and contracted staff, including new hires.	Ongoing	ET	Successful if training is completed

CONSTRUCTION SITE RUNOFF CONTROL

Permit Requirements

The permit requirements for Construction Site Runoff Control on Storm Water Impacts can be found in Section 4.2.4 of the permit. A copy of the permit is included in Appendix E for reference. The permit outlines in general the following requirements

1. Have an ordinance or other regulatory mechanism requiring the implementation of proper erosion and sediment control practices on construction sites. This will include a requirement for a Storm Water Pollution Prevention Plan (SWPPP) and enforcement provisions.
    a. Ensure construction operators obtain and maintain UPDES Construction Permit coverage for the duration of the project.

2. Develop a written enforcement strategy including
    a. Standard Operating Procedures (SOPs) for enforcing processes and sanctions on construction sites with escalating enforcement.
    b. Document and track all enforcement actions
    c.

3. Develop and implement SOPs for preconstruction SWPPP review. Include the following:
    a. A preconstruction conference to review plans and requirements
    b. Procedures for consideration of potential water quality impacts using a checklist
    c. Identifying priority construction sites
4. Develop and implement SOPs for construction site inspections and enforcement including:
    a. Inspecting sites monthly
    b. Inspecting all phases of construction
    c. Procedures for Notice of Termination and final inspections
    d. Inspecting priority areas every two weeks
    e. Follow up on inspection action items
5. Train staff to implement the construction storm water program, including permitting, plan review, construction site inspections, and enforcement.

6. Establish procedures to maintain records of all projects disturbing greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development.

Summary of Existing Efforts

City Ordinances

The City currently has an ordinance that requires a storm water construction activity permit for construction activities. The application for this permit requires a completed Storm Water Pollution Prevention Plan (SWPPP).

Site Plan Review Process
The City currently has a procedure requiring the submittal of construction drawings prior to approving a new development. A SWPPP is required to address specifically water quality impacts.

Inspections
There is currently a Public Works inspector who oversees construction of new developments. There is also a storm water inspector to review and inspect the implementation of the SWPPP. Inspection forms and checklists are provided to the contractors and used by City personnel. BMPs are to be installed and maintained before, during and after construction.

Training
Inspectors and plan reviewers will be trained on the proper planning and installation of BMPs. They will also be trained on proper documentation and enforcement activities.

Records
Each applicable construction site will have its own storm water file maintained by the Public Works Department. There will be hard copies as well as electronic files stored for five (5) years per the General Permit requirements.

Best Management Practices (BMPs)

In order to help meet the goals and objectives of this SWMP Kaysville City has chosen to adopt the following BMPs for use within our city as applicable. Each BMP is cross referenced by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness and can be found in the indicated appendix.

BMP	Code	Appendix
Certification and Inspector Training	CCIT	A,B
Classroom Education on Storm Water	CESW	A,B
Erosion Control Plan	ECP	A,B
Education Materials	EM	A,B
Housekeeping Practices	HP	A,B
Landscape and Irrigation Plan	LIP	A,B
Ordinance Development	OD	A,B
Zoning	ZO	A,B
Public Education & Participation	PEP	A,B

Goals

In order to more fully realize the benefit of the BMP the City has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Final Storm Water Phase II Rule for Construction Site Runoff Control.

The following table includes the goals for MCM 4.

MCM	Target		Desired Result	Measurable Goal	Milestone	Assoc.	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)			Date	BMP	
4	Sediment, Construction Site Debris, Hydrocarbons	Contractors and Developers	4.2.4.1 – Revise, as necessary, and enforce an ordinance or other regulatory mechanism that requires the use of erosion and sediment control at construction sites. Ordinance shall be equivalent with most current UPDES Storm Water General Permits for Construction, include sanctions, require contractors to implement a Storm Water Pollution Prevention Plan (SWPPP) and obtain permit coverage from UPDES, and provide access for MS4 to inspect BMPS on private property.	Require a SWPPP for every construction site over one acre or less than one acre if part of CPOD	Ongoing	OD	Successful if 95% of all active construction sites have a working SWPPP
4	Sediment, Construction Site Debris, Hydrocarbons	Contractors and Developers	4.2.4.2 – Develop a written enforcement strategy and implement the enforcement provisions of the ordinance or other regulatory mechanism.	Enforce ordinance through written escalating enforcement plan and maintain documentation	Ongoing	OD	Successful if completed
4	"	"	4.2.4.2 Documentation and tracking of all enforcement actions	Continue using construction site enforcement action log/database	Ongoing	OD	Successful if we have a log and are using it
4	Sediment, Construction Site Debris, Hydrocarbons	Contractors and Developers	4.2.4.3 Develop and implement SOP's for pre-construction SWPPP review for construction sites	Utilize a checklist for preconstruction reviews of SWPPP	Ongoing	ECP	Successful if we are conducting SWPPP reviews

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
4	"	"	4.2.4.3.1 – Conduct a pre-construction SWPPP review which includes: •Review of the site design •Review of the planned operations at the construction site •Review planned BMPs during the construction phase •Review planned BMPs to be used to manage runoff created after development	Hold Pre-con meetings on all sites greater than 1 acre	Ongoing	ECP	Successful if we are conducting Pre-con meetings
4	"	"	4.2.4.3.2 - The Permittee must develop procedures for receiving and considering information and Comments submitted by the public on proposed projects.	Allow for public comment on proposed projects through planning commission and city council meetings during development review process.	Ongoing	PEP	Public comments received during development review process.
4	"	"	4.2.4.3.2 – Identify priority construction sites considering the following factors at a minimum: •Soil erosion potential •Site slope •Project size and type •Sensitivity of and proximity to receiving waterbodies •Non-SW discharges and past record of noncompliance by the operators of the construction site	Develop a plan to identify priority areas based on recommended factors.	Ongoing	ZO	Successful if all priority sites are identified

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
4	Sediment, Construction Site Debris,	Contractors and Developers	4.2.4.4.1 Inspections of all new construction sites ... at least monthly by qualified personnel	Conduct monthly inspections of all construction sites - Emphasize self-inspections - sensitive areas to be inspected twice monthly	Ongoing	CCIT	Successful if all active construction sites are inspected monthly
4	"	Contractors, developers and MS4 staff	4.2.4.4.1 - "Qualified Person"	Develop policy that all SWPPP inspectors to be RSI trained	Ongoing	CCIT	Successful if completed
4	"	Contractors, developers and MS4 staff	4.2.4.4.2 ...The Permittee must inspect all phases of construction and include in its SWMP document a procedure for being notified by construction Operators/owners of their completion of active construction so that verification of final stabilization and removal of all temporary control measures may be conducted.	Develop SOPS for inspections prior to land disturbance, during active construction, and following active construction. Develop a written Notice of Termination process for use within the city	Ongoing	ECP	Successful if 95% of all active construction sites are inspected & terminated appropriately
4	"	Contractors, developers and MS4 staff	"	Train SWPPP inspectors, their supervisors, and any personnel who grant final occupancy permits on the NOT process	Ongoing	ECP	Successful if 95% of all active construction sites are terminated appropriately
4	"	"	4.2.4.4.3 Conduct Bi-weekly inspections on high priority construction sites	Inspect high priority sites	Ongoing	ECP	Successful if all high priority sites are inspected bi-weekly

MCM	Target		Desired Result	Measurable Goal	Milestone	Assoc.	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)			Date	BMP	
4	Sediment, Construction Site Debris	Contractors, Developers and MS4 Staff	4.2.4.4.4 - Permittees shall utilize an electronic site inspection to conduct MS4 oversight inspections at construction sites. Permittees may complete an on-site inspection if the Permittee has a documented reason for justifying an on-site oversight inspection.	Follow inspection and enforcement SOPS provided by the DEQ; Provide an Electronic Inspection Guide to contractors; Document opt-out forms or onsite oversight inspection justification as required	Ongoing	ECP	Successful if SOPS are followed and inspections, opt-out forms & onsite oversight inspections justifications are documented
4	“	“	4.2.4.4.4 - Permittees shall provide 48-hours advance notice of on-site inspection in this case unless there is an imminent threat of a discharge.	Follow inspection and enforcement SOPS provided by the DEQ to ensure compliance	Ongoing	ECP	Successful if SOPS are followed and operators are given 48 hours’ notice before an onsite oversight inspection
4	“	“	4.2.4.4.5 - Follow up and enforcement actions must be taken, tracked, and documented (based on inspection findings).	Follow inspection and enforcement SOPS provided by the DEQ to ensure compliance	Ongoing	ECP	If enforcement action has been taken, tracked and documented as necessary
4	"	“	4.2.4.5 Provide training to city staff and 3rd party designers	Develop policy that all SWPPP inspectors to be RSI trained	Ongoing	CCIT	Successful if completed
4	"	"	4.2.4.6 Maintain a record of all sites greater than one acre, including CPOD, for at least five years.	Maintain documentation	Ongoing	ECP	Successful if active construction sites documentation is recorded and saved

LONG-TERM STORM WATER MANAGEMENT IN NEW DEVELOPMENT/REDEVELOPMENT (POST-CONSTRUCTION STORM WATER MANAGEMENT)

Permit Requirements

The permit requirements for Post-Construction Storm Water Management can be found in Section 4.2.5 of the permit. A copy of the permit is included in Appendix E for reference. The permit outlines in general the following requirements

1. Have an ordinance or other regulatory mechanism requiring the implementation of long-term post-construction storm water controls at new and redevelopment sites.

2. Develop an enforcement strategy and implement enforcement provisions of the ordinance including escalating enforcement for recalcitrant violators.

3. Develop requirements or standards for new development and redevelopment projects to include storm water controls or management practices that will prevent or minimize impacts to water quality, including:

    a. Non-structural BMPs
    b. Structural BMPs that focus on Low Impact Development which encourages infiltration, evapotranspiration or harvesting.
    c. If LID is not feasible document why and provide the rationale for alternative controls to be used
    d. Develop a retrofit plan for existing developed sites that are adversely impacting water quality.

4. Define specific hydrologic method for calculating runoff and flow rates to be used to size structural BMPs and facilitate plan review. These methods shall include:
    a. Requirements to prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 80^{th} percentile rainfall event.
    b. If retaining this event is infeasible, document why and provide alternative design criteria.

5. Adopt and implement procedures for site plan review which incorporate consideration of water quality impacts These procedures shall include:.
    a. Reviewing plans to ensure that they include long-term storm water management measures that meet the requirements
    b. Providing developers and contractors with preferred design specifications to more effectively treat storm water

6. Develop, adopt and implement Standard Operating Procedures (SOPs) for site inspection and enforcement of post-construction storm water control measures.

These procedures must ensure adequate ongoing long-term operation and maintenance by including:

a. A requirement for annual inspections of all long-term BMPs
b. Maintenance agreements addressing maintenance requirements for any control measures
c. Allowing the MS4 to conduct oversight inspections
d. Inspection of long-term BMPs during construction to ensure they get constructed properly

7. Provide adequate training for staff concerning post-construction storm water management, plan review, inspections and enforcement.

8. Maintain an inventory of all post-construction structural storm water control measures. This includes public and private facilities.

Summary of Existing Efforts

Ordinance

Kaysville City currently has Ordinances and Standards in place to address post construction water quality concerns including peak discharge rates, detention, retention, LID, and maintenance agreements.

Low Impact Development

Working with JUB engineers, Kaysville City has developed an LID handbook to aid Developers and City Staff in understanding and implementing retention requirements. The handbook will be updated as needed to comply with changing requirements.

Kaysville City requires new development and redevelopment projects, that meet requirements for LID implementation, to retain the 80th percentile rainfall event. Kaysville has chosen to use 0.48 inches or 0.04 feet as stated in the City's LID manual

Landscaping Plans

Developers are required to present a plan outlining landscaping plans to the City for commercial or business sites. Open spaces or parks typically will also have landscaping plans submitted and are required to be landscaped before final approval.

Design Storm

Design storm parameters can be found in the Kaysville City Drainage and Design Manual (Appendix A).

Site Plan Review Process

The City currently has a procedure requiring the submittal of construction drawings prior to approving a new development. Water quality measures will be considered and assessed through the review process.

Training
Inspectors and plan reviewers will be trained on the proper planning and installation of post-construction BMPs and the procedures in the SOPs.

Inventory
Kaysville City has a fairly comprehensive, GPS based, storm drain map showing the storm drain system and its points of discharge. A copy of this map is included in Appendix F. The private storm drain control measures may or may not be included at this time. The City plans to make an effort to continue to collect data per the requirements of this permit.

Best Management Practices (BMPs)

In order to help meet the goals and objectives of this SWMP Kaysville City has chosen to adopt the following BMPs for use within our city as applicable. Each BMP is cross referenced by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness and can be found in the indicated appendix.

BMP	Code	Appendix
BMP Inspection and Maintenance	BMPIM	A,B
Educational Materials	EM	A,B
Infrastructure Planning	IPL	A,B
Landscape and Irrigation Plan	LIP	A,B
Ordinance Development	OD	A,B
Low Impact Development	LID	A,B

Goals

In order to more fully realize the benefit of the BMP the City has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Final Storm Water Phase II Rule for Post Construction Runoff Control.

The following table includes the goals for MCM 5.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
5	All Pollutants	MS4 Staff, Contractors and Developers	4.2.5.1 - Post Construction controls. Program must have Standards/requirements to prevent or minimize impacts to water quality.	Follow updated standards, ordinance, and LID handbook to meet requirement	Ongoing	OD	If standards, ordinance, and LID handbook are in place and followed
5	"	"	4.2.5.1.1 - Program should include nonstructural BMP requirements/standards that work to protect the integrity of natural resources and sensitive areas.	Follow updated standards and LID handbook that require assessment/use of non-structural BMPs for long term storm water management	Ongoing	OD/LID	If standards, ordinance, and LID handbook are in place and followed.
5	"	"	4.2.5.1.2 - Retention requirement - Develop and define a specific hydrologic method for calculating runoff volumes and flow rates to ensure consistent sizing of structural BMPS in jurisdiction and to facilitate plan review.	Follow updated standards and LID handbook that includes specific hydrologic calculation methods.	Ongoing	OD/LID	If standards, ordinance, and LID handbook are in place and followed.
5	"	"	4.2.5.1.2 - Retention requirement for new and redevelopment projects. (80th Percentile storm event)	Follow updated standards, ordinance, and LID handbook to meet requirement	Ongoing	OD/LID	If standards, ordinance, and LID handbook are in place and followed.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
5	"	"	4.2.5.1.3 - LID Approach - Implement a process which requires the evaluation of LID for all projects subject to the requirements in 4.2.5.1.2	Follow updated standards, ordinance and LID handbook that includes requirements to retain the 80th percentile storm or approved alternative design criteria.	Ongoing	OD/LID	If standards, ordinance, and LID handbook are in place and followed.
5	"	"	4.2.5.1.4 - Feasibility- Provide rationale if meeting retention standards in part 4.2.5.1.2 is infeasible.	Follow updated standards, ordinance, and LID handbook that provide guidance for determining feasibility.	Ongoing	OD/LID	If standards, ordinance, and LID handbook are in place and followed.
5	All Pollutants	MS4 Staff, Contractors and Developers	4.2.5.2. Develop and adopt an ordinance or other regulatory mechanism that requires long-term post-construction storm water controls at new development and redevelopment sites.	Follow updated ordinance that meets requirements of permit	Ongoing	OD/IPL	If ordinance is in place and followed

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
5	"	"	4.2.5.2.1 - Include escalating enforcement provisions in ordinance to ensure compliance.	Ordinance in place	Ongoing	OD	If ordinance is in place and followed
5	"	"	4.2.5.2.2 – Document how the requirements of the ordinance or other regulatory mechanism will protect water quality and reduce the discharge of pollutants to the MS4. Documentation shall include: •How long-term storm water BMPs were selected •The pollutant removal expected from the selected BMPs •The technical basis which supports the performance claims for the selected BMPs	Updated Ordinance requires contractors and developers to submit documentation on: how long-term BMPs were selected, pollutant removal expected from the BMP, and technical basis supporting performance claims	Ongoing	OD/IPL	If ordinance is in place and followed.

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
5	"	"	4.2.5.2.3 ... require private property owner/operators or qualified third parties to conduct maintenance and provide annual certification that adequate maintenance has been performed and the structural controls are operating as designed to protect water quality. In this case, the Permittee must require a maintenance agreement addressing maintenance requirements for any control measures installed on site.	Updated ordinances require maintenance agreements to be recorded with plat.	Ongoing	OD/BMIPM	If maintenance agreements are documented and recorded.
5	"	"	4.2.5.2.4 - Permanent structural BMPs shall be inspected at least once during installation by qualified personnel. Upon completion, the Permittee must verify that long-term BMPs were constructed as designed.	Conduct inspections as required by the permit	Ongoing	BMPIM	Inspections are conducted and documented
5	"	"	4.2.5.2.5 - Inspections and any necessary maintenance must be conducted at least every other year by either the Permittee	Conduct inspections as required by the permit	Ongoing	BMPIM	Inspections are conducted and documented

MCM	Target		Desired Result	Measurable Goal	Milestone	Assoc.	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)			Date	BMP	
5	"	"	4.2.5.3.1 - Adopt and implement procedures for site plan review that evaluate water quality impacts.	Follow SOPS and Conduct site plan reviews which evaluate water quality	Ongoing	IPL	If reviews are conducted
5	"	"	4.2.5.3.2 - Review post construction plans for all new and redevelopment projects.	Follow SOPS and conduct site plan reviews for post construction plans as required by permit	Ongoing	IPL	If reviews are conducted
5	"	"	4.2.5.4 - Maintain an inventory of post construction structural storm water control measures including - description, maintenance requirements, inspection information.	Maintain and update Inventory log annually	Ongoing	BMPIM	If log is maintained and updated
5	"	MS4 Staff	4.2.5.5 Permittees shall provide adequate training for all staff involved in post-construction storm water management, planning and review, and inspections and enforcement.	Schedule and conduct training for appropriate personnel	Annually	BMPIM	If all appropriate personnel are trained

POLLUTION PREVENTION / GOOD HOUSEKEEPING FOR MUNICIPAL OPERATIONS

Permit Requirements

The permit requirements for Pollution Prevention and Good Housekeeping on Storm Water Impacts can be found in Section 4.2.6 of the permit. A copy of the permit is included in Appendix E for reference. The permit outlines in general the following requirements

1. Develop and implement an operation and maintenance program for City-owned or operated facilities.

2. Maintain an inventory of City-owned or operated facilities and storm water controls. Assess said list for their potential to discharge typical urban pollutants to the storm water system.

3. Identify 'high-priority' facilities or operations that have a high potential to generate storm water pollutants. Included with Standard Operating Procedures (SOPs) specific to municipal operations. The SOPs shall include appropriate pollution prevention and good housekeeping procedures for all of the following types of facilities and/or activities listed below:
    a. Buildings and facilities
    b. Material storage areas, heavy equipment storage areas and maintenance areas
    c. Parks and open spaces
    d. Vehicle and equipment
    e. Roads, highways, and parking lots
    f. Storm water collection and conveyance system
    g. Other facilities and operations (those not listed, but would reasonably be expected to discharge contaminated runoff)

4. Develop and implement a SWPPP for all "high priority" facilities

5. Conduct inspections of "high priority" facilities
    a. Monthly visual inspections
    b. Semi-Annual comprehensive inspections (twice a year)
    c. Annual visual observation of storm water discharges

6. Develop and implement SOPs for the following types of facilities and/or activities
    a. Buildings and facilities
    b. Material and equipment storage areas
    c. Parks and open space
    d. Vehicles and equipment
    e. Roads, highways and parking lots
    f. Storm water collection and conveyance systems
    g. Other facilities and operations

7. If a third-party is to conduct municipal maintenance or private developments conduct their own maintenance, the contractor shall be held to the same standard as the City. This should be outlined and defined in contracts.

8. Inspection schedules and logs should be part of the O&M program.

9. Develop and implement a process to assess the water quality impacts in the design of all new flood management structural controls that are associated with the MS4.

10. City construction projects shall comply with the requirements applied to private projects.

11. Include annual employee training on how to incorporate pollution prevention and good housekeeping techniques into municipal operations, including SOPs.

Summary of Existing Efforts

Inventory

The City has a fairly comprehensive, GPS based, storm drain map showing the storm drain system and its points of discharge. A copy of this map is included in Appendix G. The City-owned and operated facilities are also identified in the GIS. Detail maps of the facilities are included in Appendix G.

Storm Drain Maintenance Program

The City currently maintains inlet boxes and other MS4 improvements systematically as well as on an as-needed basis. Streets are also swept systematically and as-needed. Records and schedules will be documented routinely. Standard Operating Procedures (SOPs) for said maintenance procedures are located in Appendix B. If a third-party plans to maintain a facility, an operation and maintenance agreement will be executed. A copy of said agreement will be developed and then made part of this SWMP in Appendix A.

Inspections

The storm water inspector will inspect and review high priority sites with proper checklists following the developed SOP. Documentation will accompany said inspections.

Public Construction Projects

Storm water control measures and BMPs will be implemented on MS4 projects per the General Permit requirements and guidelines. Proper documentation and inspections will be recorded for public construction projects.

Best Management Practices (BMPs)

In order to help meet the goals and objectives of this SWMP Kaysville City has chosen to adopt the following BMPs for use within our city as applicable. Each BMP is cross referenced by code to a fact sheet that describes the BMP, its applicability, its limitations, and its effectiveness and can be found in the indicated appendix.

BMP	Code	Appendix
Employee Training	ET	A,B
Housekeeping Practices	HP	A,B
Infrastructure Planning	IPL	A,B

Goals

In order to more fully realize the benefit of the BMP the City has set the following goals. The goals set along with the existing efforts fulfill the requirements of the Final Storm Water Phase II Rule for Pollution Prevention/Good Housekeeping.

The following table includes the goals for MCM 6.

MCM	Target		Desired Result	Measurable Goal	Milestone	Assoc.	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)			Date	BMP	
6	All pollutants	MS4 Staff	4.2.6.1. Permittees shall develop and keep current a written inventory of Permittee-owned or operated facilities	Complete listing of MS4 owned/operated facilities	Ongoing	HP	If list is completed and updated
6	All pollutants	MS4 Staff	4.2.6.2 All Permittees shall assess the written inventory of Permittee-owned or operated facilities and make a list of common pollutants that may originate from these facilities and how to prevent them from entering the storm water system	Assess pollution potential using facilities evaluation form	ongoing	HP	If form is used as described
6	All pollutants	MS4 Staff	4.2.6.3 Based on the assessment required in Part 4.2.6.2., the Permittee must identify as “high-priority” those facilities or operations that have high potential for storm water pollution	Identify high priority sites using facilities evaluation form	Ongoing	HP	If high priority sites are properly identified
6	All pollutants	MS4 Staff	4.2.6.4 Permittee shall prepare and implement a SWPPP for all high priority areas	Implement a SWPPP for all high priority sites	Ongoing	HP	If SWPPP is in place
	"	"	4.2.6.5.1 Monthly visual inspections: The Permittee must perform monthly visual inspections of “high priority” facilities in accordance with the developed SOPs to minimize the potential for pollutant discharge.	Conduct monthly inspections	Ongoing	HP	If at annual review all monthly inspections are logged and reports completed

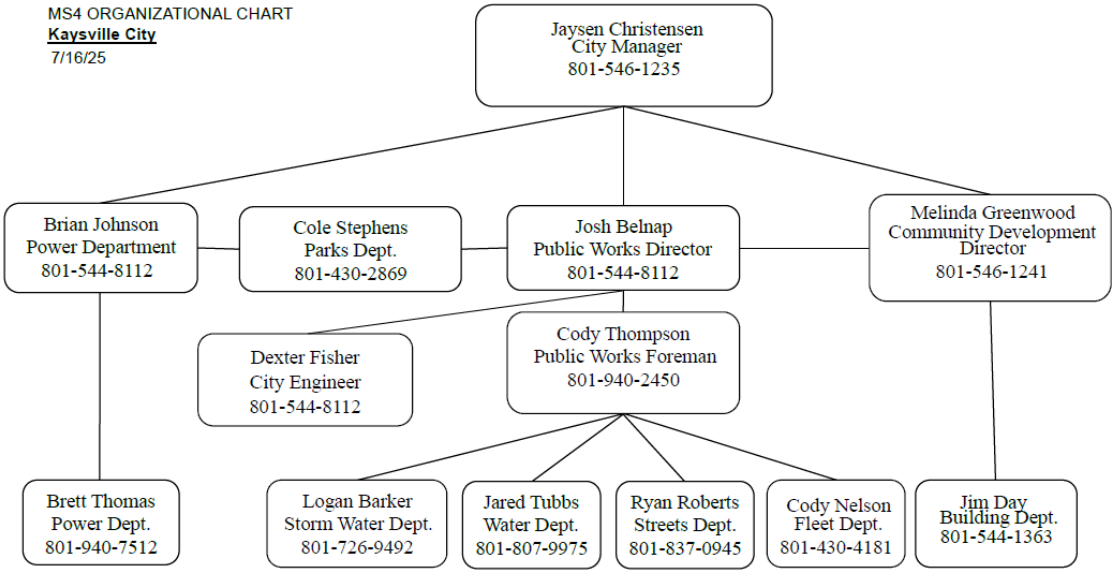
MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
	"	"	4.2.6.5.2 Semi-Annual comprehensive inspections: At least twice per year, a comprehensive inspection of "high priority" facilities, including all storm water controls, must be performed	Conduct semi-annual comprehensive inspections	Ongoing	HP	If at annual review all semiannual inspections are logged and reports completed
6	"	"	4.2.6.5.3 Annual visual observation of storm water discharges: At least once per year, the Permittee must visually observe the quality of the storm water discharges from the "high priority" facilities	Conduct annual visual observations of storm water discharges at high priority facilities	Ongoing	HP	If at annual review all annual visual monitoring is completed and logged and reports completed
6	All pollutants	MS4 Staff	4.2.6.6 Permittees shall develop and implement SOPs to protect water quality at each of the facilities owned or operated by the Permittee and/or activities conducted by the Permittee including maintenance schedules	Develop and implement SOPS as described in permit parts 4.2.6.6	Ongoing	HP	If SOPS are in place and followed
6	All pollutants	MS4 Staff	4.2.6.6.3 Permittees must ensure and document proper disposal methods of all waste and wastewater removed during cleaning and maintenance of the storm water conveyance system	Develop and implement SOPS as described in permit parts 4.2.6.6.3	Ongoing	HP	If SOPS are in place and followed

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
6	All pollutants	MS4 Staff	4.2.6.6.4 Permittees must ensure that vehicle, equipment and other wash waters are not discharged to the MS4 or waters of the state	Develop and Implement SOPS as described in permit part 4.2.6.6.4	Ongoing	HP	If SOPS are in place and followed
6	All pollutants	MS4 Staff	4.2.6.6.5 The Permittee shall develop a spill prevention plan in coordination with the local fire department.	Review current Spill Prevention plan with Fire Chief and update as necessary	Ongoing	HP	If plan is reviewed and updated annually
6	All pollutants	MS4 Staff	4.2.6.6.6 Permittees must maintain an inventory of all floor drains inside all Permittee owned or operated buildings. The inventory shall be kept current. The Permittee shall ensure that all floor drains discharge to appropriate locations.	Dye test all floor drains to ensure proper discharge to sewer and maintain inventory	Ongoing	HP	If inventory is maintained and updated annually

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
6	All pollutants	MS4 Contractors	4.2.6.7. The Permittee shall be responsible for ensuring, through contractually-required documentation and/or periodic site visits that contractors performing O&M activities for the Permittee are using appropriate storm water controls and following the SOPS, storm water control measures, and good housekeeping practices of the Permittee	Provide appropriate training for all city contractors	Ongoing	HP	If all city contractors are trained and following prescribed procedures
6	"	MS4 Staff, Contractors and Developers	4.2.6.8. The Permittee must develop and implement a process to assess the water quality impacts in the design of all new flood management structural controls that are associated with the Permittee or that discharge to the MS4.	Enforce a policy/process to assess water quality impacts on all new flood control projects	Ongoing	IPL	If water quality is being considered on all new flood management structural controls
6	All pollutants	MS4 Staff	4.2.6.9. The Permittee must develop a plan to retrofit existing developed sites that the Permittee owns or operates that are adversely impacting water quality	Annually assess city facilities and their impact on water quality. Use LID manual as guidance for retrofit projects	Ongoing	IPL	If annual review is completed

MCM	Target		Desired Result	Measurable Goal	Milestone Date	Assoc. BMP	Measure of Success (Effectiveness)
	Pollutant(s)	Audience(s)					
6	"	MS4 staff	4.2.6.10. Permittees shall provide training for all employees who have primary construction, operation, or maintenance job functions that are likely to impact storm water quality.	See individual training goals within other MCMs			
6	"	"	"	Conduct ongoing training according to schedule	Ongoing	ET, HP	If training is completed and documented according to schedule at annual evaluation

Kaysville City Organizational Chart



STORM WATER MANAGEMENT PLAN - 2025

Kaysville City Department Responsibilities

City Manager

- Liaison with City Council and Planning Commission
- Coordination with all City Directors/Departments

Public Works Director

- Liaison with Administration and City Council
- Coordination with Department Heads
- General oversight of Storm Water Management Program (SWMP)

City Engineer

- Drainage System Coordinator
- LID Implementation
- Private Storm Water Facilities Maintenance Agreements
- Construction Plan Review

Asst. Public Works Director/Foreman

- Liaison with Administration and City Council
- Coordination with Department Heads
- Oversight on shared facilities and work areas

Public Works Secretary

- Assist in implementation and management of Storm Water Management Program (SWMP)
- Assist in maintaining and updating SWMP (documentation)
- Assist in compiling the annual report
- Assist in coordination with Department Heads

Storm Water Department Head

- SWMP implementation including inspections, enforcement, and documentation
- Implementation/management of Storm Water Management Program (SWMP)
- Submits annual report
- Keep inlets clean and operating
- Maintain drainage areas in the public works facility
- Maintain public and private parking lots
- Maintain BMPs (Detention Basins, Catch Basins, etc.)
- Assist in compiling the annual report
- Assist in maintaining and updating SWMP

Streets Department Head

- Streets department maintenance work area
- Streets department equipment operation
- Equipment maintenance for streets department

- Training streets department personnel
- Chemicals storage in work area
- Snow plowing program
- Street sweeping program

Parks Department Head

- Parks department maintenance work area
- Pesticide, Herbicide, and Fertilizer (PHF) program
- Training parks department personnel
- Chemical storage in work area
- Parks department equipment operation
- Parks department equipment maintenance
- Mowing program

Water Department Head

- Water department maintenance work area
- Training water department personnel
- Chemical storage in work area
- Water department equipment operation
- Equipment maintenance for water department equipment

Fleet Department Head

- Fleet department maintenance work area
- Training fleet department personnel
- Chemicals, fluids, and oils in work area
- Metal fabrication area

Power Department Head

- Power department maintenance work area
- Training Power department personnel
- Chemicals, fluids, and oils in work area
- Maintain electrical equipment storage areas

Community Development Director

- Oversight of Building and Community Development departments
- Training Building and Community Development department personnel
- Development plan review and approval process
- Development review and City fees

JUSTIFICATION FOR CHANGES

Updating Storm Water Management Program: Updates to the Storm Water Management Program must be done in accordance with Section 4.4 of the MS4 Permit.

During this current review of our SWMP plan, several BMPs have been updated/added to meet new permit requirements and changes. No BMPs have been removed or replaced due to ineffectiveness.

The most significant changes to our SWMP have been a result of our efforts to implement the requirements of Utah Code § 19-5-108.3. These new requirements can be found in Part 4.2 of the modified MS4 permit in effect March 11th, 2025. Included in the updated SWMP appendices are all Inspection/Enforcement SOP's, Electronic Site Inspection Guides and Fee Schedules developed by USWAC and the DEQ, and an electronic inspection opt-out form developed by Kaysville City. Training of city staff has been ongoing as we implement these new procedures.

Measurable Goals for the requirements of Permit Part 4.2.1.4 have also been updated. Rather than handing out packets with SWPPP information to contractors, we have been providing annual training through coalition-sponsored events. These events have been a great success, and we highly encourage all contractors working within Kaysville City to attend. We will also continue hosting SWPPP resources on our website.

Certification and Signature. (6.8.3) (by Principal Executive Officer or Ranking Elected Official)
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Josh Belnap - Public Works Director

Name & Title

Josh Belnap Digitally signed by Josh Belnap
Date: 2025.08.14 07:55:33 -06'00'

Signature & Date

APPENDIX A

SUPPLEMENTAL GUIDE TO STORM WATER MANAGEMENT
FOR CONTRACTORS AND DEVELOPERS

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Special Environmental Considerations
Drainage Evaluation and Design Manual
Kaysville City LID Handbook
Storm Water Permitting Information for Developers
Kaysville City BMP Manual
Construction Standards and Details
Private Storm Water Facilities O&M Template
Private Storm Water Facilities Inspection Form
Private Storm Water Facilities Maintenance Agreement

APPENDIX B

SUPPLEMENTAL GUIDE TO STORM WATER MANAGEMENT
FOR PUBLIC WORKS DEPARTMENTS

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Standard Operating Procedures
BMP Fact Sheets
Process for Including Water Quality in City Projects

APPENDIX C

GENERAL PROGRAM DOCUMENTATION

This information is saved in the Kaysville City file storage system and is available upon request by contacting the Kaysville City Storm Water Manager.

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APPENDIX D

CURRENT CITY ORDINANCE APPLICABLE TO STORM WATER

All City Ordinances are available online at the link below

https://library.municode.com/ut/kaysville/codes/city_ordinances

Titles Relevant to the Storm Water Program Include:

TITLE 8 – COMMUNITY DEVELOPMENT
TITLE 9 – PUBLIC WORKS
TITLE 17 – PLANNING AND ZONING
TITLE 18 – BUILDING REGULATIONS
TITLE 19 – SUBDIVISIONS

APPENDIX E

STATE PERMITS AND DOCUMENTS REGULATING THE KAYSVILLE CITY STORM WATER PROGRAM

General Permit for Discharges from Small Ms4s – UTR090000 effective March 11th, 2025 –

https://lf-public.deq.utah.gov/WebLink/ElectronicFile.aspx?docid=535832&eqdocs=DWQ-2025-000521

UPDES Construction General Permit Number UTRC00000 effective July 1st, 2024 –

https://lf-public.deq.utah.gov/WebLink/ElectronicFile.aspx?docid=424911&eqdocs=DWQ-2024-004974

Davis County Storm Water Coalition Interlocal Agreement

\\kshare\cityshare\Public Works\1-Storm Water\Coalition\Forms\2021 Interlocal Cooperation Agreement.pdf

APPENDIX F

SYSTEM MAPS AND INVENTORIES

Kaysville City maintains a comprehensive GIS Map that can be accessed by authorized individuals only.

https://kaysville.maps.arcgis.com/apps/webappviewer/index.html?id=5c94e786618144d88f04fd047b8d44dd

City Owned Facilities Inventory Documentation

\\kshare\cityshare\Public Works\1-Storm Water\City owned Facilities

KAYSVILLE CITY STORM WATER MANAGEMENT PROGRAM

APPENDIX A

SUPPLEMENTAL GUIDE TO STORM WATER MANAGEMENT
FOR CONTRACTORS AND DEVELOPERS

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Private Storm Water Facilities Inspection Form
Private Storm Water Facilities Maintenance Agreement

Special Environmental Considerations

Discharges to Water Quality Impaired Waters

The permittee "must determine whether storm water discharge from any part of the MS4 contributes to a 303(d) listed (i.e. impaired) waterbody." (Small MS4 General UPDES Permit 3.1.1.1) The 303(d) list of impaired waterbodies is found at:

https://surface-water-quality.ugrc.utah.gov/

Threatened or Endangered Species

Where applicable, compliance efforts to this law shall be reflected in the SWMP document. The following web sites are helpful in determining the status of any species of interest:

http://wildlife.utah.gov/

https://www.fws.gov/program/endangered-species

Historic Properties

Where applicable, compliance efforts to this law shall be reflected in the SWMP document. Web sites include the following, along with possible county and city listings:

https://ushpo.utah.gov/shpo/national-register/

Kaysville City

DRAINAGE EVALUATION & DESIGN

MANUAL

2025

List of Tables

Appendices

1. Purpose

The purpose of this manual is to provide some information concerning the review process, design standards, regulations, recommendations, and hydrologic/hydraulic methods for evaluating and designing both storm drain and drainage facilities in Kaysville City (City). All construction projects shall conform to requirements of this Manual, the City's Storm Water Management Program, the City's LID Manual, the City's ordinances, and the City's Construction Standards (Standards).

All drainage evaluation and design should be done by licensed engineers who are experienced in the field of drainage and runoff, and the "Standard of Care" for Professional Engineers should be considered throughout their work.

2. Drainage Submittal Requirements

2.1 Introduction

Site grading and drainage plans for parcels of any size shall be reviewed and approved as part of the development review process as detailed in Title's 9 and 19 of the City Ordinances. Developments can be categorized into one of the following development types:

1. Single residential lot
2. Minor development – Typically a single non-residential lot
3. Major development – Typically a multi-lot development

Depending on the size or complexity, a single non-residential lot development could be considered a major development. The City Engineer, shall ultimately determine the applicable drainage criteria to be used in the planning and design process.

2.2 Ground Water Report

In accordance with Title 19-6-3 item 2, a Groundwater Report is required for all development types. The Groundwater Report shall be performed by a reputable geotechnical engineering firm and certified by a licensed professional engineer. In general, a Groundwater Report consists of an excavation to observe soil conditions and to determine the existing static groundwater elevation. An acceptable Groundwater Report shall consist of the following:

1. Date of excavation observation; name of development applicant; property address; and subdivision name, plat, and lot number; etc.
2. General location of excavation, i.e. 20 feet from the west property line and 35 feet from the north property line.
3. Groundwater depth must be referenced from a permanent feature on the site, such as the sidewalk, curb, gutter, water valve, manhole lid, construction benchmark, etc. Do not reference the groundwater elevation from existing ground.
4. The excavation must extend to a minimum of 4 feet below the lowest level of the proposed structure.
5. Provide a description of soils encountered, thickness of soil layers, and evidence of seasonal groundwater fluctuations.
6. Provide specific recommendations that are pertinent to the site such as: fooling drains, waterproofing requirements, surface grading, locations of downspouts for roof drainage, etc.
7. If high water tables are an issue, a piezometer must be installed on site for long-term groundwater monitoring.

2.3 Grading and Drainage Plan Submittal requirements for Single Residential Lots

A lot Grading Plan shall be submitted to the City Engineer for single residential lot developments. In conjunction with Title 18-3-8 and 19-3-3 of City Ordinance, the proposed site plans must also include the following information:

DRAWINGS

1. How the development will address any subdivision or lot specific requirements. For example; geologic hazards, steep slopes or sensitive lands, high water table area, existing upstream and downstream drainage facility or other features, setbacks, etc.
2. Flow arrows that represent the intended flow patterns of finish grade
3. Elevations of the top of curb, flow line of gutter, building and driveway, as necessary, to depict intentions of grading.

2.4 Storm Drainage Report and Management Plan Submittal Requirements for Minor Developments

A Storm Drainage Report and Management Plan shall be submitted to the City Engineer for minor developments and shall be prepared by a professional civil engineer registered in the State of Utah. The submittal shall contain the following information:

REPORT

1. Description of the lot location (township, range, section, subdivision and lot).
2. General description of the property, area, existing site conditions including all existing onsite drainage facilities such as roads, culverts on natural waterways, ditches, canals, washes, drainage waterways from mountain drainages including ephemeral streams, swales, structures, storm drains, springs, detention and retention basins, and any proposed modifications to the same.
3. General description of off-site drainage features and characteristics upstream and downstream of the site and any known drainage problems and a plan to mitigate those problems. This shall include natural waterways from mountain drainages and a capacity analysis of any downstream storm drain pipes or open channels to confirm that those facilities have capacity to accept runoff from the proposed development
4. General description of the proposed storm water facilities that will be used to manage onsite and offsite runoff discharging onto the parcel. Description of debris/sedimentation facilities needed to manage offsite runoff.
5. General description of master planned drainage facilities on or adjacent to the lot and proposed drainage features and how the development and proposed drainage facilities conform to the storm water master plan.
6. Detailed runoff calculations for the design storm. See Section 3 for design criteria.
7. Describe if a FEMA floodplain is on or adjacent to the lot. It must be noted if there are plans to modify the ground surface (cut or fill) in a FEMA floodplain.
8. Provide the elevation of the lowest habitable floor space.

9. A list of all other applicable permits that may need to be obtained, including: Floodplain Permit, State Stream Alteration Permit, Davis County Flood Control Permit, Army Corps of Engineers Permit.
10. Statement that BMPs for Storm Water Pollution Prevention will be utilized to comply with the City LID requirements. Describe proposed LID practices that will be implemented for both water quality and runoff volume reduction in accordance with the City's LID requirements (see Section XXXX).
11. SWPPP Narrative.
12. Describe existing and proposed structures and any structures that may be demolished.

DRAWINGS

1. Scale, north arrow, legend, title block showing project name, date, preparers name, engineer's seal and signature on 11"x17" electronic format set up to print on 11"x17" or 22"x34" paper.
2. Existing and proposed property lines, rights-of-way and easements.
3. Existing and proposed topography (2-foot maximum contour interval) extending at least 50 feet beyond the lot boundaries.
4. Existing improvements on or within 15 feet of the property.
5. Existing drainage and irrigation facilities.
6. Location of required drainage easements.
7. Existing drainage patterns and runoff flow paths.
8. Design details of proposed storm drain facilities, including storm drain inlets, outfalls, and connections to existing storm drain facilities. Include separate maintenance and monitoring plan for any proposed storm water detention, retention, or water quality facilities including debris/sediment basins.
9. FEMA floodway and floodplain boundaries and elevations.
10. Proposed drainage patterns and runoff flow paths.
11. Location of any proposed storm water management facilities including: storm drain pipes, inlets, manholes, cleanouts, swales, channels, retention and detention facilities, and debris/sediment basins.
12. Other relevant drainage features.
13. Show existing and proposed structures and indicate structures that may be demolished.
14. Locations of proposed storm water BMPs.
15. Locations of runoff volume reduction facilities to meet requirements outlined in the City's LID manual.

2.5 Storm Drainage Report and Management Plan Submittal Requirements for Major Developments

A Storm Drainage Report and Management Plan shall be submitted to the City Engineer for major developments and shall be prepared by a professional civil engineer registered in the State of Utah. The submittal shall contain the following information:

REPORT

1. Title page showing project name, date, preparer's name, seal and signature.
2. Description of the development, including location (township, range, section, subdivision and lot).
3. Description of property, area, existing site conditions including all existing drainage facilities such as ditches, canals, washes, swales structures, storm drains, springs, detention and retention basins.
4. Description of off-site drainage features and characteristics upstream and downstream of the site and any known drainage problems and plan to mitigate problems. Description of debris/sedimentation facilities needed to manage offsite runoff.
5. A description of proposed facilities that will be used to manage on-site and off-site storm water runoff associated with the development, including calculations used to estimate runoff and size storm water facilities. See Section 3 for design criteria and Section 4 for approved rainfall-runoff computation methods.
6. Description of master planned drainage facilities on or adjacent to the development and how the development and proposed drainage facilities conform to the storm water master plan.
7. Description of existing downstream facilities that will receive storm water runoff from the development and appropriate analyses and discussion to determine if those facilities have capacity available to receive runoff from the site. Include calculations.
8. Description of other drainage studies that affect the site.
9. Description of FEMA floodway and floodplain boundaries and associated elevations on or adjacent to the property.
10. Design calculations to support inlet spacing and sizing of storm water conveyance facilities. Include a description of drainage facility design computations. See Section 3 for facility design criteria.
11. Describe how development activities will comply with applicable City and Davis County flood control requirements and FEMA requirements, if applicable.
12. Identify any needed drainage easements or rights-of-way.
13. Preliminary drawings of proposed drainage facilities that also show existing storm drain facilities on or adjacent to the site.
14. Summary of design runoff computations. See Section 4 for approved rainfall-runoff computation methods.
15. Provide the elevation of the lowest habitable floor space. A separate groundwater report will be required to recommend an appropriate elevation for structures in some areas (see Section 2.2).
16. Appendices showing all applicable reference information.
17. A list of all other applicable permits that may need to be obtained, including: Grading Permit, Floodplain Permit and/or Stream Alteration Permit.
18. Conclusions and statements that indicate that proposed improvements associated with the development will comply with City drainage requirements that proposed storm drain facilities will be effective, and that the computations were performed using the current standard of care. See Section 3 for design criteria.
19. Provide a Storm Water Pollution Prevention Plan that identifies appropriate BMPs.

20. SWPPP Narrative (see Kaysville City Code).
21. Describe existing and proposed structures and any structures that may be demolished.
22. Describe proposed LID practices that will be implemented for both water quality and runoff volume reduction in accordance with the City's LID manual.
23. Summary of hydraulic calculations for sizing culverts and all other hydraulic features.

DRAWINGS

1. Drawings shall be submitted in electronic format set up to be printed on 11"x17" or 22"x34" paper.
2. Existing and proposed property lines.
3. Existing and proposed topography (2-foot maximum contour interval) extending at least 100 feet beyond the site.
4. Existing and proposed streets, easements, and rights-of-way.
5. Existing drainage and irrigation facilities.
6. FEMA floodway and floodplain boundaries and elevations, if applicable.
7. Required setbacks for structures from the center line of stream channels, if applicable.
8. Drainage basin boundaries and subbasin boundaries on a topographical map.
9. Existing drainage patterns and runoff flow paths.
10. Proposed drainage patterns and runoff flow paths.
11. Location and size of proposed storm water management facilities including: storm drain pipes, inlets, manholes, cleanouts, swales, channels, retention and detention basins, and debris/sediment basins.
12. Include spot elevations of proposed grade, flow line and top, back of curb.
13. Design details of proposed storm drain facilities, including storm drain inlets. Include separate maintenance and monitoring plan for any proposed storm water detention, retention, or water quality facility.
14. Design details of proposed improvements to existing irrigation facilities and any facilities to be used to manage high groundwater conditions on the site.
15. Location of required drainage easements.
16. Hydraulic grade line on a pipeline profile drawing showing backwater affects from receiving streams and full detention/retention basins.
17. Other relevant drainage features.
18. Scale, north arrow, legend, title block showing project name, date, preparers name, seal and signature.
19. Show existing and proposed structures and indicate structures that may be demolished.
20. Show proposed land to be disturbed (show "do not disturb" line).
21. Show sensitive lands (i.e. steep slopes, shallow groundwater, wetlands, water bodies).
22. Locations of proposed storm water BMPs.

23. Locations of runoff volume reduction facilities to meet requirements outlined in the City's LID manual.

2.6 Utah Pollutant Discharge Elimination System (UPDES) Permits and Storm Water Pollution Prevention Plans (SWPPP)

In accordance with Title 9-3b of the City Ordinance's, all projects that involve land disturbance of 1 acre or more, or are part of a common plan of development that is 1 acre or more, or that are determined by the Storm Water Official to have an elevated hazard potential shall be required to obtain a UPDES Permit from the State, which includes submitting a SWPPP to the City's Storm Water Official. See City Code for approved Best Management Practices (BMPs) and additional information regarding the SWPPP.

2.7 Floodplain Permit

A Floodplain Development Permit must be obtained from the City for all developments that are located within a floodplain, as defined on the current FEMA Flood Insurance Rate Map. The permit application must address activities that may include but are not limited to: modifying the existing ground in or near the floodplain (i.e. cutting or filling), adding a culvert or bridge in the floodplain, or constructing a structure or fence in the floodplain. See Appendix G for permit application.

3. Design Criteria for Storm Drain Facilities

The proper design of storm drain facilities is critical to the performance of the facilities during runoff events. The purpose of this section is to provide approved design criteria for projects within the City, and design engineers should follow these criteria unless otherwise directed by the City Engineer.

3.1 Objectives

Proper management of storm water runoff is essential to fulfill Kaysville City's grading and drainage objectives, which are:

1. Reduce the risk of flood damage, including life and property, from storm water runoff events.
2. Minimize the increase of storm water runoff from new developments into existing City facilities.
3. Reduce soil erosion and sedimentation from development and construction projects.
4. Adequately design and construct storm drainage facilities that minimize maintenance requirements and meet industry standards of care.
5. Minimize pollutants in storm water runoff.
6. Utilize LID to replicate pre-development hydrology through infiltration, evaporation, and detention of runoff close to its source.

3.2 General

1. Consider the flood history of the area and the effect that the proposed development will have on existing and proposed drainage features for all hydrologic analyses.
2. Maintain and mimic natural drainage characteristics and patterns to the maximum extent practicable.
3. Account for all offsite drainage, including from mountain watersheds. Design for the safe conveyance of storm water from offsite drainages through new and existing storm drain facilities. Design new storm drain facilities to avoid plugging of manholes or conduits/pipes. See 3.14 Mountain Drainages.
4. Verify that existing or proposed downstream storm drain facilities have adequate capacity to convey stormwater in accordance with the complete requirements in Section 3 of this manual.

3.3 Conduits

Design Flow – Storm drain pipelines shall be designed to convey the computed design storm runoff (see Section 4.1 for design storm parameters) under full pipe capacity, but with no surcharging. Backwater from receiving streams and full detention/retention basins shall be accounted for in the design.

Minimum Pipe Size – The minimum allowable pipe diameter is 18 inches for mainline storm drain pipes and 15 inches for laterals to inlets.

Pipe Material – Storm drain pipelines material shall be reinforced concrete. Other materials may be approved on a case-by-case basis by the City Engineer.

Minimum Cover – Minimum 2 feet of cover, unless otherwise approved by the City Engineer.

Pipe Slope / Velocity – The velocity of storm water discharge is controlled by the slope of the pipe. The pipeline minimum slope shall be designed such that the flow velocity of the design discharge is greater than 3.0 feet per second. Design flow velocities greater than 28 feet per second should be avoided. Pipes that are designed to operate under supercritical flow conditions shall account for hydraulic jumps and energy dissipation. Pipes upstream of hydraulic jumps should be vented to prevent flow surges. Pipe sizes are not allowed to decrease in the downstream direction without use of a diversion or a stormwater detention facility.

Location – City owned storm drain pipelines shall be located within the street right-of-way (ROW) in accordance with current City Standards or in a dedicated easement. Privately owned storm drain pipelines or drainage facilities may be located on private property, but must still meet City Standards, and shall also obtain a Storm Water Maintenance Agreement.

3.4 Manholes (see standard drawings for additional details)

Location – A manhole or cleanout structure shall be located at the upstream end of a storm drain conduit and at all changes in pipe size, horizontal alignment, slope, and material of the storm drain. City owned manholes shall be located within the pavement and ROW, unless otherwise directed by the City Engineer. The edge of the concrete collar must either be located at least 3 feet away from the edge of asphalt or gutter to allow for paving between the manhole and edge of pavement, or the collar must be poured adjacent to (but separate from) the curb.

Spacing – Unless otherwise approved by the City Engineer, the maximum horizontal distance between manholes is 400 feet.

Size – The minimum manhole size is 48-inches in diameter and shall be sized to meet manufactures recommendations based on pipe penetration size and configuration.

Configuration – Either cast-in-place or precast concrete manhole structures or cleanouts can be used as junction structures. These structures shall have formed concrete troughs that match the diameter of the inlet and outlet pipes to reduce hydraulic losses. The troughs should be formed at least to the springline of the outlet pipe. For mainline pipes that are 48-inches in diameter or larger, a precast tee manhole may be used as a cleanout structure if approved by the City Engineer.

3.5 Inlets (see standard drawings for additional details)

Location – Storm drain catch basins or inlets shall generally be located on both sides of the street and in road sag locations (See Section 3.6 for Road Sags).

Configuration – All inlets shall have a curb-back opening and bicycle safe grate with a 12-inch minimum sump depth.

Road Sags – At a minimum, double inlets space four feet apart shall be installed in City-approved road sag locations (See Section 3.6 for Road Sags).

Spacing – Inlet spacing and configuration shall be designed to meet the design spread requirements from the FHA Urban Drainage Design Manual as shown in Table 3-1. As a general rule, inlets shall be installed at intervals not to exceed 400 feet. Inlet spacing shall be addressed and documented during the design phase and shall account for longitudinal road slope.

Table 3-1
Allowable Gutter Spread for Design of Streets

Street Classification	Design Frequency	Design Gutter Spread
High Volume		
< 45 MPH	10-Year	Shoulder plus 3 feet
> 45 MPH	10-Year	Shoulder
Sag Point	50-Year	Shoulder plus 3 feet
Collector		
< 45 MPH	10-Year	½ Driving Lane
> 45 MPH	10-Year	Shoulder
Sag Point	10-Year	½ Driving Lane
Local Streets		
Low ADT	5-Year	½ Driving Lane
High ADT	10-Year	½ Driving Lane
Sag Point	10-Year	½ Driving Lane

3.6 Hydraulic Capacity of Streets

Design Spread – Storm drain facilities in streets shall be designed to meet the design gutter spread indicated in section 3.5.

100-Year Flow Conveyance – Streets shall be designed to safely convey runoff from a 100-year design storm (see Section 4.1 for design storm parameters) to adequate downstream conveyance facilities. The 100-year design storm runoff in streets should be contained within street right-of-way. Provisions shall be made, such as flood easements, to allow runoff within the street to enter downstream detention basins, to allow runoff to be conveyed out of road sags or other similar situations.

Cul-De-Sacs and Dead-End Streets – Downhill-sloping cul-de-sacs and dead ends will not be allowed unless specifically approved by the City Engineer. If they are allowed, means to safely convey runoff from extreme storm events across the site must be provided with appropriate drainage easements.

Tee Intersections – Special consideration, such as higher curbs, additional inlets or flood easements, shall be given to downhill tee intersections to ensure that flooding will not occur outside of the right-of-way during a major storm event.

Road Sags – Sags in roadways will not be allowed unless specifically approved by the City Engineer. If a road sag is absolutely necessary, it will be required to obtain a drainage easement and to construct

drainage system improvements that will provide safe drainage and minimum flow conveyance of runoff associated with the 50-year design storm. Depending on the site and potential impacts to property or infrastructure, the City Engineer may require that capacities of the storm drain catch basins and conveyance pipeline be sized to safely convey runoff from a 100-year design storm.

3.7 Outlet Structures from Closed Conduit to Open System

Location – An outlet structure shall be installed on the downstream end of all closed conduits at the point where the storm water will be discharged into an open channel.

Grating – The outlet structure shall have vertical bars only with an opening spacing of 4 inches and shall be hinged at the top.

Riprap Design – Rock riprap shall be installed downstream of outlet structures based on discharge velocity and receiving stream. The minimum thickness of riprap shall be 1.5 X D_{50}. Riprap design calculations shall be submitted to the City Engineer for review.

3.8 Open Channels

The use of open channels to convey storm water runoff must be approved by the City Engineer. If the use of an open channel is approved, the open channel shall be designed to meeting the following criteria:

Velocity – Open channel design shall be dictated by the maximum permissible velocity of the channel material/lining. Table 3-2 shows the maximum permissible velocity for the most common channel material/lining.

Table 3-2
Maximum Permissible Mean Channel Velocities
(From the Clark County Hydrologic Criteria and Drainage Design Manual)

Material/Lining	Maximum Permissible Mean Channel Velocity (feet per second)
Natural and Improved Unlined Channels	
Fine Sand, Colloidal	1.5
Fine Gravel	2.5
Coarse Gravel, Noncolloidal	4.0
Cobbles	5.0
Fully Lined Channels	
Unreinforced Vegetation	5.0
Loose Riprap	10.0
Grouted Riprap	15.0

Longitudinal Channel Slope – Channel slope is dictated by maximum permissible velocity requirements. Where the natural topography is steeper than desirable, drop structures shall be utilized to limit design velocities.

Easements – Any necessary easements or agreements shall be finalized and recorded prior to approval.

Channel Cross Section – Channels shall be constructed with a trapezoidal shape. Unless otherwise approved, channel side slopes shall not be designed steeper than 3 horizontal to 1 vertical (3H:1V).

Maintenance – Channels shall be designed to be low maintenance and to minimize erosion potential. All open channels shall be accessible by vehicles/equipment for maintenance.

Freeboard – The open channel shall have a minimum of 1 foot of freeboard above the design flow water surface elevations.

Depth – Unless otherwise approved, the maximum allowable design depth of flow is 4 feet.

Bottom Width – Unless otherwise approved, the minimum bottom width shall be 4 feet.

Low Flow Channel – All grass lined channels shall be constructed with a low flow channel. The low flow channel shall be lined with concrete, or other material approved by the City Engineer.

Levees – Levees or berms along the channel will only be allowed to meet freeboard requirements. Levees or berms shall not be designed to impound storm water.

Channel Transitions and Bends – All channel transitions and horizontal bends in the alignment shall be designed to be gradual enough so as to not induce erosion or have adequate bank stabilization measures installed.

Other Agency Permits – Most of the major open channels, streams and natural drainages are under the jurisdiction of various other agencies. If a planned development proposes to modify or connect to Davis County controlled items, a Davis County Flood Control Permit must be obtained by the Owner. If any construction work is performed within 30 feet of an open channel or stream for which the State of Utah has jurisdiction, a State Stream Alteration Permit must be obtained by the Owner. If a proposed development impacts a jurisdictional wetland, the Owner must obtain a permit from the U.S. Army Corps of Engineers prior to disturbing any wetlands. Contact the Division of Water Rights office (phone 801-538-7240) and Davis County Public Works (801-444-2230) to find out if your proposed project will require permits. Be aware that there is a fee and review period associated with the applications.

3.9 Detention Basins

All detention basins serving a development shall be designed according to the criteria listed below. Design criteria for regional detention basins, or detention facilities that receive storm water runoff from multiple developments, shall be defined by the City Engineer on a case-by-case basis.

Release Rate – The post-construction release rate shall be equal to or less than the preconstruction discharge. Under no circumstances shall the post-development discharge be greater than 0.2 cfs per acre for a 100-year design storm.

Volume – Detention basins shall be sized to detain the 10-year cloudburst design storm as well as a 50-year 24-hour storm event to meet the release rate requirement. The volume requirements shall not be reduced based on evaporation or infiltration due to percolation.

Freeboard – A minimum of 1 foot of freeboard for the 10-year cloudburst design storm as well as a 50-year 24-hour storm event shall be provided.

Emergency Spillway/Outlet – An outlet shall be designed to safely discharge runoff during the 100-year storm event.

Detention Time – The detention time should be as short as possible; typically limited to a maximum of 18 hours.

Water Depth – The maximum water depth shall not exceed 3 feet for a detention basin in a residential area and 1 foot for a commercial/industrial area, including parking lots.

Side Slope – Detention basin side slopes shall be 3H:1V or flatter unless otherwise approved.

Inlet Design – A concrete apron must be installed at entrance and exit structures to minimize erosion and accommodate maintenance.

Outlet Design – All detention basins shall have an outlet to the City storm drain system. A trash rack shall be installed at the outlet(s) to prevent debris from entering the storm drain system and to protect the public. The orifice restriction should be designed to minimize clogging from debris.

Dewatering – Detention basins shall include provisions for a concrete low flow channel and/or a perforated pipe under-drain system to ensure positive dewatering of the basin.

Location – Detention basins should be located in a manner to minimize their impact on the site and to ensure public safety. Detention basins shall be located at least 40 feet from any structure with a foundation. All detention basins shall have vehicular access for maintenance. All public detention basins shall be accessible from a public ROW or a dedicated easement.

Ownership and Maintenance – Unless the detention facility is owned by the City, the property owner or home-owners association shall own and maintain the detention facility including landscaping. No alterations to the pond shall be permitted without the approval of the City Engineer. Means of vehicular access to the outlet structure and the bottom of the facility shall be provided.

Landscape – All facilities shall be landscaped in accordance with City Standards.

Groundwater – Detention Basins will not be allowed in areas with high groundwater as determined by the City Engineer. See Section 3.13for development in sensitive lands. As a general rule, the bottom of a storm water detention facility shall be at least 4 feet above the seasonal high water table.

3.10 Retention Basins

Regional retention facilities are discouraged unless it can be shown that there are no feasible outlets to discharge water to storm water conveyance systems. Section 3.1.1 of the City's LID manual touches

extensively on retention basins. Retention facilities for onsite drainage must be designed to meet the criteria in the City's LID Manual, the MS4 Permit and the following minimum criteria:

Volume – Retention basins shall be sized to retain onsite runoff from the 80th percentile storm and the 100-year 24 hour storm event. The City's 80th percentile storm depth is identified in section 2.2.6 of the City's LID manual.

Freeboard – A minimum of 1 foot of freeboard shall be provided.

Emergency Outlet or Spillway – An emergency outlet shall be designed to safely discharge the peak runoff from storm events that exceed the 100-year design storm.

Retention Time – The retention basin shall be designed to drain completely within 48 hours of the end of the storm event. Retention time must be addressed during the design process and retention parameters must be approved by the City Engineer.

Water Depth – The maximum water depth shall not exceed 3 feet for a retention basin in a residential area and 1 foot for a commercial/industrial area, including parking lots.

Side Slope – Retention basin side slope shall be 3H:1V or flatter unless otherwise approved.

Location – Retention basins should be located so as to minimize their impact on the site and to maximize public safety. Retention basins shall be located at least 30 feet from any structure with a foundation. All retention basins shall have vehicular access for maintenance. All public retention basins shall be accessible from a public ROW or a dedicated easement.

Ownership and Maintenance – Unless the detention facility is owned by the City, the property owner or home-owners association shall own and maintain the retention facility, including landscaping. No alterations to the pond shall be permitted without the approval of the City Engineer. Means of vehicular access to the facility shall be provided.

Landscape – All facilities shall be landscaped in accordance with City Standards.

Groundwater – Retention Basins will not be allowed in areas of high groundwater as determined by the City Engineer. See Section 3.12 for development in sensitive lands.

3.11 Storm Drain Sumps (see standard drawings for additional details)

A storm drain sump is a facility that allows storm water runoff to percolate into the ground. The use of storm drain sumps must be approved by the City Engineer. If the use of a storm drain sump is approved, it must meet the requirements within section 3.1 of the City's LID manual following criteria:

Groundwater – The bottom of the storm drain sump is four feet above the estimated spring-time ground water elevation. Storm drain sumps will not be allowed in areas with high groundwater, including, but not limited to, areas of high groundwater as determined by the City Engineer. See Section 3.13 for development is sensitive lands.

Pretreatment – The storm drain sump is fitted with a storm water pre-treatment device, located in a separate inlet structure.

Filter Fabric – The storm drain sump must be wrapped in filter fabric.

Percolation rate –The design percolation rate must be based on a site-specific analysis.

Location – Storm drain sumps may not be located in the following areas:

- Within 100 feet of a culinary water well
- Within 100 feet of a surface water feature
- Within 25 feet of a structure foundation
- Areas prone to landslides
- Areas containing soils with very slow percolation rates
- Over fill material

State Inventory – Inventory form must be completed by the Owner and sent to the State of Utah and Kaysville City. The form can be downloaded from:

www.waterquality.utah.gov/UIC/UICForms/ClassVFrms/StormWaterEntirePkg.pdf

3.12 Culverts

Culverts are conduits that convey runoff from an open channel in a closed conduit under a road or parcel.

General – Culverts shall be sized to convey the computed design storm runoff (see Section 4.1 for design storm parameters) without runoff overtopping the road or leaving the channel. The minimum allowable culvert diameter is 24 inches.

Design Load – The existing and future street design shall be used to develop the design load and minimum cover. HL-93 loading shall be used if no other loading information is available.

Headwall – Improvements shall be installed at entrance and exit structures to minimize erosion and accommodate maintenance. Culverts that are 36 inches in diameter or larger, or that exceed an area of 7 square feet, shall have a headwall with wing walls.

Debris – A culvert blockage factor of 50 percent shall be used for culverts placed in drainages with upstream debris producing potential, as determined by the City.

Headwater – Size the culvert such that the headwater at the culvert inlet:

- **Is no more than 2 feet above the top inside of pipe or box**
- **Is no less than 1 foot below the edge of the paved roadway surface**

Backwater – Backwater surface computations upstream of culverts shall be performed and shown to be non-damaging to upstream properties. If the culvert is on a stream mapped by FEMA, provide a letter of No-Rise or a CLOMR, as directed by the City.

Configuration – Culverts shall be designed to have a single opening. Multiple side-by-side culverts are susceptible to clogging.

3.13 Sensitive Lands

Requirements for construction of developments on sensitive lands are highlighted below. Sensitive lands are defined as lands that include steep slopes, wetlands, shallow water table, or floodplains.

Hillside Development Standards – Land having a slope greater than 8% is defined as "steep slope", and a geologic study report shall be submitted for development on lands steeper than 8%. No development will be permitted on land where the slope is steeper than 30%.

Shallow Water Table and Wetland Area Development Standards – The areas of shallow water table are determined by the City Engineer.

Floodplain Development Standards – Development located in or near floodplains shall meet the requirements of the National Flood Insurance Program and conform to Title 8-5-15 of the City Ordinance's. For all developments that cover over 5 acres or have 50 or more lots, a developer shall perform a study to estimate the 100-year flood elevations if those elevations are not defined on the FEMA Flood Insurance Rate Map. Construction of habitable structures will not be allowed in the 100-year special flood hazard area unless all criteria for the National Flood Insurance Program and Title 8-5-15 of City Code have been satisfied.

3.14 Mountain Drainages

Requirements for developments that are adjacent to a mountain drainage or historically has received storm runoff or snowmelt runoff from mountain drainages are provided below.

- If runoff from a mountain watershed is to be diverted and conveyed in a piped storm drain system, sediment and debris removal shall be required upstream of the piped system. The City Engineer shall determine the distinction between a culvert and a piped system.
- If a trash rack or screen is used for debris removal it shall be designed for a minimum of 50 percent plugging and shall allow for easy removal of debris by maintenance personnel. Provide adequate access for equipment to maintain sediment/debris facilities. Vertical slats are preferred for ease of maintenance, with slat spacing no closer than 4 inches. Rack sizing should be at least 10 to 15 times the area of the inlet pipe. Rack or screen angle should be between 2H:1V and 1H:1V. Rack efficacy is decreased if water is able to flow around the sides of the rack.
- If a new development will be located within one hundred feet of a major drainage channel under the jurisdiction of Davis County, it shall comply with all Davis County Flood Control requirements and be approved by Davis County.

4. Hydrologic Analysis

4.1 Design Storm

Rainfall Depth and Intensity – Rainfall depth and intensity shall be obtained from the National Weather Service's Precipitation Frequency Data Server (http://hdsc.nws.noaa.gov/hdsc/pfds/sa/ut_pfds.html) using the annual maximum time series option. Appendix B contains depth-duration-frequency and intensity-duration-frequency tables for various areas of the City.

Distribution and Duration –A 3-hour synthetic storm duration shall be used to masterplan large areas and for large developments and to design detention and retention basins.

The 3-, 6-, and 24-hour synthetic storm durations shall be used to evaluate and design storm drain storage facilities (i.e. detention and retention basins). The maximum peak volume from these three storm durations shall be used to evaluate and design the storage facility.

Storm distributions for the 3-, 6-, and 24-hour storms are provided in Appendix C.

Frequency – Storm drain facilities shall be designed to include major and minor conveyance facilities and storage. Minor system facilities generally include storm drain pipes and detention basins. Minor system facilities shall be designed to collect and convey storm water runoff from a storm with a return frequency of 10 years.

Major system facilities generally include streets, retention basins, streams, and culverts. Major system facilities shall be designed to collect and convey storm water runoff from a storm with a return frequency of 100 years.

4.2 Drainage Basin Characterization

Soil Classification – Soil classification shall be estimated from site specific analysis or from a soil survey, such as the NRCS Web Soil Survey (WSS). This map, and its associated data can be found at https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

Land Use – Existing land use shall be obtained from site survey or analysis of current aerial photography. Future land use shall be estimated based on proposed development or from the City General Plan if future development plans are unknown.

Physical Parameters – Physical parameters such as drainage basin area, length and slope shall be obtained using a current topographic map and existing storm drain facilities.

4.3 Runoff Computational Methods

Acceptable Methods – There are three acceptable standard methods for estimating the peak runoff: the Rational Method, TR-55 and HEC-HMS, as described below. TR-55 and HEC-HMS can also be used to estimate runoff volume for storage facility sizing. See Section 3 for design criteria.

Other methods for estimating peak runoff and runoff volume must first be approved by the Public Works Director, or his/her designee. Table 4-1 indicates the applicable total drainage area for each modeling approach.

Table 4-1
Drainage Models and Applicable Total Drainage Area

Drainage Model	Maximum Drainage Area
Rational Method	< 200 Acres
TR-55	< 2000 Acres for Urban Areas
HEC-HMS	Any

Rational Method

i. **Runoff Equation –** Q = CiA where,
Q – Instantaneous Peak Runoff
C – Runoff Coefficient (see Table 4.2)
i – Intensity (inches/hour)
A – Area (acres)

ii. **Time of Concentration –** Time of concentration shall be calculated using the method found in SCS Technical Release 55 (SCS, 1986). Appendix E contains a sample worksheet (Worksheet 3) from that publication, which can be used to calculate the time of concentration. The minimum allowable time of concentration to be used in runoff calculations shall be 10 minutes.

iii. **Rainfall Intensity –** The rainfall intensity shall be selected from the intensify-duration-frequency curve in Appendix B. The duration is assumed to equal the time of concentration. The design storm frequency can be obtained from Section 4.1.

iv. **Runoff Coefficient –** Table 4-2 shall be used to estimate runoff coefficients when using the Rational Formula.

Table 4-2
Rational Method Runoff Coefficients[1]

Type of Drainage Area	Runoff Coefficient, C*
Business:	
Downtown areas	0.70 – 0.95
Neighborhood areas	0.50 – 0.70
Residential:	
Single-family areas	0.30 - 0.50
Multi-units, detached	0.40 - 0.60
Multi-units, attached	0.60 – 0.75
Suburban	0.25 – 0.40
Apartment dwelling areas	0.50 – 0.70
Industrial:	
Light areas	0.50 – 0.80
Heavy areas	0.60 – 0.90
Parks, cemeteries	0.10 - 0.25
Playgrounds	0.20 – 0.35

Type of Drainage Area	Runoff Coefficient, C*
Railroad yard areas	0.20 – 0.35
Unimproved areas	0.10 – 0.30
Lawns, sandy soil:	
Flat, 2%	0.05 - 0.10
Average, 2 – 7%	0.10 – 0.15
Steep, 7%	0.15 – 0.20
Lawns, heavy soil:	
Flat, 2%	0.13 – 0.17
Average, 2 – 7%	0.18 – 0.22
Steep, 7%	0.25 – 0.35
Pavement:	
Asphaltic and Concrete	0.70 – 0.95
Brick	0.75 – 0.85
Roofs	0.75 – 0.95

*Higher values are usually appropriate for steeply sloped areas and longer return periods because infiltration and other losses have a proportionally smaller effect on runoff in these cases.

v. **Runoff Computations.** Runoff computations for directly connected impervious areas shall be performed separately from areas that have pervious surfaces.

SCS TR-55

- The 24-hour SCS Type II storm distribution shall be used (see Appendix C) if the TR-55 method is used.
- The storm depths shall be selected from the depth-duration-frequency curve in Appendix B (see Section 4.1).
- Table 2-2a-d in TR-55 shall be used to estimate the runoff Curve Number (CN). Table 2-2a-d and associated information is located in Appendix E. See below for note regarding modeling impervious area.

Note: A composite SCS curve number may be used to estimate runoff from areas with only pervious surfaces. These composite curve numbers represent all of the different soil groups and land use combinations (such as lawn and xeriscaping) within the subbasin for the PERVIOUS areas only. When modeling a developed subbasin to estimate storm water runoff, the pervious and impervious areas must be modelled using separate subbasins. Some methods, including TR-55, suggest that a composite can be selected that will account for impervious area. However, those

methods tend to underestimate the runoff potential for the impervious areas and should not be used.

TR-55 Worksheet 3: Time of Concentration, and TR-55 Worksheet 4: Graphical Peak Discharge Method, are included in Appendix E.

HEC-HMS

There are four main input categories in HEC-HMS which are: design storm, loss method, transform method and routing method. The design storms shall be obtained using the procedure described below. For the loss, transform and routing methods, there are multiple options within HEC-RAS than can be used. Below is a description of the preferred method. Other methods may be allowed, but must first be approved by the Public Works Director, or his/her designee.

v. **Design Storm –** The design storm shall be developed in accordance with Section 4.1

vi. **Loss Method –** The SCS Curve Number loss method shall be used. The primary input parameter for this method is the Curve Number. As described below, for developed areas, the percent impervious is also entered. The initial abstraction is typically left blank. The program will calculate the initial abstraction based on the Curve Number using the equation documented in TR-55.

vii. **Curve Number –** Table2-2a-d in TR-55 shall be used to estimate the pervious runoff Curve Number (CN). Table 2-2a-d and associated information is located in Appendix E. The categories most often used to estimate the pervious CN are highlighted.

viii. **Soil Classification –** In order to estimate the CN, the hydrologic soil group classification for the drainage basin must be determined. The hydrologic soil group shall be obtained from the NRCS SSURGO dataset. SSURGO data can be obtained from the Soil Data Mart (http://soildatamart.nrcs.usda.gov/). A figure showing the hydrologic soil groups for Kaysville City is contained in Appendix D.

ix. **Modeling Impervious Areas –** The directly connected impervious area (DCIA) should be used when modeling developed areas. The DCIA should be measured from aerials for existing developments, or should be obtained from the design plans for a proposed development.

x. **Transform Method –** The SCS Unit Hydrograph transform method shall be used. This method requires the input of a single variable: lag time.

a. **Lag Time for Natural Watersheds –** The Corps of Engineers version of Snyder's equation shall be used to calculate the lag time for natural watersheds (USBR, 1989) as shown below:

1. $$\text{Lag Time} = C_t \left(\frac{LL_{ca}}{S^{0.5}}\right)^{0.33}$$

Where:

C_t = Constant between 1.3 and 2.2. 1.6 is typical for the Kaysville City area
L = Length, in miles, of the longest watercourse
L_{ca} = Length, in miles, along L to the centred of the drainage basin
S = Overall drainage basin slope, in feet/mile.

b. Lag Time of Urban Areas - The lag time for small urban areas is assumed to be equal the time of concentration. Appendix E contains a sample worksheet (Worksheet 3) from TR-55 that can be used to calculate the time of concentration.

i. Routing Method - The Muskingum-Cunge method shall be used for routing runoff hydrographs. This method uses "reaches" to connect subbasins. Examples of reaches in the real world include open channels and pipes. The method requires that the follow parameters be input:

Length – Total length of the reach element.

Slope – Average slope for the entire reach.

Invert – Optional. Typically not used.

Cross Section Shape – Multiple cross sections are available to select from. Depending on the cross section chosen, additional information is required (i.e. diameter, side slope).

Manning's "n" – Average value for the entire reach. Typical values for Manning's "n" used for storm drain conveyance facilities area shown in Table 4-3.

Table 4-3
Values of Manning's Coefficient (n) for Channels and Pipes

Conduit Material	Manning's n*
Plastic pipe	0.011 – 0.015
Steel/cast iron pipe	0.012 – 0.015
Concrete pipe	0.013 – 0.015
Corrugated metal pipe	0.012 – 0.026
Concrete-lined channel	0.013 – 0.020
Excavated or Dredge Channels	
Earth channel – straight and uniform	0.020 – 0.030
Earth channel – winding, fairly uniform	0.025 – 0.040
Rock	0.030 – 0.045
Unmaintained	0.050 – 0.140
Natural Channel	
Fairly regular section	0.030 – 0.070
Irregular section with pools	0.040 – 0.100

* Lower values are usually for well-constructed and maintained (smoother) pipes and channels.

Other Models

Other computer programs can be used to model the rainfall-runoff process that use similar hydrologic modeling methods, but care should be taken to make sure modeling methods are used correctly. Examples of similar programs include StormCAD, SWMM-5 and StormNET. The City Engineer must approve the use of all computer programs and methods that are not described above.

4.4 Model Calibration

Peak runoff records are typically not available for local drainage studies. However, an effort should be made to ensure that rainfall runoff analysis results for local drainage studies are consistent and compatible with the City's Storm Drain Master Plan and other pertinent local drainage studies.

It should be noted that the term "calibration" in this context refers to the process of adjusting parameters to achieve results consistent with available reference information, rather than adjusting for actual stream flow observations from the study area. Multiple hydrologic methods should be evaluated and compared to identify reasonable runoff computation results.

These methods may include the Rational Formula, the SCS Curve Number Method, the SCS Pervious CN Method, and the Constant and Initial Loss Method. Regional regression equations may also be used to evaluate results depending on the basin size.

Calibration for Natural Watersheds

Results from hydrologic models should be compared to:

- Actual flow records for modeled drainage channels
- Stream flow records from hydrologically similar drainages in the vicinity of the study
- Regional stream flow data (in the event that stream flow records for the local area are not available).

Calibration for Urban Areas

For small urban (developed) areas, the USGS published regression equations that can be used to "calibrate" hydrologic models (see Peak-flow Characteristics of Small Urban Drainages Along the Wasatch Front, Utah). The range of basin characteristics used to develop the regression equations are shown in Table 4-4.

Table 4-4
Range of Basin Characteristics Used To Develop
Regression Equations for Small Urban Drainages

Basin Characteristic	Unit	Range in Values
Drainage Area (DA)	mi^2	0.085 – 0.87
Basin Slope (BS)	Percent	0.3 – 15
Effective Impervious Area (EIA)	Percent	22 – 57

The equations shown in Table 4-5 are only applicable to drainage basins that meet the range of values shown above.

Table 4-5
Regression Equations for Peak Flows For Small Urban Drainages

Design Storm Recurrence Interval (Years)	Equations	Average Standard Error of Estimate (Percent)
10	$Q_{10} = 0.575\ DA^{0.285}\ BS^{0.410}\ EIA^{1.29}$	32
25	$Q_{25} = 66.1\ DA^{0.093}\ BS^{0.243}$	33
100	$Q_{100} = 120\ DA^{0.158}\ BS^{0.194}$	29

The unit peak runoff varies depending on slope and the drainage basin percent impervious. In general, the 10-year event for small urban drainages should be between 0.3 cfs/acre and 1.0 cfs/acre. Modification to input parameters should be considered if simulated runoff results are not within this range.

5. References

1. American Society of Civil Engineers, New York, p. 332, 1969, Design and Construction of Sanitary and Storm Sewers.
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3. Federal Highway Administration, August 2001, Urban Drainage Design Manual, Hydraulic Engineering Circular No. 22, Second Edition.
4. National Oceanic and Atmospheric Administration, 2006, NOAA Atlas 14, Precipitation-Frequency Atlas of the United States, Volume I, Version 4, Semiarid Southwest.
5. Thomas, B.E., H.W. Hjalmarson and S.D. Waltemeyer, 1994, Methods for Estimating the Magnitude and Frequency of Floods in the Southwestern United States, U.S. Geological Survey, Open File Report 93-419.
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Kaysville City

LOW IMPACT DEVELOPMENT MANUAL

2021

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1. Introduction

1.1 Purpose

The purpose of this manual is to provide some basic information and understanding of how new construction and re-development, in accordance with Kaysville City ordinances, can fulfill the requirements outlined in Utah's Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4). Specific audiences include developers, designers, contractors and homeowners. This manual may not detail all Kaysville City, State or Federal requirements.

1.2 Background

Polluted storm water runoff is often transported to MS4s and ultimately discharges into local rivers and streams without treatment. EPA's Storm Water Phase II Rule establishes an MS4 storm water management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that are introduced into storm sewer systems during storm events. Common pollutants include oil and grease from roadways, roadway salts and deicing materials, pesticides and fertilizers from lawns, sediment from construction sites, and carelessly discarded trash, such as cigarette butts, paper wrappers, and plastic bottles. When deposited into nearby waterways through MS4 discharges, these pollutants can impair the waterways, thereby discouraging use of the resource, contaminating water supplies, and interfering with the habitat for fish, other aquatic organisms, and wildlife.

In 1990, EPA promulgated rules establishing Phase I of the National Pollutant Discharge Elimination System (NPDES) storm water program. The Phase I program for MS4s requires operators of "medium" and "large" MS4s, that is, those that generally serve populations of 100,000 or greater, to implement a storm water management program as a means to control polluted discharges from these MS4s. The Storm Water Phase II Rule extends coverage of the NPDES storm water program to certain "small" MS4s but takes a slightly different approach to how the storm water management program is developed and implemented. Kaysville City is currently regulated under the General Permit for Discharges from Small MS4s.

1.3 Scope

The scope of this manual is to provide information relative to the State of Utah proposed UPDES permit section 4.2.5.3.2 which states "…the program shall include a process which requires the evaluation of Low Impact Development (LID) approach…", furthermore, "If an LID approach cannot be utilized, the Permittee must document an explanation of the reasons preventing this approach and the rationale for the chosen alternative controls on a case by case basis for the project."

All determinations and approvals for LID designs and plans shall be made at the sole discretion of the City.

2. Low Impact Development Principles

2.1 What is Low Impact development

As defined in the State of Utah's "***A Guide to Low Impact Development within Utah***", " LID refers to engineered systems, either structural or natural, that use or mimic natural processes to promote infiltration, evapotranspiration, and/or reuse of storm water as close to its source as possible to protect water quality and aquatic habitat." LID generally targets minimizing runoff and may incorporate man made treatment or a combination of processes.

Low Impact Development is not a replacement for Flood Control. LID techniques target water quality. These standards should be followed in conjunction with volume and flood control efforts.

2.2 Developing a Low Impact Development Plan

New construction or redevelopments that disturb one acre or more of land, or that are part of a larger common plan of development that disturbs one acre of more, will be required to incorporate LID measures into their design plans, and submit said plans to the City for review and approval. This requirement also applies to all redevelopment of property where existing development is demolished and rebuilt, or significantly improved where said improvements disturb one acre or more of land. This requirement does not apply to remodels or additions that disturb less than one acre of land. The design plans will be subjected to a review process prior to the issuance of approvals for permits and construction.

The purpose of this manual is to provide information that can be used to select the appropriate Best Management Practices (BMPs) for a given site. This manual describes some of the minimum standards and methods for sizing and designing LID facilities. This is a minimum standard. Other more rigorous methods may be used and will be evaluated on a case-by-case basis.

To develop a plan that works with the site, it is imperative to include consideration in the conceptual design phase of the project. It is also important to have a general understanding of the specific site and any site constraints that might exist.

2.2.1 BMP Determination and Feasibility

Most long-term LID BMPs can fit into two general functional categories; BMPs that infiltrate, and BMPs that filter. Some BMPs are hybrids that can accomplish more than one function at a time. The order of priority specified below shall are according to documented feasibility and apply to all projects.

1. Infiltration (Retention of the 80th percentile storm on site)
2. Natural Filters or Treatment
3. Man Made Filters or Treatment
4. Combination of the above

Because of the retention requirement, BMPs that infiltrate are given the highest priority and should be utilized until the Water Quality Volume (as detailed in section 2.2.6 below) has been captured and stored. If it is not feasible to retain and infiltrate, then treating and releasing may be considered. If compliance is infeasible, the project Site and LID Plan shall document an explanation of the reasons preventing this approach and the rationale for the chosen alternative controls on a case by case basis for the project.

Infiltration/retention will be considered feasible only when all of the following criteria can be met:

- The lowest elevation of all retention facilities shall be a minimum of three feet above the documented water table
- Retention volumes must infiltrate or evaporate within two days or 48 hours after a storm has subsided
- Retention facilities can be no closer than thirty feet from the nearest structural foundation
- Retention facilities can be no closer than fifty feet horizontally from live streams or water bodies
- Retention facilities can be no closer than five feet horizontally from roads or parking lots
- If a slope in the project vicinity is steeper than 20%, there must be a geotechnical investigation to determine a safe setback from the top of slope to allow for any infiltration to occur
- Retention facilities cannot be placed on slopes exceeding 5%
- Retention shall not be allowed in areas where a licensed geotechnical engineer determines that infiltration would adversely impact the potential for geological hazards on the project site or on neighboring parcels of land
- Side slopes on all open retention facilities must be 3:1 or flatter
- A project has no land drains
- Soil infiltration rates must be 0.5 inches per hour, or greater
- Infiltration will not be allowed in Zones 1 or 2 of any Drinking Water Source Protection Plan for a Public Water System
- Infiltration will not be allowed in HSG soil classifications C and D

2.2.2 Determining Soil Characteristics

Soil characteristics play a major role in determining LID feasibility and sizing of facilities on a site. A basic soil evaluation will need to be conducted on each site. Kaysville has elected to standardize based on the Natural Resource Conservation Service (NRCS) Hydrologic Soil Group (HSG) classifications. The NRCS system includes four hydrologic soil groups: A, B, C, and D as described below:

> **Group A** is sand, loamy sand or sandy loam types of soils. It has low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission.
>
> **Group B** is silt loam or loam. It has a moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.
>
> **Group C** soils are sandy clay loam. They have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure.
>
> **Group D** soils are clay loam, silty clay loam, sandy clay, silty clay or clay. This HSG has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material.

Soils analysis may be done utilizing information obtained from the National Cooperative Soil Survey. The NRCS mapping tool is called Web Soil Survey (WSS) and provides information on drainage characteristics, water table depth (in some cases) and soil groups: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx.

2.2.3 Determining Water Table Depth

Water table depth is a major factor in determining feasibility and sizing of LID techniques that infiltrate. Shallow groundwater may severely hinder or prohibit the effectiveness of infiltration. A part of any geotechnical investigations at a site should include an assessment of the high groundwater level. This should include a measurement of the existing water table at the time of the investigation and careful review of the soil structure, looking for evidence of the historic high water.

2.2.4 Determining Existing Drainage Patterns

An assessment of the existing drainage system/patterns will also assist in locating/sizing LID facilities. A detailed site survey should be conducted and existing contours developed. Preliminary site plans will include existing contours and show existing drainage patterns. Any existing storm drains should be identified, located, and elevations established. It is easier to mimic pre-development hydrology if existing drainage patterns can be maintained. Locating LID facilities

generally works best by following natural patterns. An understanding of flow direction and locating natural storm drainage collection points can simplify LID design.

2.2.5 Determining Infiltration Rates

The bottom line number that will dictate sizing of most LID facilities is the infiltration rate. Kaysville City has adopted the approach of using generalized hydraulic conductivity rates based on NRCS HSGs. This is a simplified approach. If a developer chooses to do a more detailed analysis by actually measuring infiltration rates in the field, these will be reviewed on a case-by-case basis. The type of LID facility proposed will dictate acceptable methods for determining the rate at which stormwater can be absorbed into the ground. The following table shall be used to size LID facilities unless a more stringent process is followed by the developer and infiltration rates are determined in the field.

Typical infiltration rates of various soil groups

Table 2-1: Hydraulic Conductivity of NRCS Soil Groups

NRCS HSG	Typical Soil Texture	Saturated Infiltration Rate (in./hr)	Porosity (Volume ratio)	Field Capacity (dimensionless)
A	Sand	8.0	0.437	0.062
A	Loamy sand	2.0	0.437	0.105
B	Sandy loam	1.0	0.435	0.190
B	Loam	0.5	0.463	0.232
C	Silt loam	0.25	0.501	0.284
C	Sandy clay loam	0.15	0.398	0.244
D	Clay loam and silty clay loam	<0.09	0.465	0.325
D	Clay	<0.05	0.475	0.378

(Taken from Design of Urban Stormwater Controls, a revision of the Water Environment Federation's (WEF's) and the American Society of Civil Engineer's (ASCE's) manual of practice titled *Urban Runoff Quality management (1998).* Table 9.2, pg. 367*)*

2.2.6 Determining Water Quality Volume (WQV)

The *General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (MS4) Permit No. UTR090000,* requires projects to "manage rainfall on-site, and prevent the off-site discharge of the precipitation from all rainfall events less than or equal to the 80th percentile rainfall event." The volume of water generated from this 80th percentile event is being defined as the Water Quality Volume.

Table 2-2: 80th Percentile Precipitation Rates at Surrounding Weather Stations

Location	Station	Elevation	Years of Record	80th Percentile Storm (inches)
Weber Basin	USC00429346	4899.9	55	0.64
Fruit Heights	US1UTDV0024	4801.8	6	0.64
Ogden Hinckley	USW00024126	4470.1	25	0.50
Farmington Lower	US1UTDV0001	4238.9	11	0.50
Triad Center	USC00427606	4279.86	34	0.48
Salt Lake Airport	USW00024127	4225.07	71	0.44

Information in Table 2-2 was taken from the Utah Climate Center. Elevations in Kaysville range from 4780 on the east side to 4230 on the west side. To simplify calculations**, Kaysville City has chosen to use 0.48 inches or 0.04 feet** as the 80th percentile storm depth.

The Water Quality Volume is calculated using the following equation:

$WQV = R_V dA$

Where:
WQV = 80th percentile volume, cf
R_V = Volumetric runoff coefficient, unitless
d = 80th percentile precipitation depth, ft (convert from inches to feet if required)
A = Project area or BMP drainage area, sf

The NRCS has developed regression equations to determine the runoff coefficient R_v. There are three equations based on soil type:

Table 2-3: Runoff Coefficient Equations Based on NRCS Soil Groups

NRCS Soil Group		
A	B	C/D
$R_{V\text{-}A} = 0.84i^{1.302}$	$R_{V\text{-}B} = 0.84i^{1.169}$	$R_{V\text{-}C/D} = 0.83i^{1.122}$

Note: "*i*" is runoff intensity, measured in in/hour

Using these equations a WQV is calculated in cubic feet. This is the volume that needs to be retained (with no discharge) until it infiltrates or evapo-transpires.

2.3 Universal LID Best Management Practices

Not all LID BMPs include construction of a structure. Some LID BMPs involve the implementation of basic principles. These principles should be a general practice on all sites. If applicable and feasible for the given site conditions, the following measures are required and should be incorporated on all projects:

2.3.1 Eliminating Directly Connected Impervious Areas

One of the primary contributors to urban runoff is directly connected impervious areas or DCIAs. They affect both water quality and water volume. A directly connected impervious area is defined as a surface where stormwater conveys directly from an impervious area to a storm drain or waterway. Examples of directly connected impervious areas include; building downspouts that are piped to the gutter or storm drain pipe, and parking lots with inlets in the gutter that go straight to the storm drain pipe.

All new development should eliminate these direct connects and direct runoff through landscape areas and LID facilities whenever possible. Infiltration that occurs across landscape areas may be calculated and applied toward meeting WQV requirements. The amount of infiltration allowed will be a function of soils, vegetation and slope (residence time) of the landscape areas.

2.3.2 Utilizing Landscaped (Natural) Buffers

Much the same as eliminating DCIAs, maintaining landscaped buffers through which stormwater flows provides opportunities for natural filtering and infiltration that you don't get in a pipe or gutter. The best buffers are ones where the pre-development ground and vegetation are left undisturbed; however, it is recognized that a more groomed approach is desirable in many cases. Development is strongly encouraged to utilized landscape areas as buffers and direct stormwater to these landscaped areas. Stormwater can be collected in the landscaped areas after it has had a chance to filter/infiltrate.

3. Various BMP Details and Abilities

3.1 Best Management Practice Categories

Structural BMPs shall be designed to manage and capture stormwater runoff. Most long-term stormwater BMPs can fit into three general functional categories; BMPs that infiltrate, BMPs that harvest, and BMPs that filter. Some BMPs are hybrids that can accomplish more than one function at a time. The order of priority specified below shall apply to all projects. Each type of BMP shall be implemented to the maximum extent feasible when determining the appropriate BMPs for a project before moving to the next priority.

1. Infiltration
2. Natural Filters
3. Combination of any of the above

Because of the retention requirement, BMPs that infiltrate are given the highest priority and should be utilized until the WQV has been captured and stored. If it is not feasible to retain the entire WQV (feasibility is defined in section 3.1.1 below) then harvesting should be considered. Utah water rights laws limit the amount of stormwater that can be harvested and reused. If the WQV cannot be handled by the first two priorities then treating and releasing may be considered. If partial or complete onsite compliance of any type is technically infeasible, the project Site and LID Plan shall be required to document an explanation of the reasons preventing this approach and the rationale for the chosen alternative controls on a case by case basis for the project.

3.1.1 Infiltration Feasibility

Infiltration will be considered feasible only when all of the following criteria can be met:

- The lowest elevation of all retention facilities shall be a minimum of three (3) feet above the measured water table
- Retention volumes must infiltrate or evaporate within two (2) days or 48 hours after a storm has subsided
- Retention facilities can be no closer than thirty (30) feet from the nearest structural foundation
- Retention facilities can be no closer than fifty (50) feet horizontally from live streams or water bodies
- Retention facilities can be no closer than five (5) feet horizontally from roads or parking lots .
- If a slope is steeper than 20%, there must be a geotechnical investigation to determine a safe setback from the top of slope to allow for any infiltration to occur.
- Retention facilities cannot be placed on slopes exceeding 5%

- Retention shall not be allowed in areas where a licensed geotechnical engineer determines that infiltration would adversely impact the potential for geological hazards on the project site or on neighboring parcels of land
- Side slopes on all open retention facilities must be 3:1 or flatter
- BMPs that focus on infiltration will not be allowed if land drains are required for a development.
- Infiltration will not be allowed in Zones 1 or 2 of any Drinking Water Source Protection Plan for a Public Water System
- Infiltration will not be allowed in HSG soil classifications C and D.

3.1.2 Infiltration BMPs

The following paragraphs provide general descriptions of various types of infiltration BMPs.

3.1.2.1 Infiltration basin

Description: Infiltration basin consists of an earthen basin constructed in naturally pervious soils with a flat bottom typically vegetated with dry-land grasses or irrigated turf grass. An infiltration basin functions by retaining the design runoff volume in the basin and allowing the retained runoff to percolate into the underlying native soils over a specified period of time.

Application: Infiltration Basins are typically utilized for larger drainage areas

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for all open infiltration basins:

Parameter	Requirement
Minimum depth to measured water table from the lowest elevation in the basin	3 feet
Maximum standing water time	48 hours
Maximum side slope	3 H: 1 V
Minimum freeboard	1 foot

Other	Must have a safe flood path to convey up to the 100 year storm safely to an established Right-of-way
WQV	As defined in Section 2.2.6
Maximum Infiltration Rate	As determined in Section 2.2.5

3.1.2.2 Infiltration Trenches

Description: Infiltration trenches, which are similar to basins, are long, narrow, gravel-filled trenches, often vegetated, that infiltrate stormwater runoff from small drainage areas. Infiltration trenches may include a shallow depression at the surface, but the majority of runoff is stored in the void space within the gravel and infiltrates through the sides and bottom of the trench.

Application: Infiltration trenches are commonly used for moderately sized drainage areas where the available footprint is narrow.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for all infiltration trenches:

Parameter	Requirement
Minimum depth to the measured water table from the lowest elevation in the basin	3 feet
Minimum depth of trench	2 feet
Maximum longitudinal trench slope	1%
Minimum width	2 feet
WQV	As defined in Section 2.2.6
Maximum Infiltration Rate	As determined in Section 2.2.5

3.1.2.3 Infiltration galleries

Description: Infiltration galleries are similar to infiltration basins except they are underground. A number of vendors offer prefabricated, modular infiltration

galleries that provide subsurface storage and allow for infiltration. Infiltration galleries come in a variety of material types, shapes and sizes.

Infiltration galleries are best served when there is an isolator row or pretreatment device. Maintaining underground retention without the isolator row or pretreatment can be problematic and costly.

Application: Infiltration Galleries are typically utilized for drainage areas between 5 and 50 acres.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for all infiltration galleries:

Parameter	Requirement
Minimum depth to the measured water table from the lowest elevation in the basin	3 feet
Maximum standing water time	48 hours
Other	- Must have a safe flood path to convey up to the 100 year storm safely to an established Right-of-way - Must meet all the requirements of the manufacturer.
WQV	As defined in Section 2.2.6
Maximum Infiltration Rate	As determined in Section 2.2.5

3.1.2.4 Injection Wells

Description: An injection well is defined as an excavated, bored, drilled, or driven shaft or hole whose depth is greater than its width. Injection wells are similar to infiltration trenches in their design and function, as they are designed to temporarily store and infiltrate runoff, primarily from rooftops or other impervious areas with low pollutant loading. An injection well may be either a drilled borehole filled with aggregate or a prefabricated storage chamber or pipe segment.

Application: Injection wells are best suited for soils with high conductivity rates. They can contribute to aquifer recharge. As such, they should be registered as Class V Injection Wells with the State Division of Water Quality https://deq.utah.gov/legacy/programs/water-quality/utah-underground-injectioncontrol/drainage-wells/index.htm.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for all injection wells:

Parameter	Requirement
Minimum depth to the measured water table from the lowest elevation in the basin	3 feet
Maximum standing water time	48 hours
Other	- Must have a safe flood path to convey up to the 100 year storm safely to an established Right-of-way. - Must meet all the requirements of the manufacturer.
WQV	As defined in Section 2.2.6
Maximum Infiltration Rate	As determined in Section 2.2.5

3.1.2.5 Constructed Wetlands

Description: A constructed wetland is an artificial wetland created for the purpose of treating discharges such as municipal stormwater runoff. Constructed wetlands are engineered system that use natural functions of vegetation, soil, and organisms to treat water running through them. The wetlands should be designed to spread the flow, slow the velocity and maximize infiltration. The wetlands should also be designed to meet the specific needs of the water running through them including sediment removal, nutrient uptake, and heavy metals containment. Constructed wetlands may also serve a secondary purpose of providing habitat for native or migratory wildlife.

Application: Constructed wetlands can handle unlimited volumes of water provided there is a large enough footprint to process the flows. A good rule of thumb in sizing wetlands is to use 0.5% to 2.0% of the contributing drainage area for the wetland footprint (Tyndall & Bowman, 2016 – *A NRS Cost Tool Overview*). Constructed wetlands are typically not as effective when they are less than 0.25 acre in size.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for all constructed wetlands:

Parameter	Requirement
Maximum depth to the measured water table from the lowest elevation in the wetland	1.5 feet with no supplemental water
Supplemental water	To keep a wetland viable it requires a fairly consistent water source. Stormwater, by itself in Utah, does not usually provide adequate water source. It is very likely that supplemental water will be needed.
Hydraulic residence time	≥ 48 hours to achieve 80% reduction in Nitrogen
WQV	As defined in Section 2.2.6
Maximum Infiltration Rate	As determined in Section 2.2.5

3.1.2.6 Combined Measures

Any of the above infiltration type BMPs may be combined with any other BMPs to fit the site and to meet the allowable discharge requirements.

3.1.3 Natural Filters

Natural Filter facilities are landscaped shallow depressions that capture and filter stormwater runoff. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, and biodegraded by the soil and plants. Because they are not contained within an impermeable structure, they may allow for some infiltration.

Projects that have demonstrated they cannot manage 100% of the water quality design volume onsite through infiltration may manage the remaining volume through the use of a high removal efficiency natural filter BMP. A high removal efficiency natural filter BMP shall be sized to adequately capture **1.5** times the volume not managed through infiltration and/or capture and use.

3.1.3.1 Biofilter

Description: Most natural filter systems can be classified as biofilters. They normally consist of a ponding area, mulch layer, planting soils, plants, and in some cases an underdrain. Runoff that passes through a biofiltration system is treated by the natural absorption and filtration characteristics of the plants, soils, and microbes with which the water contacts. Plants are used to increase infiltration and nutrient uptake.

Application: Biofilters are typically incorporated into site landscaping elements and are commonly used in park strips and parking lot islands

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for biofilters:

Parameter	Requirement
Minimum depth to the measured water table from the lowest elevation in the basin	3 feet
Maximum standing water time	48 hours
Maximum ponding depth	1 foot
WQV	As defined in Section 2.3.5
Maximum Infiltration Rate	As determined in Section 2.3.4
Minimum freeboard	6 inches
Other	Must have a safe flood path to convey up to the 100 year storm safely to an established Right-of-way.

3.1.3.2 Rain Gardens

Description: Rain gardens are simply gardens designed to capture and treat runoff. Rain gardens usually consist of a small depression with engineered or native soils and a variety of plants. The plants are used to increase infiltration and nutrient uptake. They are often topped with wood or rock mulch. For projects with impervious areas exceeding 4,000 square feet; biofilters, planter boxes with infiltration, vegetated swales or natural buffer strips should be considered.

Application: Small sites – impervious areas < 4,000 square feet

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for rain gardens:

Parameter	Requirement
Minimum depth to the measured water table from the lowest elevation in the basin	3 feet
Maximum standing water time	48 hours
Maximum ponding depth	18 inches
Maximum side slopes	3H:1V
Minimum freeboard	6 inches
Other	Must have a safe flood path to convey up to the 100 year storm safely to an established Right-of-way.
WQV	As defined in Section 2.2.6
Maximum Infiltration Rate	As determined in Section 2.2.5

3.1.3.3 Planter Boxes with infiltration

Description: Planter boxes with infiltration are natural filtration treatment control measures located in and around structures and facilities to handle larger volumes of water than a typical rain garden. They typically are constructed with vertical or near vertical sides and above ground. They can be equipped with underdrains if necessary. Planter boxes with infiltration should maintain setbacks from adjacent buildings, other structures, sidewalks or roadways.

Application: Planter boxes with infiltration are typically incorporated into site landscaping elements and are commonly used in park strips and parking lot islands. They are sometimes raised planters. Raised planters are most successful for treating stormwater from roof tops.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for planter boxes with infiltration:

Parameter	Requirement
Minimum depth to the measured water table from the lowest elevation in the basin	3 feet
Maximum standing water time	48 hours
Maximum ponding depth	1 foot
WQV	As defined in Section 2.3.5
Maximum Infiltration Rate	As determined in Section 2.3.4
Minimum freeboard	6 inches
Other	Must have a safe flood path to convey up to the 100 year storm safely to an established Right-of-way.

3.1.3.4 Bio-Infiltration

Description: Bioinfiltration facilities are designed for partial infiltration of runoff and partial biotreatment. These facilities are similar to bioretention devices with underdrains but they include a raised underdrain above a gravel sump designed to facilitate infiltration and nitrification/denitrification. These facilities can be used in areas where there are little to no hazards associated with infiltration, but infiltration screening does not allow for infiltration BMPs due to low infiltration rates or high depths of fill.

Application: Bio-infiltration systems are typically incorporated into site landscaping elements and are commonly used in park strips and parking lot islands. Bio-infiltration includes a higher likelihood for infiltration than the basic biofilter.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Excellent
Metals	Excellent
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for bio-infiltration:

Parameter	Requirement
Minimum depth to the measured water table from the lowest elevation in the basin	3 feet
Maximum standing water time	48 hours
Maximum ponding depth	1 foot
WQV	As defined in Section 2.3.5
Maximum Infiltration Rate	As determined in Section 2.3.4
Minimum freeboard	6 inches
Other	Must have a safe flood path to convey up to the 100 year storm safely to an established Right-of-way.

3.1.3.5 Vegetated Swales

Description: Vegetated swales are open, shallow channels with dense, low-lying vegetation covering the side slopes and bottom that collect and slowly convey runoff to downstream discharge points. An effective vegetated swale achieves uniform sheet flow through the densely vegetated area for a period of several minutes. The vegetation in the swale can vary depending on its location and is the choice of the designer. Most swales are grass-lined.

Application: Vegetated swales serve a dual function. They are used both as a minor treatment alternative and as a conveyance system.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Good
Nutrients	Fair
Metals	Good
Bacteria	Fair
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for vegetated swales:

Parameter	Requirement
Minimum depth to the measured water table from the lowest elevation in the basin	3 feet

Maximum longitudinal slope	5%
Maximum side slope	3H:1V
Maximum velocity	1.0 ft/s
Maximum flow depth	2/3 vegetation height
WQV	As defined in Section 2.3.5
Minimum freeboard	6 inches
Maximum Infiltration Rate	As determined in Section 2.3.4
Minimum residence time	5. min
Vegetative Cover	>65%

3.1.3.6 Filter or buffer strips

Description: Filter strips are vegetated areas designed to treat sheet flow runoff from adjacent impervious surfaces such as parking lots and roadways, or intensive landscaped areas such as golf courses. While some assimilation of dissolved constituents may occur, filter strips are generally more effective in trapping sediment and particulate-bound metals, nutrients, and pesticides. Filter strips are more effective when the runoff passes through the vegetation and thatch layer in the form of shallow, uniform flow. Filter strips are primarily used to pretreat runoff before it flows to an infiltration BMP or another natural filtration BMP.

Application: Most effective when inflow is not concentrated, but comes in by sheet flow. Works well on road shoulders or off parking lots with no curb and gutter.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Good
Nutrients	Fair
Metals	Good
Bacteria	Excellent
Oil/Grease	Excellent

Design Criteria: The following criteria shall be met for filter or buffer strips:

Parameter	Requirement
Minimum flow length	15 feet
Maximum longitudinal slope	5H:1V
Maximum flow velocity	1.0 ft/s
Maximum flow depth	2/3 vegetation height
Minimum freeboard	6 inches

Minimum vegetation cover	>65%
WQV	As defined in Section 2.2.6
Maximum Infiltration Rate	As determined in Section 2.2.5

3.1.3.7 Velocity Dissipaters

Description: Velocity dissipaters are BMPs designed to slow the velocity and minimize erosive action of flowing water. Check dams and level spreaders are two kinds of velocity dissipaters that are commonly used. Check dams are designed to create a series of step-downs with pools in between while level spreaders are designed like weirs to spread the flow out and to control water levels. Level spreaders are commonly used in wetland areas to maintain a uniform distribution of water and keep the flows from channelizing.

Application: Typically used in flow channels (concentrated flows) or to disperse water entering into a wetland area

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Good
Nutrients	Fair
Metals	Fair
Bacteria	Good
Oil/Grease	Fair

Design Criteria: The following criteria shall be met for velocity dissipaters:

Parameter	Requirement
Maximum flow velocity	1.0 f/s
Minimum freeboard	6 inches
WQV	As defined in Section 2.2.6
Maximum Infiltration Rate	As determined in Section 2.2.5

3.1.4 Man-made Treatment

3.1.4.1 Hydrodynamic Separators

Description: Hydrodynamic separators are stormwater management devices that work primarily based on vortex and gravity principles to separate stormwater from the pollutants. They are generally designed as flow-through systems with either on-line or off-line storage of pollutants. They include chambers for settling and storage of pollutants and are often used in conjunction with other BMPs as pretreatment. They are not especially effective for the removal of fine materials or dissolved pollutants. On-line separators are more susceptible to scour or re-suspension of pollutants than systems that incorporate off-line storage. They are generally not designed to treat stormwater flows exceeding 25 cfs.

Application: Typically limited by flow rates. Small footprint, but normally require depth for pollutant storage

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Excellent
Nutrients	Good
Metals	Excellent
Bacteria	Fair
Oil/Grease	Good

Design Criteria: The following criteria shall be met for hydrodynamic separators:

Parameter	Requirement
Maximum flow rate for prefabricated units	25 cfs
Design per manufacturer's requirements	
Typically need a high flow bypass	
WQV	As defined in Section 2.2.6

3.1.4.2 Safl Baffle

Description: Safl Baffles are a brand name product designed primarily as a post-construction retrofit pretreatment system. They require a sump structure. A specially designed perforated metal plate is installed inside a sump manhole or vault. Water flows through the plate. This action facilitates improved settling and re-suspension characteristics. Sediment removal rates are generally less than with hydrodynamic separators. These baffles are a fair low cost alternative that require a minimal footprint.

Sediments are stored in the lower reaches of the manhole or vault. Safl Baffles are not effective for floatables.

Application: Typically can be used anywhere a hydrodynamic separator can be used, but can handle higher flow rates. Pollutant removal rates slightly worse than a hydrodynamic separator.

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Good
Nutrients	Fair
Metals	Good
Bacteria	Fair
Oil/Grease	Poor*

*When used in conjunction with a skimmer their performance with oil/grease is “Good”

Design Criteria: The following criteria shall be met for Safl Baffles:

Parameter	Requirement
Maximum flow rate	50 cfs
Design per manufacturer’s requirements	
Removal efficiency goes down with higher flows	
WQV	As defined in Section 2.2.6

3.1.4.3 Skimmer

Description: Skimmers are designed to trap floatables in a holding facility until they can be removed by absorbent materials or a vactor truck. They can take many shapes and sizes. They can be prefabricated or custom built to fit the needs of almost any project. They generally require a certain amount of standing water to maintain a seal so the floatables cannot escape. They also require relatively frequent inspection and maintenance because of small storage capacity. They work on the principle of baffles

Application: Skimmers are typically not used as standalone treatment options. They are best utilized when floatables are the primary pollutant of concern

Water Quality Effectiveness:

Target Pollutant	Relative Removal Effectiveness
Sediment	Poor
Nutrients	Poor
Metals	Poor
Bacteria	Poor
Oil/Grease	Good

Design Criteria:

Per Manufacturer's recommendations

3.2 Sample Calculations

All categories of BMPs require a determination of the Water Quality Volume (WQV). Section 2.2.6 describes that calculation process.

3.2.1 Calculating Size Requirements for Infiltration BMPs

The main challenge associated with infiltration BMPs is preventing system clogging and subsequent infiltration inhibition. In addition, infiltration BMPs must be designed to drain in a reasonable period of time so that storage capacity is available for subsequent storms and so that standing water does not result in unwanted conditions. Infiltration BMPs should be designed according to the requirements listed in Table 3-1 and outlined in the following text:

Infiltration facilities must be sized to completely infiltrate the design capture volume within **72 hours**.

Step 1: Calculate the Design Volume

Infiltration facilities shall be sized to capture and infiltrate the water quality volume as described in section 2.2.6.

Table 3-1: Infiltration BMP Design Criteria

Design Parameter	Unit	Basins and Trenches	Galleries	Permeable Pavement	Dry Well	Hybrid Bioretention/ Dry Well
Design Water Quality Volume	cubic feet	See Section 2.3.5				
Design Surface Drawdown Time	hr	48				
Setbacks and Elevations	feet	In accordance with the Infiltration Feasibility Criteria, Section 3.1.1				
Pretreatment	-	Appropriate Treatment Control Measure shall be provided as pretreatment for all tributary surfaces other than roofs				
Hydraulic Conductivity, $K_{sat,measured}$	in/hr	In accordance with Section 2.3.4 or as measured in the field by a certified hydrogeologist				
Factor of Safety, FS	-	5				
Facility geometry	-	Bottom slope ≤ 3% (basins); side slope shall not exceed 3:1 (H:V)	Flat bottom slope	Pavement slope ≤ 5%; If ≥ 2%, area shall be terraced	Typical 18 – 36 inch diameter; flat bottom slope	Bioretention: Bottom slope ≤ 3%; side slope shall not exceed 3:1 Drywell: flat bottom
Ponding Depth	inch	18 (maximum)[a]				
Media Depth	feet	2 (min) 8 (max)	-	2 (min) 8 (max)	-	2 (min) 8 (max)
Gravel media diameter	inch	1 – 3	-	1 - 2	3/8 – 1	3/8 - 1
Inlet erosion control	-	Energy dissipater to reduce velocity				
Overflow device	-	Required if system is on-line and does not have an upstream bypass structure. Shall be designed to handle the peak storm flow in accordance with the Building and Safety code and requirements				

a: Ponding depth may vary for galleries (which have a storage depth) and may be different from one vendor to another. Ponding depth is not necessarily applicable to permeable pavement.

Step 2: Calculate the BMP Surface Area

Determine the size of the required infiltrating surface by assuming the water quality volume will fill the available ponding depth.

Determine the minimum infiltrating surface area necessary to infiltrate the design volume

$$A_{min} = (V_{design} \times 12 \text{ in/ft}) / (T \times K_{sat,\ design})$$

Where:

A_{min} = Minimum infiltrating surface area (sq ft),

V_{design} = Design volume (cf)

T = Drawdown time (hours), 72 hours

$K_{sat,design}$= Design infiltration rate of filter media (in/hr)

For infiltration basins, the surface area should be calculated as the surface area at mid-ponding depth. For infiltration trenches, the surface area should be calculated at the bottom of the trench.

3.2.2 Natural Filter Calculations

Natural filter facilities can be sized using one of two methods: a simple sizing method or a hydrologic routing modeling method. With either method the design capture volume must be completely infiltrated within the drawdown time shown in Table 3-2. Steps for the simple sizing method are provided below. BMPs should be designed according to the requirements listed in Table 3-2 and outlined in the following text. Swales and filter strips must be handled as indicated in the following sections.

Table 3-2: Natural Filter BMP Design Criteria

Design Parameter	Unit	Rain Garden	Planter Box	Bio-infiltration		Vegetated Swale	Filter Strip
Water Quality Volume, WQV	cubic feet	See Section 2.3.5					-
Design Drawdown Time	hr	48				-	-
Factor of Safety[c]	-	3				-	
Soil Media Infiltration Rate	in/hr	5 (max)				-	
Design Contact Time	min	-				≥ 7	
Slope in Flow Direction	%	-				1% (min) 6% (max)	2% (min) 33% (max)
Design Flow Velocity	ft/sec	-				≤ 1	
Maximum Ponding/Flow Depth	inch	18	12	18	-	5	1
Minimim Width	ft	2			-	2	15
Soil Depth	ft	2 (3 preferred) Topped with 3” of mulch			-	2	-
Underdrain	-	Slotted PVC pipe embeded in 12” gravel section and located 1” from bottom of facility		Slotted PVC pipe at least 2’ above bottom of facility		N/A	Not required

Step 1: Calculate Water Quality Volume

See Section 2.2.6

Step 2: Determine Infiltration Rate

See Section 2.2.5

Step 3: Calculate Ponding Depth

Select a ponding depth (*dp*) that satisfies geometric criteria and is congruent with the constraints of the site. The ponding depth must satisfy the maximum ponding depth constraint shown in Table 3-2 as well as the following:

$$d_p \text{ (ft)} = (K_{sat,design} \times T) / 12$$

Where: d_p = Ponding depth (ft)

$K_{sat,design}$= Design infiltration rate of filter media (in/hr)

T = Required surface drain time (hrs), from Table 4.2

Step 4: Calculate Surface Area

$$A_{min} = (V_{design}) / [(T_{fill} \times K_{sat}/12) + d]$$

Where:

A_{min} = Design infiltrating area (sq ft)

T_{fill}= Time to fill to max ponding depth with water (hrs) [unless a hydrologic routing model is used, assume a maximum of 3 hours]

$K_{sat,}$= Design infiltration rate of filter media (in/hr)

d = depth of ponded water (ft)

The calculated BMP surface area only considers the surface area of the BMP where infiltration through amended media can occur. The total footprint of the BMP should include a buffer for side slopes and freeboard.

3.2.3 Swale Sizing

Swales shall be designed with a trapezoidal channel shape with side slopes of 3:1 (H:V). They shall incorporate at least two feet of soil beneath the vegetated surface. Swale sizing will be determined on a case-by-case basis. As is the case with other biofiltration BMPs, the sizing criteria presented in Table 3-2 must be met.

3.2.4 Filter Strip Sizing

Because filter strips are most often used for pretreatment purposes, their design will depend on the desired flow-rate to be treated and the type of BMP downstream, among other factors. As a result, filter strip sizing is not covered in this manual, but will be determined on a case-by-case basis.

4. Offsite Mitigation Measures

4.1 Offsite Mitigation Measures

Offsite mitigation shall only be utilized after on-site mitigation opportunities are exhausted and after approval from the City. If on-site mitigation meets the minimum requirements no off-site mitigation will be required. The following criteria shall be implemented in considering off-site mitigation:

1. Locate off-site projects as close as possible to the project site.
2. Locate off-site projects within the same sub-watershed as the proposed project.
3. Off-site projects may be completed on either private or public land.
4. Secure needed easements and rights to the property on which off-site projects are completed.
5. Demonstrate that same level of water quality protection is achieved as if all the runoff were retained on-site.
6. Demonstrate that the off-site project, including any on-site mitigation, addresses the same volume of water that would have been addressed if BMPs were all constructed on-site.
7. The developer shall execute an Agreement in Perpetuity with the city and recorded with the property, for on-going maintenance and upkeep of both on-site and off-site BMP(s).

4.2 Regional Facilities

In lieu of an independent off-site mitigation project designed specifically to meet the needs of a given project, the developer may be able to work together with the City and/or other groups to construct a larger regional water quality mitigation project. If a regional project is pursued, the following criteria should be considered:

1. An agreement shall be obtained with the City and/or other partners for the design, sizing, construction and maintenance of the regional facility.
2. The regional facility shall be sized to accommodate the water quality needs of all interested parties.
3. The same net level of water quality protection shall be achieved for the combined facility as would be required for each separate entity as if they were separate and distinct facilities.
4. The same total volume of water required to be addressed at each individual and independent site shall be addressed as the accumulated total volume at the regional facility.
5. All Maintenance Agreements in Perpetuity that would have been required for each separate facility shall be addressed in agreement(s) for the regional facility and shall be recorded with each parcel encompassed as part of the regional facility.

APPENDIX A

WATER QUALITY VOLUME REPORT FORM

Water Quality Volume Report Form

STORM WATER QUALITY REPORT

Date: _____
Project Name: _____
Project ID: _____
Design Engineer: _____

Is the project within a watershed that is 303(d) listed? (http://mapserv.utah.gov/surfacewaterquality/)

If yes:

Name of Receiving Water(s): _____

Listed Impairment(s): _____

Does the watershed have an approved TMDL?

If yes:

Approved TMDL(s): _____

I have reviewed the storm water quality design and find this report to be complete, accurate, and current.

_____
(Name), Project Manager

_____
(Name), Permittee's Designated Storm Water Coordinator

(PE stamp required)

_____
(Name), Permittee's Head of Maintenance

Project Information

Type of Project (New Development, Redevelopment): _____

Area of Land Disturbance (acre): _____

Project Impervious Area (acre): _____

Project Imperviousness (%): _____

Project Runoff Coefficient, R_v: _____

90th Percentile Storm Depth (in): _____

Project 90th Percentile Volume, V_{goal}(cf): _____

Groundwater Information

Depth to Groundwater (ft): _____

Historical High Depth to Groundwater, if known (ft): _____

Source: _____

Soil Information

Infiltration Rate (in/hr): _____

Source: _____

LID Drainage Areas

(add additional rows as needed)

Contributing Drainage Area	Area (acre)	Impervious Area (acre)	Imperviousness (%)	Runoff Coefficient, R_v	Water Quality Volume WQV (cf)
				Total WQV (cf)	

LID BMP Design

(add additional rows as needed)

Contributing Drainage Area	LID BMP Type	Water Quality Volume WQV (cf)	Runoff Retained (cf)	Percent of Runoff Captured (%)
Total Volume Retained (cf)				

Percent of V_{goal} captured by LID BMPs: _____%

If 100% of V_{gpal} is not captured, document and provide narrative of technical infeasibilities and/or alternate compliance measures below:

_____

_____

_____

_____

Describe additional storm water quality measures incorporated into the site:

_____

_____

_____

_____

APPENDIX B

80TH PERCENTILE STORM EVENT CALCULATION

Appendix B: 80th Percentile Storm Event Calculations

Weber Basin

Fruit Heights

Ogden Hinkley Airport

Farmington Lower

Triad Center

Salt Lake International Airport

Calculating the 80th Percentile Storm Event

The desire of the National and State Storm Water Regulations is for the hydrology of any given site after development should mimic the hydrology of that same parcel of land in its natural state. The State of Utah has selected the 90th Percentile Storm as the standard to use to meet this desire. The State of Utah has further outlined the steps to be taken to determine the depth of the 90th Percentile storm at any given weather station. The following text was taken from the State of Utah: *A Guide to Low Impact Development within Utah.*

90th Percentile Depth

Determine the 90th percentile precipitation depth.

1. Obtain long-term daily rainfall data from the following sources:
    a. National Oceanic and Atmospheric Administration (NOAA): https://www.ncdc.noaa.gov/cdoweb/datatools/selectlocation; or
    b. Reliable historical local data; or
    c. Any other reliable data source.
2. Sort data low to high
3. Remove small precipitation events (≤0.1 inch) and all snowfall.
4. Use the Excel PERCENTILE function to calculate the 90th percentile rainfall depth.

A more in-depth discussion on determining the 90th percentile precipitation depth is found here: https://owl.cwp.org/mdocs-posts/urban-subwatershed-restoration-manual-series-manual-3/

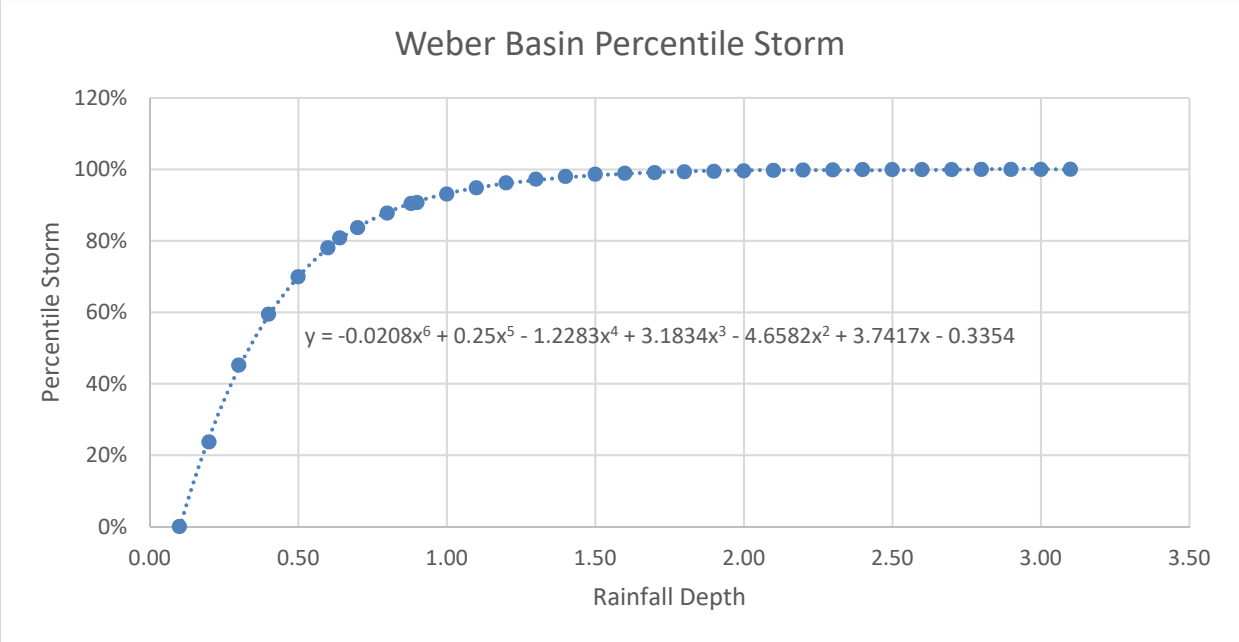
A reliable record of historical precipitation data should meet the following conditions:

1. Come from an active rain gage;
2. Have at least 30 years of data;
3. Have 90% data coverage for the period of record.

Of the stations available for analysis and with a long enough period of record to provide reliable data, it was felt that the Triad Center was the station that best represents Kaysville City in elevation and proximity to the mountains. The following pages include a summary of data collected from local rain gages taken from the Utah Climate Center.

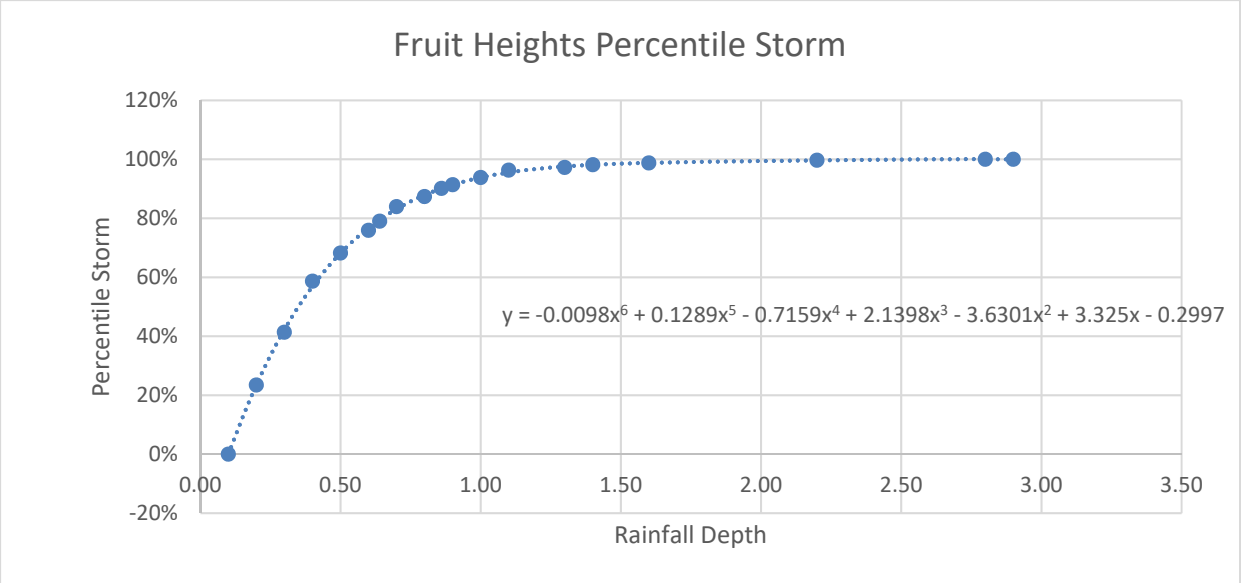
Weber Basin

Number of Storms Greater than or equal to	Rainfall (in)	Percentile Storm
3011	0.10	0%
2298	0.20	24%
1651	0.30	45%
1222	0.40	59%
906	0.50	70%
662	0.60	78%
578	0.64	81%
492	0.70	84%
369	0.80	88%
288	0.88	90%
281	0.90	91%
209	1.00	93%
156	1.10	95%
115	1.20	96%
84	1.30	97%
61	1.40	98%
42	1.50	99%
33	1.60	99%
28	1.70	99%
22	1.80	99%
17	1.90	99%
14	2.00	100%
9	2.10	100%
7	2.20	100%
0	3.10	100%



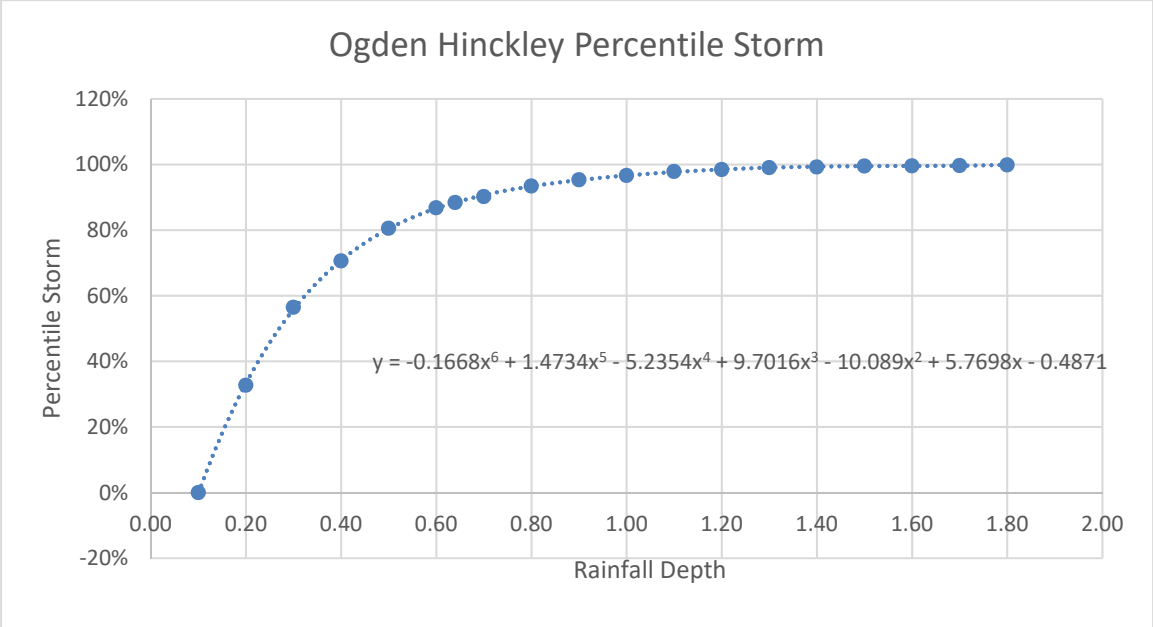
Fruit Heights

Number of Storms Greater than or equal to	Rainfall (in)	Percentile Storm
324	0.10	0%
248	0.20	23%
190	0.30	41%
134	0.40	59%
103	0.50	68%
78	0.60	76%
68	0.64	79%
52	0.70	84%
41	0.80	87%
32	0.86	90%
28	0.90	91%
20	1.00	94%
12	1.10	96%
9	1.30	97%
6	1.40	98%
4	1.60	99%
1	2.20	100%
0	2.80	100%



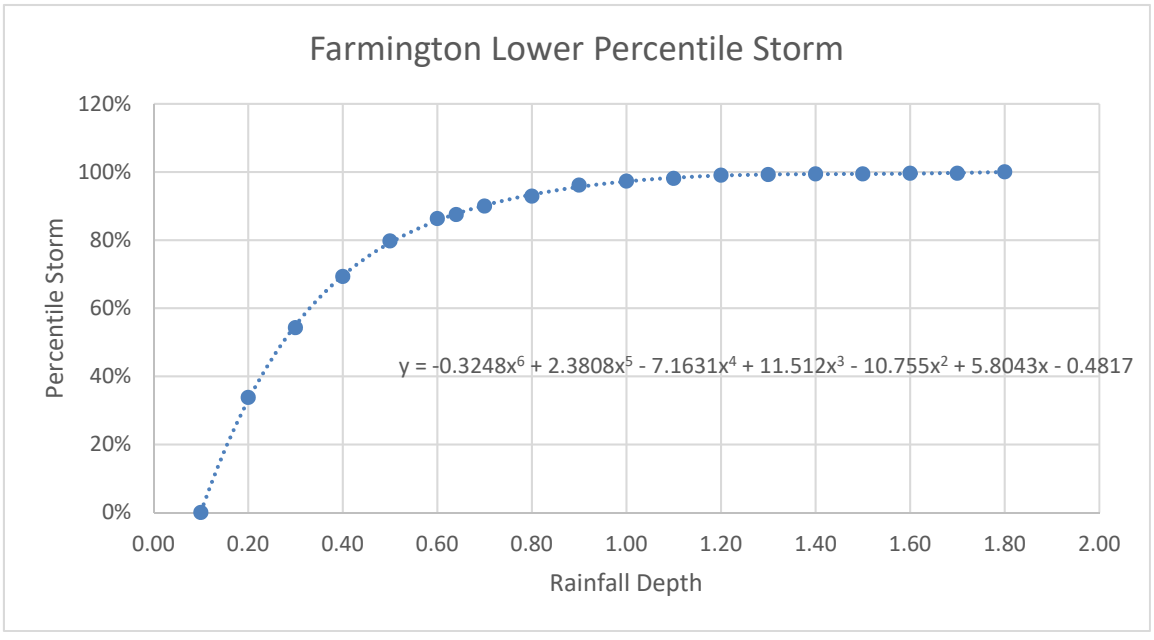
Ogden Hinckley Airport

Number of Storms Greater than or equal to	Rainfall (in)	Percentile Storm
1055	0.10	0%
710	0.20	33%
459	0.30	56%
310	0.40	71%
205	0.50	81%
139	0.60	87%
122	0.64	88%
103	0.70	90%
69	0.80	93%
49	0.90	95%
35	1.00	97%
22	1.10	98%
16	1.20	98%
10	1.30	99%
8	1.40	99%
5	1.50	100%
4	1.60	100%
3	1.70	100%
1	1.80	100%
0	3.40	100%



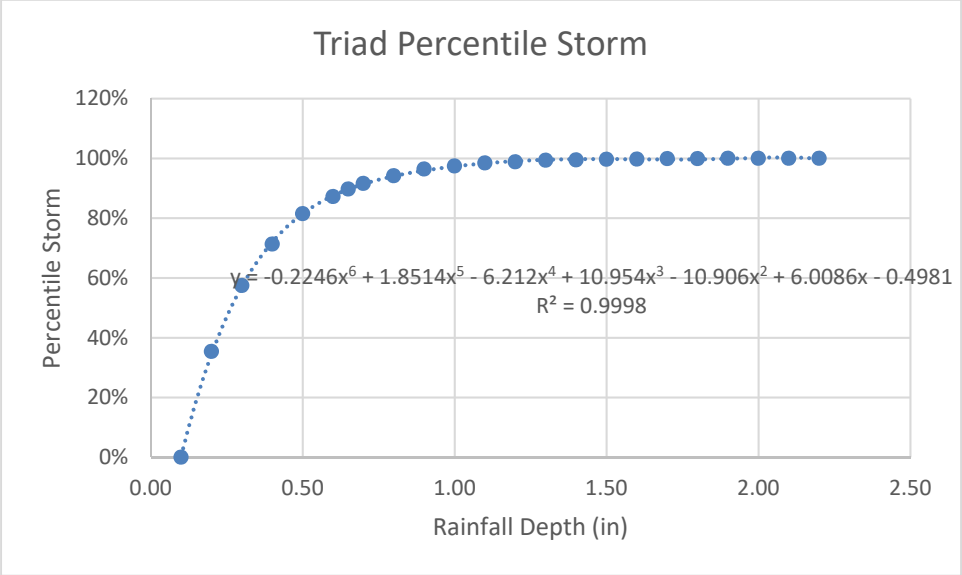
Farmington Lower

Number of Storms Greater than or equal to	Rainfall (in)	Percentile Storm
518	0.10	0%
343	0.20	34%
237	0.30	54%
159	0.40	69%
105	0.50	80%
71	0.60	86%
65	0.64	87%
52	0.70	90%
37	0.80	93%
20	0.90	96%
14	1.00	97%
10	1.10	98%
5	1.20	99%
4	1.30	99%
3	1.40	99%
3	1.50	99%
2	1.60	100%
2	1.70	100%
0	1.80	100%



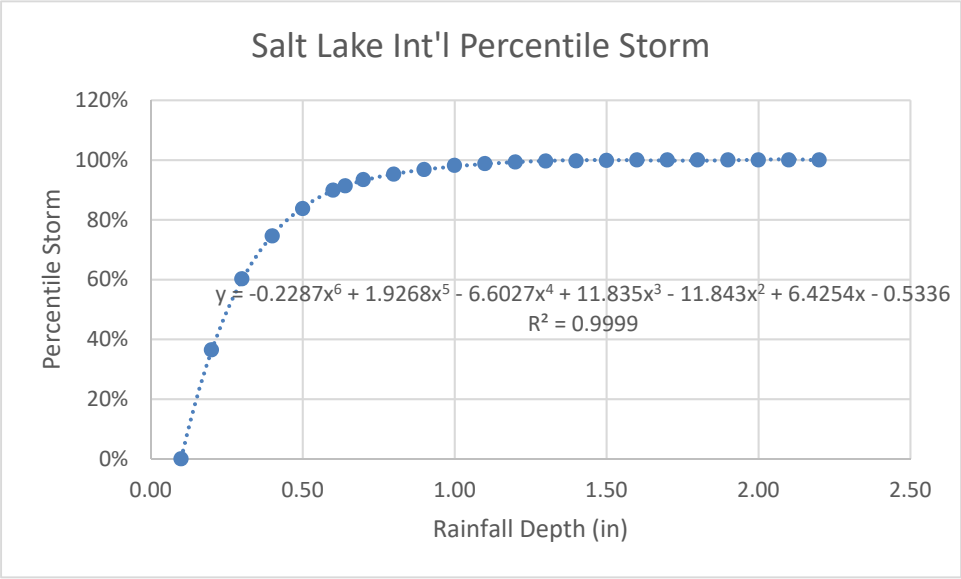
Triad Center

Number of Storms Greater than or equal to	Rainfall (in)	Percentile Storm
1286	0.10	0%
831	0.20	35%
547	0.30	58%
369	0.40	71%
238	0.48	80%
164	0.60	87%
132	0.65	90%
108	0.70	92%
75	0.80	94%
46	0.90	96%
33	1.00	97%
20	1.10	98%
15	1.20	99%
8	1.30	99%
7	1.40	99%
4	1.50	100%
3	1.60	100%
1	1.70	100%
1	1.80	100%
0	1.90	100%



Salt Lake International Airport

Number of Storms Greater than or equal to	Rainfall (in)	Percentile Storm
1305	0.10	0%
829	0.20	37%
519	0.30	60%
332	0.40	75%
284	0.44	80%
212	0.50	84%
132	0.60	90%
113	0.64	91%
86	0.70	93%
62	0.80	95%
42	0.90	97%
24	1.00	98%
16	1.10	99%
9	1.20	99%
5	1.30	100%
4	1.40	100%
2	1.50	100%
0	1.60	100%



APPENDIX C

MUNICIPAL ORDINANCES

Title 9 – Public Works

Chapter 3 ..... Storm Water

Chapter 3a..... Storm Drainage System

Chapter 3b..... Storm Water Management and Permit

Chapter 3c..... Prohibited Actions

Chapter 3d..... Violations and Enforcement

Title 18 – Building Regulations

Chapter 1..... General Provisions

Chapter 2.....Standard Codes

Chapter 3..... Residential Construction

Chapter 4.....Commercial, Industrial, and Institutional Development

Chapter 5.....Commercial Building Design

Title 19 – Subdivision

Chapter 1 ..... General Provisions

Chapter 2 .....Development Procedures

Chapter 3 ..... Preliminary Plat

Chapter 4 .....Final Plat

Chapter 5 .....Subdivision Standards

Chapter 6 ..... Subdivision Improvements Required

Chapter 7 ..... Fees

General Construction (Storm Water): UPDES Permits

Utah requires an UPDES construction storm water permit for soil disturbances of an acre or more, including less than an acre if it is part of a common plan of development or sale (that is over an acre). Soil disturbance is described as clearing, grading, or excavating. These permits are necessary to ensure that discharges from construction sites will not adversely impact any applicable water quality standard.

What type of permit do I need?

General Permit

This permit covers all types of construction disturbances of an acre or more. This permit also covers non-residential disturbances less than an acre that are part of a common plan of development.

Common Plan Permit

This permit covers disturbances of an acre or less on a single residential lot that were subdivided for separate sale after Oct. 1992.

Construction Dewatering / Hydrostatic Testing (CDHTs)

Covers in-stream, surface-area, and groundwater dewatering, in addition to hydrostatic testing.

Permit process

1. Complete a site specific Storm Water Pollution Prevention Plan (SWPPP)
2. Obtain Permit Coverage
    - Submit a Notice of Intent (NOI) requesting authorization for coverage under a Construction General Permit (CGP) or Common Plan Permit (CPP) through NeTCGP.
    - The fees for the CGP and CPP can be found on the 2025 Fee schedule. After completing the application and payment, the project site will be issued a permit identification number, UPDES ID.

- Permits are active for 1 year and must be renewed yearly until termination. An active permit is required until construction activities are completed and final stabilization is achieved.
- A renewal can be submitted up to 30-days prior to expiration through a 60-day grace period following the expiration date.
- After the 60-day grace period ends, the permit expires and cannot be renewed and the site is operating without a permit until a new NOI is submitted.

3. Terminate the General Permit
    - Once construction activities are completed and final stabilization is achieved, complete and submit a Notice of Termination (NOT) through NeTCGP to terminate coverage under the CGP or CPP.

Resources

All the information required to prepare a SWPPP and obtain permit coverage can be found on the Utah Department of Environmental Quality Storm Water Permitting Webpage (linked below). Including SWPPP templates, Inspection Forms, FAQ's, Permits, and more.

General Construction (Storm Water): UPDES Permits - https://deq.utah.gov/water-quality/general-construction-storm-water-updes-permits

Review Process

Kaysville City is required by the MS4 Permit to enforce erosion and sediment control practices at constructions sites within City jurisdiction. This includes a review of the SWPPP and permit coverage to ensure it meets the requirements set forth in the applicable storm water permit. A pre-construction SWPPP meeting should be conducted which includes a review of the site design, planned operations at the construction site, planned BMPs during the construction phase, and planned BMPs to be used to manage runoff created after development. All SWPPP related documents should be submitted to the public works department for review. Construction cannot begin until the review process is complete and the SWPPP is approved by Kaysville City. Kaysville City Ordinance and Construction Standards can be found at https://www.kaysville.gov/.

Kaysville City
Preferred BMP List
For Permitted Construction Sites

Adopted January 1, 2025

Revised December 19, 2024

Introduction

The operator is responsible for selecting effective site specific Best Management Practices (BMPs) for erosion and sediment control as well as pollution prevention operations according to the site's unique current conditions and the conditions that will occur throughout construction. A qualified person (as described in section 7.2 of the Construction General Permit, and section 4 of the Common Plan Permit) should evaluate the site to ensure the selected BMP is suitable and may need to consider a series of BMPs based on site conditions and construction operations. Conditions such as slope, proximity to water, soil type, infiltration rate, feasibility, etc should all be considered.

BMPs that do not meet their performance criteria can result in oversight authority notice of Storm Water Pollution Prevention Plan (SWPPP) violation(s) and potential enforcement.

Purpose

The purpose of the State Preferred BMP List is to meet the requirements of Utah Code 19-5-108.3. Each MS4 in the State of Utah will select which BMPs from this Preferred BMP List document are acceptable for use within that jurisdiction at permitted construction sites.

Applicability

This Preferred BMP List document shall be applicable to all sites that require regulation under the General Permit for Storm Water Discharges from Construction Activities (CGP) and the Common Plan Permit (CPP).

The USWAC Preferred BMPs are intended to be installed and maintained specifically as described. The operator or SWPPP agent is responsible for choosing BMPs that are applicable and will be effective at containing and managing the site's unique exposures and construction operations. The USWAC Preferred BMP List does not contain all BMPs for every situation or imply that all Preferred BMPs are agreeable to the operator.

When necessary, the operator or SWPPP agents may need to use BMPs not found in the USWAC BMP Preferred List. Where this is the case, a BMP Template is provided as the basis to describe the alternative BMP. In addition to BMPs not covered with the preferred list, the operator or SWPPP agents are invited to modify any of the USWAC BMPs to manage project exposures and operations. However, in both cases the alternative BMPs must be designed to satisfy or exceed the minimum performance criteria. The operator or SWPPP agents must submit modified or alternative BMPs to the oversight authority for review.

Stormwater pollution control requirements are intended to be proactive and implemented on a year-round basis. Appropriate pollution control includes both erosion control and sediment mitigation as well as track out controls, non-stormwater discharge and waste management, and material pollution BMPs. Some BMPs can be implemented as a stand-alone device while others can be combined to improve effectiveness and compliance.

Reporting

The CGP and CPP require operators to conduct inspections of storm water pollution prevention controls and keep record of these inspections. The GCP/CPP report requirements are to demonstrate that selected BMPs are effective at controlling sources of storm water pollution. The report must include actions taken to maintain, repair, or install new BMPs as needed to fulfill the pollution prevention plan created for the site. The DEQ has provided a SWPPP inspection form for operators to utilize to record this minimum information as well as record actions taken to correct issues. See SWPPP Inspection Form.

Utah State Code 19-05-108.3 requires that operators submit "electronic site inspections" which is defined as "geo-located and time-stamped photos taken, evaluated, and submitted electronically by the applicant to the municipal system." To guide the operator in fulfilling this additional requirement, an *Electronic Site Inspection Guide* document has been created and is accessible via the hyperlink and is found towards the bottom of the webpage.

It is important that the BMPs in the photos support the operator's SWPPP inspection report and represent the condition of each BMP. BMPs (either sourced from this preferred list or added by the operator or SWPPP agents) that do not meet the installation, maintenance and performance criteria specified must be corrected to achieve compliance with the site specific SWPPP and CGP/CPP. After the BMP is corrected, provide a description of how the BMP was corrected and the date the correction was made in the SWPPP Inspection report. Provide adequate geo-located and time-stamped photo(s) that support the correction action. If applicable, also address any deficiencies noted by the oversight authority within the established deadlines provided in the oversight inspection report. For guidance in which case corrective actions versus routine maintenance must be reported, refer to the CGP/CPP for specifications.

Acknowledgement

The creation of this USWAC Preferred BMP List would not have been possible without the support of the Utah Storm Water Advisory Committee and BMP Subcommittee. We take this opportunity to express gratitude to the MS4 Unification Committee who have been instrumental in the successful completion of this project.
And to many others who contributed their time and effort to the contents of this document, thank you!

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…

Template for Adding an Alternate BMP (Operator Version)

"Operators are invited to use an alternative BMP or modify a BMP from the USWAC Preferred List so long as the BMP has the same performance criteria or better as the preferred BMP. Any deviations from the preferred BMP installation and use parameters must be reviewed and accepted by the oversight authority."

[BMP # - Title]

Replace all blue text in brackets with BMP specific data. Then delete any remaining unnecessary blue instructional text.

[Insert the BMP detail drawing specific to the proprietary device you will use. It should illustrate the structure of the BMP, installation requirements, and any typical variances due to site conditions.]

[IMAGE]

APPLICATION

- [Describe specifically when and where this BMP will be used on site]

INSTALLATION/USE PROCEDURES

- [Describe how this BMP should be installed or how it should be practiced]
- [Describe further so that it is very clear, such as minimum length of structure, etc]

BMP MODIFICATION OR REPLACEMENT JUSTIFICATION

Use only one of the two following bullets

- This BMP is replacing or augmenting [list the preferred BMP that is being replaced] OR
- This BMP is being added and implemented as the conditions or operations cannot be adequately managed by a BMP from the USWAC Preferred List.

MAINTENANCE/MANAGEMENT

- [Add maintenance criteria for proper BMP performance]
- [Describe how the BMP should look or function during an inspection]
- [Describe when maintenance is necessary]
- [Describe when replacement is necessary]
- [Describe when no action is needed]

PERFORMANCE

- [Describe performance expectations of the alternative BMP. This includes how it protects water resources, manages hazards, and limits public complaints]

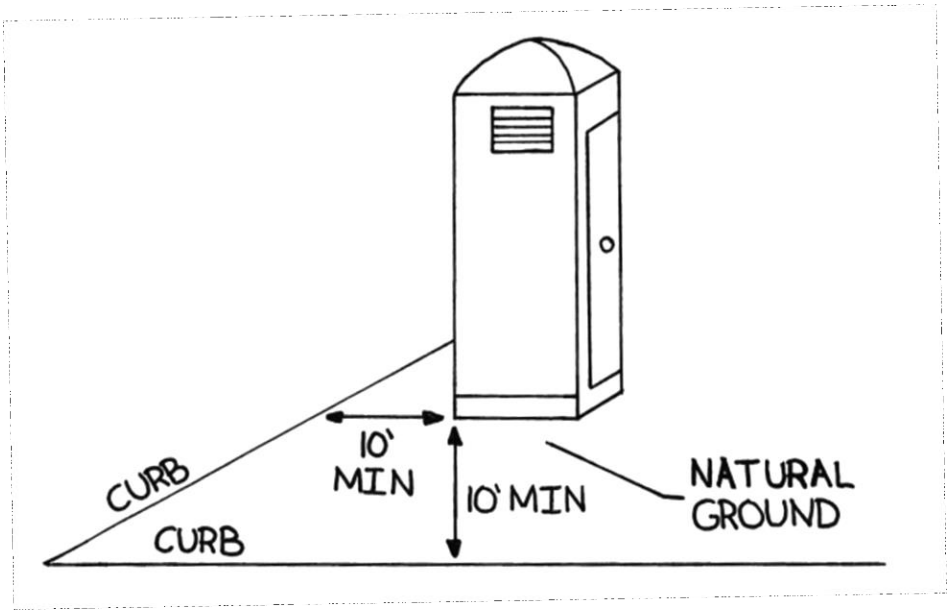
GENERAL

- [Include other information, direction, instruction, and BMP criteria that does not fit well into the other categories.]

REFERENCE

- [CGP and Federal Regulations sections, numbers, link to proprietary documentation, etc]

BMP 1- Portable Toilet on Pervious Surface



APPLICATION

- Provide temporary sanitary facilities when permanent facilities are too far from activities or are unavailable.

INSTALLATION/USE PROCEDURE

- Locate portable toilets away from waters of the state, and at least 10 feet from any storm water conveyance, inlet, curb and gutter, or conduit to a waterway.
- Wherever possible, locate portable toilet upon natural ground and not on impervious surfaces such as asphalt, concrete, or similar
- Prepare a level surface and provide clear access to the toilet(s) for servicing and for on-site personnel
- Wherever possible, locate a portable toilet next to track out pad or provide gravel access pad for maintenance pick up to reduce occurrence of mud track out by service provider.
- Secure portable toilets to prevent tipping e.g. stakes, tie downs, etc.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.
- Also see BMP 2- Portable Toilet on Pavement

MAINTENANCE/MANAGEMENT

- Portable toilets should be maintained in good working order by licensed service
- Portable toilets should be inspected daily to detect any leaks
- Damaged toilets must be repaired/replaced immediately
- All waste must be deposited in the sanitary sewer system for treatment with appropriate agency approval
- Implement spill BMP immediately upon spill incident
- If track out from the service provider occurs, debris must be removed as soon as practicable.

PERFORMANCE

- A portable toilet is expected to contain human waste with zero exposure to storm water.
- A successful portable toilet is clean, effective, and is processed by the appropriate licensed facility.

REFERENCE

- Construction General Storm Water Permit (CGP) 2.3.3(f)
- Common Plat Permit (CPP) 2.4.4

BMP 2- Pavement Mounted Portable Toilet

Picture for concept purpose only

APPLICATION

- Use portable toilets on pavement only for projects without pervious staging areas. Usually projects within existing right-of-ways.
- Do not install portable toilets on pavement when private property is expected to be used. Generally, portable toilets installed on pavement are not acceptable for commercial and residential projects.

INSTALLATION/USE PROCEDURE

- When near inlets, always locate portable toilets downstream of inlets. Identify on SWPPP BMP map.
- Place portable toilet on a surface no steeper than 2% grade.
- Attach portable toilet contractor illustrations, service and any maintenance information. For ground mount toilets provide each corner with 50# weights or as specified by the service contractor. For trailer mounted systems, provide a plan for securing the trailer as specified by the service contractor.
- Provide secondary containment. Submit for oversight authority review. A gutter dam BMP is a good choice.
- Obtain private or public right of way encroachment permit (or local equivalent) when required by the local authority.
- Attach a copy of the portable toilet manufacturer's maintenance literature.
- Ensure the spill prevention program includes containment materials and protocols for potential portable toilet spills.

- Ensure maintenance personnel and site workers involved in site operations understand BMP requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect BMP location corresponds with SWPPP BMP map. Locations are often dynamic for projects within right-of-ways.
- Inspect maintenance per manufacturer requirements
- Inspect for leaks and tank levels
- Inspect anti-tipping system

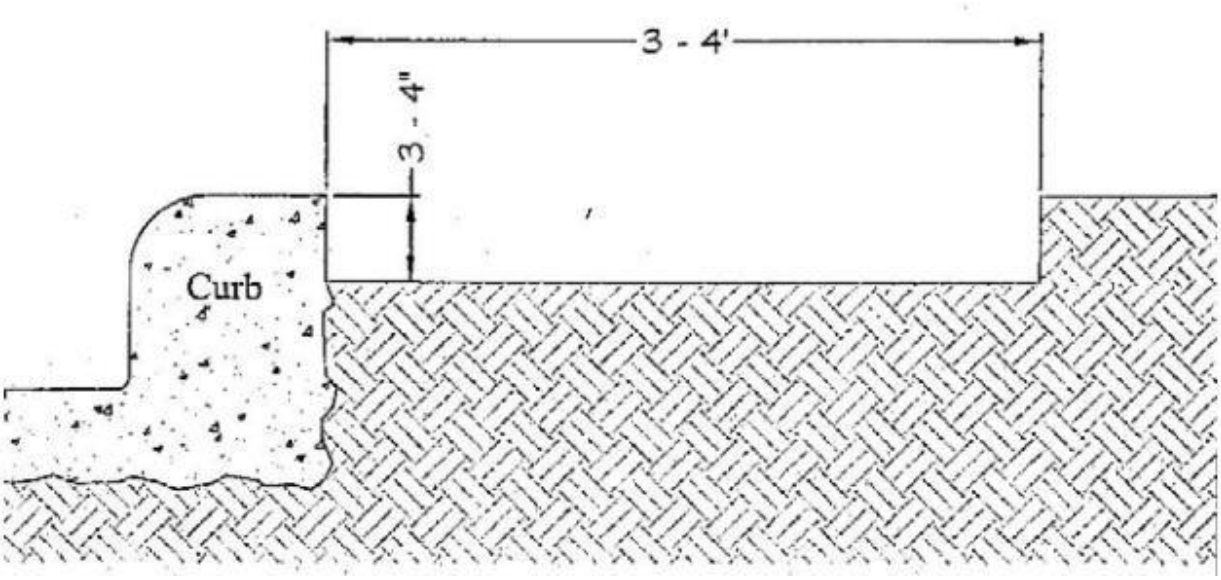
PERFORMANCE

- A portable toilet is expected to contain human waste with zero exposure to storm water.
- A successful portable toilet is clean, effective, and is processed by the appropriate licensed facility.

REFERENCE:

- CGP 2.3.3(f), 2.4.4
- CPP 2.4.4

BMP 3- Curb Sedimentation Trap



APPLICATION

- Use at project boundaries in which final grading is sloped towards pavement or roadways to retain sediment.
- Only applicable when the site is sloped towards the curb such that runoff overtops the curb
- Particularly useful for residential sites when major earth disturbing activities have ceased and final site stabilization (landscape installation) is pending.

INSTALLATION/USE PROCEDURE

- Excavate soil behind curb to a depth of 3-4 inches
- Extend the excavation 3-4 feet behind the curb to form a sediment trap
- Should not be installed on a slope that exceeds 5% as it may be ineffective and compromise the integrity of the curb
- Not suitable if underlying soil is expansive or collapsible, refer to the soils report.
- The sedimentation trap may be implemented behind a sidewalk instead of the curb
- The depth and width of the excavation may be increased if more sediment storage is necessary

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect at least once every seven calendar days, or once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.5 inches or greater.
- Remove accumulated sediment when it reaches ½ height of original excavation.

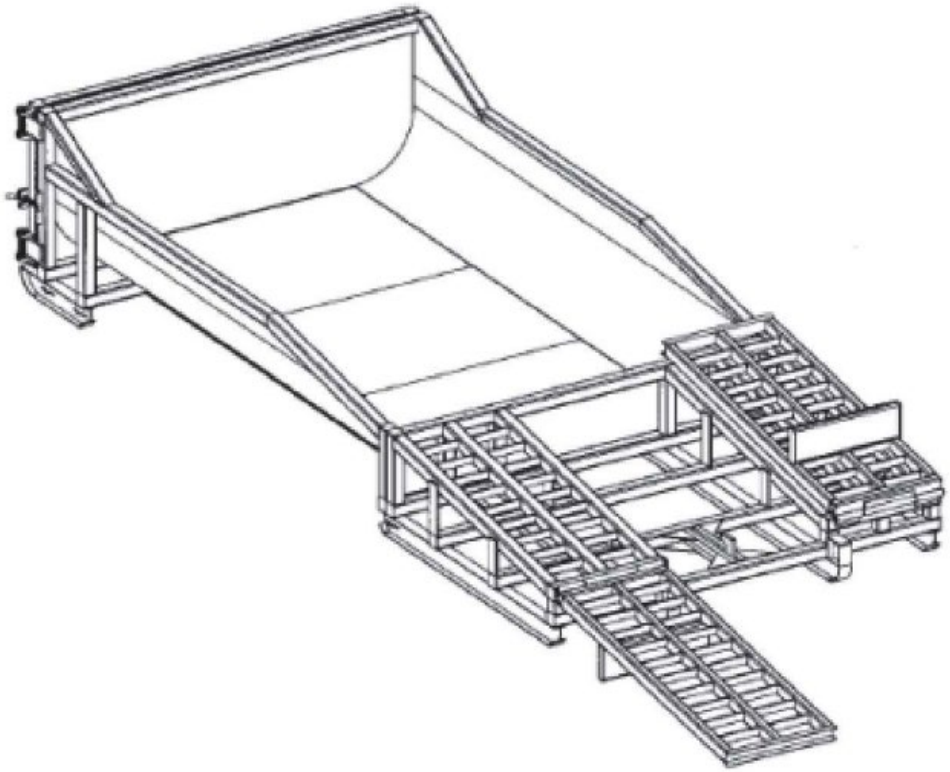
PERFORMANCE

- Sediment, or sediment laden water overtopping the curb, leaving the site, and entering the roadway constitutes BMP failure and must be corrected immediately.

REFERENCE

- CGP 2.2.3
- CPP 2.1.2

BMP 4- Concrete Washout Pan



NOT TO SCALE *

*Picture for concept only, attach detail for chosen site specific wash out pan

APPLICATION

Concrete waste management is necessary on construction sites when:

- Concrete, grout, or mortar is used as a construction material.
- Concrete truck drums, chutes, and hoses, or other concrete equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) are washed on-site and it is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Grout or mortar mixing stations are used.

INSTALLATION/USE PROCEDURES

- Locate pans next to track-out or parking pad or provide its own anti-track-out system and area for driver chassis washing. Attach illustration with dimensions. Reference other track-out BMPs as needed to manage site conditions.
- Install a sign at each washout location and identify on the SWPPP BMP map.
- Locate washout facilities a minimum of 50 feet from sensitive areas such as storm drains, open ditches, water bodies, wetlands, or where an infiltration feature will be installed. Protect downstream inlets.

- When the minimum distance from sensitive areas is not practicable, provide secondary containment and attach containment system specifications to this BMP.
- Empty excess concrete onto the ground near the pour site until only liquid cement remains on tools and equipment.
- Wash cement off of the chute, pump equipment, and tools directly into the washout pan.
- Ensure concrete truck operators and concrete transport/disposal service providers have the necessary support to protect water quality.
- The operator is expected to modify the concrete waste management system, location and capacity when necessary as site conditions and operations warrant.
- The operator shall oversee and enforce concrete waste management procedures.
- Educate employees, concrete suppliers, and subcontractors of these concrete waste management requirements. Discuss the concrete management techniques with concrete suppliers before any deliveries are made.
- Incorporate requirements for concrete waste management into concrete supplier and subcontractor agreements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Washouts must be maintained to provide adequate holding capacity with one foot of freeboard.
- Washout pan must be cleaned, or additional pans provided and ready for use once the concrete washout pan is 70% full.
- Maintenance includes removal and disposal of hardened concrete and excess liquid or slurry. Excess liquid and slurry shall be pumped or evaporated prior to removal of solids.
    - Attach method of liquid disposal including licensed dumping location.
- Dispose of all materials in conformance with applicable federal, state, and local regulations.
    - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.
- Inspect washout pans at least weekly, and before and after each concrete operation. During extended wet weather conditions, ensure track out is not occurring.
    - Check overall condition and performance.
    - Check remaining capacity (% full)
    - If using prefabricated pan containers, check for leaks.
- Damaged or leaking washout facilities shall be addressed immediately.

PERFORMANCE

- Pans must be water-tight with sufficient volume plus 1 foot freeboard to meet concrete washout needs in between maintenance/service intervals. Attach concrete waste volume calculations and identify the number washout pans required.
- The performance expected of a wash out pan is to contain all pollutants associated with washout of concrete, slurry, mortar, and other products with no discharge at anytime during operations.

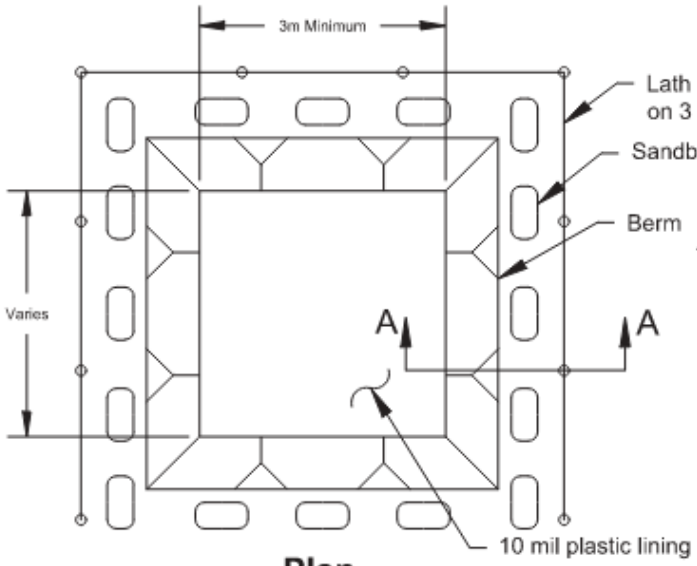
It is considered a concrete waste management failure when any of the following occur:

- There are leaks, overflows, or spills of concrete waste. The discharge of concrete washout waters is classified as a “Prohibited Discharge”
- Track-out associated with the concrete washout BMP operation.

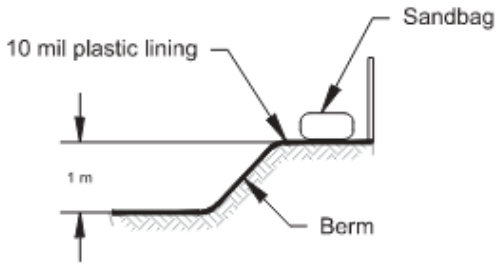
REFERENCE

- CGP 2.3.4
- CPP 2.9.1

BMP 5- Concrete Washout Ground Fixed Systems



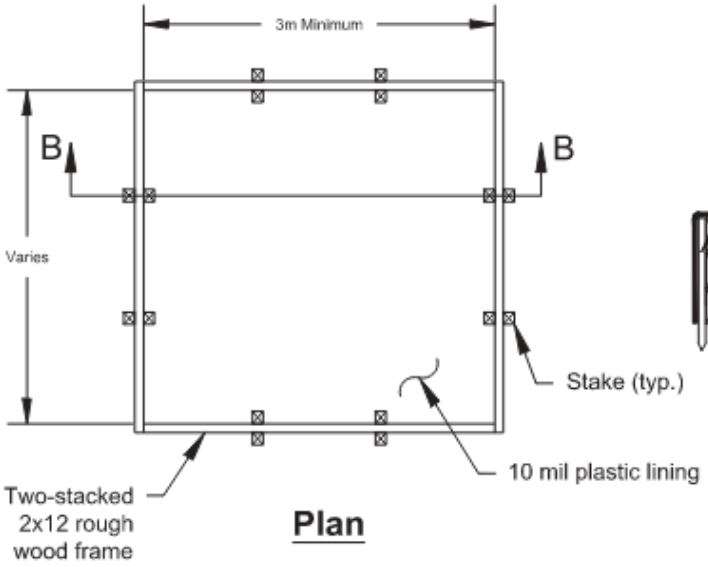
Plan



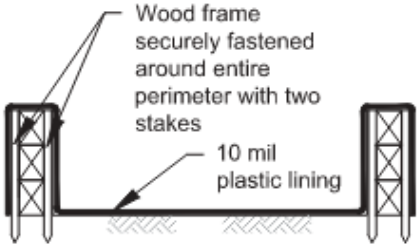
Section A-A

Type "Below Grade"

Notes:
1. Actual layout determined in the field.
2. A concrete washout sign shall be installed within 10 m of the temporary concrete washout facility.



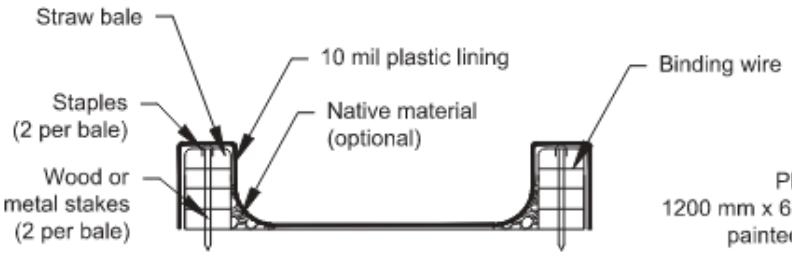
Plan



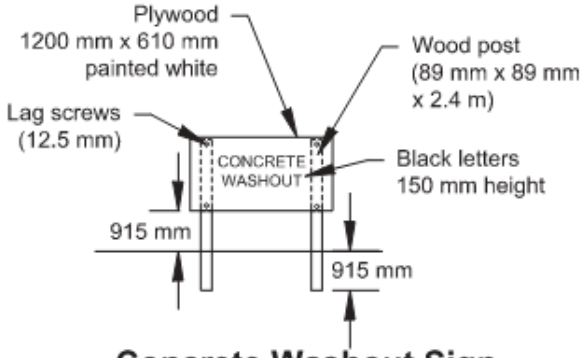
Section B-B

Type "Above Grade" with Wood Planks

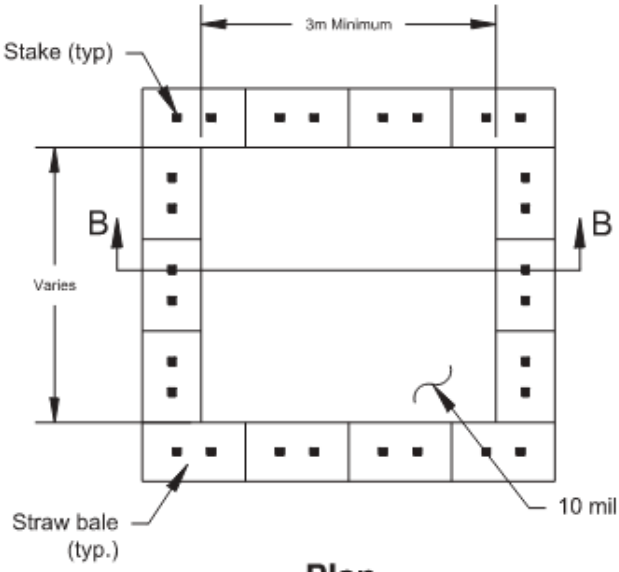
NOT TO SCALE



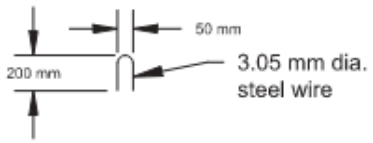
Section B-B



Concrete Washout Sign Detail (or equivalent)



Plan



Staple Detail

Notes:

1. Actual layout determined in the field.
2. The concrete washout sign shall be installed within 10 m of the temporary concrete washout facility.

Type "Above Grade" with Straw Bales

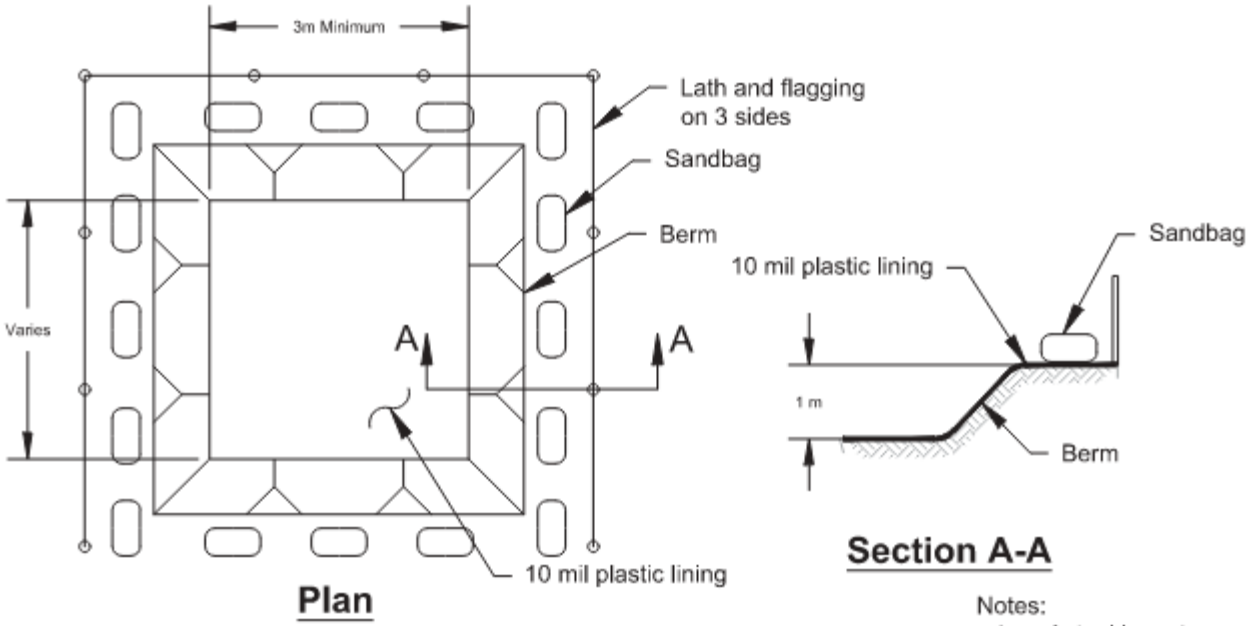
NOT TO SCALE

APPLICATION

Concrete waste management is necessary on construction sites when:

- Concrete, grout, or mortar is used as a construction material.
- Concrete truck drums, chutes, and hoses, or other concrete equipment are washed on-site and it is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Grout or mortar mixing stations are used.

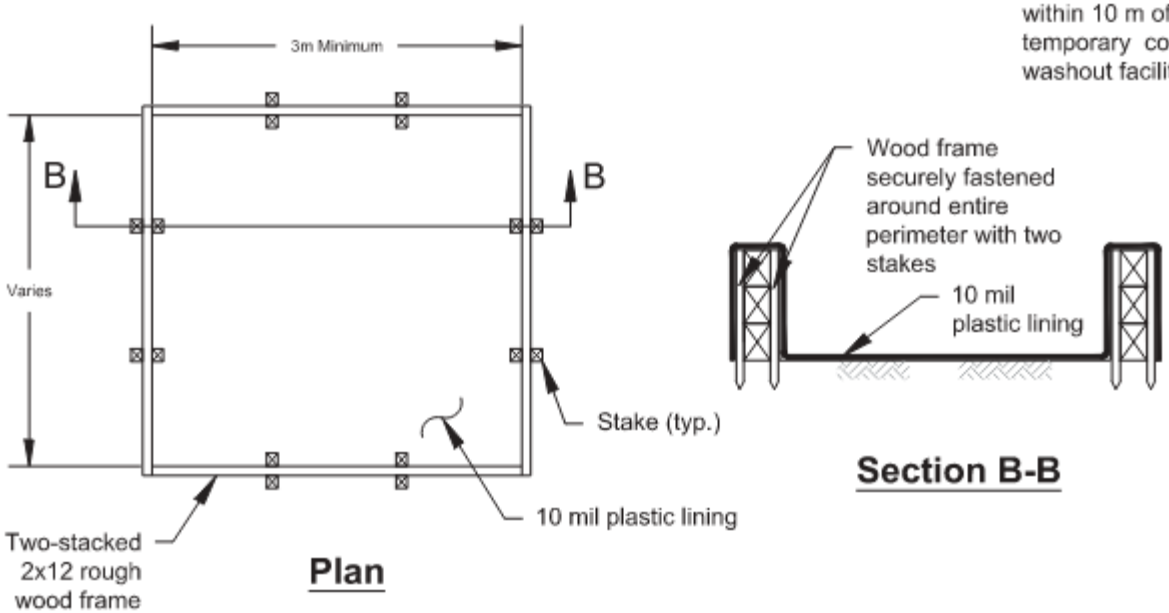
INSTALLATION/USE PROCEDURES



Notes:

1. Actual layout determined in the field.
2. A concrete washout sign shall be installed within 10 m of the temporary concrete washout facility.

Type "Below Grade"



Type "Above Grade" with Wood Planks

NOT TO SCALE

- The washout facility shall be watertight and impermeable.
- The washout facility may be a self-installed structure or a pre-fabricated structure
- For self-installed washout structures, the lining material shall be a minimum of 10-mil polyethylene sheeting and must be free of holes, tears, or other defects that compromise the impermeability of the material. Liner materials shall be installed in accordance with manufacturer's recommendations.
    - No seams in the plastic are allowed at the bottom of the washout. The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.
- Washout facilities shall be constructed and maintained with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
- On large sites with extensive concrete work, multiple washouts may be needed to provide adequate capacity.
- Locate pans next to track-out or parking pad or provide its own anti-track-out system and area for driver chassis washing. Attach illustration with dimensions. Reference other track-out BMPs as needed to manage site conditions.
- A sign shall be installed at each washout location.
- Install the washout at the location specified in the SWPPP.
- Locate washout facilities a minimum of 50 feet from sensitive areas such as storm drains, open ditches, water bodies, wetlands, or where an infiltration feature will be installed. Protect downstream inlets.
- When the minimum distance from sensitive areas is not practicable, provide secondary containment and attach containment system specifications to this BMP.
- Keep the washout areas away from other construction traffic and access areas to reduce the likelihood of accidental damage, spills, or tracking.
- Inspect and verify that concrete washout areas are in place prior to the commencement of concrete work.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- When materials are removed from ground fixed concrete washout systems, build a new structure; or, if the previous structure is still intact, inspect for signs of weakening or damage, and make any necessary repairs. Re-line the structure with new 10-mil polyethylene sheeting after each cleaning.
- Washouts must be maintained to provide adequate holding capacity with one foot of freeboard.
- Once the concrete washout system is 70% full, it is time to remove the existing waste material to allow further use or provide an additional washout facility.
- Maintenance includes removal and disposal of hardened concrete and excess liquid or slurry. Excess liquid and slurry shall be pumped or evaporated prior to removal of solids.

    - Attach method of liquid disposal including licensed dumping location.
- Dispose of all materials in conformance with applicable federal, state, and local regulations.
    - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.
- Inspect ground fixed concrete washout systems at least weekly, and before and after each concrete operation. During extended wet weather conditions, ensure track out is not occurring.
    - Check overall condition and performance.
    - Check remaining capacity (% full)
    - Check for leaks
- Damaged or leaking washout facilities shall be addressed immediately.
- When concrete washout areas are no longer required for the work, the hardened concrete and containment system shall be removed and disposed of at a licensed waste facility. Attach information of disposal facility. Where concrete is recycled attach recycling facility information.
- Holes, depressions, or other ground disturbances caused by the removal of concrete washout areas shall be backfilled, repaired, and stabilized to prevent erosion.

PERFORMANCE

- The performance expected of a wash out pan is to contain all pollutants associated with washout of concrete, slurry, mortar, and other products with no discharge at any time during operations.

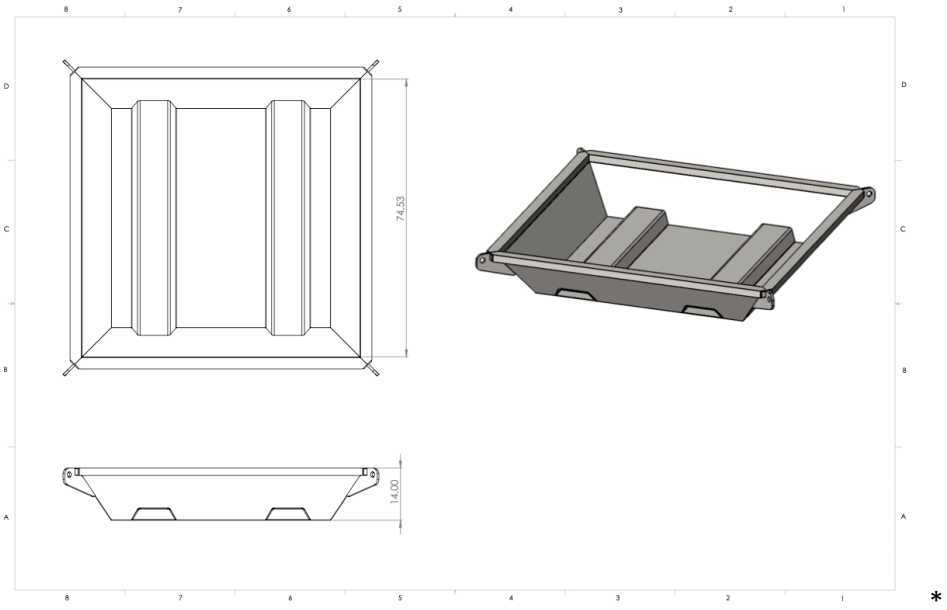
It is considered a concrete waste management failure when any of the following occur:

- There are rips, tears, or defects in the containment system
- Seepage overflows are observed or waste is outside of the containment system
- Track-out associated with the concrete washout BMP operation.

REFERENCE

- CGP 2.3.4,
- CPP 2.4.5, 2.9.1

BMP 6- Small Concrete Management Operations



*Picture for concept purpose only

APPLICATION

- Use for small pours only. Usually for single lot residential homes or other minor projects where the washout volume is small and using a standard proprietary concrete washout pan system is not feasible.

INSTALLATION/USE PROCEDURES

- Small metal pan, plastic pools or equal portable watertight disposable container that can contain caustic materials. Attach dimensions of containers.
- Calculate concrete waste volume required. Attach calculations and identify the number of containment systems needed. Simply repeat this BMP for each day's concrete operation. Provide one additional container for redundancy.
- Maximize the capacity of the small containment system:
    - Empty excess concrete onto the ground near the pour site.
    - Wash cement off of the chute, pump equipment, and tools directly into the washout container.
- Place containers on a flat surface, near the track-out where there is enough room to wash the chassis and remove mud from the tires. Locate on the site BMP map.
- Containers are not allowed in roadway right of ways.
- Do not haul containers away until the waste concrete is set and all water has evaporated.
- Ensure the workforce is informed how to use your concrete management BMP.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.

- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Cover the containment system when not in use if a rain event is anticipated.
- Individual containers should no longer be used for washout once the volume capacity has reached 70% full. Utilize an additional container.
- This is a one time disposable BMP, typical maintenance is not necessary. Any exposed concrete washing and disposal operations are considered a BMP failure because the operation was not adequately anticipated and implemented.
- When the daily concrete management operation is completed simply repeat this BMP.

PERFORMANCE

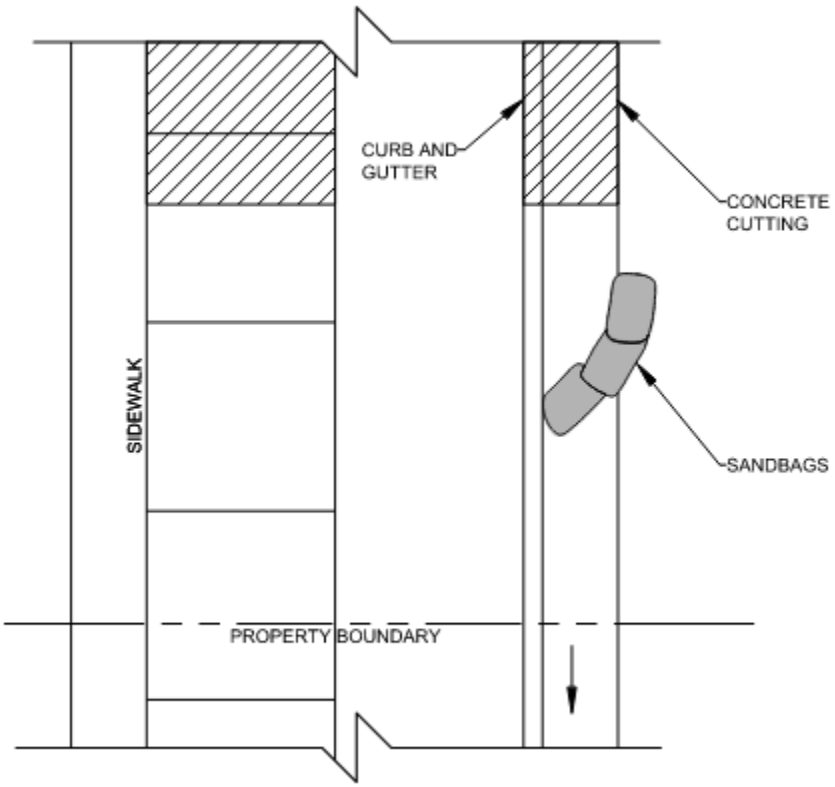
It is considered a concrete waste management failure when any of the following occur:

- Washout container overflows.
- Containers are hauled away prior to concrete set up and when liquid was not completely evaporated.
- When track-out results from washout container inadequate placement.
- When supply truck chassis are being washed outside of the containment system.

REFERENCE:

- CGP 2.3.4
- CPP 2.4.5, 2.9.

BMP 7- Pavement Saw Cutting-Wet



APPLICATION

- Use Pavement Saw Cutting-Wet BMP when cutting pavement with wet saw, especially in curb and gutter applications.
- Appropriate for use when dry cutting is not allowed or dust control is desired.

INSTALLATION/USE PROCEDURES

- Install 6" min diameter sand or gravel bags in a manner to contain slurry from moving downslope from the cutting operation. Double up bags as necessary.
- Install enough bags anticipating the volume of cut slurry.
- Schedule cutting during dry weather periods.
- Remove slurry at the end of day or prior to rain events whichever comes first. When wet conditions exist, mix slurry with dirt or other absorbing material and remove immediately.
    - Dump waste in concrete washout containment system.
    - Dry the waste in a contained area and dispose of waste in regular waste management container.
- Sweep until no more waste can be picked up with a square nose shovel.
- Do not use water to rinse slurry from the cutting operation area, dry clean up methods only as described above.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- BMP is installed and removed with each cutting operation, no maintenance is necessary.

PERFORMANCE

- Utilizing water during saw cutting is a great way to capture dust from cutting operations so that dust does not travel out of the cutting operation area nor pollute the air.
- Additionally utilization of this BMP will prevent high density opacity for nearby drivers and operators.
- Performance criteria to judge application success would be that airborne dust does not occur and slurry is contained and disposed per BMP.

It is considered a BMP failure when any of the following occur:

- The dam created with sand or gravel bags overflows
- Cutting operations are not cleaned up by the end of day or prior to wet conditions.
- Any waste material is not disposed per BMP or otherwise can contaminate water resources

REFERENCE:

- CGP 2.3.4
- CPP 2.9.1

BMP 8- Pavement Saw Cutting-Dry

APPLICATION

- Use for pavement cutting on directly connected pavements or where cutting dust can be washed to drainage systems, especially in curb and gutter applications.

INSTALLATION/USE PROCEDURES

- Schedule cutting during dry weather periods.
- Remove cutting dust immediately following the cutting operation.
- Sweep until no more waste can be picked up with a square nose shovel.
- Dispose of cutting dust in a concrete waste container or regular waste management container.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- BMP is installed and removed with each cutting operation, no maintenance is necessary.

PERFORMANCE

- BMP application success would be that dust is contained to the cutting operation area and disposed per BMP.

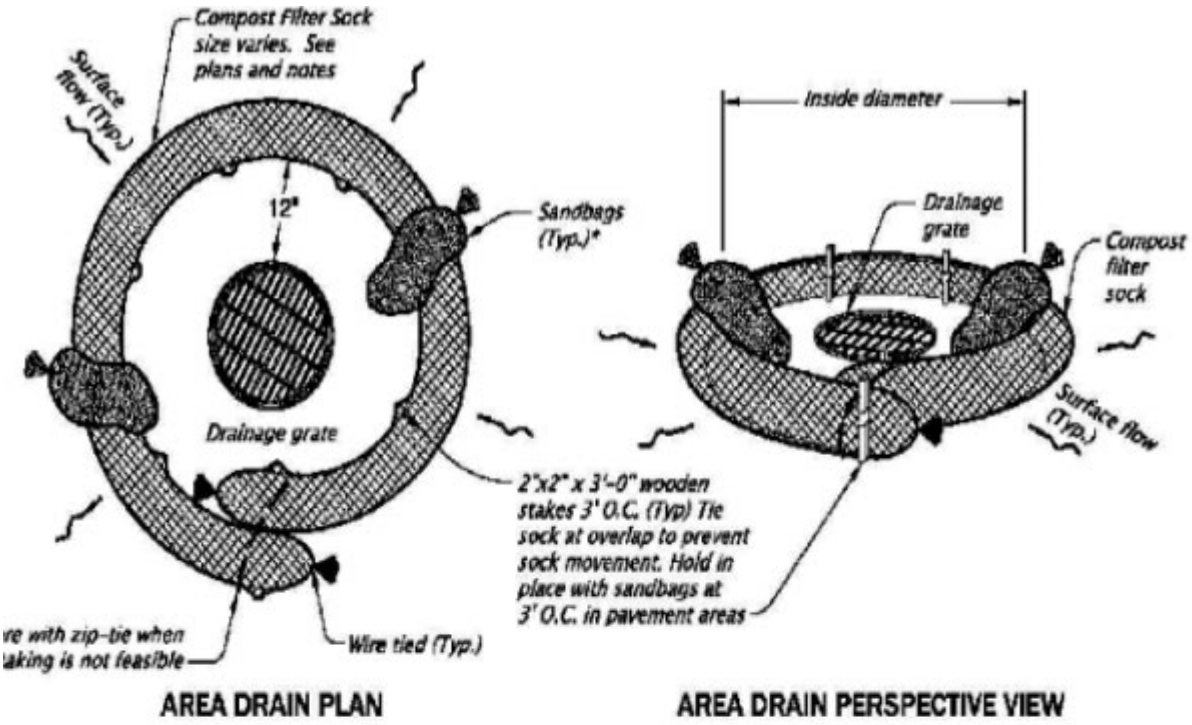
It is considered a BMP failure when any of the following occur:

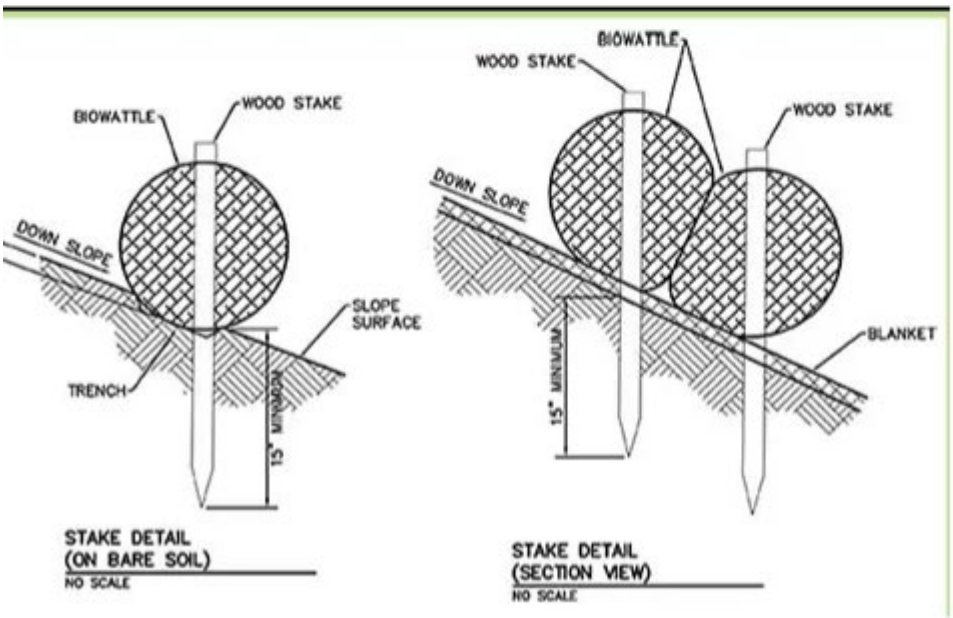
- Cutting dust enters drainage systems
- Cutting operations are not cleaned up immediately following the cutting operation
- Any waste material is not disposed per BMP or otherwise can contaminate water resources

REFERENCE:

- CGP 2.3.4
- CPP 2.9.1

BMP 9- Area Drain Filtration





APPLICATION

- Straw wattles or filter tubs are an open weave, mesh tube that is filled with a filter material (compost, wood chips, straw, coir, aspen fiber, or a mixture of materials) used to divert or filter stormwater.

- Straw wattles are a temporary BMP that can be used in the rough grading process of construction. Straw wattles and large filter sock can be used with or without storm drain inlet tops, but not ready for grading of roadway.
- Can be used for area drains until final stabilization is complete.

INSTALLATION/USE PROCEDURES

- On natural ground tubes shall be staked with 2 inch by 2 inch wooden stakes at a maximum spacing of 4 feet. Rebar or similar metal stakes may be used instead of wooden stakes. Filter tubes shall be embedded a minimum of two inches when placed on soil.
- Sand or rock bags shall be placed at a minimum, one foot from each end of the tube and at the middle of the tube.
- The end of tubes shall overlap a minimum of 18 inches when multiple tubes are connected to form a linear control along a contour or a perimeter.
- Straw wattles should wrap around the entirety of the storm drain to prevent sediment and other pollutants from entering the storm drain.
- Follow manufacturer's recommendations for staking or other methods of approved securement when used on pavement.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Check straw wattles material to make sure it has not become clogged with sediment or debris. Clogged filter tubes usually lead to standing water behind the filter tube after a rain event. Sediment shall be removed from behind the filter tube before it reaches half the height of the exposed portion of the tube.
- The straw wattles should be checked to ensure it is in continuous contact with the soil at the bottom of the embedment trench. Closely check for rill erosion that may develop under the filter tubes. Eroded spots must be repaired and monitored to prevent reoccurrence. If erosion under the tube continues, additional controls are needed.
- Any straw wattles destroyed by construction operations or UV degradation will need to be removed and replaced.

PERFORMANCE

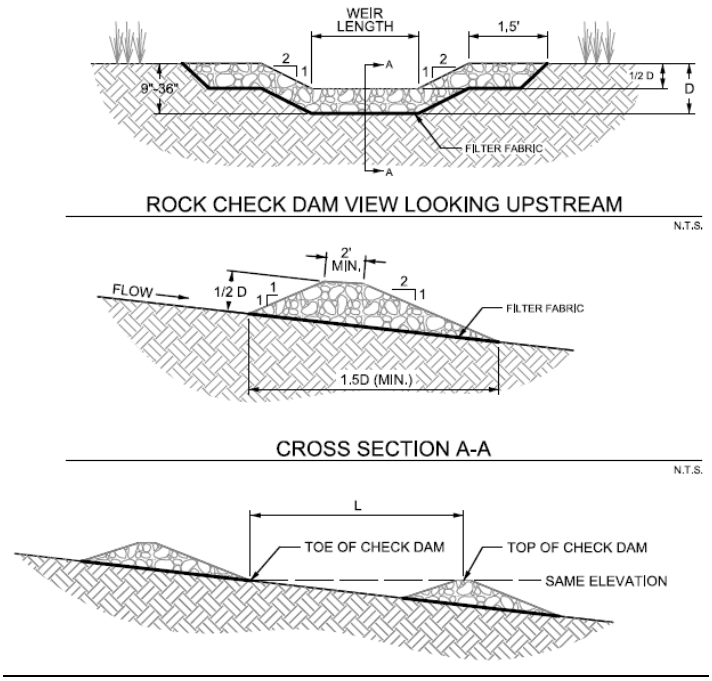
It is considered a BMP failure when any of the following occur:

- Damaged or not installed to the BMPs details or attached manufacturer illustrations
- Sediment depth around wattle exceeds maintenance tolerances.
- Opening or gaps in straw wattles.

REFERENCE

- CGP 2.2.10

BMP 10- Rock Check Dam for Channels



APPLICATION

- Check dams are used in swales and drainage ditches (including those along linear projects such as roadways).
- They can also be used in short swales down a steep slope to reduce velocities.
- Check dams shall not be used in live stream channels.
- Check dams should be installed before the contributing drainage area is disturbed, so as to mitigate the effects on the swale from the increase in runoff.
- If the swale itself is graded as part of the construction activities, check dams are installed immediately upon completion of grading to control velocities in the swale until stabilization is completed.

INSTALLATION/USE PROCEDURES

- Install rock check dam per illustrated detail. D=24” or less and install the center of the dam about 6” lower than the sides.
- Check dams should be used in conjunction with other sediment reduction techniques prior to releasing flow offsite.
- Use 4” or greater rock diameter and non-woven geotextile fabric under check dams of 12 inches in height or greater. When high flow rates and velocities are anticipated engineering is required.
- Dam height should be between 9 and 36 inches and less than one-third the depth of the channel
- Dams should be spaced such that the top of the downstream dam is at the same elevation as the toe of the upstream dam. On channel grades flatter than 0.4 percent, check dams should be placed at a distance that allows pools to form between each check dam.
- The top of the side of the check dam shall be a minimum of 12 inches higher than the middle of the dam. In addition, the side of the dams shall be embedded a minimum of 18 inches into the

side of the drainage ditch, swale or channel to minimize the potential for flows to erode around the side of the dam.

- Use geotextile fabric (of appropriate tensile strength, puncture rating and apparent opening size) under check dams of 12 inches in height or greater.
- Loose soil, wood chips, compost, and other floatable materials that are transportable during runoff should not be used to construct a check dam.

ALTERNATIVE DESIGN

- **Rock Check Dams:**
  - Stone shall be well graded with stone size ranging from 3 to 6 inches in diameter for a check dam height of 24 inches or less. The stone size range for check dams greater than 24 inches is 4 to 8 inches in diameter.
- **Rock Bag Check Dams:**
  - Rock bag check dams should have a minimum top width of 16 inches.
  - Minimum rock bag dam height of 12 inches would consist of one row of bags stacked on top of two rows of bag. The dam shall always be one more row wide than it is high, stacked pyramid fashion.
  - Bags should be filled with pea gravel, filter stone, or aggregate that is clean and free of deleterious material.
  - Sand bags shall not be used for check dams, due to their propensity to break and release sand that is transported by the concentrated flow in the drainage swale or ditch.
  - Bag material shall be polypropylene, polyethylene, polyamide or cotton burlap woven fabric, minimum unit weight 4-ounces-per-square-yard, Mullen burst strength exceeding 300-psi as determined by ASTM D3786, Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method, and ultraviolet stability exceeding 70 percent.
  - PVC pipes may be installed through the dam to allow for controlled flow through the dam. Pipe should be schedule 40 or heavier polyvinyl chloride (PVC) having a nominal internal diameter of 2 inches.
- **Sack Gabion Check Dams:**
  - Sack gabion check dams may be used in channels with a contributing drainage area of 5 acres or less.
  - Sack gabions shall be wrapped in galvanized steel, woven wire mesh. The wire shall be 20 gauge with 1 inch diameter, hexagonal openings.
  - Wire mesh shall be one piece, wrapped around the rock, and secured to itself on the downstream side using wire ties or hog rings.
  - Sack gabions shall be staked with ¾ inch rebar at a maximum spacing of three feet. Each wire sack shall have a minimum of two stakes.
  - Stone shall be well graded with a minimum size range from 3 to 6 inches in diameter.
- **Organic Filter Tube Check Dams:**
  - Organic filter tubes may be used as check dams in channels with a contributing drainage area of 5 acres or less.
  - Organic filter tubes shall be a minimum of 12 inches in diameter.
  - Filter material used within tubes to construct check dams shall be limited to coir, straw, aspen fiber and other organic material with high cellulose content. The material should be slow to decay or leach nutrients in standing water.

- Staking of filter tubes shall be at a maximum of 4 foot spacing and shall alternate through the tube and on the downstream face of the tube.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect the check dam system each report period and after storm events.
- Remove silt when sediment accumulation reaches approximately 1/3 the height of the dam.
- Inspect for erosion beneath and around the check dam (particularly where the edge of the dam meets the side of the channel) and restore as needed each report period.
- If erosion continues to be a problem, modifications to the check dam or additional controls must be engineered.

PERFORMANCE

- Check dam systems are intended to perform as engineered up to .25" of rain fall
- Rock check dams are performing as intended if the drainage channel they are protecting does not develop deep erosive gulleys between dams and the dam itself is not being undercut by erosion or eroded to either side of the dam.
- Due to the minimal sediment capture capability of check dams, good performance will include accumulations of sediment on the upstream side of dams between maintenance intervals.

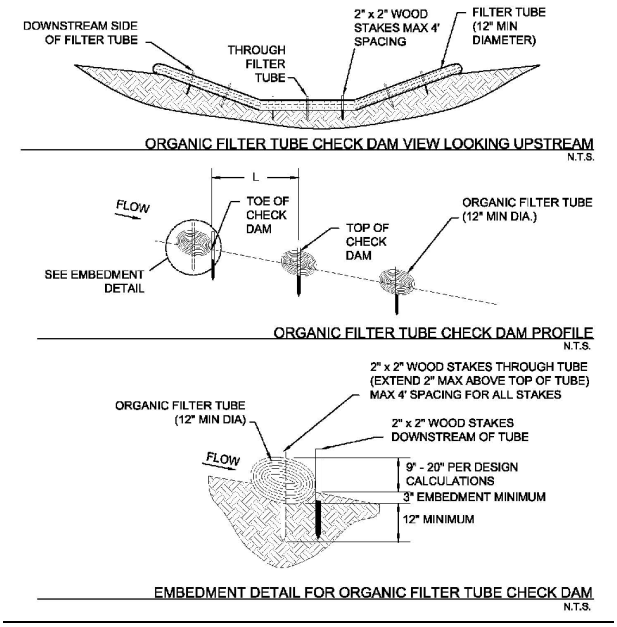
It is considered a BMP failure when any of the following occur:

- System not installed per illustrated detail, system not maintained, or system damaged by construction operations.
- Erosion damage resulting in variance from detail dimensions

REFERENCE

- U-CGP 2.2.11 – "Minimize erosion of constructed or natural site drainage feature channels and their embankments, outlets, adjacent streambanks, slopes, and downstream waters. Use erosion controls and velocity dissipation devices within and along the length of any constructed or natural site drainage feature channel and at any outlet to slow down runoff and minimize erosion."

BMP 11- Straw Wattle Check Dam for Channels



APPLICATION

- Check dams are used in swales and drainage ditches (including those along linear projects such as roadways).
- They can also be used in short swales down a steep slope to reduce velocities.
- Check dams shall not be used in live stream channels.
- Check dams should be installed before the contributing drainage area is disturbed, so as to mitigate the effects on the swale from the increase in runoff.
- If the swale itself is graded as part of the construction activities, check dams are installed immediately upon completion of grading to control velocities in the swale until stabilization is completed.

INSTALLATION/USE PROCEDURE

- Dam height should be between 9 and 36 inches and less than one-third the depth of the channel
- Dams should be spaced such that the top of the downstream dam is at the same elevation as the toe of the upstream dam. On channel grades flatter than 0.4 percent, check dams should be placed at a distance that allows small pools to form between each check dam.
- The top of the side of the check dam shall be a minimum of 12 inches higher than the middle of the dam. In addition, the side of the dams shall be embedded a minimum of 18 inches into the side of the drainage ditch, swale or channel to minimize the potential for flows to erode around the side of the dam.
- Check dams should be used in conjunction with other sediment reduction techniques prior to releasing flow offsite.
- Use geotextile fabric (of appropriate tensile strength, puncture rating and apparent opening size) under check dams of 12 inches in height or greater.
- Loose soil, wood chips, compost, and other floatable materials that are transportable during runoff should not be used to construct a check dam.

ALTERNATIVE DESIGN

- See “Rock Check Dam for Channels”

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect the check dam system each report period and after storm events.
- Remove silt when sediment accumulation reaches approximately 1/3 the height of the dam.
- Inspect for erosion beneath and around check dam (particularly where edge of the dam meets the side of the channel) and restore as needed each report period.
- If erosion continues to be a problem, modifications to the check dam or additional controls must be engineered.

PERFORMANCE

- Check dam systems are intended to perform as engineered up to .25” of rain fall
- Check dams are performing as intended if the drainage channel they are protecting does not develop deep erosive gulleys between dams and the dam itself is not being undercut by erosion or eroded to either side of the dam.
- Due to the minimal sediment capture capability of check dams, good performance will include accumulations of sediment on the upstream side of dams between maintenance intervals.

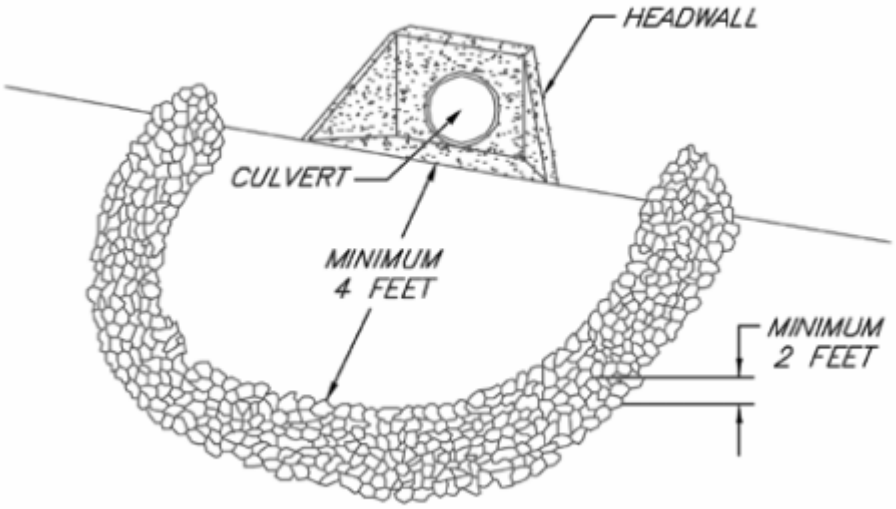
It is considered a BMP failure when any of the following occur:

- System not installed per illustrated detail, system not maintained, or system damaged by construction operations.
- Erosion damage resulting in variance from detail dimensions.

REFERENCE

- U-CGP 2.2.11 – “Minimize erosion of constructed or natural site drainage feature channels and their embankments, outlets, adjacent streambanks, slopes, and downstream waters. Use erosion controls and velocity dissipation devices within and along the length of any constructed or natural site drainage feature channel and at any outlet to slow down runoff and minimize erosion.”

BMP 12- Culvert Sediment Barrier



APPLICATION

A culvert inlet sediment barrier is a temporary rock barrier at a culvert inlet. The purpose of the barrier is to reduce the amount of sediment that enters the culvert by creating a small ponding area for the sediment to settle out.

- For use on a site with open culverts within the project area that are exposed to runoff.

INSTALLATION/USE PROCEDURES

- A geotextile should be placed between the stone barrier and the natural ground.
- Surround all sides of the culvert with Class II Channel Lining at a minimum of 4 feet from the culvert.
- The barrier must be designed to ensure that no bypasses occur up to 0.5" of rainfall
- Control the location of the sediment barrier spillway by placing an overflow notch at a selected location in the middle portion of the barrier.
    - The notch should be at least six inches lower than the rest of the barrier.
    - The downgradient portion of the overflow notch should be protected from erosion caused by potential spillover with Class II Channel Lining.
- The upstream face of the barrier should consist of smaller stone to decrease the flow rate through the stone.
- If a culvert inlet sediment barrier is intended to be used for long-term storm water management, design and installation must be approved by an accredited engineer.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.

- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect the condition of the sediment barrier weekly and after every rainfall event greater than one-half inch. Erosion and scouring would necessitate barrier reinforcement.
- Remove sediment and/or debris when depth reaches one-half the height of the barrier.

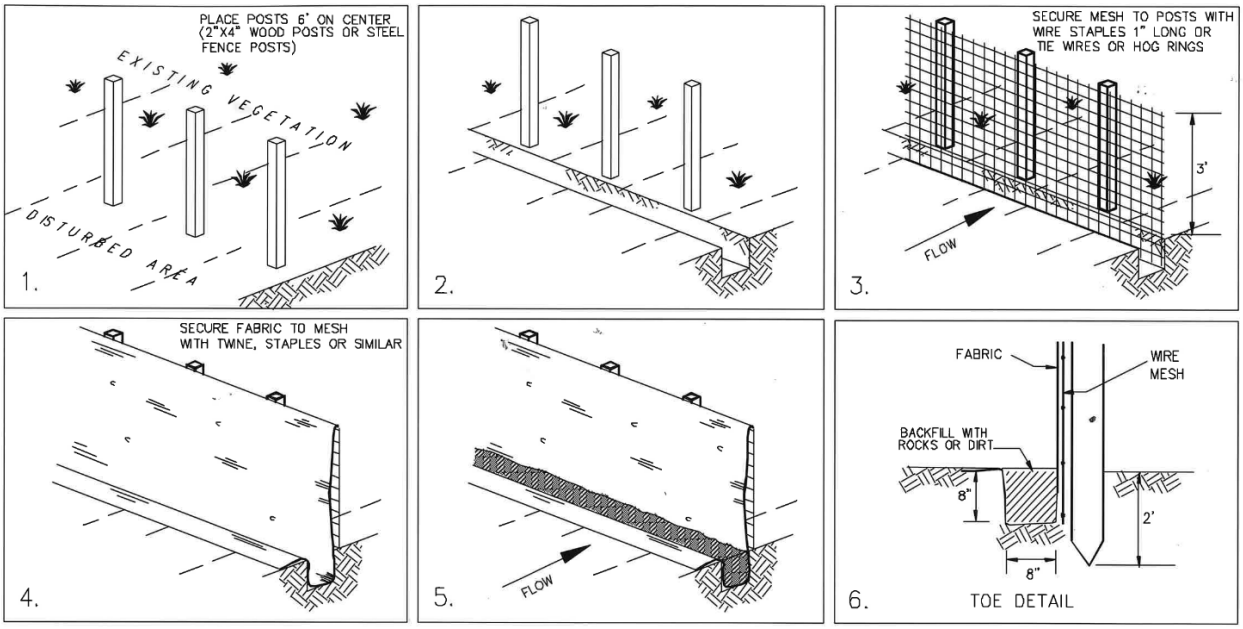
PERFORMANCE

- A culvert inlet sediment barrier is expected to utilize sediment deposition to the maximum extent possible before allowing runoff to enter the culvert.
- The overflow spillway should not compromise the capacity of the berm to slow the flow of the first half inch of rain

REFERENCE

- CGP 2.2.11
- CPP 2.3

BMP 13- Silt Fence



APPLICATION

A silt fence when properly installed and maintained can help mitigate the discharge of sediment in storm water runoff. It can be used in multiple applications such as:

- Downstream project boundaries
- Downstream side(s) of erodible stockpiled materials.
- Minor channels or slopes when calculations show runoff volumes will not exceed the anticipated volume capacity and strength of the system.

A silt fence is not intended for:

- Controlling large volumes of concentrated runoff. Use an alternative BMP
- Border control or limits of construction site only (i.e. not intended to fulfill the same purpose as construction fencing)

INSTALLATION/PROCEDURE/CALCULATIONS

- Install silt fence per detail dimensions, description and materials or -
- For proprietary systems attach all design, performance, installation, maintenance requirements and the proprietary BMP detail documents. All requirements of this BMP remain except for any differences necessary to achieve design performance.
- Install silt fence downstream of all necessary exposed boundaries as shown by the grading sheet, demolition map, phasing map, and or SWPPP BMP map, etc. Attach topographic maps for all construction phases to this BMP or reference where these maps are found in the SWPPP.
- Install silt fence along contours of the slope to maximize effectiveness.
- Overlap each fence segment in a series by at least 6 inches to prevent gaps.
- The end of the silt fence must be installed in a “J-hook” to treat runoff effectively. Flare the ends uphill to provide storage capacity of storm water runoff
- Attach engineering calculations for sites with steep slopes, for large areas clear of vegetation and when runoff rates or when runoff volumes behind fences will feasibly cause failure for

storm events less than 2yr 24hr intensities and volumes. In this case, engineering calculations are required or as allowed by oversight authority.

- Ensure all workers are trained on proper installation, maintenance, and inspection of silt fences.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect the silt fence prior to a forecasted rain event and during weekly inspections.
- Maintain or repair within the period given by the inspector following city and state code within the reporting period or prior to storm event.
- Inspect silt fence after storm events. Restore any fence damaged back to the installation requirements.
- Remove accumulated sediment when it reaches one-third fence height or as specified by proprietary system.

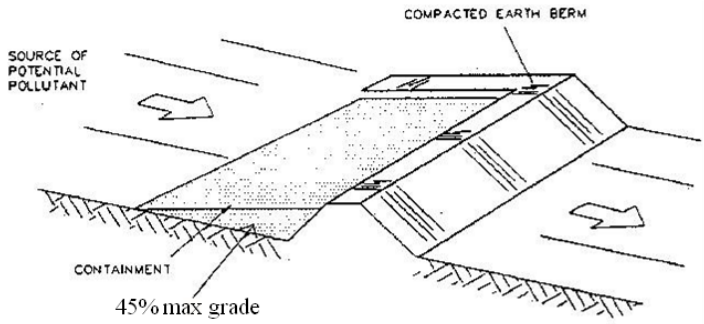
PERFORMANCE

- A silt fence allows water to pass trapping sediment behind. Runoff going around, under or over silt fence would indicate a silt fence system failure.
- A silt fence is expected to filter sediment for storm events less than 2yr 24hr storm events. Fence failures for events less than a 2yr 24hr storm feasibly means the silt fence was either designed, installed, was unmaintained, was damaged by construction operations or the silt fence was not the best BMP for the site exposure. When the area tributary to the fence results in runoff rates greater than silt fence design capability, provide conveyance swales and retention pond BMPs or as per other CGP options.

REFERENCE

- CGP 2.2.3, 2.2.5, 2.2.11, 2.2.12, 7.3.3

BMP 14- Earth Berm Barrier



APPLICATION

A temporary containment control constructed of compacted soil.

- Construct around waste and materials storage area.
- Construct around staging and maintenance areas.
- Construct around vehicle parking and servicing areas.

Not intended for erosion control.

INSTALLATION/USE PROCEDURES

- Construct an earthen berm downhill of the area to be controlled. The berm should surround fueling facilities and maintenance areas on three sides to provide containment.
- Berm needs to be a minimum of 1 foot tall by 1 foot wide and be compacted by earth moving equipment.
- The berm should be protected from heavy equipment traffic through signage or training

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Observe daily for any non-stormwater discharge.
- Look for runoff bypassing ends of berms eroding, or breaching.
- Repair or replace damaged areas of the berm and remove accumulated sediment.
- Recompact soil around the berm as necessary to minimize erosion rates.

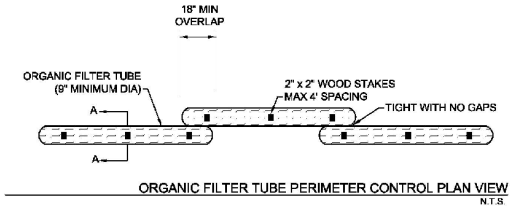
PERFORMANCE

- An earthen berm should be able to contain incidental spills in the area that it is installed while the spill control plan in the SWPPP is being put into effect.

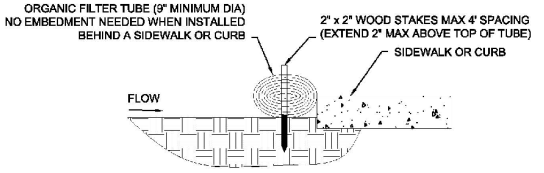
REFERENCE

- CGP 2.2.11
- CPP 2.3

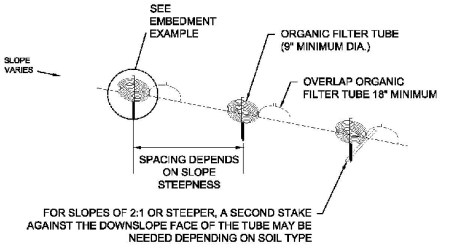
BMP 15- Filter Tubes on Slopes



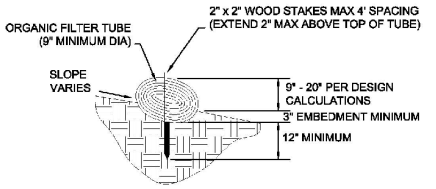
ORGANIC FILTER TUBE PERIMETER CONTROL PLAN VIEW
N.T.S.



INSTALLATION EXAMPLE FOR ORGANIC FILTER TUBEABUTTING PAVEMENT
N.T.S.



ORGANIC FILTER TUBE SLOPE PROTECTION PROFILE
N.T.S.



EMBEDMENT EXAMPLE FOR ORGANIC FILTER TUBE
N.T.S.

APPLICATION

Filter tubes are also called fiber rolls, fiber logs, wattles, mulch socks, and/or coir rolls. The tubes can be filled with organic material (compost, wood chips, straw, coir, aspen fiber, or a mixture of materials) or geosynthetic material. Though filter tubes have many uses, this BMP focuses on slope management.

- If the tubes will be left onsite as part of the final stabilization plan (such as in Arid and Semi-Arid areas with exceptions to final stabilization timeline requirements) they must be constructed of 100 percent biodegradable jute, coir, sisal or similar natural fiber or 100 percent UV photodegradable plastic, polyester or geosynthetic material.
- Filter tubes can be used to treat sheet flow over a short distance and can be used on steep slopes as both sediment and erosion control.
- Filter tubes work by detaining flow and capturing sediment as a linear control along the contours of a slope, or as a perimeter control down-slope of a disturbed area (when appropriately sized).
- Filter tubes are most effective with coarse to silty soil types; additional controls may be needed to remove fine silts and clays suspended in stormwater.

INSTALLATION/USE PROCEDURES

- Filter tubes should be installed along the contour.
- Tubes shall be staked with 2 inch by 2 inch wooden stakes at a maximum spacing of 4 feet. Rebar or similar metal stakes may be used instead of wooden stakes.
- When placed on pavement, sand or rock bags shall be placed abutting the down-slope side of the tubes to prevent runoff from dislodging the tubes. At a minimum, bags shall be placed one foot from each end of the tube and at the middle of the tube.
- Filter tubes shall be embedded a minimum of three inches when placed on soil. Placement on rock shall be designed as placement on pavement.
- The end of tubes shall overlap a minimum of 18 inches when multiple tubes are connected to form a linear control along a contour or a perimeter.

- Loose mulch material shall be placed against the log on the upstream side to facilitate contact with the ground.
- The last 10 feet (or more) at the ends of a line of tubes shall be turned upslope to prevent bypass by stormwater. Additional turned-upslope lengths of tubes may be needed every 200 to 400 linear feet, depending on the traverse slope along the line of tubes.
- The most common sizes of tubes are 6 to 24 inches in diameter; however, tubes are available in sizes as small as 4 inches and up to 36 inches in diameter. The designer shall specify a diameter based on the site application. Tubes less than 8 inches in diameter when filled will require more frequent maintenance if used.
- When using manufactured tubes, the manufacturer's recommendations for diameter and spacing based on slope, flow velocities, and other site conditions shall be followed and documented in a site's SWPPP.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Organic filter tubes should be inspected regularly each inspection period.
- The filter tube should be checked to ensure that it is in continuous contact with the soil at the bottom of the embedment trench. Closely check for rill erosion that may develop under the filter tubes. Eroded spots must be repaired and monitored to prevent reoccurrence. If erosion under the tube continues, additional controls are needed.
- Staking shall be checked to ensure that the filter tubes are not moving due to stormwater runoff. Repair and re-stake slumping filter tubes. Tubes that are split, torn or unraveling shall be repaired or replaced.
- Check the filter tube material to make sure that it has not become clogged with sediment or debris. Clogged filter tubes usually lead to standing water behind the filter tube after the rain event. Sediment shall be removed from behind the filter tube before it reaches half the height of the exposed portion of the tube.

PERFORMANCE

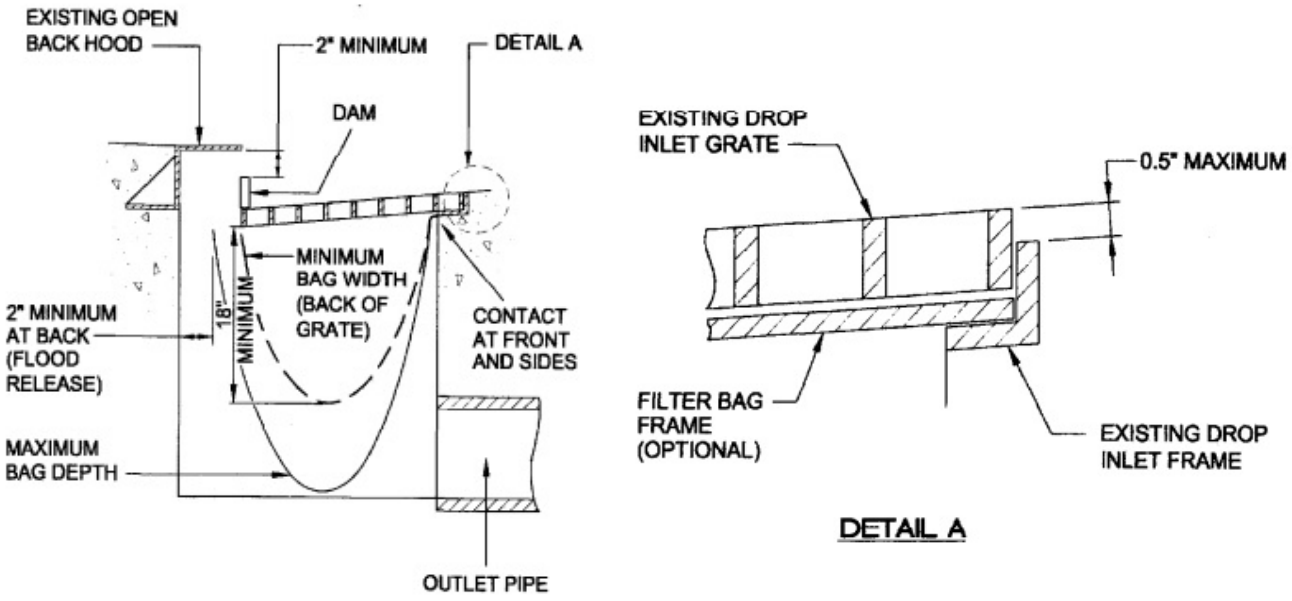
- Organic filter tubes are performing as intended if sheet flow of runoff is passing over or through the barrier and not simply around it, bypassing the control.
- Additionally, performance is achieved if the filter tube barrier is effectively minimizing the off-site discharge of sediment from the drainage area it is controlling and does not develop erosive rills/gullies between filter tubes and the tubes are not being undercut by erosion or eroded to either side of the barrier.
- Due to the relatively smaller sediment capture capability of these filter tubes, as compared to taller barriers, good performance will include accumulations of sediment on the upstream side of filter tubes until maintenance occurs, which will likely require more frequent maintenance.

REFERENCE

- CGP 2.2.3, 2.2.5, 2.2.11

- CPP 2.3

BMP 16- Drop Inlet Bag with Overflow



[Picture for concept purpose only]

APPLICATION

- Use drop inlet bag BMPs with overflow systems at roadway sag locations. Note, these BMP can be appropriate on collector roadways when inspections show success at preventing surface ponding. Note, the local municipality will need to evaluate the traffic risk on a case by case basis.
- Use drop inlet bag BMPs when other surface inlet BMPs like sand bags are less feasible due to high traffic in the area.

INSTALLATION/USE PROCEDURES

- Attach drop inlet bag proprietary manufacturer installation and maintenance detail literature to this BMP. Provide drop inlet bag system designed for inlet type needed, e.g. open face, not open face gutter, etc.
- Install the drop inlet bag system in accordance with the manufacturer literature.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect and maintain if necessary every report period. Empty and dispose of debris accumulations when the bag capacity has reached 50% full or before the bag becomes unmanageable or ineffective.
- Inspect the unit prior to and after storm events. Large storm events will scour sediment from almost all roadway inlet BMPs, therefore regular maintenance is the best management practice.
- Remove and dispose of any sediment found inside the inlet box resulting from BMP failure or resulting during maintenance operations.
- Conduct any maintenance required by the drop inlet bag manufacturer.
- In collector roadways or other locations oversight authority requires, check during storm events and prevent hazardous driving conditions.

PERFORMANCE

- A drop inlet bag is expected to prevent debris and large sediment particles from entering a storm drain.
- Minor ponding should be expected, but the overflow would prevent excessive ponding
- A drop inlet bag should not allow the accumulated debris to fall into the structure it is protecting at anytime both during maintenance and removal. The design and installation specifications should support this ideal.

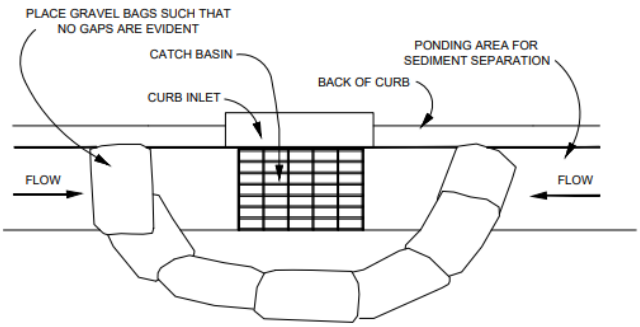
It is considered a BMP failure when any of the following occur:

- System not installed or maintained to installation and operation requirements
- System not installed and maintained to manufacturer requirements
- Sediment scour resulting from irregular maintenance.
- Sediment left in inlet following maintenance.
- Excessive ponding resulting from irregular maintenance or blocked overflow.

REFERENCE

- Construction General Storm Water Permit (CGP) 2.2.10
- Common Plan Permit (CPP) 2.1.3

BMP 17- Gravel Bag Curb Inlet Protection



PLAN VIEW

APPLICATION

- The purpose of placing gravel bags around an inlet or other runoff receiving area is to slow the flow of water to allow sediment deposition to be maximized before runoff enters the inlet or other receiving area.
- Ideal for areas near storm drains, curb inlets, and other drainage structures.
- Not intended for high-flow areas without additional support measures.
- Do not use on collector roadways and where the control could create safety concerns such as hydroplaning.

INSTALLATION/USE PROCEDURES

- Ensure the bags are properly positioned to maximize the area available for ponding.
- Use appropriate types of inlet protection based on site-specific conditions.
- Install inlet protection measures that remove sediment from discharges prior to entry into any storm drain inlet that carries storm water flow from your site to surface water of the state, provided you have authority to access the storm drain inlet.
- This BMP is designed for 1/4" (~2yr 10min intensity) rain storm events.
- Train SWPPP inspection and maintenance team

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Regularly inspect and maintain the system to ensure proper function.
- If repairs are needed, repair the system as soon as practicable.
- Inspect inlet protection before and after storm events or other large volume runoff events.

- Remove accumulated sediment and debris when deposits are ⅓ the height of the gravel bag barrier.
- Ensure a clear area around inlet protection devices to facilitate inspections and maintenance.
- Check during storm events and prevent hazardous surface water driving conditions.

PERFORMANCE

- Inlet protection is considered effective if it mitigates target pollutants from entering the stormwater system.
- Inlet protection system resulting in spill over during an event less than 1/4”(~2yr 10min intensity) of rain is considered a failure.

REFERENCE

- CGP-2.2.10
- CPP- 2.1.3

BMP 18- Below Grate Inlet Filter

APPLICATION

- Can be used at sag locations but only where hydroplaning or the surface water is not a risk or concern. Inlet cover only BMPs can easily clog when used at sag locations and usually result in slow draining conditions.
- Use on at-grade gutter inlets with no open face castings but only when coupled with downstream BMPs to compensate for by-pass. Generally, at grade inlet cover BMPs have much higher sediment and debris by-pass.
- Use in combination with other gutter dam type BMPs
- Not intended for high-flow areas without additional control measures.

INSTALLATION/USE PROCEDURES

- Wrap entire inlet casting with 8oz propylene, non-woven geotextile fabric. Allow for about 6" fabric overlap or more on all sides.
- Sediments will collect in the grate and will need to be removed regularly. The fabric can be cleaned by removing the grate and sediment or by vacuum operations.

- Sediments fill this system quickly and debris will float over it therefore, downstream dam type systems are usually necessary in combination.
- Train SWPPP inspection and maintenance team

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- For this BMP to work storm events need to be anticipated and the system cleaned before and after. There is very little sediment storage within the grate/fabric filter system.
- Inspect for compliance with installation requirements and for any damage
- Be aware of downstream systems and inspect for by-passed sediment and debris.
- Inspect for sediments and remove with shovel and broom or vacuum tools.
- When fabric removal or replacement results in sediment dropping into the inlet, use hydro vacuum machinery or safely remove by other means
- When installation at sag locations are allowed by the municipality, inspect during the storm event as often as necessary to ensure no vehicle or pedestrian hazardous conditions exist.
    - Use a shovel, broom or vacuum tools necessary to remove clogging before puncturing or removing fabric during the storm event.

PERFORMANCE

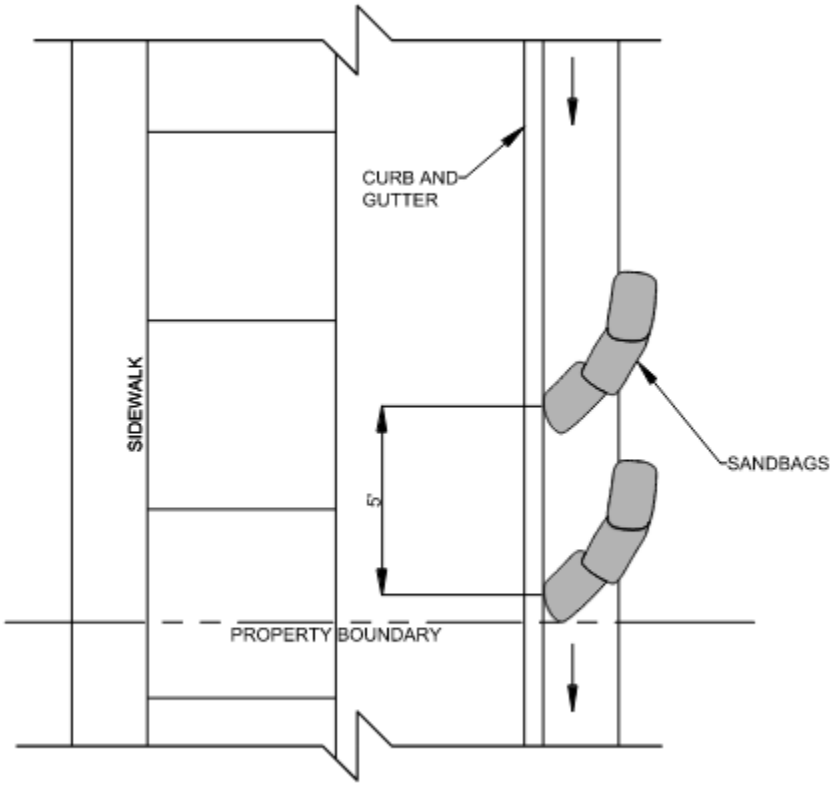
It is considered a BMP failure when any of the following occur:

- System not installed or maintained to installation and operation requirements
- Sediment and debris by-pass is not accounted for by other BMPs
- Surface water increases the risk of hydroplaning, ADA and pedestrian pathway concerns.
- Torn or punctured fabric. Usually, the result of others or SWPPP team personnel managing emergency surface water situations during storm events. If emergency action damage is regular then select another BMP.
- Not removing sediment left behind in inlet box during maintenance

REFERENCE

- CGP 2.2.10
- CPP 2.1.3

BMP 19- Gutter Dam



APPLICATION

- This BMP allows sediment laden storm water to be filtered by the gutter dam minimizing sediment from reaching downstream inlets.
- This BMP allows for runoff by-pass during intense storm events but when adequately maintained can minimize sediment by-pass common with many inlet cover only BMPs. Inlet cover only BMPs should have secondary containment built in or coupled with downstream BMPs to contain sediment and debris by-pass.
- Use Gutter Dam BMP when the project is expected to contain its impact from other operators downstream BMPs. This is a common concern between operators when multiple independent builders are building homes in the same subdivision.
- Warning: This BMP is easily damaged by vehicles that park along the curb and gutter, and by snow removal operations.

INSTALLATION/USE PROCEDURES

- Install 6” min dia sand or gravel bags. Double up bags as necessary.
- Install upstream of inlets.
- This gutter dam system is working when the first dam is holding more sediment than the downstream dams. When the sediment collection is about the same then something is wrong.
- This system can scour out easily and needs regular maintenance to be effective.
- Inform subcontractors and suppliers of the gutter dams placement to roadside parking from damaging the sand or gravel bags.
- Train SWPPP inspection and maintenance team

- This BMP is designed for 1/4" (~2yr 10min intensity) rain storm events.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Anticipate significant storm events, repair damage and remove sediment deposits prior to storm events that could scour sediment deposits from the gutter dam.
- Inspect, remove sediment and repair gutter dam regularly during the report period and following each storm event.
- Following storm events the first dam should have more sediment than the downstream dams. When inspection shows failure persists, even with regular maintenance, a third dam should be installed. If the gutter dam system does not perform as intended, a different or additional BMP is warranted.
- Bring awareness to workforce and suppliers parking near the gutter dam.
- Check during storm events and prevent driving hazardous resulting from surface water conditions.

PERFORMANCE

- A gutter dam system is expected to slow the flow of runoff in the gutter to allow for sediment deposition. Erosion control of non-stabilized sediment should be used in conjunction with a gutter dam system. This BMP should be utilized as a secondary control to erosion control BMPs.

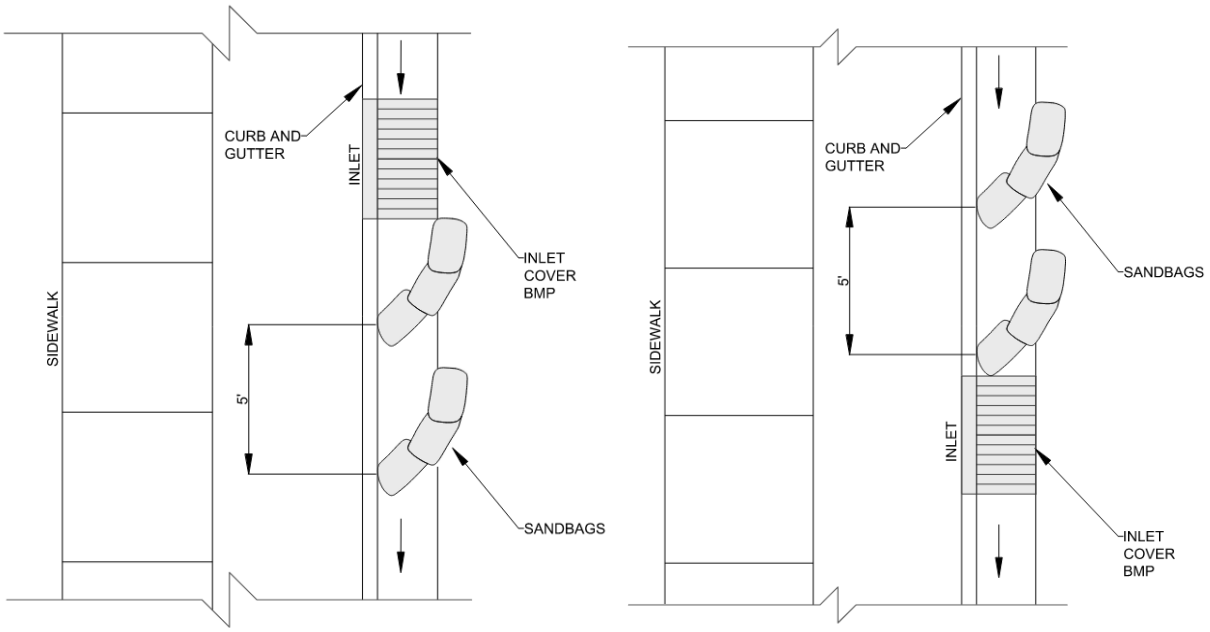
It is considered a BMP failure when any of the following occur:

- When storm events less than ¼" of rain results in significant scour an alternative BMP is warranted.
- When regular damage occurs to the gutter dam system due to traffic or snow operations an alternative BMP is warranted.
- When sediment deposits are equal to or greater in the downstream dam following storm events of 1/4" or less, the BMP is not adequate and warrants a different BMP.

REFERENCE:

- CGP 2.2.10
- CPP 2.1.3

BMP 20- Inlet Filter with Gutter Dam Combo



APPLICATION

- This BMP allows sediment laden storm water to be filtered by inlet cover and the gutter dam. Installing the gutter dam on the downstream end of the inlet will increase filter effectiveness and reduce sediment and debris by-pass. This configuration can reduce passing higher volumes downstream.
- This BMP allows for runoff by-pass during intense storm events but when adequately maintained can minimize sediment reaching storm water inlets. Inlet cover only BMPs should have secondary containment built in.
- Use Inlet Filter Gutter Dam Combo BMP for at grade inlets.
- Warning: This BMP is easily damaged by vehicles that park along the curb and gutter, and by snow removal operations.

INSTALLATION/USE PROCEDURES

- Install 6” min dia sand or gravel bags. Double up bags as necessary.
- Install upstream of inlets.
- This gutter dam system is working when the first dam is holding more sediment than the downstream dams. When the sediment collection is about the same then something is wrong.
- This system can scour out easily and needs regular maintenance to be effective.
- Inform subcontractors and suppliers of the gutter dams placement to roadside parking from damaging the sand or gravel bags.
- Train SWPPP inspection and maintenance team
- This BMP is designed for 1/4” (~2yr 10min intensity) rain storm events.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Anticipate significant storm events, repair damage and remove sediment deposits prior to storm events that could scour sediment deposits from the gutter dam.
- Inspect, remove sediment and repair gutter dam regularly during the report period and following each storm event. Check for out of place or broken bags, and torn or punctured fabric.
- Following storm events the first dam should have more sediment than the downstream dams. When inspection shows failure persists, even with regular maintenance, a third dam should be installed. If the gutter dam system does not perform as intended, a different or additional BMP is warranted.
- Inspect for sediments and remove with shovel and broom or vacuum tools.
- When fabric removal or replacement results in sediment dropping into the inlet, use hydro vacuum machinery or safely remove by other means
- Bring awareness to workforce and suppliers parking near the gutter dam.
- Check during storm events and prevent driving hazardous resulting from surface water conditions.

PERFORMANCE

- A gutter dam system is expected to slow the flow of runoff in the gutter to allow for sediment deposition. Erosion control of non-stabilized sediment should be used in conjunction with a gutter dam system. This BMP should be utilized as a secondary control to erosion control BMPs.

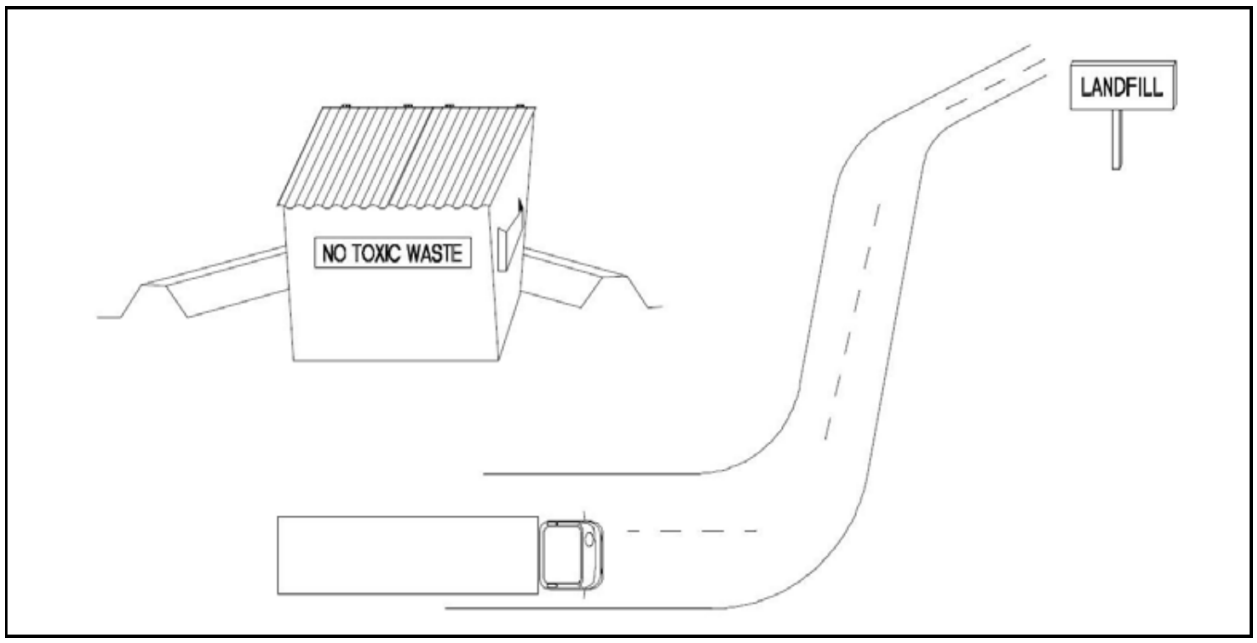
It is considered a BMP failure when any of the following occur:

- When storm events less than ¼" of rain results in significant scour an alternative BMP is warranted.
- When regular damage occurs to the gutter dam system due to traffic or snow operations an alternative BMP is warranted.
- When sediment deposits are equal to or greater in the downstream dam following storm events of 1/4" or less, the BMP is not adequate and warrants a different BMP.

REFERENCE:

- CGP 2.2.10
- CPP 2.1.3

BMP 21- Solid Waste Management



APPLICATION

- This BMP is necessary when construction activities generate solid waste that needs to be collected and disposed of properly to prevent environmental contamination.
- Use this BMP when: The site generates solid waste, including packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, styrofoam, concrete, demolition debris; and other trash or building materials that could potentially contaminate stormwater if not managed correctly.

INSTALLATION/USE PROCEDURES

- **Selection Criteria**: Use durable, watertight containers (e.g., dumpster, trash receptacle) that are appropriately sized for the volume of waste generated on-site.
- **Placement**: position dumpsters on a flat, stabilized surface, away from storm drains and water bodies. Identify these locations on the site plan.
- **Usage**: ensure all construction waste is placed inside the dumpster. Do not overfill; waste should not extend beyond the sides or top of the dumpster. Do not dispose of liquids in this BMP. Most dumpsters and garbage trucks are not water tight.
- **Containment:** Provide containment or cover for waste that is blowable or that can leach nutrients, metals, pesticides, herbicides, oil, grease, bacteria, or other pollutants.
- **Segregation:** separate hazardous waste from non-hazardous waste and use appropriately labeled and secured containers for hazardous materials.
- Locate on parking pad or next to track-pad to prevent track-out when servicing. Show location on site BMP map.
- Do not install in roadways without approval of local municipality. This usually means obtaining a local right-of-way encroachment permit or equal to stage dumpsters in right-of-ways.
- Train workforce.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Ensure the workforce is informed about proper waste disposal procedures and the importance of maintaining the integrity of waste management BMPs.
- Operator is expected to modify the solid waste management system, location and capacity when necessary as site conditions and operations warrant.
- Inspect dumpsters for leaks, damage, and proper cover.
- Collect any trash around the construction site daily and deposit it in the waste container at designated collection areas.
- Arrange for regular waste removal to a licensed facility often enough to prevent overfilling.
- Contain and clean up spilled waste or overflow immediately.

PERFORMANCE

A solid waste management BMP is considered effective if:

- All construction and domestic waste generated is contained
- No incidents of dumpster overflow or leaks
- No visible waste or debris around the construction site or dumpster area

REFERENCE

- CGP 2.3.3 (e).

BMP 22- Chemical/Hazardous Materials Management

APPLICATION

- Use Chemical/Hazardous Materials Management BMP when chemicals or hazardous materials are used or stored at the construction site.

INSTALLATION/USE PROCEDURES

- Store chemicals and/or other hazardous materials in sealed, clearly labeled containers.
- Safety Data Sheets (SDS) specific to each chemical must be accessible on site.
- When chemicals/hazardous materials are not in use, store materials in such a way that they are not exposed to stormwater or runoff. (covered and off the ground)
- Storage and use areas must be located away from waters of the state, sensitive areas, and storm water conveyance systems
- Submit illustration or detail for secondary containment system when secondary containment and/or cover is required (containers more than 55 gallons); such as drip pan, spill containment pallets, or spill berm with impermeable liner.
- Attach a spill plan and provide a spill kit in good working condition sufficient to address small spills and protect water quality.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Train employees and subcontractors in chemical/hazardous materials BMPs.
- Regularly inspect the chemical storage area and the construction site for evidence of spills
- Spills must be properly cleaned up with dry clean up methods only.
- For spills that occur on permeable surfaces, remove contaminated material before leaching occurs and dispose according to manufacturer's recommended method of disposal and in compliance with Federal, State, Tribal, and local requirements
- Large spills must be documented and reported according to Section 2.3.6 of the CGP.
- Keep ample supplies of spill cleanup materials on-site and perform any repairs necessary to contain chemicals appropriately immediately.
- Dispose of expired or used up hazardous materials in accordance with the manufacturer's recommended method of disposal and in compliance with Federal, State, Tribal, and local requirements

PERFORMANCE

- This BMP is expected to contain chemical/hazardous materials in such a way that it cannot pollute the environment.
- No pollutants are allowed to reach storm water conveyance systems or waters of the state

REFERENCE

- CGP 2.3.3

BMP 23- Onsite Equipment Fueling

APPLICATION

- Use when fixed onsite fueling tanks are planned.

INSTALLATION/USE PROCEDURES

- Locate fueling operations a minimum of 50 feet from receiving waters, constructed or natural site drainage features, and storm drain inlets. If infeasible due to site constraints, store containers as far away from these features as the site permits. If site constraints prevent you from storing containers 50 feet away from the features identified, you must document in your SWPPP the specific reasons why the 50-foot setback is infeasible.
- Store fuels in sealed, clearly labeled containers.
- Containers must be covered and/or have secondary containment (curbing, spill berms, dikes, spill containment pallets, double-walled storage tank)
- Submit illustration or detail for secondary containment of fuel containers and secondary containment used during active fueling (drip pan, drop cloth, etc)
- Discourage topping-off of fuel tanks.
- Carry out all Federal and State requirements regarding stationary above ground storage tanks. (40 CF Sub. J) Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas.
- Create and attach a Spill Plan specific to the project.
- If you fuel many vehicles or pieces of equipment, consider using an off-site fueling station. These areas are better equipped to handle fuel and spills properly.
- Provide a copy of your off site written policy to the oversight authority for review

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Fuel equipment in designated areas only
- Train employees and subcontractors in proper fueling and cleanup procedures.
- Regularly check for leaks and damage including but not limited to: tanks, hoses, and secondary containment.
- Keep ample supplies of spill cleanup materials on-site and perform any repairs necessary to contain fuel appropriately immediately.
- If spill occurs, use dry clean up methods and dispose of spill clean up materials to a proper licensed facility.
- Large spills must be documented and reported according to Section 2.3.6 of the CGP.

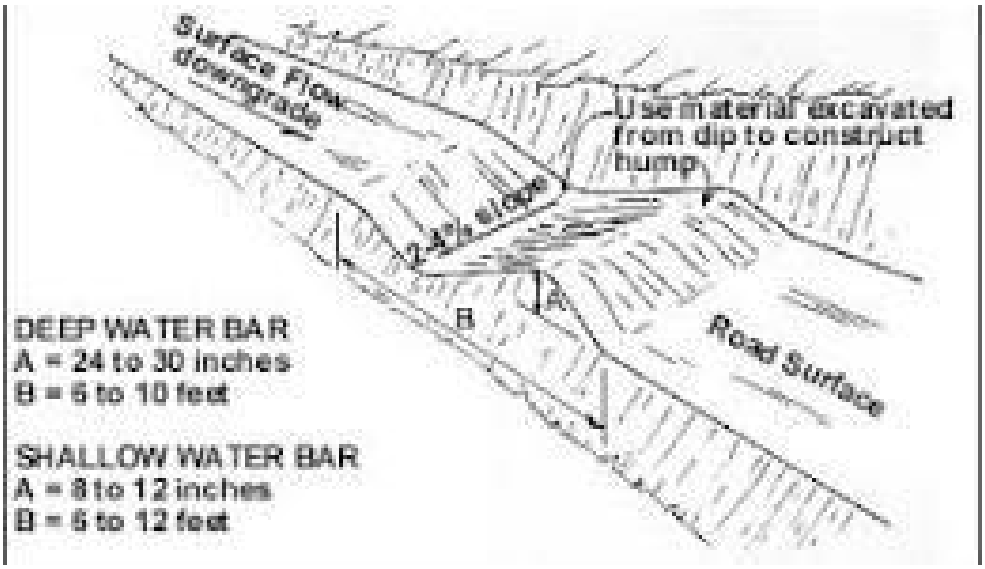
PERFORMANCE

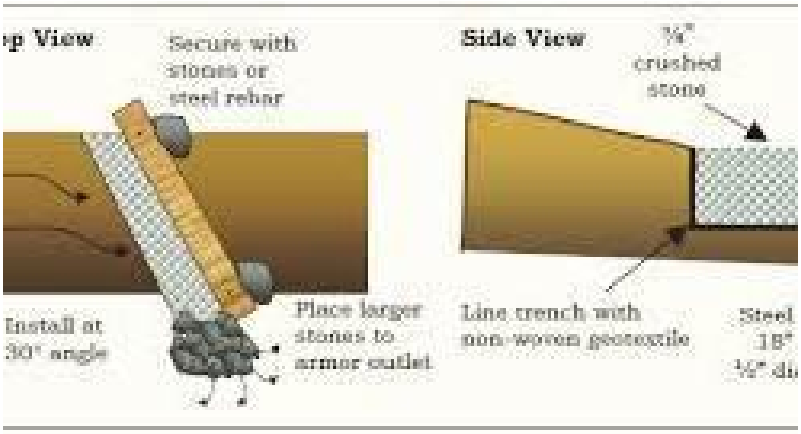
- Onsite equipment fueling BMPs are expected to protect stormwater to the extent that no fuel, oil, or solvents are allowed to pollute waters of the state or storm water conveyances.

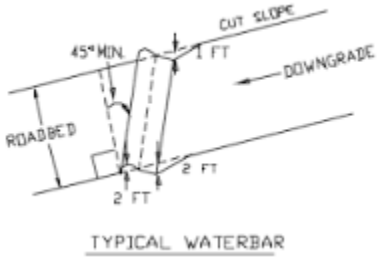
REFERENCE

- CGP 2.3.1

BMP 24- Water Bars







TYPICAL WATERBAR

APPLICATION

Water Bars may be used as a means of erosion control when:

- Clearing right-of-way and construction of access for power lines, poplins, and other similar installations that often require long narrow rights-of-way over sloping terrain.
- Disturbance and compaction promote gully formation in these cleared strips by increasing the volume and velocity of runoff
- Gully formation may be especially severe in tire tracks and ruts. To prevent gullying, runoff can often be diverted across the width of the right-of-way to undisturbed areas by using small predesigned diversions generally referred to here as water bars.

INSTALLATION/USE PROCEDURES

- Give special consideration to each outlet area individually, as well as to the cumulative effect of added diversions. Use gravel to stabilize the diversion where significant vehicular traffic is anticipated.
- Design the height of the Water Bar with the slope in mind to effectively divert the volume needed.
- Design the base width of the ridge with the slope and volume of water diverted in mind.
- Locate well-vegetated and stable areas to use natural drainage systems and to discharge into well-vegetated stable areas.
- During a rain event ensure that the installed Water Bars are effective in diverting the runoff away from the road, or path and that the discharge areas are effective at handling the volume of water being diverted.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Periodically inspect right-of-way diversions for wear and after every heavy rainfall for erosion damage.
- Immediately remove sediment from the flow area and repair the dike.
- Check outlet areas and make timely repairs as needed.
- When permanent road drainage is established and the area above the temporary right-of-way diversion is permanently stabilized, remove the dikes and fill the channel to blend with the natural ground, and appropriately stabilize the disturbed area.

PERFORMANCE

It is considered a Water Bar management failure when any of the following occurs:

- Water is not being properly diverted from the intended area.
- Sediment is built up in diverted flow areas and needs to be maintained.

REFERENCE

2.1, 2.2, 2.3

BMP 25- Portable Sediment Tank

APPLICATION

- This BMP is necessary when construction activities generate significant amounts of sediment-laden water that needs to be managed to prevent environmental contamination.
- Use this BMP when: The site requires the temporary storage and treatment of sediment-laden water due to construction activities such as excavation, dewatering, or stormwater runoff collection.

INSTALLATION/USE PROCEDURES

- **Placement:** position the portable sediment tank (frac tank) on a flat, stabilized surface, away from storm drains and water bodies. Identify these locations on the site plan.
- **Connection:** ensure all hoses and connections are secure and leak-free. Properly connect the inlet and outlet hoses to direct sediment-laden water into the tank.
- **Filling:** gradually fill the tank with sediment-laden water, allowing sediments to settle out. Avoid overfilling the tank.
- **Sediment removal:** periodically remove accumulated sediments from the tank according to proprietary specifications to maintain capacity and effectiveness. Follow appropriate disposal methods for the removed sediments.
- **Discharge:** discharge the treated water in compliance with local regulations, ensuring that it meets the required water quality standards.
- **Training:** ensure the workforce is informed about the correct operation and maintenance procedures for portable sediment tank (frac tank).

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect the portable sediment tank (frac tank) and associated equipment for leaks, damage, and proper functioning.
- Ensure that sediment levels are monitored and sediments are removed as needed to maintain tank capacity.

- Applicant is expected to modify the portable sediment tank system, location and capacity when necessary as site conditions and operations warrant.

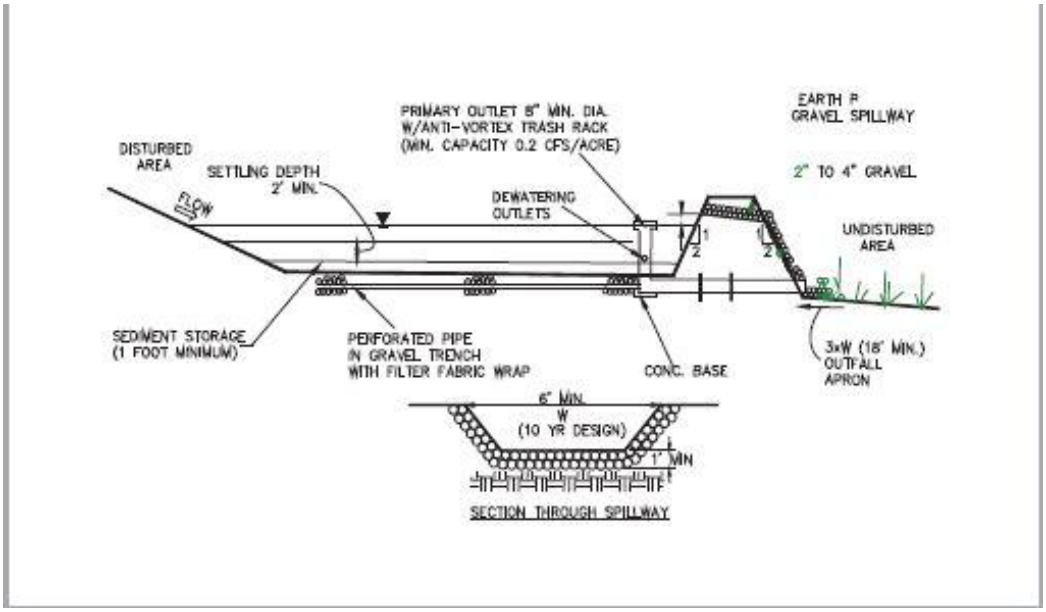
PERFORMANCE

- Ensure that the discharge from the frac tank meets local, state, and federal water quality standards for sediment and turbidity. Any discharge with visible sediment or cloudiness constitutes failure and requires immediate corrective action.
- Any leak or spill around the tank area indicates BMP failure.
- Sediment within the tank must be kept below the manufacturer's recommended level.

REFERENCE

- CGP 2.2.12, 7.3.5, A.2.4

BMP 26- Sediment Basin



APPLICATION

Sediment basins serve as treatment devices which can be used on a variety of project types. They are normally used in construction projects where:

- Large areas of land drain to the basin
- At the outlet of disturbed watersheds 10 acres or larger
- At the outlet of smaller watersheds as necessary
- Where post construction basins will be located
- for disturbed upstream drainage areas of 5 acres or more

INSTALLATION/USE PROCEDURES

- Determine the number of basins needed. In some cases, it is more effective to have multiple smaller basins versus one large basin. This is particularly important in areas with larger-grained sediments. In addition, potential damage from basin failure can be minimized by using multiple smaller basins, versus one large basin.
- Whenever possible, construct the sedimentation basins before clearing and grading work begins.
- Construct sediment basins at locations that are accessible for cleanout.
- Situate the basin or impoundment outside of any water of the state and any natural buffers.
- Design the basin or impoundment to avoid collecting water from wetlands or high ground water.
- Design the basin or impoundment to provide for either:
    (1) The calculated volume of runoff from the 2-year, 24-hour storm; or
    (2) 3600 cubic feet per acre drained.
- Utilize outlet structures that withdraw water from near the surface of the sediment basin or similar impoundment, unless infeasible.
- Use erosion controls and velocity dissipation devices to prevent erosion at inlets and outlets.
- Sediment basins and ponds must be installed only within the property limits where failure of the structure would not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.

- Sediment basins and ponds are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the pond is required, the type of fence and its location should be shown on the Stormwater Pollution Prevention Plan (SWPPP).
- Because of additional detention time, sediment basins may be capable of trapping smaller sediment particles than traps. However, they are most effective when used in conjunction with other BMPs such as seeding or mulching.
- Sediment basins can be converted to permanent structures after completion of the construction project. Remove all excess sediment from the basin. The containment volume must meet the design specifications of the approved plan set. The inside of a permanent sediment basin should be stabilized to meet local and UPDES requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect after each rainfall event and at a minimum as part of any regularly scheduled inspections.
- Repair any damage to the berm, spillway, sidewalls and outlet structures or mechanisms.
- Remove accumulated sediment to maintain at least one-half of the design capacity and conduct all other appropriate maintenance to ensure the basin or impoundment remains in effective operating condition.
- Check outlet for sedimentation/erosion of downgradient area and remediate and/or install downgradient BMPs as necessary.

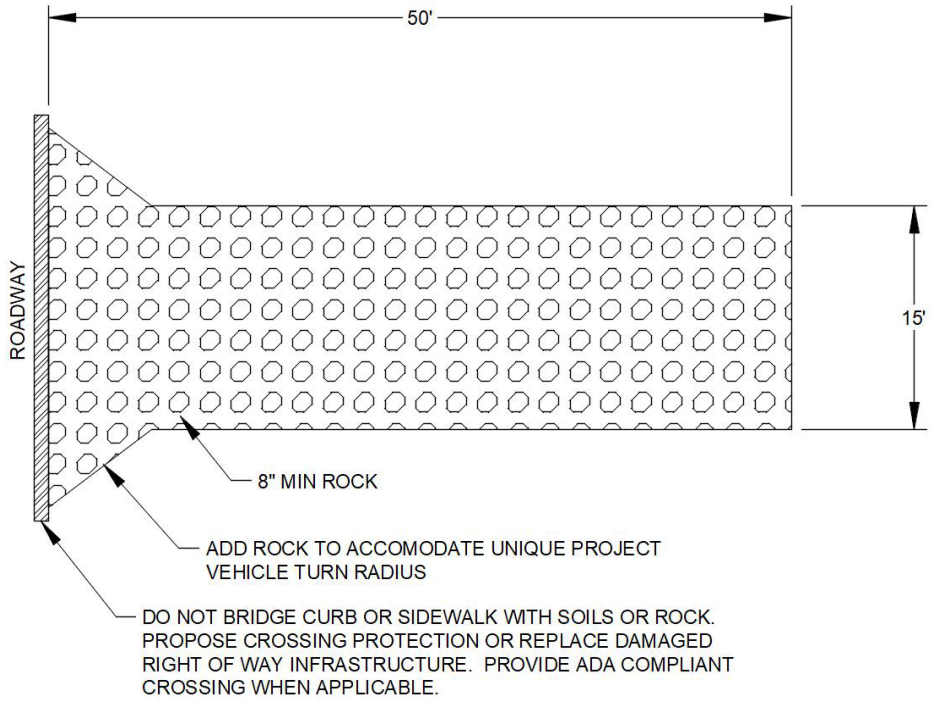
PERFORMANCE

- Sediment basins are at best only 70-80 percent effective in trapping sediment which flows into them. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc. to reduce the amount of sediment flowing into the basin.
- A type of outlet being used with increasing frequency is the floating skimmer. Some early tests indicate that the skimmer (which draws water only from the surface) might be more effective at retaining sediment in the basin than the standard riser and barrel configuration.

REFERENCE

- CGP 2.2.12, 7.3.5
- Drainage Design Manual for City
- Salt Lake County Best Management Practices for Construction Activities

BMP 27- Rock Track Out Pad



APPLICATION

- Use this BMP when vehicles and equipment operations require egress from the project property to decrease the amount of debris leaving the site via vehicle tracking.
- Particularly applicable in wet conditions in which sediment sticks more easily to tires/tracks.

INSTALLATION/USE PROCEDURE

- Determine the ingress/egress location(s) allowed by the oversight authority and show them on the site plan.
- Use 8” rock for the track out pad at a minimum depth of 8” and use dimensions described in the illustration above.
- Workforce and subcontractors must utilize the track out pad when leaving the construction site.
- Move vehicles forward and in reverse until mud is removed from tires.
- Stop, for rocks wedged in dual tires and remove any unremoved mud and wedged rocks.
- Ensure the workforce is trained regarding track-out BMP requirements.
- Use of Sweeping BMP is still usually necessary at the end of the day at minimum.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Rake, refresh or wash rock as necessary when space between rocks is inundated with mud.
- Add, extend or replace rock as necessary to achieve performance criteria results.
- Train workforce when BMP improper use is recognized.
- When sediment, rock, or gravel track out occurs due to BMP failure or misuse, debris must be removed from roadways according to the CGP criteria.
    - Street clean-up operations are separate from this Rock Track Out Pad BMP, but necessary to address unacceptable track out that may occur.

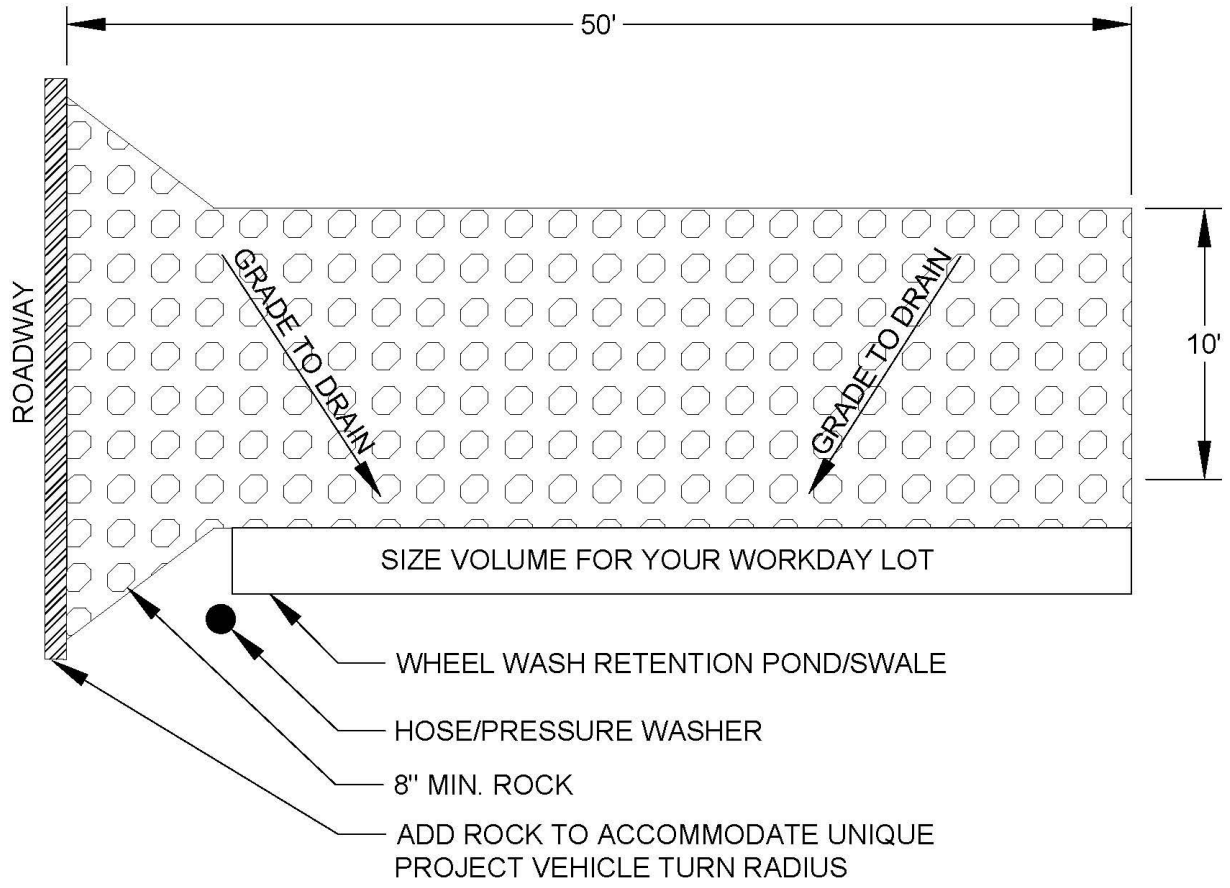
PERFORMANCE:

- Slick conditions, slurry, mud chucks, rocks, gravel, water quality risk and driver hazards constitute BMP failure and require immediate sufficient action.
- Light tracking is expected and requires regular maintenance but not usually immediate action. Light tracking is defined as minor residual dirt that can't be picked up by a square nose shovel.
    - Remove/sweep prior to unsafe and wet conditions or end of workday, whichever is first.

REFERENCE:

- CGP 2.2.4, 5.1, 5.2.1
- CPP 2.4.1

BMP 28- Wheel Wash



APPLICATION

- Use this BMP when vehicles and equipment operations require egress from the project property to decrease the amount of debris leaving the site via vehicle tracking.
- Use wheel wash BMP when mud needs to be removed from tires.
- Wheel washes are a logical redundant option during very wet conditions when other wheel agitation type tire mud management systems are not effective.

INSTALLATION/USE PROCEDURE

- Determine the ingress/egress location(s) allowed by the oversight authority and show them on the site plan.
- Do not bypass the wheel wash area when track out prevention is necessary.
- Wash all wheels with a hose or pressure washer provided. Pull forward as necessary to remove all mud from tires and tread.
- Check for rocks wedged in dual tires and remove.
- Identify the necessary retention volume needed for wash waters and attach to this BMP.
- Ensure the workforce is trained regarding track-out BMP requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.

- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Rake or wash rock as necessary when BMP is not working.
- Remove pond/swale sedimentation at 50% capacity.
- Expand the wash water basin as necessary to contain the retention volume required.
- Do not wash wheels anywhere on site except at the designed wheel wash area that has a retention pond to retain and treat wash waters.
- Train workforce when BMP improper use is recognized.
- When sediment, rock, or gravel track out occurs due to BMP failure or misuse, debris must be removed from roadways according to the CGP criteria.
    - Street clean-up operations are separate from this wheel wash BMP, but necessary to address unacceptable track out that may occur.

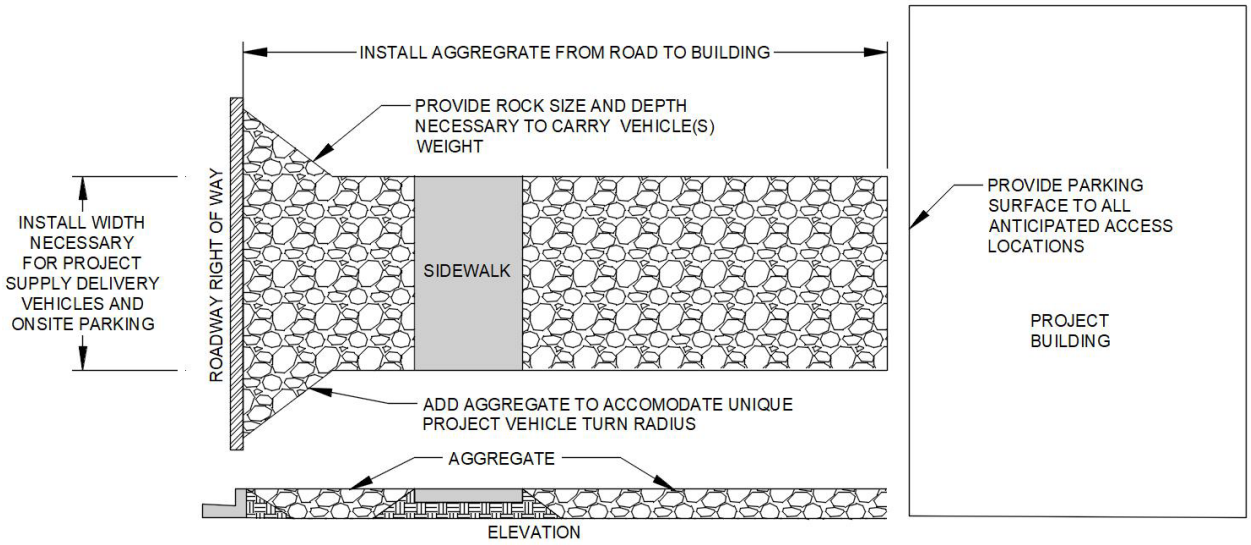
PERFORMANCE:

- The Wheel Wash BMP is expected to greatly minimize the risk of excessive track out onto roadways and also utilizes sediment deposition in the wash water retention pond.
- Slick conditions, slurry, mud chucks, rocks, gravel, water quality risk and driver hazards constitute BMP failure and require immediate sufficient action.
- Light tracking is expected and requires regular maintenance but not usually immediate action. Light tracking is defined as minor residual dirt that can't be picked up by a square nose shovel.
    - Remove/sweep prior to unsafe and wet conditions or end of workday, whichever is first.

REFERENCE:

- CGP 2.2.4, 5.1, 5.2.1
- CPP 2.4.1

BMP 29- Parking Pad & Supplier Access



APPLICATION

- Use a parking pad for supply delivery vehicles, tool drop off and onsite project parking etc.
- Use this BMP to *prevent* mud from sticking to tires. This BMP will not remove mud sticking to tires.

INSTALLATION/USE PROCEDURES

- Determine where supplies and tools need to be delivered or dropped off and show the delivery area on the site plan. Coordinate with oversight authority for any prohibited access locations.
- Do not drive beyond the parking pad.
- Size pad to accommodate project supply vehicles and any necessary onsite parking. Attach illustration of specific dimensions for the parking pad and gravel/rock specific to the project needs with this BMP detail.
- Ensure the workforce is trained regarding proper use and maintenance of the parking/delivery pad.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Refresh parking/access pad as necessary when BMP is not effective at preventing mud from sticking to tires.
- Add, extend or replace rock as necessary to achieve performance criteria results.
- Train workforce when BMP improper use is recognized.

- When sediment, rock, or gravel track out occurs due to BMP failure or misuse, debris must be removed from roadways according to the CGP criteria.
    - Street clean-up operations are separate from this Parking Pad BMP, but necessary to address unacceptable track out that may occur.

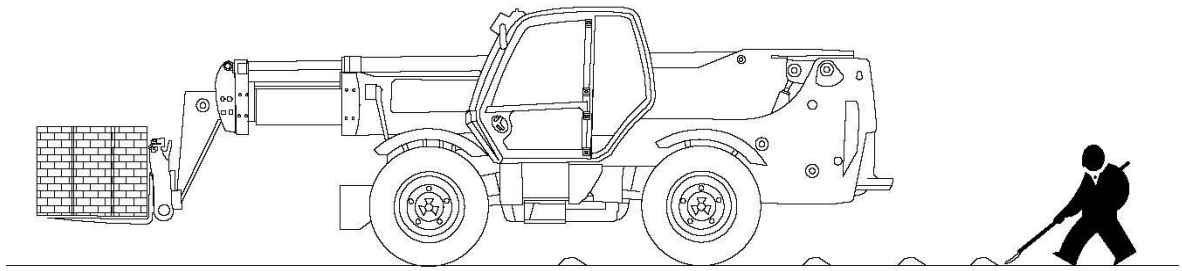
PERFORMANCE

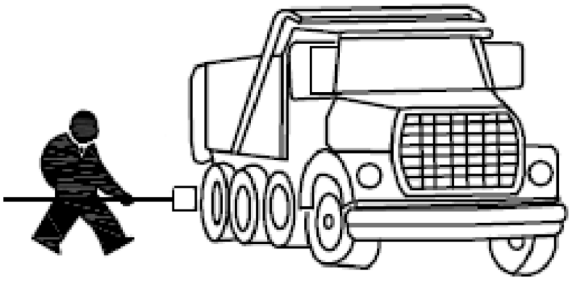
- The parking pad and supplier access gravel pad is expected to reduce vehicle contact with exposed sediment on site.
- In addition, it also acts as a visual marker for suppliers to know where to make deliveries, increasing work site operation efficiency.
- Slick conditions, slurry, mud chucks, rocks, gravel, water quality risk and driver hazards constitute BMP failure and require immediate sufficient action.

REFERENCE:

- CGP 2.2.4, 5.1, 5.2.1
- CPP 2.4.1

BMP 30- Manual Mud Removal





APPLICATION

- Use this BMP when vehicles and equipment operations require egress from the project property during wet conditions resulting in mud sticking to vehicle tires and tracks.
- Use this BMP when non-regular egress is necessary or using the primary track out BMP is not practical for an unusual situation.
- Use this BMP as a redundant BMP when the primary track out BMP(s) is not working.
- Use this BMP for short transfer of vehicles for short distances, e.g. across the street.

INSTALLATION/USE PROCEDURES

- Stop before exiting the site and use a square nose shovel or stiff broom to remove mud from tires and remove mud tracks when applicable.
    - When manually removing mud on pavement, shovel and sweep with each track out occurrence and always perform this BMP when incidents are upstream of inlets.
- Check for and remove rocks wedged in dual tires.
- Ensure the workforce is trained regarding mud removal and clean up of trackout BMP requirements.
- Use of Sweeping BMP is still usually necessary at the end of day minimum.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- When removing mud from tires or tracks on pavement sweep prior to wet conditions or end of day, whichever comes first.
- Train workforce when BMP improper use is recognized.
- When sediment, rock, or gravel track out occurs due to BMP failure or misuse, debris must be removed from roadways according to the CGP criteria.
    - Street clean-up operations are separate from this Manual Mud Removal BMP, but necessary to address unacceptable track out that may occur.

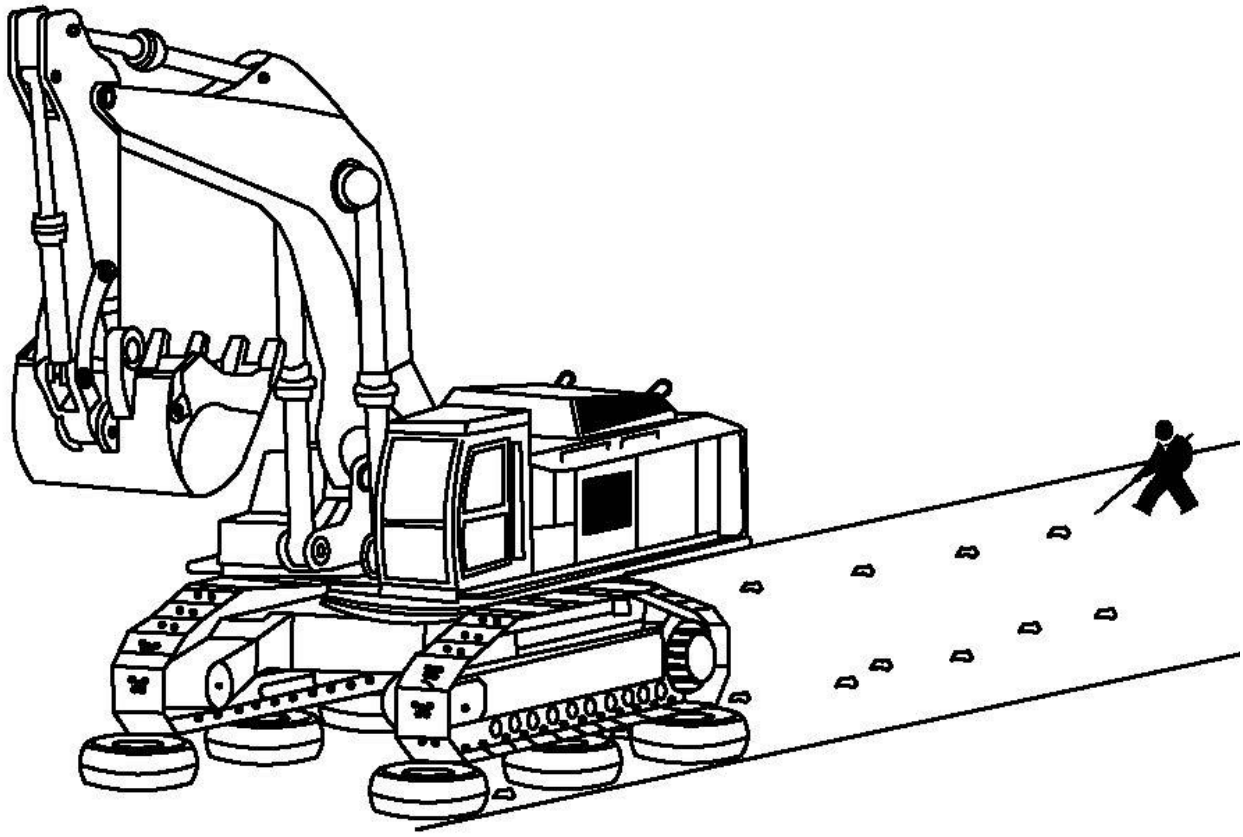
PERFORMANCE:

- Slick conditions, slurry, mud chucks, rocks, gravel, water quality risk and driver hazards constitute BMP failure and require immediate sufficient action.
- Light tracking is expected and requires regular maintenance but not usually immediate action. Light tracking is defined as minor residual dirt that can't be picked up by a square nose shovel.
    - Remove/sweep prior to unsafe and wet conditions or end of workday, whichever is first.

REFERENCE:

- CGP 2.2.4, 5.1, 5.2.1
- CPP 2.4.1

BMP 31- Track Vehicle Crossing



APPLICATION

- Use when track vehicle road crossing for multiple project sites is planned.
- It is not practical to remove mud from most tracked construction equipment. Even track washing is usually impractical.

INSTALLATION/USE PROCEDURES

- When road crossings are short distances, remove clumps with a square nose shovel and broom at each crossing. The clumps will be compacted to the road reducing vacuum sweeper effectiveness.
- When distant crossings are necessary, scraping or track washing BMPs are usually necessary. A machinery bucket blade can also work but follow up with a vacuum operated sweeper is also necessary.
- Protect roadway infrastructure from vehicle tracks. Placing tires beneath tracks is usually effective. Decide the track buffer method and attach your plan to this BMP.
- Ensure the workforce is trained regarding track-out BMP requirements.
- Use of Sweeping BMP is still usually necessary at the end of day minimum.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Regular sweeping is usually necessary daily. Shovels are intended to remove the dirt/mud clumps but will not move residual slurry that collects over multiple days.
- Train workforce when BMP improper use is recognized.
- When sediment, rock, or gravel track out occurs due to BMP failure or misuse, debris must be removed from roadways according to the CGP criteria.
    - Street clean-up operations are separate from this Track Vehicle Crossing BMP, but necessary to address unacceptable track out that may occur.

PERFORMANCE

- Slick conditions, slurry, mud chucks, rocks, gravel, water quality risk and driver hazards constitute BMP failure and require immediate sufficient action.
- Light tracking is expected and requires regular maintenance but not usually immediate action. Light tracking is defined as minor residual dirt that can't be picked up by a square nose shovel.
    - Remove/sweep prior to unsafe and wet conditions or end of workday, whichever is first.

REFERENCE

- CGP 2.2.4, 5.1, 5.2.1
- CPP 2.4.1

BMP 32- Street Sweeping

APPLICATION

- A Sweeping BMP is necessary to address the immediate safety, water quality and complaint issues that exist resulting from vehicle track out.
- Sweeping BMPs do not eliminate the requirement for egress track out BMPs, but are necessary to compensate for the practical limitations of most egress track out BMPs.

INSTALLATION/USE PROCEDURES

- Use vacuum type sweeping machinery.
- Anticipate end of day sweeping or multiple times a day as needed. The better the egress track out BMP the less sweeping operations are necessary.
- A Square nose shovel and broom are also always a good roadway sediment and debris removal option.
- Identify the sweeper hopper licensed dump location. Attach dump location information to this BMP.
- Ensure the workforce is trained regarding track-out BMP requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Employ sweeping operations at the end of the workday and as necessary.
- Train workforce when BMP improper use is recognized.

PERFORMANCE:

- Slick conditions, slurry, mud chucks, rocks, gravel, water quality risk and driver hazards constitute BMP failure and require immediate sufficient action.
- Light tracking is expected and requires regular maintenance but not usually immediate action. Light tracking is defined as minor residual dirt that can't be picked up by a square nose shovel.
    - Remove/sweep prior to unsafe and wet conditions or end of workday, whichever is first.

REFERENCE:

- CGP 2.2.4, 5.1, 5.2.1
- CPP 2.4.1

BMP 33- Fugitive Dust Control Plan

APPLICATION

- Dust control applies to any bare earth on the project that is at risk of being picked up by wind erosion.
- Dust suppression is necessary for all areas where vegetation is removed.
- A good BMP for dust management is to minimize and phase vegetation removal. See Phase Clearing BMP.

INSTALLATION/USE PROCEDURES

- Attach a copy of the Fugitive Dust Control Plan and DAQ permit information
- Attach a copy of the Dust Control Plan Tools and details for suppression, including but not limited to equipment information, methods, and responsible party (inhouse or subcontracted)
- Attach a list of all dust generating operations, including but not limited to; vehicle traffic, dirt processing, load and haul, brick mason operations, etc.
- Ensure the workforce is trained regarding track-out BMP requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Implement Fugitive Dust Control plan per DAQ permit.
- Train workforce when BMP improper use is recognized.

PERFORMANCE:

- UAC section R307-309-5. Typically this means no greater than 10% opacity at property boundaries.
- Any neighbor complaints warrants reevaluation of the effectiveness of the dust control plan and/or an inspection by the oversight authority.

REFERENCE:

- UAC section R307-309-5
- CGP 2.2.6
- CPP 2.2.6

BMP 34 - Vegetation Removal Phasing

APPLICATION

- Erosion and dust suppression is necessary for all areas where vegetation is removed.
- Apply vegetation removal management to minimize dust and erosion risk. Many large projects can benefit from this BMP.

INSTALLATION/USE PROCEDURES

- Attach a copy of phasing maps showing no disturbance areas for each phase. A vegetated buffer can also be utilized to provide erosion control along the outskirts of the project area.
- Ensure the workforce are informed regarding no disturbance areas.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Train workforce when encroachment into no disturbance areas are found. Update no disturbance maps and SWPPP document as relevant.
- Address encroachment exposures and add or amend BMPs to compensate for the exposure as necessary.

PERFORMANCE:

- Encroachment of no disturbance phasing plan areas constitutes BMP non-compliance.

REFERENCE:

- UAC section R307-309-5
- CGP 2.2.2, 2.2.9, 2.2.6, 7.3.2.f
- CPP 2.2.14

BMP 35 - Final Stabilization

APPLICATION

- Construction projects considered completed that will have bare, unimproved, erodible surfaces
- Projects with temporary exposed surfaces exceeding the CGP cover and time limits.
- A Final Stabilization Plan is necessary for all projects. The final stabilization CGP goal is when the final landscape plan achieves surface stabilization of 70% uniformly distributed cover by either finish grade mulch or established vegetation.

INSTALLATION/USE PROCEDURES

- Attach a copy of the final landscaping plan, including but not limited to vegetation establishment periods.
- Attach a copy temporary vegetation, including but not limited to temporary seed plan, chemical treatment of erodible surfaces, erosion control blankets, etc,
- Provide a list of all the SWPPP erosion, operation and fugitive dust BMPs that must remain in place through the final stabilization installation and establishment period.
- Ensure the workforce is informed of the final stabilization BMP requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is expected to submit a site specific final stabilization plan attached to this BMP. This may include: Proprietary system literature, illustrations, any operation procedures and maintenance required to achieve storm water pollution prevention and final stabilization.

MAINTENANCE/MANAGEMENT

- Ensure all other SWPPP containment BMPs are installed, maintained and inspected throughout the installation of the final landscaping infrastructure and vegetation establishment period.
- Train workforce when final stabilization plan and site BMP non-containment is recognized.

PERFORMANCE:

A Final Stabilization Plan is not effective when any of the following occurs:

- Erosion occurs beyond the disturbance boundary or sediment is leaving the site.
- A pollutant risk to water quality is present.
- Fugitive dust opacity exceeds DAQ Permit requirements which is usually opacity exceeding 10% at the property boundary.
- Any neighbor complaints warrants an inspection.

REFERENCE:

- UAC section R307-309-5
- CGP 2.2.6, 2.2.14, 2.2.14.a, 7.3.5.b
- CPP 2.2.14, 8.2.1

BMP 36 - Stockpile Management

APPLICATION

- Projects where topsoil is stripped and will be reused at a later phase
- Projects where any natural materials must be stored on site for use throughout the project
- Projects which have an offsite stockpile area

INSTALLATION/USE PROCEDURES

- Provide staging/storage area location(s) on the BMP map.
- For offsite storage yard or stockpiles that are used in conjunction with the project, include appropriate storm water pollution prevention controls and BMPs in the SWPPP and show the location on the site map
- Provide stockpile toe BMP when sediment is not adequately contained by other boundary BMPs. Reference other boundary BMPs managing the stockpile exposure risk.
- Ensure the workforce is informed of stockpile management requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Ensure all other sediment control BMPs are installed, maintained and inspected throughout storage, staging, and topsoil redistribution operations.
- Train workforce when non-containment is recognized.
- If stockpile is not being actively used, cover it and/or provide containment so that runoff cannot enter sensitive areas, waters of the state, or storm water conveyances.

PERFORMANCE:

Successful stockpile management occurs when:

- Storage areas are noted on the SWPPP documentation and are up to date
- Stockpiles are covered and/or contained with little to no contaminated runoff leaving the area

REFERENCE:

- CGP 2.2.8 7.3.3
- CPP 2.2.5, 7.3.3, 2.2.14

BMP 37 - Construction Dewatering Retention

APPLICATION

- Project where waterline system commissioning is necessary
- A DEQ Dewatering permit is not required when full retention is provided onsite. Note, groundwater warranted dewatering operations usually do not qualify for a DEQ Dewatering Permit waiver. The exposure period and amount of groundwater results in uncertain volume calculations.

INSTALLATION/USE PROCEDURES

- Provide a retention location on BMP map.
- Provide a simple detail of retention pond and operation volume necessary for full retention of anticipated dewatering volume. Attached copy of volume calculations to this BMP.
- Ensure the workforce is informed of the CGP dewatering BMP requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Inspect following dewatering operation and ensure volume exists for any subsequent dewatering operations.
- Train workforce when non-containment is recognized.

PERFORMANCE:

- Any uncontained dewatering volume constitutes BMP failure.

REFERENCE:

- CGP 1.2.2, 1.2.4, 2.3.7, 7.3.4
- CPP 1.2.4, 2.2.7

BMP 38 - Construction Dewatering Water Truck

APPLICATION

- Project where waterline system commissioning is necessary
- A DEQ Dewatering permit is not required when dispersing water onsite. Note, groundwater warranted dewatering operations usually do not qualify for a DEQ Dewatering Permit waiver. The exposure period and amount of groundwater results in uncertain volume calculations.

INSTALLATION/USE PROCEDURE

- Pump hyperchlorinated water to water truck and use for dust suppression. Attach operation details.
- Show dispersal areas on BMP site map. Not allowed on impervious surfaces are directly connected to inlets or other waterways
- Ensure the workforce is informed of the CGP dewatering BMP requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Train workforce when non-containment is recognized.

PERFORMANCE:

- Any uncontained dewatering volume constitutes BMP failure.

REFERENCE:

- CGP 1.2.2, 1.2.4, 2.3.7, 7.3.4
- CPP 1.2.4, 2.3.7

BMP 39 - Construction Dewatering DEQ Permit Required

APPLICATION

- Projects where groundwater is anticipated or other dewatering operation volumes would exceed available space for onsite retention.
- Project where pressure system and waterline commissioning is necessary
- Projects where groundwater warranted dewatering operations are anticipated.

OPERATION PROCEDURE

- Provide dewatering operation location(s) on BMP map.
- Attach a copy of the DEQ Dewatering Permit to this BMP.
- Attach a copy of all permit required inspection, monitoring requirements, operator prepared BMPs or proprietary systems and chemical treatment methods.
- Ensure the workforce is informed of the DEQ permit dewatering BMP requirements.

OPERATOR BMP MODIFICATION OR REPLACEMENT

- Operator is invited to propose an alternative BMP or modify this preferred BMP. The proposed BMP must match or exceed performance requirements as this preferred BMP. Any deviations from this preferred BMP must be reviewed and accepted by the oversight authority.
- Submit BMP modifications or replacements to the oversight authority for review; including but not limited to; Proprietary system literature, modified illustrations, any operation procedures and maintenance adjustments, etc.

MAINTENANCE/MANAGEMENT

- Ensure proprietary system, inspection, monitoring maintenance and application methods are followed.
- Train workforce when non-containment is recognized.

PERFORMANCE:

- Any uncontained dewatering volume constitutes BMP failure.
- Any DEQ Dewatering Permit non-compliance.

REFERENCE:

- CGP 1.2.2, 1.2.4, 2.3.7, 7.3.4
- CPP 2.2.3

KAYSVILLE CITY

DEVELOPMENT CODE

TECHNICAL SPECIFICATIONS AND STANDARD DRAWINGS FOR ALL DEVELOPMENT AND CONSTRUCTION

SECONDARY WATER SPECIFICATION REFERENCES

July 2020

DIVISION 1

GENERAL IMPROVEMENT REQUIREMENTS

1.01 SCOPE OF WORK:

This Division defines the general requirements for improvements to be built by the Developer or Subdivider or Contractror ("Developer").

The improvements shall include all street improvements in front of all lots and along all dedicated streets to a connection with existing improvements of the same kind. Layout must provide for future extension to adjacent development and to be compatible with the contour of the ground for proper drainage. All water lines, sewer lines, power lines, secondary water lines, and any other buried conduit shall be installed to the boundary lines of the development.

1.02 CONSTRUCTION DRAWINGS:

Complete and detailed construction plans and drawings of all improvements shall be submitted to the City for review and approval prior to receiving final plat approval from the City. No construction shall be started until plans have been checked and approved by all responsible parties.

1.03 STANDARDS FOR CONSTRUCTION DRAWINGS:

The following instructions are for the purpose of standardizing the preparation of drawings to obtain uniformity in appearance, clarity, size, and style.

These plans and designs shall meet the standards defined in the specifications and drawings hereinafter outlined. The minimum information required on drawings for improvements are as follows:

All drawings and/or prints shall be clear and legible and conform to accepted engineering and drafting practices on a computer aided drafting program. Size of drawings shall be 22" x 34" with a 1-inch border on all sides.

A. In general, the following shall be included on drawings:

(1) North Arrow (plan)
(2) Scale and elevations referenced to State Plane datum
(3) Stationing and elevations for profiles
(4) Title block, located in lower right corner of sheet to include:
    i. Name of City
    ii. Project Title (subdivision, etc.)
    iii. Specific type and location of work
    iv. Space for approval signature of City Engineer and date
    v. Name of engineer or firm preparing drawings with license number, stamp and signature

B. Curb and gutter, drains and drainage structures, sidewalks and street surfacing drawings shall show:

(1) Scale: No smaller than 1" = 50' horizontal and 1" = 5' vertical
(2) Both plan view and profiles must be shown for each side of the street; street centerline profile must be shown
(3) Stationing and top of curb elevations with curve data must be shown
(4) Flow direction and type of cross drainage structures at intersections with adequate flow line elevations
(5) Bench Mark (B.M.) location and elevation (use State Plane datum)
(6) Typical cross section for all street sizes and variations including pavement structure detail (thickness of granular subbase, base course, and asphalt surface course)

C. Where applicable, Storm Water Pollution Prevention Plans (SWPPP) shall be required. The plan shall meet State criteria and show Best Management Practices (BMPs) that will be used for the construction project. The SWPPP shall be reviewed and approved by the Storm Water Official prior to work commencing.

D. Sewer drawings shall conform to the applicable Sewer District Standards and show:

(1) Scale: No smaller than 1" = 50' horizontal and 1" = 5' vertical (may be shown on street or utility drawings)
(2) Location, size, and slope of mains
(3) Manhole size, location, and flow line elevation
(4) Type of pipe
(5) Bench Mark (B.M.) location and elevation (use State Plane datum)
(6) An overall development plan view of the sewer (horizontal scale 1" = 100')

E. Culinary water drawings shall show:

(1) Scale: 1" = 100' horizontal; an overall development plan view
(2) Size and location of water mains, valves, hydrants, and any other culinary water structure
(3) Type of pipe

F. Each set of plans shall be accompanied by a separate sheet of details for structures which are to be constructed. All structures shall be designed in accordance with minimum requirements established by Kaysville City Development Standards.

(1) Drawing size: 22" x 34" (trim line)
(2) Scale of each detail

(3) Title block, lower right hand corner (same format on all sheets) including the name of the development
(4) Completely dimensioned and described

Six copies of the construction plans shall be submitted to the City. One copy will be stamped as "Approved" and returned to the Developer. This approved set shall be kept available at the construction site at all times. A reproducible and electronic copy of all drawings shall be submitted to the City at the time of the Preconstruction Conference. A reproducible and electronic copy of all drawings containing all "as constructed" information and a list detailing the location of all service laterals shall also be submitted to the City prior to the issuance of building permits.

1.04 PRECONSTRUCTION CONFERENCE:

A preconstruction conference shall be held before any excavation or other work is begun in the development. The meeting will be held at a time and location to be set by Kaysville City and will include: (a) City Engineer; (b) Developer; (c) development engineer; (d) all contractors and subcontractors involved with installing the development improvements; (e) a representative of Kaysville City Public Works and Power Departments; (f) a representative from Central Davis Sewer District; (g) a representative from Davis County Flood Control, where applicable; (h) representatives of utility companies including pressure irrigation, natural gas, telephone, and cable TV; and (i) a SWPPP Inspector.

The Developer shall give 5-days notice of when they will be ready for a Preconstruction Conference. Items pertaining to the construction and inspection of the development improvements will be discussed. Once work starts, an approved set of plans must be on site at all times.

1.05 PERMISSIBLE MATERIALS:

Permissible materials for use in constructing required improvements and related sections in the Technical Specifications are as follows:

A. Water Lines
(1) C-900 PVC Pipe (Division 4a)
(2) High Density Polyethylene Pipe (Division 4b), when specifically approved by the City Engineer.

B. Water Laterals/Services
(1) Copper Pipe (Division 4d)
(2) Poly Pipe Schedule 40
(3) Service Saddles (Division 4d)

C. Sanitary Sewer Line – As required by the applicable Sewer District (either Central Davis Sewer District "CDSD" or North Davis Sewer District "NDSD").

D. Sanitary Sewer Laterals – As required by CDSD or NDSD.

E. Storm Drain – Minimum 15-inch diameter, unless otherwise approved by the City Engineer
   (1) Reinforced Concrete Pipe (RCP) (Division 3a)
   (2) Double Wall Polyethylene Pipe (Division 3c), when specifically approved by the City Engineer.
   (3) High Density Polyethylene Pipe (Division 4b), when specifically approved by the City Engineer.

F. Gravity Flow Irrigation Lines
   (1) Concrete Pipe (Division 3a)
   (2) Double Wall Polyethylene Pipe (Division 3c), when specifically approved by the City Engineer.
   (3) High Density Polyethylene Pipe (Division 4b), when specifically approved by the City Engineer.

G. Subsurface Drain Lines – are generally tight joint pipe and shall be open jointed and/or perforated only when specifically approved by the City Engineer.
   (1) Concrete Pipe (Division 3a)
   (2) Perforated PVC (Division 3b)
   (3) Perforated Polyethylene (Division 3c)

H. Culinary Water Appurtenances–
   (1) Water Meter Boxes and Lids
      i. Concrete Boxes (Division 4d), when specifically approved by the City Engineer.
      ii. Double Wall Polyethylene (Division 4d)
      iii. Cast Iron Lids (Division 4d)
   (2) Water Valves (Division 4c)
   (3) Fire Hydrants (Division 4c)

I. Secondary Water – As required by the applicable service provider.

1.06 INSPECTION:

All construction work involving the installation of improvements in development shall be subject to inspection by the City. It shall be the responsibility of the person responsible for construction to insure that inspections take place where and when required. Certain types of construction shall have continuous inspection, while others may have only periodic inspections.

A. Continuous inspection shall be required on the following types of work:
   (1) Laying of street asphalt surfacing
   (2) Placing of concrete for curb and gutter, sidewalks, and other structures

(3) Laying of sewer pipe, drainage pipe, water pipe, valves, hydrants and testing

B. Periodic inspections shall be required on the following:
(1) Street grading and gravel base
(2) Excavations for curb and gutter and sidewalks
(3) Trenches for laying pipe
(4) Forms for curb and gutter, sidewalks, and structures

On construction requiring continuous inspection, no work shall be done except in the presence or by permission of the City Public Works (PW) Inspector, or the applicable utilities inspector.

1.07 REQUESTS FOR INSPECTION:

Requests for inspections shall be made to the City by the person responsible for the construction. Requests for inspection on work requiring continuous inspection shall be made 3-working days prior to the start of work needing inspection. Notice shall also be given 24-hours in advance of the starting of work requiring periodic inspection.

1.08 CONSTRUCTION COMPLETION INSPECTIONS:

A written inspection request shall be made by email or letter to the PW Inspector, after the necessary construction work is completed before building permits can be issued. Any defective work or work that does not comply with the applicable standards shall be corrected by the Developer within a period of 35-days from the date on punch list. If items are found to still be incomplete, there will be a $50.00 inspection fee charged to the Developer for the 2nd inspection and for every inspection thereafter.

Requests for inspection shall be made 3-working days prior to the needed inspection. Inspections shall require that all snow, ice or other visual obstructions be removed by the Developer from inspected items and surfaces before the inspection.

1.09 GUARANTEE OF WORK:

The Developer shall warrant and guarantee (and post bond in the amount of 10% of the estimated cost of improvements as approved by Kaysville City at the time of final approval) that the improvements provided for in the Subdivision Ordinance, and every part thereof, will remain in good condition during the warranty period. The Developer shall also make all repairs to and maintain the improvements and every part thereof in good condition during that time with no cost to the City. The guarantee hereby stipulated shall extend to and include, but shall not be limited to, the entire street base and all pipes, joints, valves, backfill and compaction, as well as the working surface, curbs, gutters, sidewalks, and other accessories that are or may be affected by the construction operations.

No more than 30 days before the conclusion of the warranty period, a written inspection request shall be made by email or letter to the PW Inspector. A punch list shall be generated and

delivered to the Developer listing any defective work or work that does not comply with the applicable standards. These items shall be corrected by the Developer, and a request for verification of punch list completion shall be made, via email or writing, to the PW Inspector. If items are found to still be incomplete, there will be a $50.00 inspection fee charged to the Developer for the 2nd inspection and for every inspection thereafter.

If the Developer fails to do so within 15-days from the date of the service of such notice, the City Engineer may have such repairs made, and the cost of such repairs shall be paid by the Developer, together with 25% in addition thereto, as and for stipulated damages for such failure on the part of the Developer to make the repairs.

In order to receive final acceptance of improvements, the following criteria must be met:

A. Completion of end of warranty period punch list items.
B. PW inspector or their designee shall get signed approval from utility companies. This includes, but not limited to, Public Works, Power, CDSD or NDSD, the secondary water provider, and Davis County Flood Control.
C. Notice of Termination (NOT) for Storm Water Pollution Prevention Plan (SWPPP) at the end of the warranty period.
D. Conclusion of the one (1) year warranty period.

1.10 DEVELOPMENT SAFETY:

It shall be the responsibility of the Developer and/or his development representative to maintain and enforce all Federal, State, and Local safety codes involved with the development.

DIVISION 2a

TRENCH EXCAVATION AND BACKFILL

2a.01 GENERAL:

This Division covers the requirements for trenching and backfilling for underground utilities. Unless otherwise directed by the City Engineer, pipe shall be laid in an open trench. All incidental clearing, preliminary grading, structure removal, and benching shall be considered a part of the trenching operation.

2a.02 BARRICADES:

It is the Developer's responsibility to submit a traffic control plan to the City for approval at least 48-hours prior to digging, and shall not commence until City approval is received. Barriers shall be placed at each end of all excavations and at such places as may be necessary along excavations to warn all pedestrians and vehicular traffic of such excavations. Warning signs shall also be installed placed on both sides of overhead lines to warn workers, operators, truck drivers etc. of potential dangers. Lights or reflective barricades shall also be placed along excavations from one hour before sunset each day to one hour after sunrise of the next day until such excavations are entirely refilled, compacted, and surfaced or final graded. All excavations shall be barricaded in such a manner as to prevent persons from falling, walking, or otherwise entering any excavation in any street, roadway, parking lot, or any other area, public or private. Impacted residents, businesses or other parties shall be contacted no less than 24-hours prior to excavations that will impact utilities at or access to those properties.

2a.03 BLASTING:

Blasting will not be allowed except by permission from the City Engineer. The Developer shall comply with all laws, ordinances, and applicable safety code requirements and regulations relative to the handling, storage, and use of explosives and protection of life and property, and it shall be fully responsible for all damage attributable to its blasting operations. Excessive blasting or overshooting will not be permitted, and any material outside the authorized cross section which may be shattered or loosened by blasting shall be removed by the Developer.

2a.04 SHEETING, BRACING AND SHORING OF EXCAVATIONS:

Excavations shall be sheeted, braced, and shored as required to support the walls of the excavations, to eliminate sliding and settling and as may be required to protect the workmen, the work in progress, and existing utilities, structures and improvements. All such sheeting, bracing, and shoring shall comply with the requirements of the Utah Labor Commission, Occupational Safety and Health Act (OSHA), and accident prevention and safety provisions of the contract.

The Developer shall be fully responsible for the adequacy of methods and materials used in trench sheeting, bracing, shoring, and/or other systems provided to protect workmen. Injury to or

death of workmen resulting from inadequate trench safety measures shall be the full and complete responsibility of the Developer.

All damages resulting from lack of adequate sheeting, bracing, and shoring shall be the responsibility of the Developer, and the Developer shall affect all necessary repairs or reconstruction at its own expense resulting from such damage.

Sheeting or shoring that does not extend below the centerline of the pipe may be removed at the discretion and responsibility of the Developer after the trench backfill has been placed and compacted to a level 12-inches above the top of the pipe. Following removal of the sheeting or bracing, the trench shall be immediately backfilled and compacted or consolidated.

2a.05 CONTROL OF GROUNDWATER:

All trenches shall be kept free from water during excavation, fine grading, pipe laying and jointing, and pipe embedment operations. Where the trench bottom is mucky or otherwise unstable because of the presence of groundwater, and in all cases where the static groundwater is above the bottom of any trench or bell hole excavation, such groundwater shall be lowered to the extent necessary to keep the trench free from water and the trench bottom stable when the work within the trench is in progress. The discharge from excavation dewatering shall be conducted to natural drainage channels, gutters, or storm drains, in accordance with applicable water quality regulations and requirements. No sanitary sewer shall be used for disposal of trench water. If any evidence of contamination in the water based on olfactory or visual indication, cease excavation work until potential risks are evaluated. During evaluation, handle water as a contaminated material. Surface water shall be prevented from entering trenches.

2a.06 TRENCH EXCAVATION

Excavation for pipelines shall follow the line and grade shown on the approved plans. Trenches shall be excavated to the depths and widths required to accommodate construction of the pipelines, as follows:

A. Authorized Over-Excavation:

Excavation for trenches in ledge rock, cobble rock, stones, or other material unsatisfactory for pipe foundation shall extend to a depth of at least 6-inches below the bottom of the pipe. Where unstable earth or muck is encountered in the excavation at the grade of the pipe, a minimum of 12-inches below grade will be removed. Such over-excavation and placing imported special foundation material shall not be made except as directed by the City Engineer or their designee. Over-excavations not ordered, specified, or shown shall be handled the same as unauthorized over-excavation.

B. Unauthorized Over-Excavation:

Where any unauthorized excavation is carried below the elevation required to install the pipe to the grade shown on the plans, specified in these specifications or directed by the City Engineer, the excavation shall be backfilled in accordance with these specifications for "Imported Granular Material" and "Gravel Foundation for Pipelines and Pipeline Structures," all at the Developer's expense.

C. Trench Width:

The trench shall be excavated such that the pipe is always centered in the trench. The clear trench width at the horizontal diameter of the pipe must be equal to 18-inches on either side. If a trench is excavated to a greater width, the Developer will be required to restore the trench to an acceptable condition by following the steps outlined in these specifications for "Trenches in Embankments."

Trench width for pipeline structures, valves, or other accessories shall be sufficient to leave at least 12-inches clear between their outer surfaces and the trench. Backfill with native soil or excavated spoils under structures, pipes or valves will not be permitted. Any unauthorized excess excavation below the elevation indicated for foundation of any structures shall be backfilled in accordance with these specifications for "Imported Granular Materials," and "Gravel Foundation Pipelines and Pipeline Structures," all at the Developer's expense.

D. Trenches in Embankments:

Before laying pipes that are to be in fill or embankment areas, the embankment shall first be placed and compacted to the specified density to a depth of not less than 2-feet above the top of the proposed pipe. After placing and compacting the embankment, the trench for the pipe or conduit shall be excavated through the fill and fine graded and the pipe installed as specified.

E. Placement of Excavated Material:

All excess excavated material not fit for use in construction shall be hauled away from the construction site and disposed of in an area obtained by the Developer. The Developer shall be responsible for all rights-of-way, easements, and access associated with the disposal of excess excavated material. It shall further be responsible to obtain permission from the property owner or person(s) controlling the property where the Developer plans to dispose of excavated material.

Otherwise, excavated material shall be piled in a manner that will not endanger the work, will avoid obstructing sidewalks, driveways and streets and will comply with all applicable water quality rules and regulations. Gutters and irrigation ditches shall allow for street drainage and continuity of irrigation.

Grading of the area surrounding the trenches, including excavated materials, shall be performed as necessary to prevent surface water from flowing into trenches, or other excavations. Control of groundwater shall be as specified herein.

F. Fine Grading the Trench Bottom:

The bottom of the Trench shall be accurately graded and prepared to provide uniform bearing and support on undisturbed soil or compacted gravel foundation at every point along the entire length of the pipe. Bell holes shall be hand excavated after the trench bottom has been fine graded. Bell holes shall be only large enough to permit making the joints and to assure that the pipe is not supported by any portion of the joint or bell.

2a.07 TRENCH BACKFILL

A. Imported Granular Material:

(1) General. When the excavated materials are not satisfactory for pipe foundation, pipe bedding or backfill, as determined by the Engineer, the Developer shall provide imported granular material. Imported granular material for foundation, bedding and backfill shall be cleaned, crushed rock or gravel free from sod, vegetation and other organic or deleterious material. Slag will not be allowed in the pipe zone.

(2) Gradation. Imported granular material shall conform to the following gradation specifications:

i. Gravel Foundation Material:
100% passing a 1-inch screen and 5% passing a ½-inch screen.

ii. Gravel Bedding Material:
Ductile Iron or concrete pipe – 100% percent passing a 1-inch screen and 5% passing a No. 4 sieve.

iii. PVC or polyethylene pipe:
100% passing a ¾-inch screen and 5% passing a No. 4 sieve.

iv. Copper tubing:
100% passing a ¾-inch screen and 5% passing a No. 4 sieve.

v. Gravel Backfill Material:
100% passing a 3-inch square sieve and 15% passing a 200 mesh sieve.

B. Gravel Foundation for Pipe and Pipeline Structures:

The Gravel foundation is defined as fill material below the bottom of the pipe, pipeline structure or accessory. Wherever the trench is excavated below the subgrade for the pipe, pipeline structure, or accessory the subgrade shall be replaced with crushed rock or gravel to an elevation sufficiently above the bottom of the pipe so that the trench can be properly fine graded as specified and the pipe will be true to line and grade. The gravel material shall be deposited over the entire trench width in layers. The layers shall have a maximum un-compacted thickness of 6-inches. The gravel material is to be compacted using vibratory equipment to 96% of the maximum index density of the material as determined by ASTM D4253 (Relative Density Test).

The material shall then be fine graded in accordance with the specification for Fine Grading herein.

C. Pipe Bedding:

Pipe bedding is fill material in the pipe zone. The pipe zone is defined as the area from the bottom of the pipe to 12-inches above the top of the pipe, or any area within 12-inches of any pipe, pipeline structure or accessory.

Excavated materials consisting of loose earth, sand or gravel having no material larger than 2-inches in any dimension, no greater than 1-inch in any dimension for PVC pipe or no greater than ½-inch for copper tubing may be considered for use as pipe bedding material. The City Engineer, or their designee, shall qualify excavated material for use as bedding.

If the excavated materials are not satisfactory, imported granular material as specified herein shall be used for pipe bedding. When gravel is used around pipe bedding, the Developer must place a fabric over gravel layer to keep fines from washing into gravel, creating a void. Fabric must be at least a 200-pound tensile strength woven ground stabilization fabric (in

accordance with AASHTO M 288) and shall be installed on top of gravel prior to sand or road base placement.

After the pipe is in place, bedding material shall be placed at any point below the mid-point of the pipe simultaneously and uniformly on both sides of the pipe in uncompacted layers not to exceed 10-inches or 1/2 the diameter of the pipe, whichever is less. Bedding material shall be placed with care to prevent displacement of or damage to the pipe during the bedding process, with each10-inch lift then compacted. Material shall be scattered alongside the pipe and not dropped into the trench in compact masses.

That section of the pipe zone from the mid-point of the pipe to 12-inches above the top of the pipe shall then be filled with bedding materials and compacted to the density required in these specifications for backfill in this section of the trench.

D. Trench Backfill:

The trench shall be backfilled from 12-inches above the top of the pipe to the natural surface level or the finished grade specified on the approved drawings. Excavated materials consisting of good sound earth, sand, and gravel may be used for backfill. No oil cake, asphalt, concrete, rocky, clay or other lumpy material may be used in the backfill. Perishable or spongy material shall not be used in backfilling. The City Engineer, or their designee, shall qualify excavated material for use as backfill.

Under pavements, shoulders or other surface improvements, the in-place density shall be a minimum of 96% of laboratory standard maximum dry density as determined by AASHTO T-180 (ASTM D1557). In shoulders and other areas the in-place density shall be a minimum of 90% of the maximum dry density as determined by AASHTO T-180 (ASTM D1557). The backfill in the trenches shall be either compacted or consolidated according to the requirements of the materials being placed.

Density and compaction testing shall be done at a frequency of one test per 200-feet of trench length.

E. Compaction of Backfill:

Backfill shall be compacted by means of sheepsfoot rollers, pneumatic tire rollers, vibrating rollers, or mechanical tampers. Where compaction methods are used, the material shall be placed at a moisture content and un-compacted lift thickness such that after compaction the required relative densities will be produced. In no event will the material be placed in lifts which, prior to compaction, exceed 12-inches.

Prior to compaction each layer shall be evenly spread, moistened, and worked by disk harrowing or other equivalent means.

If the required relative density is not attained, test sections will be required to determine any adjustments in compaction equipment, thickness of layers, moisture content, and compactive effort necessary to attain the specified minimum relative density.

Approval of equipment, thickness of layers, moisture content, and compactive effort shall not be deemed to relieve the Developer of the responsibility for attaining the specified minimum relative densities. The Developer, in planning its work, shall allow sufficient time to perform the work connected with test sections and to permit the City Engineer or their designee to make tests for relative densities.

F. Consolidation of Backfill:

Consolidation of backfill, when authorized by the City Engineer, shall be accomplished by those methods in which water is used as the essential agent to produce the desired condition of density and stability. Water shall be applied by jetting unless flooding is specifically authorized by the City Engineer. Authorization by the City Engineer to use any consolidation method does not relieve the Developer of their responsibility to meet the specified density requirements. Water for consolidation shall be furnished by the Developer at their expense.

In the jetting procedure the jets shall be inserted at not more than 4-foot intervals (staggered throughout the length of the backfilled area) and shall be slowly forced down to the bottom of the trench or to of the previously jetted lift and held until the trench backfill is completely saturated with water. Depth of a jetted lift shall not exceed 5-feet.

The minimum size of hose equipment shall be such as to provide a minimum pressure of 35-psi at the discharge. The jet shall be rigid iron pipe with a minimum diameter of 1-inch.

After the water-settled trench has set for several days, any depression in the trench shall be filled, mounded over and wheel rolled to compact the material thus placed.

All precautions necessary shall be taken by the Developer to prevent damage and movement (including floating) of the pipeline, structures, and existing adjacent improvements and utilities. The allowance of the use of consolidation methods shall not be construed as guaranteeing or implying that the use of such methods will not result in damage to the adjacent

ground. The Developer shall make their own determination in this regard and shall assume all risks and liability for settlement or lateral movement of adjacent ground, or improvements, or utilities, either on the surface of the ground or underground.

2a.08 TRENCH CROSSINGS AND EASEMENTS:

At road crossings or where existing driveways occur on a road, the Developer shall make provisions for trench crossings either by means of backfills, tunnels, or temporary bridges.

When excavating within easements, the Developer shall carefully remove all shrubs, fences, and other above ground items, carefully cut and remove any lawn sod and remove the topsoil for a depth of at least 12-inches (or the depth of the actual topsoil if less than 12-inches with the width of the lawn sod and/or topsoil removal being at least 2-feet wider (1-foot each side) than the excavated trench width and excavated material pile). The lawn sod and topsoil material shall be piled separately from and shall not be mixed with the remainder of the excavated material.

When working in already developed areas on private property the City Engineer may require that following completion of the backfilling and the compaction of the trench, the Developer shall replace topsoil, lawn sod, shrubs, fences, and other items that may have been removed from within the easement area and clean up and remove any rocks, dirt or any other debris that remain from the construction work. When required, the Developer shall obtain a release from the property owner stating that the repairs have been made to the satisfaction of the Owner. A copy of said release shall be delivered to the City Engineer.

2a.09 RESTORATION OF CONSTRUCTION SITE:

During the progress of the work, the Developer shall clean up all construction debris, excess excavation and construction materials, and shall restore all fences, irrigation structures, ditches, culverts, and similar items. The Developer shall stockpile the excavated trench material so as to do the least damage to adjacent grassed areas, or fences, regardless of whether these are on private property or public rights of way. All excavated materials shall be removed from grassed and planted areas and these surfaces shall be left in a condition equivalent to their original surface and free from all rocks, gravel, boulders, or other foreign materials.

2a.10 DEVELOPER'S RESPONSIBILITY:

The Developer will be responsible to see that the backfilling, consolidation and compaction are properly and adequately done. Settlement of trenches within a period of 1-year after final acceptance of the project, shall be considered incontrovertible evidence of inadequate compaction, and the Developer shall be responsible for correcting the condition in accordance with the provisions of these Specifications, including the replacement of the surface materials. The Developer is responsible to maintain and repair any problems caused by them to adjoining properties.

2a.11 KAYSVILLE CITY POWER AND LIGHT UNDERGROUND CONDUIT REQUIREMENTS:

The Developer is responsible for installing conduit for road crossings. The properties should be marked and radius for corners marked and staked. A representative from Kaysville City Power and Light (Power) will mark crossing for the Developer. The Developer is required to dig a trench 4-feet deep and stub 8-feet from the back of curb for future tie-in of conduit. The Developer will seal both ends of conduit crossing with conduit seal.

Prior to the digging of the trench for the conduit system, the Developer will have curb and gutter in with property marks on curb and property stakes in back of properties. The Developer shall excavate a serviceable trench 4-feet deep and 13-feet from the center of trench to the back of curb, exposing the road crossing conduit for Power (offsets may vary depending on type of subdivision). A serviceable trench is one that is level, does not have sidewalls that are collapsing, and does not having ponding water. A representative from Power shall determine if a trench is serviceable or not, and shall require issues to be remedied before being accepted as serviceable.

Once the trench is deemed serviceable, Power will install the conduit, according to their availability. Power shall be the only utility allowed in this trench, and will be notified prior to any changes or if problems arise, and will be responsible to approve any changes prior to them being incorporated and/or made.

Backfilled trenches should have the center of the conduit, or conduit bundles, located 13-feet behind the curb. Material used for backfill of the trench must not pose a risk of damaging the conduit during placement, compaction or loading. If backfill material is not suitable, as determined by Power, sand may be required to “shade” the conduit to help protect it from damage before backfilling the trench. Any broken, damaged or defective conduit shall be excavated by the Developer and repaired by Power. Once any necessary repairs are made, the Developer will be responsible to then backfill and make any other necessary repairs to complete the work.

DIVISION 2b

EARTHWORK

2b.01 GENERAL:

This Division defines the requirements for excavation and backfill for structures, construction requirements for embankments and fills, and subgrade preparation for pavements and other surface improvements.

2b.02 EXCAVATION FOR STRUCTURES:

Where suitable subgrade soils exist structures shall be founded on undisturbed original subsoil. All unauthorized excavation below the specified subgrade shall be replaced with concrete, monolithic with that of the slab above or with coarse gravel thoroughly compacted into place.

Subgrade soils for structures not suitable for proper support shall be replaced with firm, dense, thoroughly compacted and consolidated material free from mud and muck. Coarse gravel or crushed stone may be used for subsoil reinforcement if satisfactory results can be obtained thereby. Such material shall be applied in thin layers, each layer being embedded in the subsoil by thorough tamping. All excess soil shall be removed to compensate for the displacement of the gravel or crushed stone and the finished elevation of any subsoil reinforced in this manner shall not be above the specified subgrade elevation.

2b.03 BACKFILL AROUND STRUCTURES:

Backfill around structures shall be placed to the lines shown on the drawings, or as directed. After completion of foundation footings and walls and other construction below the elevation of the final grades, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of suitable excavated material or imported sand, gravel, or other suitable material, and shall be placed in lifts which will allow the densities to be achieved and which in any event shall not exceed 8-inches in uncompacted thickness. Each layer shall be compacted by hand or machine tampers or by other suitable equipment to a density equal to 96% of maximum dry density as measured by AASHTO T-180 (ASTM D1557).

2b.04 CONSTRUCTION OF EMBANKMENTS AND FILLS:

Unsuitable materials, such as roots, vegetation, or other organic material that occur in the foundations for embankments and fills shall be removed by clearing, stripping, and/or grubbing. Where suitable materials occur after stripping, the foundation shall be scarified to a depth of not less than 6-inches, and the loosened material shall be moistened and compacted as hereinafter specified for each layer. All materials in embankments and fills shall be placed, moistened, and compacted as provided in the following paragraphs.

When the embankment or fill exceeds the amount of excavation, sufficient additional material shall be obtained from borrow pits provided by the Developer. All material proposed to be imported shall be subject to the review and approval of the Engineer or their designee prior to starting of hauling operations.

The materials used for embankment and fill construction shall be free from sod, grass, trash, clods, rocks larger than 8-inches in diameter, and all other material unsuitable for construction of compacted fills.

Grading of completed embankments and fills shall bring the surfaces to a smooth, uniform condition with final grades being within 0.1-foot of the design grade.

2b.05 COMPACTING EARTH MATERIALS:

The material shall be deposited in horizontal layers having a thickness of not more than 10-inches prior to being compacted as hereinafter specified; provided that when mechanical equipment is used for placing and compacting the material on a sloping foundation, the layers may be placed parallel to the foundations. The distribution of materials shall be such that the compacted material will be homogeneous and free from lenses, pockets, or other imperfections.

Prior to and during compaction operations, the material shall have the optimum moisture content required for the purpose of compaction, and the moisture content shall be uniform throughout the layers, insofar as practicable. The moisture shall be controlled at two percent plus or minus of the optimum moisture as determined by AASHTO T-180 (ASTM D1557). Moistening of the material shall be performed at the site of excavation, but such material shall be supplemented as required by sprinkling at the site of construction. If the moisture content is more than optimum for compaction, the compaction operations shall be delayed until such time as the material has dried to the optimum moisture content. When the material has been conditioned as hereinbefore specified, the backfill or embankment shall be compacted as follows:

A. All trenches in the City Right of Way (typically under roadways and extending one foot beyond the proposed back of walk and under sidewalks and drive approaches to at least one foot each side of the edge of the slab), the fill or embankment material shall be compacted to a density equal to not less than 96% of maximum dry density as measured by AASHTO T-180 (ASTM D1557).

B. Other fills and embankments not listed above shall be compacted to a density equal to not less than 90% of maximum dry density, as measured by AASHTO T-180 (ASTM D1557).

DIVISION 3a

CONCRETE PIPE

3a.01 GENERAL:

This Division covers the requirements for concrete pipe materials and installation in sanitary sewer, storm drain, and other gravity line construction. For information regarding requirements for sanitary sewer, refer to the standard drawings and specifications of either the Central Davis Sewer District or North Davis Sewer District, depending on the location.

3a.02 PIPE:

Concrete pipe used in sewer line, storm drain line and other gravity line construction shall be reinforced concrete pipe for 15-inch and larger. The minimum size for storm drain pipes is a 15-inch inside diameter pipe, unless otherwise instructed by the City Engineer. (See Sewer District standards for minimum pipe sizes for sanitary sewer lines.):

A. Reinforced Concrete Pipe:

All reinforced concrete pipe used in the construction shall be of the rubber gasket type, bell and spigot joint design, conforming to the requirements of the latest revision of ASTM C76. Pipe class shall be as shown on the approved set of plans. The minimum joint length of all pipe provided shall be 90-inches.

B. Bell and Spigot Joints:

Bell and spigot joints, including rubber gaskets, shall conform to the requirements of the latest revision of ASTM C443. The pipe joint shall be so designed as to provide for self centering, and when assembled, to compress the gasket to form a watertight seal. The gasket shall be confined in a groove on the spigot, so that pipe movement or hydrostatic pressure cannot displace the gasket.

C. Tracer Wire:

All non-conductive pipes require a tracer wire (12 gauge) for locating purposes placed on top of pipe from manhole to manhole. Where splices are to be made, a water tight splice kit must be used. See Drawings for tracer wire installation. Tracer wire tail length must not exceed 2-feet.

3a.03 PIPE LAYING:

All concrete pipe installation shall proceed upgrade on a stable foundation, with joints closely and accurately fitted. Rubber gaskets shall be fitted properly in place, and care shall be taken in

joining the pipe units to avoid twisting of gaskets. Joints shall be clean and dry, and a joint lubricant as recommended by the pipe supplier shall be applied uniformly to the mating joint surfaces to facilitate easy positive joint closure.

Pipe shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells.

Select material shall be compacted around the pipe to firmly bed the pipe in position. If adjustment of position of a pipe length is required after being laid, it shall be removed and re-jointed as for a new pipe. When laying is not in progress, the ends of the pipe shall be closed with a tight-fitting stopper to prevent the entrance of foreign material.

In addition to the above requirements, all pipe installation shall comply with the specific requirements of the pipe manufacturer.

3a.04 GRAVEL FOUNDATION FOR PIPE:

Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, or where groundwater must be drained, the subgrade shall be excavated to such depth as may be necessary and replaced with crushed rock or gravel compacted into place.

Gravel for concrete pipe foundation shall be clean crushed rock or gravel with 100% passing a 1-inch screen and 5% passing a No. 4 sieve.

3a.05 INSTALLATION REQUIREMENTS FOR LINE AND GRADE:

All concrete pipes shall be installed accurately to the defined line and grade with the following limits:

Variance from established line and grade shall not be greater than 1/16-inch per inch of pipe diameter in 10-feet, and not to exceed 1/2- inch in 10-feet, provided that such variation does not result in a level or reverse sloping invert; provided also that variation in the invert elevation between adjoining ends of pipe, due to non concentricity of joining surface and pipe interior surfaces, does not exceed 1/64-inch per inch of pipe diameter, or 1/2-inch maximum.

3a.06 PIPE BEDDING:

All pipe shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded. Bell holes shall be excavated so that only the barrel of the pipe receives bearing from the trench bottom.

Pipe bedding materials placed at any point below the mid-point of the pipe shall be deposited and compacted in layers not to exceed 10-inches in uncompacted depth. Deposition and compaction of bedding materials shall be done simultaneously and uniformly on both sides of the pipe. Compaction shall be accomplished with hand or mechanical compactors. All bedding materials

shall be placed in the trench in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compact masses. Bedding materials shall be loose earth, free from lumps; sand or gravel, free from rocks larger than 2-inch diameter. All materials shall be free from roots, sod, or other deleterious material.

In the event trench materials are not satisfactory for pipe bedding, modified bedding will be required. Modified bedding shall consist of placing compacted granular material on each side of and to the level of 12-inches above the top of the pipe.

Modified bedding material shall be graded as follows: 100% passing a 1-1/2-inch screen and 5% passing a No. 4 sieve. If gravel is used to bed pipe, then at least a 200-pound tensile strength woven ground stabilization fabric (in accordance with AASHTO M 288) should be installed on top of gravel prior to sand or road base placement.

3a.07 TESTS:

The Developer will be required to conduct an air test and displacement test in the presence of the City Engineer or representative. If these tests prove to be inconclusive, any or all of the other required tests shall be conducted in the presence of the City Engineer or representative. Tests shall be performed as follows:

A. Displacement Test:

In conducting the displacement test a light will be flashed between manholes or, if the manholes have not as yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror. If the illuminated interior of the pipe shows broken, misaligned, or displaced pipe or other defects, the defects designated by the City Engineer shall be remedied at the Developer's expense.

B. Infiltration Test:

The Developer shall furnish labor, equipment, and materials, including pumps, and shall assist the City Engineer in making infiltration tests of the completed line before it can be placed into service. The Developer shall furnish and install the measuring weirs or other measuring devices. The length of line to be tested at nay time shall be subject to the approval of the City Engineer. The maximum allowable infiltration shall not exceed 150-gallons per inch diameter per mile per 24-hours for all installed pipe. If the quantity of infiltration is in excess of the maximum allowable, the leaking joints shall be repaired to the satisfaction of the City Engineer at the expense of the Developer.

C. Exfiltration Test:

The Developer shall furnish labor, equipment, and materials, including pumps, and shall assist the City Engineer in making exfiltration tests of the completed

line before it can be placed into service. The length of line to be tested at one time shall be limited to the length between adjacent manholes. The maximum allowable exfiltration shall not exceed 150-gallons per inch diameter per mile per 24-hours for all installed pipe. The end of the line which projects into the manhole shall be plugged. The pipe shall then be filled with water from the upper manhole, and the line maintained under a light pressure of 4-feet of head. The inflow of water necessary to maintain this head shall be recorded as the leakage of the system. If the quantity of exfiltration is in excess of the maximum allowable, the leaking joints shall be repaired to the satisfaction of the City Engineer at the expense of the Developer.

D. Air Testing:

The Developer or their representative (a qualified firm or individual agreed upon by the City Engineer and the Developer) shall furnish labor, equipment, and materials, including pumps and compressors, and shall perform, in the presence of the City Engineer, air tests of the completed pipe before it can be placed in service. Each section of sanitary sewer pipeline between manholes shall be tested after all the 4-inch service laterals (and plugs) have been installed. Each test section shall be pressurized to 4.0-psi. For the purpose of stabilizing the air pressure in each test section, the 4.0-psi pressure shall be maintained for a 2-minute period. Each test section shall then be re-pressurized to 4.0-psi for a period of 4-minutes. The test section shall be accepted if, after 4-minutes, the pressure gauge indicates 3.5-psi or greater. Failure of the Developer's testing equipment to properly function shall render the test unacceptable. All faulty sections of pipeline shall be repaired and retested until the minimum air testing requirements have been met.

E. Camera Inspection Test:

The Developer or their representative shall hire a qualified firm or individual to clean and then inspect, via camera, the entire length of the piping, and provide a digital copy of the video recording of that inspection on a thumb drive to the PW Inspector for review. At the City's discretion, any defects found with the pipe, its function or installation will be fixed at the Developer's expense. Pipes shall be left clean and free of debris.

DIVISION 3b

PVC PLASTIC PIPE FOR GRAVITY LINES

3b.01 GENERAL:

This Division covers the requirements for PVC plastic pipe materials and installation of main line storm drain, land drain, and other gravity line construction. For information regarding requirements for sanitary sewer, refer to the standard drawings and specifications of either the Central Davis Sewer District or North Davis Sewer District, depending on the location.

3b.02 PIPE:

PVC gravity pipe and fittings shall conform to ASTM D3034, for diameters from 4-inch to 15-inch and ASTM F679 for 18-inch to 27-inch, with integral bell gasket joints. Rubber gaskets shall be factory installed and conform to ASTM F477. Pipe shall be made of PVC plastic having a cell classification of 12454A or 13364B (with minimum tensile modulus of 500,000-psi) as defined in ASTM D1784 and shall have a SDR of 35, and minimum pipe stiffness of 46-psi according to ASTM D2412.

Pipe shall be installed in compliance with ASTM D2321 and the manufacturer's requirements. Land drain pipes will be white or green in color, and shall include locating tape labeled “LAND DRAIN” placed 2-feet above the top of the pipe, including laterals within the right of way.

3b.03 FITTINGS:

Fittings shall be made of PVC plastic conforming to ASTM D1784, have a cell classification as outlined in ASTM D3034.

3b.04 PIPE LAYING:

All pipe installation shall proceed upgrade on a stable foundation, with joints closely and accurately fitted. Joints shall be clean and dry, and a joint lubricant as recommended by the pipe supplier shall be applied uniformly to the mating joint surfaces to facilitate easy positive joint closure.

Pipe shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells.

Select material shall be compacted around the pipe to firmly bed the pipe in position. Haunching material (bed to springline) should be carefully worked under the haunches of the pipe and compacted from the pipe to the trench wall or 2-1/2-pipe diameters on each side of the pipe to ensure support. If adjustment of position of a pipe length is required after being laid, it shall be removed and re-jointed as for a new pipe. When laying is not in progress, the ends of the pipe shall be closed with a tight-fitting stopper to prevent the entrance of foreign material.

All non-conductive pipes require a 12 gauge tracer wire for locating purposes placed on top of pipe from manhole to manhole. Where splices are to be made, a water tight splice kit must be used. Tail length on tracer wire shall not exceed 2-feet. See the Standard Drawings for details on tracer wire installation.

In addition to the above requirements, all pipe installation shall rigidly adhere to the specific requirements of the pipe manufacturer.

3b.05 GRAVEL FOUNDATION FOR PIPE:

Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, or where groundwater must be drained, the subgrade shall be excavated to such depth as may be necessary and replaced with crushed rock or gravel compacted into place.

Gravel for PVC pipe foundation shall be clean crushed rock or gravel with 100% passing a 1-inch screen and 5% passing a No. 4 sieve.

3b.06 INSTALLATION REQUIREMENTS FOR LINE AND GRADE:

All PVC pipe shall be installed accurately to the defined line and grade with the following limits:

Variance from established line and grade shall not be greater than 1/16-inch per inch of pipe diameter in 10-feet, and not to exceed 1/2-inch in 10-feet, provided that such variation does not result in a level or reverse sloping invert; provided also that variation in the invert elevation between adjoining ends of pipe, due to non concentricity of joining surface and pipe interior surfaces, does not exceed 1/64-inch per inch of pipe diameter, or 1/2-inch maximum. Ponding of 1/4-inch or more of water in a belly in the pipe, shall be dug up and fixed.

3b.07 PIPE BEDDING:

All pipe shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.

A groove shall be excavated in the bottom of the trench to receive the bottom quadrant of the pipe. Before preparing the groove, the trench bottom shall be excavated or filled and compacted to an elevation sufficiently above the grade of the pipe so that, when completed, the pipe will be true to line and grade. Bell holes shall be excavated so that only the barrel of the pipe receives bearing from the trench bottom.

Pipe bedding materials placed at any point below the mid-point of the pipe shall be deposited and compacted in layers not to exceed 10-inches in uncompacted depth. Deposition and compaction of bedding materials shall be done simultaneously and uniformly on both sides of the pipe. Compaction shall be accomplished with hand or mechanical compactors. All bedding materials shall be placed in the trench in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compact masses. Bedding materials shall be gravel, free from

rocks larger than 1-inch diameter. All materials shall be free from debris, roots, sod, or other deleterious material.

In the event trench materials are not satisfactory for pipe bedding, modified bedding will be required. Modified bedding shall consist of placing compacted granular material on each side of and to the level of 12-inches above the top of the pipe.

Modified bedding material shall be graded as follows: 100% passing a 1-1/2-inch screen and 5% passing a No. 4 sieve. Gravel shall be used to bed pipe, then at least a 200-pound tensile strength woven ground stabilization fabric (in accordance with AASHTO M 288) shall be installed on top of gravel prior to sand or road base placement.

3b.08 TESTS:

The Developer shall be required to conduct a camera investigation. The Developer or their representative shall hire a qualified firm or individual to clean and then inspect, via camera, the entire length of the piping, and provide a digital copy of the video recording of that inspection on a thumb drive to the PW Inspector for review. At the City's discretion, any defects found with the pipe, its function or installation will be fixed at the Developer's expense. Pipes shall be left clean and free of debris.

3b.09 MANHOLE CONNECTIONS:

PVC pipe connections to manholes shall be achieved by use of manhole coupling adapters, rubber ring waterstops, or rubber boots with 300-series nonmagnetic corrosion-resistant steel bands. PVC may not be grouted directly to concrete.

DIVISION 3c

CORRUGATED POLYETHYLENE PIPE

3c.01 GENERAL:

This Division covers the requirements for corrugated polyethylene pipe with integrally formed smooth interior for use in ditch piping, storm drain, and other gravity line construction with water tight joints. All pipe shall be smooth bore double wall unless an alternate is specifically authorized in writing by the City Engineer.

3c.02 PIPE:

Corrugated polyethylene (PE) pipe and fittings shall conform to ASTM F667, for diameters from 3-inch to 6-inch and ASTM F667 for 8-inch to 24-inch, with gasketed PVC thermo-molded joints and fittings manufactured in accordance with ASTM D3034. Rubber gaskets shall be factory installed and conform to ASTM F477. Other applicable documents include:

ASTM Standards

D618	Methods of Conditioning Plastics and Electrical Insulating Materials for Testing
D1248	Specifications for Polyethylene Plastics Molding and Extrusion Materials
D2412	Test Method for External Loading of Plastic Pipe by Parallel-Plate Loading
D2444	Test Method for Impact Resistance of Thermoplastic Pipe and Finttings by Means of a Tup (Falling Weight)
F412	Definitions of Terms Relating to Plastic Piping Systems
F449	Recommended Practice for Subsurface Installation of Corrugated Thermoplastic Tubing for Agricultural Drainage or Water Table Control

AASHTO Standards

M252	Corrugated Polyethylene Drainage Tubing
M294	Corrugated Polyethylene Pipe, 12-inch to 36-inch Diameter

Pipe shall be installed in compliance with the manufacturer’s requirements.

3c.03 FITTINGS:

Fittings shall be water tight rubber gasket fittings made of PVC plastic conforming to ASTM D1784, have a cell classification as outlined in ASTM D3034.

3c.04 PIPE LAYING:

All pipe installation shall proceed upgrade on a stable foundation, with joints closely and accurately fitted. Joints shall be clean and dry, and a joint lubricant as recommended by the pipe supplier shall be applied uniformly to the mating joint surfaces to facilitate easy positive joint closure.

Pipe shall be installed with uniform bearing under the full length of the barrel, with suitable excavations being made to receive pipe bells.

Select material shall be compacted around the pipe to firmly bed the pipe in position. Haunching material (bed to springline) should be carefully worked under the haunches of the pipe and compacted from the pipe to the trench wall or 2-1/2-pipe diameters on each side of the pipe to ensure support. If adjustment of position of a pipe length is required after being laid, it shall be removed and re-jointed as for a new pipe. When laying is not in progress, the ends of the pipe shall be closed with a tight-fitting stopper to prevent the entrance of foreign material.

All non-conductive pipes require a tracer wire (12 gauge) for locating purposes placed on top of pipe from manhole to manhole. Where splices are to be made, a water tight splice kit must be used. Tail length on tracer wire shall not exceed 2-feet. See Standard Drawings for details on tracer wire installation.

In addition to the above requirements, all pipe installation shall rigidly adhere to the specific requirements of the pipe manufacturer.

3c.05 GRAVEL FOUNDATION FOR PIPE:

Wherever the subgrade material does not afford a sufficiently solid foundation to support the pipe and superimposed load, or where groundwater must be drained, the subgrade shall be excavated to such depth as may be necessary and replaced with crushed rock or gravel compacted into place.

Gravel for corrugated PE pipe foundation shall be clean crushed rock or gravel with 100% passing a 1-inch screen and 5% passing a No. 4 sieve.

3c.06 INSTALLATION REQUIREMENTS FOR LINE AND GRADE:

All corrugated PE pipe shall be installed accurately to the defined line and grade with the following limits:

Variance from established line and grade shall not be greater than 1/16-inch per inch of pipe diameter in 10-feet, and not to exceed 1/2-inch in 10-feet, provided that such variation does not result in a level or reverse sloping invert; provided also that variation in the invert elevation between adjoining ends of pipe, due to non concentricity of joining surface and pipe interior surfaces, does not exceed 1/64-inch per inch of pipe diameter, or 1/2-inch maximum.

3c.07 PIPE BEDDING:

All pipe shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.

Bell holes shall be excavated so that only the barrel of the pipe receives bearing from the trench bottom.

Pipe bedding materials placed at any point below the mid-point of the pipe shall be deposited and compacted in layers not to exceed 10-inches in uncompacted depth. Deposition and compaction of bedding materials shall be done simultaneously and uniformly on both sides of the pipe. Compaction shall be accomplished with hand or mechanical compactors. All bedding materials shall be placed in the trench in such a manner that they will be scattered alongside the pipe and not dropped into the trench in compact masses. Bedding materials shall be loose earth, free from lumps; sand or gravel, free from rocks larger than 1-inch diameter. All materials shall be free from roots, sod, or other deleterious material.

In the event trench materials are not satisfactory for pipe bedding, modified bedding will be required. Modified bedding shall consist of placing compacted granular material on each side of and to the level of 12-inches above the top of the pipe.

Modified bedding material shall be graded as follows: 100% passing a 1-1/2-inch screen and 5% passing a No. 4 sieve. If gravel is used to bed pipe, then at least a 200-pound tensile strength woven ground stabilization fabric (in accordance with AASHTO M 288) shall be installed on top of gravel prior to sand or road base placement.

3c.08 TESTS:

The Developer will be required to conduct an air test and displacement test in the presence of the City Engineer or representative. If these tests prove to be inconclusive, any or all of the other required tests shall be conducted in the presence of the City Engineer or representative. Tests shall be performed as follows:

F. Displacement Test:

In conducting the displacement test a light will be flashed between manholes or, if the manholes have not as yet been constructed, between the locations of the manholes, by means of a flashlight or by reflecting sunlight with a mirror. If the illuminated interior of the pipe shows broken, misaligned, or displaced pipe or other defects, the defects designated by the City Engineer shall be remedied at the Developer’s expense.

G. Infiltration Test:

The Developer shall furnish labor, equipment, and materials, including pumps, and shall assist the City Engineer in making infiltration tests of the completed line

before it can be placed into service. The Developer shall furnish and install the measuring weirs or other measuring devices. The length of line to be tested at any time shall be subject to the approval of the City Engineer. The maximum allowable infiltration shall not exceed 150-gallons per inch diameter per mile per 24-hours for all installed pipe. If the quantity of infiltration is in excess of the maximum allowable, the leaking joints shall be repaired to the satisfaction of the City Engineer at the expense of the Developer.

H. Exfiltration Test:

The Developer shall furnish labor, equipment, and materials, including pumps, and shall assist the City Engineer in making exfiltration tests of the completed line before it can be placed into service. The length of line to be tested at one tie shall be limited to the length between adjacent manholes. The maximum allowable exfiltration shall not exceed 150-gallons per inch diameter per mile per 24-hours for all installed sewer pipe. The end of the line which projects into the manhole shall be plugged. The pipe shall then be filled with water from the upper manhole, and the line maintained under a light pressure of 4-feet of head. The inflow of water necessary to maintain this head shall be recorded as the leakage of the system. If the quantity of exfiltration is in excess of the maximum allowable, the leaking joints shall be repaired to the satisfaction of the City Engineer at the expense of the Developer.

I. Air Testing:

The Developer or their representative (a qualified firm or individual agreed upon by the City Engineer and the Developer) shall furnish labor, equipment, and materials, including pumps and compressors, and shall perform, in the presence of the City Engineer, air tests of the completed pipe before it can be placed in service. Each section of sanitary sewer pipeline between manholes shall be tested after all the 4-inch service laterals (and plugs) have been installed. Each test section shall be pressurized to 4.0-psi. For the purpose of stabilizing the air pressure in each test section, the 4.0 psi pressure shall be maintained for a two-minute period. Each test section shall then be repressurized to 4.0 psi for a period of 4-minutes. The test section shall be accepted if, after 4-minutes, the pressure gauge indicates 3.5-psi or greater. Failure of the Developer's testing equipment to properly function shall render the test unacceptable. All faulty sections of pipeline shall be repaired and retested until the minimum air testing requirements have been met.

J. Camera Test:

The Developer or their representative shall hire a qualified firm or individual to clean and then inspect, via camera, the entire length of the piping, and provide a digital copy of the video recording of that inspection on a thumb drive to the PW Inspector for review. At the City's discretion, any defects found with the pipe, its

function or installation will be fixed at the Developer's expense. Pipes shall be left clean and free of debris.

3c.09 MANHOLE CONNECTIONS:

Corrugated PE pipe connections to manholes shall be achieved by use of manhole coupling adapters, rubber ring waterstops, or rubber boots with 300-series nonmagnetic corrosion-resistant steel bands or concrete collars on the exterior and grouted on the interior.

DIVISION 3d

MANHOLES

3d.01 GENERAL:

This Division covers the requirements for manhole materials and installation. Manholes shall be installed at the locations and at the depth shown on the Drawings. Manholes shall be furnished complete with new cast iron rings and covers. Recycled rings and covers will not be accepted.

3d.02 CONCRETE BASES:

The manholes shall be furnished without bases.

3d.03 WALL AND CONE SECTIONS:

All manholes shall be precast, sectional, reinforced concrete pipe of either 48-inch or 60-inch inside diameter, as specified. Both cylindrical and taper sections shall conform to all requirements of ASTM C478 for Precast Reinforced Concrete Manhole Sections with the following exceptions:

A. The throat section of the manhole shall be adjustable, by use of manhole sections, up to 48-inches in height.

B. The taper section shall be a maximum of 3-feet in height, shall be of concentric conical design, and shall taper uniformly to 30-inches inside diameter.

C. The pipe used in the base section shall be furnished in section lengths of 1, 2, 3, and 4-feet as required. The base section shall be notched to fit over the pipe as shown on the Standard Drawings without bearing directly on the pipe. A 6-inch gravel base shall be furnished under the base section.

All joint surfaces of precast sections and the face of the manhole base shall be thoroughly cleaned and wet prior to setting precast sections. All joints, including grade rings shall be set in mortar consisting of 1-part cement and 1-1/2-parts sand with sufficient water added to bring the mixture to workable consistency, or the joints shall be sealed with a butyl rubber gasket that is permanently flexible and non shrinking. All joints shall be water tight and free from appreciable irregularities in the interior wall surface.

3d.04 CIRCULAR FLAT COVERS:

Where the line does not have sufficient depth to permit using a taper section a circular flat cover reinforced to meet H-20 Highway Loading shall be used. The cover shall have a 30-inch concentric opening for a standard ring and cover.

3d.05 IRON CASTING:

All iron casting shall conform to the requirements of ASTM A48 (Class 30) for grey iron castings.

Rings and covers shall be equal to the 24-inch standard with machined bearing surfaces and with cover weight of 150-pounds and ring weight of 233-pounds. Each cover shall contain one pick hole but shall not contain air vent holes. In addition to the foundry name and year of manufacture, the cover shall be marked for the type of line. All rings and covers shall be new; recycled or reused rings and covers shall not be allowed. Rings must be 6-inches tall; no flat rings will be permitted.

All manhole rings shall be carefully set to the grade shown on the Standard Drawings or as directed by the City Engineer. Manholes placed in asphalt surfacing shall require a concrete ring around the cast iron ring and cover to be 1/4-inch below the existing pavement. There must be a round concrete collar, 18-inches from edge of ring, or 12-inches if fiber mesh is used. The depth of the concrete collar shall be at least 12-inches.

3d.06 PRECAST MANHOLE BOXES:

Precast manhole boxes shall be constructed to the dimensions and requirements shown on the plans. Shop drawings shall be submitted for approval of the City Engineer, prior to construction of the precast manhole boxes.

Concrete and reinforcing steel shall comply to all requirements outlined in Division 5c and Division 5d, respectively.

All pressurized manholes as shown on the drawings shall have the manhole ring cast into the concrete lid.

3d.07 BACKFILL:

Backfill around manholes shall be per Division 2b. Compaction should be tested around all manholes.

3d.08 Sewer Manholes

All sanitary sewer improvements should be per CDSD or NDSD standards. The manholes should be concentric without any steps. The manhole lids should be stamped “Sewer” and not be vented. There must be no infiltration of groundwater or no exfiltration of water or sewer from the manholes. The manhole should be clean of debris. There should be only 12-inches or less of grade rings. The pan of the sewer manhole, where pipe comes in, must be grouted.

DIVISION 3e

LAND DRAIN SERVICE LATERALS

3e.01 GENERAL:

This Division covers the requirements for land drain and footing drain service laterals. They shall be constructed with the materials specified and at the locations shown on the Drawings or at the actual location established during construction by the City Engineer or their representative.

3e.02 SPECIFIC REQUIREMENTS:

Service laterals shall be constructed with materials and procedures stated in Division 3b. All laterals shall be 4-inches in diameter unless shown otherwise.

A. EXTENT OF LATERALS:

Service laterals shall extend from the land drain main to a point 10-feet beyond the street right of way line. A 2-inch by 4-inch by 6-foot marker, with the top 12-inches painted orange for footing drains, shall be installed to clearly mark the end of each lateral line. Laterals shall be capped with a cap suitable to withstand the test pressure. An identifying tape that says "Land Drain" must go the length of the lateral and wrap around the very end of the pipe.

Unless otherwise specified and approved in writing by the City Engineer, land drain main lines are maintained by the City, and service laterals are maintained by the property owner.

B. EXCAVATION AND BACKFILL:

Trench excavation, bedding and backfill shall conform to the applicable paragraphs of Division 2a. Gravel shall be used to bed the pipe, then at least a 200-pound tensile strength woven ground stabilization fabric (in accordance with AASHTO M 288) shall be installed on top of gravel prior to sand or road base placement. Fabric shall extend from the main to the edge of the City right of way.

C. PIPE:

Pipe used for service laterals shall be white PVC Plastic Pipe (unless shown otherwise) conforming to ASTM D3034 SDR 35.

D. CONNECTION TO MAIN:

Connections to the main shall be made with preformed wye's for new mains. Connections to existing mains shall be by means of a stainless steel saddle for concrete pipe or a gasketed tee for PVC pipe. The recommendations of the manufacturer of the materials used shall be carefully followed. All lateral connections into new land drain mains shall be through preformed wye fittings installed in the main line or with field installed service saddles (gasketed and clamped). All connections by field installed service saddles on new or existing sewer mains shall be done with a tapping machine and all required fittings and materials. Connections shall be at the locations shown in the approved set of plans or as staked in the field. Lateral connections shall be made at the 10 o'clock or 2 o'clock positions on the main. New laterals shall be located within 10-feet.

E. TESTING:

The service laterals shall be tested as a part of the footing drain main to which they are connected.

F. DAMAGE AND REPAIR OF MAINS AND APPURTENANCES

The Developer shall be responsible for the protection of existing improvements, and any damage resulting from their operations shall be their sole responsibility.

Damage to the mains and/or appurtenances shall be repaired by acceptable and approved methods.

DIVISION 3f

HIGH DENSITY POLYETHYLENE PRESSURE PIPE (for non-pressure applications)

3f.01 GENERAL:

This Division covers furnishing and installing High Density Polyethylene (HDPE) pressure pipe and fittings to the lines and grades shown on the Drawings and/or established in the field for non-pressure applications. See Division 4b for pipe specifications.

DIVISION 4a

PVC PRESSURE PIPE

4a.01 GENERAL:

This Division covers furnishing and installing PVC pressure pipe (as part of the City drinking water distribution system) to the lines and grades shown on the approved drawings and/or established in the field, and all flushing, testing, and repairing required to ensure adequate and safe operation of the water system. Minimum pipe size for culinary water main line is 8-inch diameter, and 6-inch diameter for fire lines, unless otherwise shown and approved by City Engineer. For information regarding furnishing and installing irrigation PVC pressure pipe, please see the standard drawings and specifications of Haights Creek Irrigation, Davis and Weber Canal Company or Benchland Water, depending on the location.

4a.02 MATERIALS:

Pipe for the transmission and distribution of water shall be manufactured in accordance with ANSI/AWWA C900, "AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water". The PVC pipe shall have a cast-iron-pipe-equivalent outside diameter. PVC pipe 14-inches and larger shall be manufactured in accordance with ANSI/AWWA C905, "AWWA Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch." All PVC pipe 4-inch and larger shall be SDR 18 with a working pressure of 150-psi. Pipe smaller than 4-inch shall be Schedule 40 PVC. Culinary water pipe must be blue in color and secondary water pipe must be purple.

4a.03 JOINTS:

Joints shall be push on rubber gasket type. Lubrication shall be water soluble, non-toxic, non-objectionable in taste and odor imparted to the water, non-supporting of bacteria growth, and have no deteriorating effect on the PVC pipe or rubber gaskets. It shall conform in every way to the National Sanitation Foundation NSF/ANSI Standard 61.

4a.04 FITTINGS:

All fittings to be used with the PVC pipe shall be the same as fittings for Ductile Iron Pipe and shall conform to the provisions of ANSI/AWWA C110/A21.10 or C153/A21.53. Mechanical joints should be restrained. Megalug by EBAA Iron is the preferred mechanical joint restraint.

4a.05 POLYETHYLENE WRAPPING:

All fittings for PVC pipe shall be wrapped as specified herein. All materials placed shall be wrapped with a polyethylene plastic wrap, including all fittings and valves, in accordance with the manufacturer's specifications.

All compression couplings, mechanical joints, flanged joints, and valves exposed to soil shall be wrapped with 8-mil thick polyethylene film adhesive tape equal to Polyken No. 900 or Scotchrap No. 50. The tape shall be installed to adhere securely to both the pipe and polyethylene. Enough film shall be used to overlap the adjoining pipe a minimum of 1 foot.

Valves shall be wrapped by bringing the wrap on the adjacent pipe over the bells of flanges of the valve and sealing with the adhesive tape. The valve bodies are then wrapped with a flat sheet of the film passed under the valve bottom and brought up around the body to the stem and fastened in place with the adhesive tape.

All fittings that require concrete blocking should be completely wrapped prior to pouring the concrete backing block.

Polyethylene wrap shall be protected from the sun and weathering prior to use. Care shall be exercised during backfilling of the protected areas to prevent puncturing the film.

4a.06 PIPE INSTALLATION:

A. Cutting:

Cutting of pipe for closure pieces or for other reasons shall be done in a neat and workmanlike manner by a method recommended by the manufacturer. After cutting, the pipe shall be beveled and filed to prevent gasket damage in joint assembly.

B. Dewatering of Trench:

Where water is encountered in the trench, it shall be removed during pipe laying operations and the trench so maintained until the ends of the pipe are sealed. See "Control of Groundwater" in Division 2 Trench - Excavation and Backfill.

C. Laying of Pipe:

The pipe and pipe coating (where applicable) shall be inspected for defects before installation. Any defects shall be repaired or the pipe shall be replaced, whichever is deemed necessary by the City Engineer or Representative.

All pipes shall be laid and maintained to the required lines and grades with fittings and valves at the required locations. The pipes shall be installed with 48 inches to the top of the pipe minimum cover from finished road surface for culinary water. The Developer shall be responsible to install the pipe line to the alignment set by the City Engineer or Representative or as shown on the Drawings.

All pipes, fittings and valves shall be carefully lowered from the truck when unloading or when installing into the trench. This should be done one piece at a time in order to prevent damage to pipe materials and protective coatings and

linings. Under no circumstances shall materials be dropped or dumped from the truck or into the trench.

The Developer shall take the necessary precautions such that foreign materials do not enter into the pipe. No debris, tools, or other materials shall be placed in the pipe during laying operations. When laying of pipe is not in progress, the pipe shall be closed by a water-tight plug.

Deflections in PVC pipe shall be made by longitudinal bending of the pipe barrel of the pipe rather than deflecting the pipe joints. Longitudinal bending shall be limited to eighty percent (80%) of that allowed by the manufacturer. This is accomplished by dividing the minimum recommended bending radius by 0.8.

All non-conductive drinking water pipes require a tracer wire (12 gauge) for locating purposes placed on top of the pipe and connected to the nearest fire hydrant, unless otherwise directed. Where splices are to be made, a water tight splice kit must be used. The wire should be run from the mainline, to the nearest fire hydrant, and connected to an above ground access station (a blue Snakepit RB14-TP, or approved equal). See standard drawings for additional detail.

D. Pipe Bedding:

All pipes shall be protected from lateral displacement and possible damage resulting from impact or unbalanced loading during backfilling operations by being adequately bedded.

In the event trench materials are not, in the judgment of the City Engineer or Representative, satisfactory for pipe bedding, imported granular bedding will be required. See Division 2a of these specifications.

E. Thrust Blocking:

Thrust blocking shall be applied at all tees, valves, plugs, caps and at bends deflecting 11 1/4 degrees or more. The fitting shall be encased in a 12 mil protective plastic wrap before the thrust block is poured. Reaction blocking shall be concrete, having a compressive strength of not less than 3000 pounds per square inch at 28 days. Blocking shall be placed between undisturbed soil and the fitting to be anchored. The area of bearing on the pipe and on the ground shall be as shown in the Drawings. Restraint sizing is based upon a maximum operating pressure of 150 psi and a test pressure of 200 psi, and a minimum soil bearing stress of 2,000 psf.

The blocking shall be so placed that the pipe and the fittings will be accessible for repair. Prior to backfilling around thrust block, secure inspection of installation by City Engineer or Representative. Concrete must be allowed to cure in thrust

restraints for 5 days prior to pressurizing water lines or have additional approved thrust restraints installed prior to pressurizing the water line.

F. Connections to Existing Water Lines:

Information on the drawings regarding existing water lines is taken from "record" drawings from the city or utility company files and may or may not be accurate as to size, type of material or location. The Developer will be responsible to determine the proper fittings and materials required, obtain the City Engineer's approval of the planned connection, and perform the construction in a suitable fashion.

G. Magnetic Locator Tape:

All pipe shall include a three inch (3") magnetic locator tape installed in the pipeline trench approximately twenty four inches (24") above the top of pipe. This tape shall be prepared for culinary water with white or black printing on a blue field having the words: POTABLE WATER.

This tape shall be prepared for secondary water with white or black printing on a purple field, color Panatone 512C, having the words: CAUTION: NONPOTABLE WATER - DO NOT DRINK.

4a.07 FLUSHING AND TESTING:

A. Pressure Test:

A leakage test shall be conducted concurrently with the pressure test. After the pipe has been laid, all newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure at the point of testing.

(1) Test Pressure Restrictions:
Test pressures shall:

i. Not be less than 1.25 times working pressure at the highest point along the test section or a minimum of 200psi.
ii. Not exceed pipe or thrust restraint design pressures.
iii. Be of at least 2-hour duration.
iv. Not vary by more than plus or minus five (± 5) psi for the duration of the test.
v. Not exceed twice the rated pressure of the valves or hydrants when the pressure boundary of the test section includes closed gate valves or hydrants.
vi. Not exceed the rated pressure of the valves when the test boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

(2) Pressurization:

Each valved section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gage, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City Engineer.

(3) Air Removal:

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Developer shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged.

(4) Examination:

All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound materials and the test shall be repeated until it is satisfactory to the Owner.

B. Leakage Test:

A leakage test shall be conducted concurrently with the pressure test.

(1) Leakage Defined:

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

(2) Allowable Leakage:

No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P)^{0.5}}{133{,}200}$$

in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gage.

i. Allowable leakage at various pressures is shown in Table 1.

ii. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/hr/in. of nominal valve size shall be allowed.

iii. When hydrants are in the test section, the test shall be made against the closed hydrant.

TABLE 1

Allowable Leakage per 1000 ft of Pipeline - gph

Average Test Pressure *psi (Bar)*	Nominal Pipe Diameter—*in.*															
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54
450 (31)	0.480	0.640	0.950	1.271	1.591	1.911	2.232	2.552	2.872	3.183	3.823	4.784	5.735.4	6.696.	7.647.	8.608.
400 (28)	0.450	0.600	0.900	1.201	1.501	1.801	2.101	2.402	2.702	3.002	3.603	4.504	5.415.0	6.315.	7.216.	8.117.
350 (24)	0.420	0.560	0.840	1.121	1.401	1.691	1.971	2.252	2.53	2.812	3.373	4.213	5.064.6	5.905.	6.746.	7.587.
300 (21)	0.390	0.520	0.780	1.041	1.301	1.561	1.821	2.081	2.342	2.60	3.122	3.903	4.684.4	5.465.	6.245.	7.026.
275 (19)	0.370	0.500	0.750	1.000	1.241	1.491	1.741	1.991	2.242	2.492	2.992	3.733	4.484.2	5.234 .	5.985.	6.726.
250 (17)	0.360	0.470	0.710	0.950	1.191	1.421	1.661	1.901	2.142	2.372	2.852	3.563	4.274.0	4 . 9 9	5.705.	6.416.
225 (16)	0.340	0.450	0.680	0.900	1.131	1.351	1.581	1.801	2.031	2.252	2.702	3.383	4.053.8	4.734.	5.415.	6.035.
200 (14)	0.320	0.430	0.640	0.850	1.060	1.281	1.481	1.701	1.911	2.121	2.552	3.192	3.823.5	4.464.	5.094.	5.735.
175 (12)	0.300	0.400	0.590	0.800	0.990	1.191	1.391	1.591	1.791	1.981	2.382	2.982	3.583.3	4.173.	4.774.	5.364.
150 (10)	0.28	0.370	0.550	0.740	0.920	1.101	1.291	1.471	1.661	1.841	2.212	2.762	3.313.0	3.863.	4.414.	4.974.
125 (9)	0.250	0.340	0.500	0.670	0.840	1.010	1.181	1.341	1.511	1.681	2.011	2.522	3.022.7	3.533 .	4.033	4.534 .
100 (7)	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3 . 1 5	3.60	4 . 0 5

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
**To obtain leakage in liters/hour, multiply the values in the table by 3.785.

(3) Acceptance of Installation:

Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than specified, the Developer shall, at its own expense, locate and repair the defective material until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

C. Flushing:

All new water systems or extensions to existing systems shall be thoroughly flushed before being placed in service. Flushing shall be accomplished through hydrants, or end of line blow-off assemblies at a minimum flushing velocity of 2.5-feet per second.

FLOW RATE AND OPENINGS TO FLUSH PIPELINES
(40-psi Residual Pressure)

Pipe Size (inches)	Flow Required to Produce 2.5 fps velocity (gpm)
2	26
4	100
6	220
8	390
10	610
12	880
14	1,200
16	1,565
18	1,980
20	2,450
24	3,525
30	5,507

D. Disinfection:

After flushing, all culinary water lines shall be disinfected by chlorination. Chlorination shall provide a minimum of 25-ppm residual after 24-hours contact in the pipeline. This may be expected with an application of 50-ppm, although some conditions may require more. Chlorine in the form of a 1% slurry of high-test calcium hypochlorite (T-Chlor, HTH, Perchloron, Pittchlor, etc. which are 70% available chlorine by weight) shall be fed into the pipeline in such a manner as to mix with the water flowing in the pipeline. (A 1% slurry – 10,000 ppm – results from mixing one pound of calcium hypochlorite with 8.40 gallons of water.)

The following table provides information as to the required quantity of slurry to be used per 100 feet of pipe to provide a chlorine concentration of 50 ppm:

Pipe Size (in.)	Vol. of 100 ft. Length (gal)	Required Amount of 1% Chlorine Slurry (gal)
1 1/2	9.18	0.07
2	16.32	0.12
2 1/2	25.50	0.18
3	36.73	0.26
4	65.28	0.47
6	146.90	1.05
8	261.10	1.87
10	408.10	2.92
12	587.60	4.20

During the process of chlorinating the pipeline, all valves and other pipeline appurtenances shall be operated several times to provide sufficient contact with the chlorinating agent. Following chlorination, the water line shall be drained and thoroughly flushed according to Section A above and, if necessary, rechlorinated until a satisfactory bacteriological test is obtained. After passing a bacterialogical test, water must be flushed from the pipe and discharged in accordance with all local, state and federal water quality requirements.

Disinfection shall conform to the requirements of AWWA C651 (or latest edition). Main lines must pass bacterialogical test. Number of samples to be determined by inspector and will be based on the size of the development. If a new main is connected to an existing main, a bacteria test must be completed and passed prior to any pressure testing being conducted.

DIVISION 4b

HIGH DENSITY POLYETHYLENE PRESSURE PIPE

4b.01 GENERAL:

This Division covers furnishing and installing High Density Polyethylene (HDPE) pressure pipe and fittings to the lines and grades shown on the Drawings and/or established in the field, and all flushing, testing, and repairing required to ensure adequate and safe operation of the water system. Use of HDPE pipe in pressurized applications is restricted, unless otherwise approved by the City Engineer. The minimum size for culinary water mains is 10-inch SDR 11 IPS (Iron Pipe Size).

If approved by the City Engineer, use of HDPE in the culinary distribution system shall only be allowed for transmission lines, meaning no service connections or saddles. In addition, the standards in this division shall be considered a minimum and the City shall reserve the right to make additional requirements to ensure proper safeguarding of the distribution system, as well as other infrastructure.

4b.02 MATERIALS:

High density polyethylene pipe shall be manufactured from resins exhibiting a cell classification of PE 345434C as defined in ASTM D3350 with an established hydrostatic design basis of 1600-psi for water at 73° F. HDPE pipe shall conform to ASTM F714. HDPE pipe shall also conform in every way to ANSI/AWWA C-906, "AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch for Water Distribution." The HDPE pipe shall be Iron Pipe Size (IPS). Coloring or marking is to be submitted to and approved by City Engineer.

4b.03 JOINTS:

HDPE pipe shall be joined by thermal butt fusion or flange assemblies. If flange assemblies are used, stainless steel bolts will be required with full-faced rubber gaskets and torqued to manufacturer’s specifications.

Only formally trained and certified technicians may conduct fusions, whether thermal butt fusions, electro fusions or otherwise. Qualification of the fusion technician shall be demonstrated for the type of fusion, the size of the pipe, and the equipment to be used on a project.

HDPE pipe shall not be joined by solvent cements, adhesives (such as epoxies) or threaded connections. All joining methods shall be capable of conveying water at a minimum of 2.0-times the working pressure rating of the pipe.

4b.04 PIPE INSTALLATION:

A. Cutting:

Cutting of pipe for shall be done in a neat and workmanlike manner by a method recommended by the manufacturer. Pipe should be cut with a chainsaw, with no bar oil. Use liquid dish soap as a lubricant. After cutting, the pipe shall be cleaned and prepared per the manufacturer's recommendations.

B. Dewatering of Trench:

Where water is encountered in the trench, it shall be removed during pipe laying operations and the trench so maintained until the ends of the pipe are sealed. See "Control of Groundwater" in Division 2a.

C. Laying of Pipe:

The pipe shall be inspected for defects before installation. Any defects shall be repaired or the pipe shall be replaced, whichever is deemed necessary by the City Engineer or Representative.

All pipes shall be laid and maintained to the required lines and grades with fittings and valves at the required locations. The pipes shall be installed with 48-inches to the top of the pipe minimum cover from finished road surface for culinary water. The Developer shall be responsible to install the pipe line to the alignment set by the City Engineer or Representative or as shown on the Drawings.

All pipes, fittings and valves shall be carefully lowered from the truck when unloading or when installing into the trench. This should be done one piece at a time in order to prevent damage to pipe materials and protective coatings and linings. Under no circumstances shall materials be dropped or dumped from the truck or into the trench.

The Developer shall take the necessary precautions such that foreign materials do not enter into the pipe. No debris, tools, or other materials shall be placed in the pipe during laying operations. When laying of pipe is not in progress, the pipe shall be closed by a water-tight plug.

Deflections in HDPE pipe shall be limited to 80% of that allowed by the manufacturer. This is accomplished by multiplying the minimum recommended bending radius by 0.8.

All non-conductive pipes require a tracer wire (12 gauge) for locating purposes placed on top of pipe and be connected to all valves and fire

hydrants. Where splices are to be made, a water tight splice kit must be used. The wire should be looped up valve boxes and fire hydrants. See Standard Drawings for tracer wire installation.

D. Pipe Bedding:

All pipes shall be protected from lateral displacement and during backfilling operations by being adequately bedded.

In the event trench materials are not, in the judgment of the City Engineer or Representative, satisfactory for pipe bedding, imported granular bedding will be required. See Division 2a of these specifications.

E. Thrust Blocking:

Thrust blocking shall be applied at all tees, bends, plugs, caps and any non HDPE bends deflecting 11.25° or more. The fitting shall be encased in a 12-mil protective plastic wrap before the thrust block is poured. Reaction blocking shall be concrete having a compressive strength of not less than 3000-pounds per square inch at 28-days. Blocking shall be placed between undisturbed soil and the fitting to be anchored. The area of bearing on the pipe and on the ground shall be as shown in the Drawings Restraint sizing is based upon a maximum operating pressure of 150-psi and a test pressure of 200-psi, and a minimum soil bearing stress of 2000-psf.

The blocking shall be so placed that the pipe and the fittings will be accessible for repair. Prior to backfilling around thrust block, secure inspection of installation by City Engineer or Representative. Concrete must be allowed to cure in thrust restraints for 5-days prior to pressurizing water lines or have additional approved thrust restraints installed prior to pressurizing the water line.

F. Connections to Existing Water Lines:

Information on the drawings regarding existing water lines is taken from "record" drawings from the city or utility company files and may or may not be accurate as to size, type of material or location. The Developer will be responsible to determine the proper fittings and materials required, obtain the City Engineer's approval of the planned connection, and perform the construction in a suitable fashion. Connection to the existing PVC or Ductile Iron main shall be made using a mechanical joint Ductile Iron sleeve (long) or reducer or equivalent fitting which complies with the recommendations of the pipe manufacturer for transitioning from HDPE to PVC or ductile iron pipe.

G. Magnetic Locator Tape:

All pipe shall include a 3-inch magnetic locator tape installed in the pipeline trench approximately 24-inches above the top of the pipe. This tape shall be prepared for culinary water with white or black printing on a blue field having the words: POTABLE WATER.

H. Valving:

All valves 10- inches and smaller shall be gate valves (resilient seated gate valve), and all valves larger than 10- inches shall be butterfly valves made by Christy (no spacer needed) or approved equal (spacer required), in accordance with Division 4c.

4b.05 FLUSHING AND TESTING:

A. Pressure Test:

A leakage test described in ASTM F2164, "Standard Practice for Field Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure", shall be conducted concurrently with the pressure test.

The maximum permissible test pressure is measured at the lowest elevation in the test section. The maximum permissible test pressure is the lower of (a) 150% of the system design operating pressure provided that all components in the test section are rated for the test pressure, or (b) the pressure rating of the lowest pressure rated component in the test section.

(1) Pressurization:

Each valved section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gage, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the City Engineer. The maximum test duration is 8-hours including time to pressurize, time for initial expansion, time at test pressure, and time to depressurize the test section. Damage to the system may occur if testing at excessive pressure or for an excessive time period.

(2) Air Removal:

Before applying the specified test pressure, air shall be expelled completely from the pipe, valves, and hydrants. If permanent air vents are not located at all high points, the Developer shall install

corporation cocks at such points so that the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged.

(3) Examination:

All exposed pipe, fittings, valves, hydrants, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, valves, or hydrants that are discovered following the pressure test shall be repaired or replaced with sound materials and the test shall be repeated until it is satisfactory to the City Engineer.

B. Leakage Test:

A leakage test described in ASTM F2164, "Standard Practice for Field Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure", shall be conducted concurrently with the pressure test.

Gradually pressurize the test section to test pressure, and maintain test pressure for three (3) hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid (typically water) will be required to maintain pressure. Immediately after the initial expansion phase, there are two alternatives to determine if there is leakage.

(1) Reduce test pressure by 10 psi, and stop adding test liquid. If test pressure remains steady (within 5% of the target value) for one (1) hour, then no leakage is indicated.

(2) (This alternative is applicable when the test pressure is 150% of the system design pressure.) Monitor the amount of make-up water required to maintain test pressure for 1, or 2, or 3-hours. If the amount of make-up water needed to maintain test pressure does not exceed the amount in the manufacturer's literature, then no leakage is indicated.

Acceptance of Installation:

Acceptance shall be determined on the basis of allowable leakage. If any test of pipe laid discloses leakage greater than specified, the Developer/Developer shall, at its own expense, locate and repair the defective material until the leakage is within the specified allowance. All visible leaks are to be repaired regardless of the amount of leakage.

C. Flushing:

All new water systems or extensions to existing systems shall be thoroughly flushed before being placed in service. Flushing shall be accomplished through hydrants, or end of line blow-off assemblies at a minimum flushing velocity of 2.5-feet per second.

FLOW RATE AND OPENINGS TO FLUSH PIPELINES
(40-psi Residual Pressure, assumed DR 11)

Pipe Size (inches)	Flow Required to Produce 2.5-fps velocity (gpm)
2	23
4	81
6	175
8	297
10	461
12	648
14	782
16	1,021
18	1,292
20	1,595
24	2,296
30	3,588

D. Disinfection:

After flushing, all culinary water lines shall be disinfected by chlorination. Chlorination shall provide a minimum of 25-ppm residual after 24-hours contact in the pipeline. This may be expected with an application of 50-ppm, although some conditions may require more. Chlorine in the form of a 1% slurry of high-test calcium hypochlorite (T-Chlor, HTH, Perchloron, Pittchlor, etc. which are 70% available chlorine by weight) shall be fed into the pipeline in such a manner as to mix with the water flowing in the pipeline. (A 1% slurry – 10000-ppm – results from mixing one pound of calcium hypochlorite with 8.40-gallons of water.)

The following table provides information as to the required quantity of slurry to be used per 100-feet of pipe to provide a chlorine concentration of 50-ppm:

Pipe Size (in.)	Vol. of 100-ft. Length (gal)	Required Amount of 1% Chlorine Slurry (gal)
2	14.98	0.11
4	53.82	0.40
6	116.63	0.88
8	197.70	1.48

10	307.08	2.30
12	432.01	3.24

During the process of chlorinating the pipeline, all valves and other pipeline appurtenances shall be operated several times to provide sufficient contact with the chlorinating agent. Following chlorination, the water line shall be drained and thoroughly flushed according to Section A above and, if necessary, rechlorinated until a satisfactory bacteriological test is obtained.

Disinfection shall conform to the requirements of AWWA C651, latest edition. Main lines must pass bacteria test. Number of samples to be determined by inspector and will be based on site of development. If a new main is connected to an existing main, a bacteria test must be completed and passed prior to any pressure testing being conducted.

Following chlorination, the water line shall be drained and thoroughly flushed and, if necessary, rechlorinated until a satisfactory bacteriological test is obtained. After passing a bacterial test, water must be flushed from the pipe and discharged in accordance with all local, state and federal water quality requirements.

DIVISION 4c

VALVES, COUPLINGS AND FIRE HYDRANTS

4c.01 GENERAL:

This Division covers distribution valves to be used in the water system, couplings and fire hydrants.

4c.02 RESILIENT SEATED GATE VALVE:

Valves in sizes 4-inch through 12-inch shall be of the iron body, non rising bronze stem, resilient seated type, manufactured to equal or exceed all applicable AWWA C-509 latest revision and all specific requirements outlined in these specifications. Acceptable manufacturers are Mueller Company, American Flow Control and Clow Valve Company, as directed by the City.

A. Valves shall open left and be provided with 2-inch square operating wrench nuts unless otherwise specified.

B. When valves are 'Mechanical Joint', they shall be furnished with all necessary glands, gaskets, followers, bolts and nuts to complete installation.

C. The disc shall have integrally cast ASTM B62 bronze stem nut to prevent twisting, binding or angling of the stem. Designs with loose stem nuts are not acceptable.

D. Bronze valve stems shall be interchangeable with stems of the double disc valves of the same size, direction of opening and manufacture.

E. All internal ferrous surfaces shall be coated, holiday free, to a minimum thickness of 4-mil with a two part thermo setting epoxy coating. Said coating shall be non-toxic, impart no taste to the water, formulated from materials deemed acceptable in the Food and Drug Administration Document Title 21 of the Federal Regulations on food additives, Section 121.2514 entitled Resins and Polymeric Coatings. It shall protect all seating and adjacent surfaces from corrosion and prevent build-up of scale or tuberculation.

F. The sealing element shall be secured to the disc with self-locking stainless steel screws, and it shall be field replaceable, and shall be such that it cannot be installed improperly.

G. Stem failure from over torquing in either the open or closed position shall occur externally at such a point as to enable the stem to be safely turned

by use of a readily available tool after exposure of the valve through excavation.

H. Valve design shall incorporate a positive metal to metal stop to prevent over-compression of the sealing element.

I. A full faced composition gasket placed between machined body and bonnet flanges is required to eliminate cold flow or creep action present with "O" ring gasketed bodies.

J. Valves shall have a test plug in the bonnet area to vent air and allow line pressure testing.

K. The exterior of the valves shall be Asphalt Varnish, JAN-P-450. If exterior epoxy is used, all bolts and nuts shall be made of Stainless Steel to prevent galvanic corrosion of said nuts and bolts due to insulation from the ferrous valve and line.

4c.03 BUTTERFLY VALVE:

All butterfly valves (Acceptable manufacturers are Mueller Company, M&H, Avtek and Clow Valve Company) shall conform to the latest revision of ANSI/AWWA Standard C504, Class 150-B, and comply with the following:

A. Valve bodies shall be cast iron, ASTM A126 Class B. Body ends shall be flanged with facing and drilling in accordance with ANSI B16.1, Class 125; or mechanical joint in accordance with ANSI/AWWA C-111/A21.11. All 'Mechanical Joint' end valves shall be furnished complete with joint accessories (bolts, nuts, gaskets, and glands). All valves shall conform with ANSI/AWWA Standard C-504, Table 3, Laying Lengths for Flanged Valves and Minimum Body Shell Thickness for all Body Types.

B. Valve disc shall be Ductile Iron ASTM A536, Grade 65-45-12. Valve disc shall be of the offset design providing 360 degree uninterrupted seating.

C. The resilient seat shall be natural rubber bonded to an 18-8, Type 304 Stainless Steel retaining ring secured to the disc by 18-8, Type 304 Stainless Steel screws. The seat shall be capable of mechanical adjustment in the field and field replaceable without the need for special tools. Valve body seat shall be 18-8, Type 304 Stainless Steel.

D. Valve shafts shall be 18-8, Type 304 Stainless Steel. Shafts shall be of the two piece stub design and attached to the disc by means of "O" ring sealed taper pins with lock nuts.

E. The valve assembly shall be furnished with a non-adjustable factory set thrust bearing designed to center the valve disc at all times.

F. Shaft bearings shall be contained in the integral hubs of the valve body and shall be self-lubricated sleeve type.

G. Valve shaft seal shall consist of "O" rings. Where the valve shaft projects through the valve body for actuator connection, the "O" ring packing seal shall be field replaceable as a part of a removable bronze cartridge.

H. When manual actuators are required they shall be of the traveling nut design capable of withstanding 450-foot-pounds of input torque against the open and closed stops. All actuators shall have adjustable mechanical stop limits. The closed position stop shall be externally adjustable. Valves shall be installed with the shaft horizontal unless otherwise directed by the City Engineer and shall be provided with a 2-inch square operating nut for manually operating the valve with a "T" handle wrench.

I. All valves shall be coated with epoxy in conformance to AWWA Standard C-550, latest revision. Interior wetted ferrous surfaces shall be coated a nominal 10 mils thick for long life; and body exterior shall have a minimum of 3 to 4-mil coating thickness in order to provide superior base for field-applied finish coats.

4c.04 VALVE BOXES:

All buried valves shall be installed complete with two-piece, cast iron, screw type, 5-1/4-inch shaft valve box with locking lid. The lid shall have the word "Water" or “Irrigation”, as appropriate, cast in the metal.

Valves and valve boxes shall be installed where shown on the drawings. Valves and valve boxes shall be set within 1/4 to 1/2-inch plumb. Valve boxes shall be vertically centered directly over the valve within a tolerance of +/- 1/2-inch. Valves shall be aligned with property lines where possible. Earth fill shall be carefully tamped around the valve box to a distance of 4-feet on all sides of the box, or to the undisturbed trench face if less than 4-feet. Valve boxes shall have the interiors cleaned of all foreign matter before installation and before and after backfill, being accessible and free of debris.

All valve boxes located in streets shall be installed as nearly to grade as possible. Valve boxes placed in bituminous asphalt concrete surfaces, after the pavement is in place, the valve boxes shall be raised to grade (1/4 – 1/2-inch lower than asphalt), the surrounding asphalt shall be neatly cut to form a circular opening 2.5-feet in diameter with the valve box centered, and a 12-inch thick concrete collar shall be cast around the box. Valve boxes shall be installed as shown on the Drawings. Valve boxes in off-road areas shall extend 6-inches above grade and be collared and marked.

4c.05 COUPLINGS:

Acceptable manufacturers of couplings are HYMAX (grip), Romac (alpha) or Smith-Blair (18-inch long). Cast iron sleeves may be utilized, as approved by the City Engineer. Couplings shall be of the straight, transition, or reducing style as required by the City for the specific installation. All steel fittings and bolts shall be coated with a non-oxide coating and wrapped with 12-mil polyethylene.

4c.06 FIRE HYDRANTS:

Fire hydrants shall be "traffic model" type designed to conform to AWWA C502 and shall be of either the compression or toggle joint type. Hydrants shall be the Mueller Modern Centurion A-442, Clow Medallion or Waterous Pacer (with alpha base).

Hydrant valves shall be a minimum of 6-inch size. Hydrants shall be supplied complete with two 2-1/2-inch hose nozzles and one 4-1/2-inch pumper nozzle. All nozzles shall be provided with National Standard threading. A one cubic yard gravel sump shall be provided at each hydrant. All hydrants shall be mechanical joint end and shall be connected to the main by means of a flanged tee and flanged by mechanical joint auxiliary gate valve (or flange by alpha gate valve) and box as shown on Kaysville Standard Drawings. Each hydrant shall also be supplied with O-ring seals, a National Standard pentagon operating nut which is designed for clockwise rotation closing, and a 6-inch mechanical joint inlet.

All hydrants shall be factory painted red and must function properly. Where a parkstrip exists, hydrants shall be centered in the parkstrip +/- 3-inches. Hydrants must have a 3-foot minimum clear space around the hydrant. Hydrants must be located as shown on approved plans/drawings and be set vertically within +/- 1-inch out of level (plumb).

DIVISION 4d

WATER SERVICE LATERALS

4d.01 GENERAL:

Water service laterals shall be constructed with materials specified and at the locations shown on the Drawings or at the actual location established during construction by the City Engineer or representative. The City shall maintain the service lateral from the main line to the end of the meter setter; the service lateral between the end of the meter setter and the property is to be maintained by the property owner.

4d.02 WATER SERVICE LATERALS:

Pipe for water service laterals shall be 3/4-inch Type K-soft copper tubing or blue HDPE SDR 9 Copper Tube Size (CTS) with a 200-psi rating.

A. Extent of Laterals:

Water service laterals shall extend from the water main to a point 10-feet beyond the street right-of-way line. A curb stop valve shall be installed on the end of the line. Type K-soft copper tubing water services shall not have any joints between the corporation stop and the meter setter. A 2-inch by 4-inch by 6-foot marker, with the top 12-inches painted blue, shall be installed to clearly mark the end of each lateral line. Tracer wire (12 gauge) shall be installed from the main to the end of each lateral line, and come up the outside of each meter box, and come into the meter box in a notch between the meter ring and the box. Meter boxes shall be installed in accordance with the Kaysville City standard drawings.

B. Excavation and Backfill:

Trench excavation and backfill shall conform to the applicable paragraphs of Division 2a. Bedding shall meet the requirement of Division 2a for PVC or polyethylene pipe.

C. Connection to Main:

Connections to the main lines shall be made by means of corporation stops using direct pipe taps for 3/4-inch and 1-inch services on Ductile Iron pipe, tapped tees for 2-inch service or approved service saddles for PVC and any of the above. HDPE fused saddles should be Frialen 10-inch to 20-inch universal service saddle with 2-inch female threaded outlet or equivalent.

D. Service Saddle Specifications:

(For use with AWWA C-900 CI O.D. for PVC plastic pipe.)

All service clamps shall be a “Full encirclement design”, and shall be O.D. controlled, which design will eliminate the possibility of pipe crushing due to the over torquing of the nuts upon installation.

All service clamps shall be manufactured of brass cast in conformance to AWWA C800, General Section – 1, Paragraph 1.2 (ASTM B62).

The two sides of the clamp shall be held together by high quality Silicon Bronze Hex Bolts (in sizes 1-inch and over) or Silicon Bronze Slotted Screws (in sizes under 1-inch), no dissimilar metals shall be allowed at this point thus eliminating the possibility of galvanic corrosion.

All service clamps shall be Mueller Model H-13490 Series, or Ford Model S-91 Series for sizes through 12-inch and Romac 305 Series for 14-inch or larger.

(For use with Ductile Iron Pipe.)

All service clamps shall be of the double strap design with brass body, flattened silicon bronze straps, rolled strap threads and O-ring sealed outlet. Saddles shall meet all applicable parts of ANSI/AWWA C-800.

All service clamps shall be Mueller Model H-16000 Series or approved equal.

E. Sample Stations:

The City may require an above ground sample station for water quality testing (Eclipse 88 type or approved equal). When required, sample stations shall be installed at a depth of 3 to 4-feet, and in accordance with the Kaysville City standard drawings. Sample station locations shall be determined by the City Engineer.

The line from the main to the sample station shall be subject to the same requirements as a service lateral.

F. Corporation Stops:

Connections of services to main lines shall be through a corporation type stop and a 24-inch gooseneck formed with copper tube. Inlet connection shall be a AWWA I.P. thread and the outlet shall be a compression fitting. Ford or Mueller are the approved manufacturers.

All connection made to pressurized water lines shall be done using a “wet-tap” method.

G. Service Tubing:

Water service lines from the main to the meter box shall be 3/4-inch, 1-inch, or 2-inch type K-soft copper tube or blue HDPE SDR 9 Copper Tube Size (CTS) with a 200-psi rating.

When transferring or replacing existing galvanized steel or plastic services, copper replacement tubing or blue HDPE shall be used, as detailed above.

All tubing for service lines shall be cut and installed in a neat and workmanlike manner by use of a wheel cutter.

H. Compression Connections:

(1) The interior surface of the coupling nut, including threads, shall have a baked on, fluorocarbon coating to reduce assembly friction and prevent the gasket from turning and twisting during tightening. The nut shall bottom on a cast or machined shoulder on the body when properly assembled. This design will provide a visual check to assure connection is properly assembled.

(2) The sealing gasket shall be of molded synthetic rubber (ASTM D-2000) with molded in place bronze spring (ASTM A-134 Alloy #6) to eliminate the possible cold flow of the gasket between the pipe and fitting.

(3) A gripper band of hardened Stainless Steel (ANSI Type 401) shall be fitted into the gasket. When the gasket is compressed it will cause the gripper ring to distort the pipe giving the fitting a high resistance to pull out. The gripper band shall overlap itself to prevent cold flow of the gasket into the cavity under the band.

(4) Compression connections and fittings shall be Mueller 110 or equal.

I. Flushing, Testing, and Disinfection:

Flushing, testing and disinfection shall be done at the time the water main is flushed, tested and disinfected. The end of the trench where the curb valve is located shall be left open to allow for discharging water out of the service line for proper flushing and to insure that the line has been adequately disinfected. Flushing, testing and disinfection shall conform to the applicable paragraphs of Division 4a or 4b.

J. Damage and Repair of Water Mains and Appurtenances:

The Developer shall be responsible for any damage to water mains and water facilities caused by their operations.

Any damage to water gates, hydrants, valve chambers, and other surface appurtenances which result from the Developer's operation shall be their sole responsibility.

DIVISION 4e

SECONDARY WATER

4e.01 GENERAL:

See the requirements of the applicable Secondary Water Provider with jurisdiction.

4e.02 PIPES:

All pipes will have locator tape and a tracer wire for locating. This should meet the City requirements for culinary water pipes (Divisions 4a-b).

4e.03 VALVES:

All valves in roadways will be set and have same requirements as culinary valves (Division 4c). The valve covers/lids must be stamped ‘Secondary’ or ‘Irrigation’.

4e.04 SERVICE BOXES:

All boxes in the park strip will be level with the TBC + 3/8”.

4e.05 APPROVALS:

Kaysville City will require a letter of approval from secondary water provider before acceptance/warranty.

DIVISION 5a

ROADWAY CONSTRUCTION

5a.01 GENERAL:

This Division covers roadway construction; earthwork, subgrade preparation, imported granular subgrade, base course, asphalt surface and raising manholes and valve boxes to grade.

All streets shall be built in accordance with the following, unless otherwise specified by the City Engineer:

A. Local Streets
   1) 12-inch minimum crushed 1.25-inch minus (State spec.) gravel untreated base course over prepared subgrade.
   2) 3-inch minimum compacted thickness of 1/2-inch aggregate PG 58/28 with 15% max rap hot plant asphalt surfacing on streets.

B. Significant Local Streets
   1) 12-inch minimum crushed 1.25” minus (State spec.) gravel untreated base course over prepared subgrade.
   2) 4-inch minimum compacted thickness of 1/2-inch aggregate PG 58/28 with 15% max rap hot plant asphalt surfacing on streets. Lifts must be completed in two 2-inch thick levels.

C. Minor Collector Streets
   1) 12-inch minimum crushed 1.25” minus (State spec.) gravel untreated base course over prepared subgrade.
   2) 4-inch minimum compacted thickness of 1/2-inch aggregate PG 58/28 with 15% max rap hot plant asphalt surfacing on streets. Lifts must be completed in two 2-inch thick levels.

D. Major Collector Streets
   1) 12-inch minimum crushed 1.25” gravel untreated base course over prepared subgrade.
   2) 4-inch minimum compacted thickness of 1/2-inch aggregate PG 58/28 with 15% max rap hot plant asphalt surfacing on streets. Lifts must be completed in two 2-inch thick levels.

E. Arterial Streets

   Pavement structure will be based on 1/2-inch aggregate PG 58/28 with 15% max rap hot plant mix asphalt surfacing on streets, and a modified or more specific design to meet conditions and traffic loads/volumes may be required.

Note: Alternative designs, materials or cross sections may be proposed, however, the City retains the right to determine the adequacy of such proposal. An approved excavation permit may be required for work or repairs required on new road surfaces and/or rights of way, in which case, the requirements of said permit must be followed.

5a.02 EARTHWORK:

The earthwork needed for roadway construction shall meet the requirements of Division 2b, Earthwork.

5a.03 SUBGRADE PREPARATION:

This work shall consist of the shaping and compacting of the subgrade in accordance with these specifications and in conformity with the lines, grades, and typical cross sections shown on the Drawings or as established by the City Engineer. The granular material shall be placed and compacted to not less than 96% maximum dry density as determined by AASHTO T-180 (ASTM D1557). No less than a 2% crown unless approved by the City Engineer (no more than 7%).

Once the subgrade is properly graded, including a 2% crown, the Developer shall notify Kaysville City to determine if a deflection test is required for the subgrade. Any soft spots found during testing shall be repaired prior to the placement of any granular base course. A deflection test of the base course will be required prior to paving.

5a.04 GRANULAR SUBBASE:

Granular subbase material, if required, shall consist of granular bank run material with a maximum size of 4 inches and less than 15% passing a No. 200 sieve.

The granular subbase material shall be compacted to not less than 96% maximum dry density as determined by AASHTO T-180 (ASTM D1557). Surfaces shall be true to the established grade with thickness being not less than 1/4-inch from the required layer thickness and with the surface elevation varying not more than 3/8-inch in ten feet from the true profile and cross section.

5a.05 BASE COURSE:

Base for all streets shall consist of crushed select material and shall be graded as per the latest edition of Section 02721 of the Utah Department of Transportation Standards and Specifications.

Mixing, placing, compacting, finishing, thickness tolerance, and quality control testing shall be in accordance with the applicable provisions of Section 02721 of the above referenced Standard Specifications.

5a.06 ASPHALT CONCRETE PAVEMENT:

Asphalt Concrete Pavement shall be in accordance with the applicable provisions of Section 02745 Asphalt Material of the latest edition of the Utah Department of Transportation Standards and Specifications, except as noted herein: 1/2-inch aggregate PG-58-28 mix with max 15% RAP.

It is the responsibility of the Developer to control traffic. All traffic shall be kept off the completed surface for a minimum period of 24-hours, unless otherwise approved by the City Engineer. Ambient and base course temperature at time of placement shall be 50° F and rising for 2- hours prior to placement and 2-hours after rolling/compaction. Asphalt temperature should be at least 220° F at the time of initial rolling/compaction and no less than 200° F at the time of final rolling/compaction. If less than 50° F degrees, an additional warranty term shall be required in writing.

5a.07 PRIME COAT:

Prime Coat is NOT required when the granular base material is clean and free from other soils tracked onto the roadway. However, the City Engineer may at their discretion require a prime coat for any areas that have been contaminated or damaged in other ways.

5a.08 ADJUSTING MANHOLES AND VALVE BOXES TO FINAL GRADE:

This section covers the requirements for adjusting manholes and valves to final grade. The adjustment shall be made with cast in place concrete rings/collars. Rings shall be constructed after the asphalt surface has been placed. Rings shall be constructed in a neat, workmanlike manner.

Concrete shall conform to the requirements of Division 5c. Concrete shall be Class AA (AE).

Manholes and valves shall require a concrete ring/collar around the cast iron ring and cover constructed such that the cast iron ring is 1/4-inch lower than the existing pavement. On newly asphalted or overlaid streets, the cast in place concrete collar shall be placed 1/4-inch lower than the surrounding asphalt. This is to allow for some consolidation of the new asphalt due to traffic and other conditions.

Where manholes are to be raised this is to be accomplished by removing the cover and frame and raising the manhole to proper elevation with concrete. Any adjustments over 3-inches require that the ring and cover be removed and a concrete grade ring be added to the top of the cone. Concrete grade rings placed on the cone combined shall be 12-inches or less in height. In the case this is to be exceeded, the cone section shall be removed and a 1-foot manhole section installed with the cone reinstalled on top of the manhole section. “Whirlygig” riser systems, or an approved equal, will be allowed in place of concrete grade rings.

DIVISION 5b

RESTORATION OF SURFACE IMPROVEMENTS

5b.01 GENERAL:

The Developer shall be responsible for the protection and the restoration or replacement of any improvements existing on public or private property at the start of work or placed there during the progress of the work.

Existing improvements shall include but not to be limited to permanent surfacing, curbs, gutters, sidewalks, planted areas, sprinklers, ditches, driveways, culverts, fences, decorative features and walls. All improvements shall be reconstructed to equal or better, in all respects, than the existing improvements removed. Any work being done in the City right of way shall first require an approved excavation permit. There are costs associated with these permits, based on the consolidated fee schedule. All work done in the City right of way shall conform with the requirements of the excavation permit.

5b.02 FIELD VERIFICATION OF IMPROVEMENTS:

The Developer will be deemed to have carefully examined the site of the work and to have acquainted themselves with all conditions relating to the protection and restoration of existing improvements. The Developer shall be responsible to protect or restore existing improvements, whether shown on the drawings or not, unless agreed to in writing by the effected property owner and approved by the City.

5b.03 REMOVAL OF PAVEMENT, SIDEWALKS, CURBS, ETC.:

Prior to any removal of road surface, the surface shall be cut vertically along the lines forming the trench, in such a manner as to not cause damage to adjoining pavement, sidewalk, curb and gutter, driveway, etc. For removal of sidewalk, curb and gutter, vertical cuts shall be made in the concrete only at the next adjacent joint. The portion to be removed shall then be broken up in a manner that will not cause damage to the asphalt or concrete outside the limits of the cuts; however, any surface damaged by the Developer or their work shall be replaced at the Developer's expense. The Public Works inspector shall determine the extents or limits of adjacent damage requiring replacement.

Broken paving materials and debris shall be removed immediately from the site of the work. If 4-feet or less of asphalt is left between the edge of a trench and the lip of the curb (or edge of pavement if there is no curb) after removal, then the asphalt shall be removed to the lip of curb (or edge of road if there is no curb) to safeguard against differential settlement.

5b.04 MATERIALS:

Materials used for repair or replacement of surface improvements shall be equal to or better than the material removed:

A. Untreated Base Course. Untreated base course shall comply with Utah Department of Transportation Standard Specifications, latest edition. The Developer shall take samples of the untreated base course on a random basis. All materials not meeting the tolerance requirements shall be removed from the project and replaced with specification material.

B. Asphalt. The asphalt surface shall be hot-rolled plant mix in accordance with the requirements of Division 5a.

C. Concrete. Concrete shall comply with section 02753 of the Utah Department of Transportation Standard Specifications.

5b.05 RESTORING CONCRETE OR ASPHALT STREET SURFACES:

Where trenches are in or cross asphalt or concrete surfaced roads, traffic lanes, driveways, parking areas, etc., the asphalt or concrete surface must be restored in accordance with the requirements of the excavation permit, including, but not limited to:

A. Before Excavation. All existing asphalt or concrete surfaces shall be saw cut or roto-milled to a square edge before excavation.

B. Temporary Graded Surface. Until resurfacing can be done in paved areas a temporary untreated base course surface shall be placed deep enough to provide a minimum of 12-inches below the bottom of the asphalt surface and shall be brought flush with the top of the adjacent paved surface.

The untreated base shall be placed in the trench at the time it is backfilled. Excess material shall be removed from the premises immediately. The temporary untreated base course surface will be maintained as needed by the Developer until the asphalt is placed.

C. Preparation for Paving. The area over trenches to be resurfaced shall be graded and rolled with a roller weighing not less than 12-tons, until the subgrade is firm and unyielding. Mud or other soft or spongy material shall be removed and the void filled with untreated base course and rolled and tamped thoroughly in layers not exceeding 12-inches in thickness. Sink holes in asphalt shall be cut out, excavated and replaced. Asphalt sinking of any kind will be cut out and replaced once the problem has been fixed. The edges of trenches which deteriorate or crumble prior to paving shall be removed and trimmed neatly before resurfacing.

Before any permanent resurfacing is placed, the Developer shall trim the existing paving to clean, straight lines as nearly parallel to the centerline of the trench as practicable.

Following backfill, the existing adjacent asphalt paving shall be cut back a minimum of an additional 18-inches beyond the previous cuts (T-Cut) for the excavation.

D. Asphalt Surface. The asphalt surface shall be restored by standard paving practices to a minimum thickness as indicated in Division 5a and on the standard drawings. Pavement over 3-inches shall be placed and rolled in two lifts. The asphalt surface should be 1/4-inch to 1/2-inch above the lip of curb and gutter. If the asphalt is more than 1/2-inch or less than 1/4-inch over the lip of the curb and gutter, an overlay to adjust the grade shall be required, as directed by the City Engineer.

Pavement restoration shall include priming of pavement edges with Type MC-70 bituminous material (tackifier) and placing rolled plant hot mix asphalt material to a level of 1/8-inch" to 1/4-inch above the adjacent pavement surfaces. Areas where there is unraveling of asphalt will be replaced.

5b.06 CRACK FILLING/SEALING:

When pavement crack repairs are needed, vegetative growth should be removed from cracks, edges, and joints. Cracks should be prepared by blowing them out and dry prior to being filled by crack sealant. Melting of sealant should be per manufacturer's guidelines. The pavement crack seal should be dry before applying asphalt coatings.

Crack seal material should be per UDOT Standards 02745, Section 2.3 HOT-POUR CRACK SEALANT FOR BITUMINOUS CONCRETE or applicable current APWA standard 32.01.17 PAVEMENT CRACK SEAL. Crack seal shall be done prior to all asphalt coating projects.

5b.07 ASPHALT COATINGS:

Depending on various factors, including, but not limited to the age and condition of adjacent asphalt, project scheduling and traffic conditions, asphalt surfacing may require a preventative maintenance coating, as determined and specified by the City Engineer. Asphalt coatings consist of chip seals with type A chips and a fog coat, type II slurries and seal coats (type specified by the City Engineer). All asphalt coatings (and their application) shall meet the applicable APWA Utah standards.

5b.08 GRAVEL SURFACE:

Where trenches are excavated through gravel-surfaced areas such as roads and shoulders, parking areas, unpaved driveways, etc., the gravel surface shall be restored and maintained as follows:

A. The gravel shall be placed deep enough to provide a minimum of six inches of material.

B. The gravel shall be placed in the trench at the time it is backfilled. The surface shall be maintained by blading, sprinkling, rolling, adding gravel, etc., to maintain a safe, uniform surface. Excess material shall be removed from the premises immediately.

C. Material for use on gravel surfaces shall be obtained from sound, tough, durable gravel or rock meeting the following requirements for grading:

Passing 1-inch sieve	100%
Passing 1/2-inch sieve	79-91%
Passing No. 4 sieve	49-61%
Passing No. 16 sieve	27-35%
Passing No. 200 sieve	7-11%

5b.09 MISCELLANEOUS IMPROVEMENTS:

It shall be the Developer's responsibility to restore to their original condition all irrigation canals, levees, culverts, gates, fences, drainage ditches, and all such improvements which are cut or disturbed during construction. Topsoil in farming areas or along road edges shall be stored separate from subsoil during pipe trench excavation. Topsoil shall be replaced during backfill operations as nearly as possible to its original condition, thereby assuring suitable soil for reseeding.

5b.10 RESTORATION OF SURFACES:

Unless otherwise directed, all street surfacing, curbs, gutters, sidewalks, driveways, or other hard surface that must be removed in the performance of the work shall be restored in kind by the Developer in accordance with the Specifications contained herein. Deviation of more than 1/4-inch between old and new work or within new construction shall be corrected. Such measurement shall be made from a 10-foot minimum length straight edge. Adjoining surfaces between old and new must be flush.

5b.11 CLEANUP:

At the completion of each area of work all equipment, barricades, and similar items shall be removed from the area. All excess material will be removed. Adjacent borrow pits and road shoulders disturbed or used for storage of excavating materials will be smoothed and returned to its original contour.

5b.12 PAVEMENT MARKINGS:

The Developer shall be responsible for restoration of pavement markings on all roadways. Restoration of pavement markings shall be provided for any removed or obliterated markings. The temporary markings shall conform to UDOT standards and specifications. Permanent

pavement markings will then be replaced to conform to the applicable local and state specifications with approval from the City Engineer or their Representative.

DIVISION 5c

PORTLAND CEMENT CONCRETE

5c.01 GENERAL:

The work shall consist of furnishing, forming, placing, finishing, and curing Portland cement concrete as required.

5c.02 MATERIALS:

A. Portland Cement shall be Type II and shall comply with the Standard Specification for Portland Cement, ASTM C150.

If air-entraining cement is to be used, the Developer shall furnish the manufacturer's written statement giving the source, amount and brand name of the air-entraining addition.

Cement shall be stored in such a manner as to be protected from weather, dampness or other destructive agents. Cement that is partially hydrated or otherwise damaged will be rejected.

B. Aggregates shall conform to Tentative Specifications for Concrete Aggregates, ASTM C33 for the specified sizes. Aggregates that fail to meet any requirement may be accepted only when: (1) the specified alternate conditions of acceptance can be proved prior to the use of the aggregates on the job and within a period of time such that no work under the contract will be delayed by the requirements of such proof; or, (2) the specification for concrete expressly contains a provision of special mix requirements to compensate for the effects of the deficiencies.

The potential reactivity of aggregates with the alkalies in cement shall be evaluated by petrographic examination and, where applicable, the chemical method of test, ASTM C289, or by the results of previous tests or service records of concrete made from similar aggregates from the same source. The standards for evaluating potential reactivity shall be as described in ASTM Specification C-33, Appendix A1.

Aggregates indicated by any of the above to be potentially reactive shall not be used, except under one of the following conditions:

(1) Applicable test results of mortar bar tests, made according to ASTM C227, are available which indicate an expansion of less than 0.1% at six months in mortar bars made with cement containing not less than 0.8% alkalies expressed as sodium oxide; or

(2) Concrete made from similar aggregates from the same source has been demonstrated to be sound after 3-years or more of service under conditions of exposure to moisture and weather similar to those anticipated for the concrete under these specifications.

Aggregates indicated to be potentially reactive, but within acceptable limits as determined by mortar bar test results or service records, shall be used only with "low alkali" cement, containing less than 0.6% alkalies expressed as sodium oxide.

Aggregate of each class and size shall be stored and handled by methods that prevent segregation of particle sizes or contamination by intermixing with other materials.

C. Water shall be cleaned and free from injurious amounts of oil, salt, acid, alkali, organic matter or other deleterious substances.

D. Air-entraining agent shall be used in all concrete exposed to the weather. The agent shall conform to ASTM C150 and C260, except that the relative durability factor in the freezing and thawing test shall be not less than 95.

E. Steel reinforcement shall be free from rust, oil, grease, paint or other deleterious matter.

Steel bars for concrete reinforcement requiring bends shall be deformed billet-steel bars conforming to ASTM A615, Grade 40 or Grade 60.

Straight steel bars shall be deformed bars conforming to one of the following specifications:

Deformed Billet-Steel Bars for Concrete Reinforcement (Grade 40 or Grade 60) - ASTM A615.

Rail-Steel Deformed Bars for Concrete Reinforcement (Grade 50 or Grade 60) - ASTM A616.

Axle-Steel Deformed Bars for Concrete Reinforcement (Grade 40 or Grade 60) - ASTM A617.

Fabricated Steel bar mats shall conform to the requirements of ASTM A184.

Welded steel wire fabric reinforcement shall conform to the requirements of ASTM A185.

Welded deformed steel wire fabric for concrete reinforcement shall conform to the requirements of ASTM A497.

Cold-drawn steel wire reinforcement shall conform to the requirements of ASTM A82.

Deformed steel wire for concrete reinforcement shall conform to the requirements of ASTM A496.

Gages, spacing and arrangement of wires in welded steel wire fabric shall be as defined in ACI Standard 315 of the American Concrete Institute for the specified style designations.

Steel reinforcement stored at the site of the work shall be stored above the ground surface on platforms, skids or other supports and shall be protected from mechanical injury and corrosion.

F. Water-reducing and set-retarding admixtures shall conform to the requirements of ASTM C494, except that resistance to freezing and thawing shall be determined in all cases, and the minimum relative durability factor shall be 95.

Admixtures shall be Type A, Water-Reducing or Type D, Water-Reducing and Retarding, as defined in ASTM C494.

When added, in the manner and amount recommended by the manufacturer, to the concrete used on the job, with no change in the cement content or proportions of the aggregates, admixtures shall have the following effects:

Type A or Type D: The water content at the required slump shall be at least 5% less with the admixture than without. The air content shall remain within the range specified, but shall not exceed 8% in any case.

Type D: The time of initial setting, determined as prescribed in ASTM C494, shall be from 1 to 3-hours longer with the admixture than without.

G. Curing compound for concrete shall meet the requirements of ASTM C309.

Unless otherwise specified, the compound shall be Type 2.

All curing compound shall be delivered to the site of the work in the original container bearing the name of the manufacturer and the brand name. The compound shall be stored in a manner to prevent damage to the containers and to protect water-emulsion types from freezing.

5c.03 CLASS OF CONCRETE:

For the purpose of practical identification, concrete has been divided into four classes: Class AA(AE), A(AE), B(AE) and C(AE). The specific use for each Class is identified in the Division in which the concrete is used. The symbol (AE) designates air-entrainment. Basic requirements for each class are as follows:

Class of Concrete	Maximum Net Water Content (gallons/bag)	Minimum Cement Content (bags/cu. yd.)	Minimum 28-day Comp. Strength (psi)
AA(AE)	5	6-1/2	4000
A(AE)	6	6	3500
B(AE)	7	5	2500
C(AE)	8	4	2000

5c.04 COMPOSITION OF CONCRETE:

A. Aggregates maximum size shall be not larger than 1/5th of the narrowest dimension between forms within which the concrete is to be cast, nor larger than 3/4th of the minimum clear spacing between reinforcing bars or between reinforcing bars and forms. For unreinforced concrete slabs, the maximum size of aggregates shall not be larger than 1/4th the slab thickness.

B. Water shall be added to the mix to produce concrete with the minimum practicable slump. The slump of mechanically vibrated concrete shall not exceed 4-inches. No concrete shall be placed with a slump in excess of 5-inches.

C. Air-Content for air-entrained concrete shall comply with the following:

Course Aggregate Size (in.)	Air Content (%)
1-1/2 to 2-1/2	5 +/- 1
3/4 or 1	6 +/- 1
3/8 or 1/2	7 +/- 1

The air-entraining agent shall be added as liquid to the mixing water by means of mechanical equipment capable of accurate measurement and control.

D. Water reducing, set retarding admixtures shall not be used except with previous approval from the City Engineer and shall in such a case, conform to the standards of materials set forth in the specification.

5c.05 DESIGN OF THE CONCRETE MIX:

The proportions of the aggregates shall be such as to produce a concrete mixture that will work readily into the corners and angles of the forms and around reinforcement when consolidated, but will not segregate or exude free water during consolidation.

Prior to placement of concrete, the Developer shall furnish the City Engineer or Representative, for approval, a statement of the materials and mix proportions (including admixtures, if any) it intends to use. The statement shall include evidence satisfactory to the City Engineer or Representative that the materials and proportions will produce concrete conforming to this specification. The materials and proportions so stated shall constitute the "job mix." After the job mix has been reviewed for conformance to specification by the City Engineer, neither the source, character or grading of the aggregates nor the type or brand of cement or admixture shall be changed without prior notice to the City Engineer. If such changes are necessary, no concrete containing such new or altered materials shall be placed until the City Engineer has approved a revised job mix.

5c.06 OBSERVATION AND TESTING:

The City Engineer shall have free entry to the plant and equipment furnishing concrete under the contract. Proper facilities shall be provided for the City Engineer to observe the materials, equipment and processes and to obtain samples of the concrete. All tests and observations will be conducted so as not to interfere unnecessarily with manufacture and delivery of the concrete.

5c.07 HANDLING AND MEASUREMENT OF MATERIALS:

Materials shall be stockpiled and batched by methods that will prevent segregation or contamination of aggregates and insure accurate proportioning of the ingredients of the mix.

Except as otherwise provided in Division 8, cement and aggregates shall be measures as follows:

Cement shall be measured by weight or in bags of 94-pounds each. When cement is measured in bags, no fraction of a bag shall be used unless weighed.

Aggregates shall be measured by weight. Mix proportions shall be based on saturated, surface-dry weights. The batch weight of each aggregate shall be the required saturated, surface-dry weight plus the weight of surface moisture it contains.

Water shall be measured by weight, to an accuracy within one per cent of the total quantity of water required for the batch.

Admixtures shall be measured within a limit of accuracy of 3%.

5c.08 MIXERS AND MIXING:

Concrete shall be uniform and thoroughly mixed when delivered to the work. Variations in slump of more than 1-inch within a batch will be considered evidence of inadequate mixing and shall be corrected by increasing mixing time or other means. For stationary mixers, the mixing time after all cement and aggregates are in the mixer drum shall be not less than 1-1/2-minutes. When concrete is mixed in a truck mixer, the number of revolutions of the drum or blades at mixing speed shall be not less than 70 or more than 100.

Unless otherwise specified, volumetric batching and continuous mixing at the construction site will be permitted if approved by City Engineer. The batching and mixing equipment shall conform to the requirements of ASTM C685 and shall be demonstrated prior to placement of concrete, by tests with the job mix, to produce concrete meeting the specified proportioning and uniformity requirements. Concrete made by this method shall be produced, inspected, and certified in conformance with Sections 6, 7, 8, 13, and 14 of ASTM C685.

No mixing water in excess of the amount called for by the job mix shall be added to the concrete during mixing or hauling or after arrival at the delivery point.

5c.09 FORMS:

Forms shall be of wood, plywood, steel or other approved material and shall be mortar tight. The forms and associated falsework shall be substantial and unyielding and shall be constructed so that the finished concrete will conform to the specified dimensions and contours. Form surfaces shall be smooth and free from holes, dents, sags or other irregularities. Forms shall be coated with a nonstaining form oil before being set into place.

Metal ties or anchorages within the forms shall be equipped with cones, she-bolts or other devices that permit their removal to a depth of at least 1-inch without injury to the concrete.

All edges that will be exposed to view when the structure is completed shall be chamfered by placing molding in the forms, unless finishing with molding tools.

5c.10 PREPARATION OF FORMS AND SUBGRADE:

Prior to placement of concrete the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings. Any oil on the reinforcing steel or other surfaces required to be bonded to the concrete shall be removed. Rock surfaces shall be cleaned by air-water cutting, wet sandblasting or wire brush scrubbing, as necessary, and shall be wetted immediately prior to placement of concrete. Earth surfaces shall be firm and damp. Placement of concrete on mud, dried earth or uncompacted fill or frozen subgrade will not be permitted.

Unless otherwise specified, when concrete is to be placed over drain fill, the contact surface of the drain fill shall be covered with a layer of asphalt-impregnated building paper or polyvinyl

sheeting prior to placement of the concrete. Forms for weepholes shall extend through this layer into the drain fill.

Items to be embedded in the concrete shall be positioned accurately and anchored firmly.

Weepholes in walls or slabs shall be formed with nonferrous materials.

5c.11 CONVEYING:

Concrete shall be delivered to the site and discharged into the forms within 1.5-hours after the introduction of the cement to the aggregates. In temperatures over 90° F or under conditions contributing to quick stiffening of the concrete, the time between the introduction of the cement to the aggregates and discharge shall not exceed 60-minutes. The City Engineer may allow a longer time, provided the setting time of the concrete is increased a corresponding amount by the addition of an approved set-retarding admixture, in which case, the time increases to 1.5-hours. In any case, concrete shall be conveyed from the mixer to the forms as rapidly as practicable by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall not be dropped more than five feet vertically unless suitable equipment is used to prevent segregation.

5c.12 PLACING:

Concrete shall not be placed until the subgrade, forms and steel reinforcement have been inspected and approved. No concrete shall be placed except in the presence of the City Engineer or Representative. The Developer shall give 48-hour notice to the City Engineer or Representative each time it intends to place concrete. Such notice will give the City Engineer or Representative adequate time to inspect the subgrade, forms, steel reinforcement and other preparations for compliance with the specifications before concrete is delivered for placing.

The concrete shall be deposited as closely as possible to its final position in the forms and shall be worked into the corners and angles of the forms and around all reinforcements and embedded items in a manner to prevent segregation of aggregates or excessive laitance. Unless otherwise specified, slab concrete shall be placed to design thickness in one continuous layer. Formed concrete shall be placed in horizontal layers not more than 20-inches thick. Hoppers and chutes, pipes or "elephant trunks" shall be used as necessary to prevent splashing of mortar on the forms and reinforcing steel above the layers being placed.

Immediately after the concrete is placed in the forms, it shall be consolidated by spading, hand tramping or vibration as necessary to insure smooth surfaces and dense concrete. Each layer shall be consolidated to insure monolithic bond with the preceding layer. If the surface of a layer of concrete in place sets to the degree that it will not flow and merge with the succeeding layer when spaded or vibrated, the Developer shall discontinue placing concrete and shall make a construction joint according to the procedure specified.

If placing is discontinued when an incomplete horizontal layer is in place, the unfinished end of the layer shall be formed by a vertical bulkhead.

5c.13 CONSTRUCTION JOINTS:

Construction joints shall be made at the locations shown on the Drawings. If construction joints are needed which are not shown on the Drawings, they shall be placed in locations approved by the City Engineer or Representative.

Where a feather edge would be produced at a construction joint, as in the top surface of a sloping wall, an inset form shall be used so that the resulting edge thickness on either side of the joint is not less than 6-inches.

In walls and columns, as each lift is completed, the top surfaces shall be immediately and carefully protected from any condition that might adversely affect the hardening of the concrete.

Steel tying and form construction adjacent to concrete in place shall not be started until the concrete has cured at least 12-hours. Before new concrete is deposited on or against concrete that has hardened, the forms shall be retightened. New concrete shall not be placed until the hardening concrete has cured at least 12-hours.

Surfaces of construction joints shall be cleaned of all unsatisfactory concrete, laitance, coatings or debris by washing and scrubbing with a wire brush or wire broom or by other means approved by the City Engineer. The surfaces shall be kept moist for at least one hour prior to placement of the new concrete.

5c.14 EXPANSION AND CONTRACTION JOINTS:

Expansion and contraction joints shall be made only at locations shown on the drawings, but on flat work, shall be placed at least every 50-feet.

Exposed concrete edges at expansion and contraction joints shall be carefully tooled or chamfered, and the joints shall be free of mortar and concrete. Joint filler shall be left exposed for its full length with clean and true edges.

Preformed expansion joint filler shall be held firmly in the correct position as the concrete is placed.

When open joints are specified, they shall be constructed by the insertion and subsequent removal of a wooden strip, metal plate or other suitable template in such a manner that the corners of the concrete will not be chipped or broken. The edges of open joints shall be finished with an edging tool prior to removal of the joint strips.

5c.15 WATERSTOPS:

Waterstops shall be held firmly in the correct position as the concrete is placed. Joints in metal waterstops shall be soldered, brazed or welded. Joints in rubber or plastic waterstops shall be cemented, welded or vulcanized as recommended by the manufacturer.

5c.16 REMOVAL OF FORMS:

Forms shall not be removed without the approval of the City Engineer or Representative. Forms shall be removed in such a way as to prevent damage to the concrete. Supports shall be removed in a manner that will permit the concrete to take the stresses due to its own weight uniformly and gradually.

5c.17 FINISHING FORMED SURFACES:

Immediately after the removal of the forms:

A. All fins and irregular projections shall be removed from exposed surfaces.

B. On all surfaces, the holes produced by the removal of form ties, cone-bolts, and she-bolts shall be cleaned, wetted and filled with a dry-pack mortar consisting of one part Portland cement, three parts sand that will pass a No. 16 sieve, and water just sufficient to produce a consistency such that the filling is at the point of becoming rubbery when the material is solidly packed.

5c.18 FINISHING UNFORMED SURFACES:

All exposed surfaces on the concrete shall be accurately screeded to grade and then float finished, unless specified otherwise.

Excessive floating or troweling of surfaces while the concrete is soft will not be permitted.

The addition of dry cement or water to the surface of the screeded concrete to expedite finishing will not be allowed.

Joints and edges on unformed surfaces that will be exposed to view shall be chamfered or finished with molding tools.

5c.19 CURING AND PROTECTION:

Concrete shall be prevented from drying for a curing period of at least 7-days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period, or until curing compound is applied as specified below. Moisture shall be maintained by sprinkling, flooding or fog spraying or by covering with continuously moistened canvas, cloth mats, straw, sand or other approved material. Wood forms (except plywood) left in place during the curing period shall be kept wet. Formed surfaces shall be thoroughly wetted immediately after forms are removed and shall be kept wet until patching and repairs are completed. Water or covering shall be applied in such a way that the concrete surface is not eroded or otherwise damaged. As soon as the concrete has hardened sufficiently to prevent damage, the finished surface shall be protected for curing in one of the following ways:

A. Ponding of water on the surface or continuous sprinkling.

B. Application of absorptive mats such as 3-inches of cured hay, clean straw or fabric kept continuously wet (as approved by the City Engineer).

C. Application of 2-inches of moist earth or sand uniformly distributed on the surface and kept saturated by spraying with water.

D. Application of light colored waterproof plastic materials, conforming to "Specifications for Waterproof Sheet Materials for Curing Concrete" ASTM C171, placed and maintained in contact with the surface of the concrete.

E. Application of a curing compound, conforming to "Specifications for Liquid Membrane - Forming Compounds for Curing Concrete" ASTM C309. The compound shall be light in color and shall be applied in accordance with the manufacturer's recommendations immediately after any water sheen, which may develop after finishing, has disappeared from the concrete surface.

Curing compound shall not be applied to surfaces requiring bond to subsequently placed concrete, such as construction joints, shear plates, reinforcing steel and other embedded items. If the membrane is damaged during the curing period, the damaged area shall be resprayed at the rate of application specified above.

5c.20 REMOVAL OR REPAIR:

When concrete is honey combed, damaged or otherwise defective, the Developer shall remove and replace the structure or structural member containing the defective concrete or, where feasible, correct or repair the defective concrete. Prior to starting repair work the Developer shall obtain the Engineer's approval of its plan for affecting the repair. The Developer shall perform all repair work in the presence of the City Engineer or Representative.

5c.21 CONCRETING IN COLD WEATHER:

Concrete shall not be mixed nor placed when the daily minimum atmospheric temperature is less than 40°F unless facilities are provided to prevent the concrete from freezing. The use of accelerators or antifreeze compounds will not be allowed.

5c.22 CONCRETING IN HOT WEATHER:

The Developer shall apply effective means to maintain the temperature of the concrete below 90°F during mixing, conveying and placing.

5c.23 ACCEPTANCE CRITERIA:

The following criteria will be used to determine if the Developer has met City standards and proper construction of improvements has taken place:

A. Water Ways

Water ways should be five (5) feet wide. Road base depth is six (6) inches and compacted to a minimum of 96% maximum dry density. Reinforcement is typically 5 #4 bars, at 12" centers. If there is ponding of water ¼" or more, the ponding section, at least, will be replaced. The water way should be replaced if any irregularities are present (spalling, scratches, foot prints, writing, etc.). If cracks are 1/8" or larger, the water way will need to be replaced. If cracks are less than 1/8" wide, then the cracks should be ground and Polyurethane Joint Sealer (Sonoborn or Sika) used to fill, with temperatures between 40° and 100° F at time of placement. For temperatures outside this range, an extended warranty may be accepted for the effected section(s). A water way with more than one crack or spider web cracking will need to be replaced. There will be no lifting of sinking water ways accepted.

B. Curb and Gutter

Curb and gutter width is 30-inches (See Standard Drawings). Road base depth is 6-inches and compacted to a minimum of 96% maximum dry density. If there is ponding of water 1/4-inch or more, the effected curb section(s) will be replaced. The curb will be replaced if any irregularities are present (spalling, scratches, foot prints, writing, etc.). If cracks are 1/8-inch or larger, the curb will need to be replaced. If cracks are less than 1/8-inch wide, the crack should be ground and use Polyurethane Joint Sealer (Sonoborn or Sika) to fill, with temperatures between 40° and 100° F at time of placement. For temperatures outside this range, an extended warranty may be accepted for the effected section(s). Curb with more than one crack or spider web cracking will be replaced. There will be no lifting of sinking curb accepted. Deflection test required before placement of concrete. Backfill curb and gutter no less than 2-inches below Top Back of Curb (TBC).

C. Sidewalk

Standard sidewalk width is 4-feet, unless noted on Drawings and approved by the City Engineer. Road base depth should be 4-inches, and 6-inches under sections located in driveways. Road base compaction should be a minimum of 96% maximum dry density. Sidewalk will be replaced if any irregularities are present (spalling, scratches, foot prints, writing, etc.). If cracks are 1/8-inch or larger, the sidewalk will need to be replaced. If

cracks are less than 1/8-inch wide, they will be ground and Polyurethane Joint Sealer (Sonoborn or Sika) used to fill, with temperatures between 40° and 100° F at time of placement. For temperatures outside this range, an extended warranty may be accepted for the effected section(s). Sidewalk with more than one crack or spider web cracking will be replaced. There will be no lifting of sinking sidewalk accepted. Deflection test required before placement of concrete. Backfill sidewalk no less than 1-inch below top surface.

Sidewalk with horizontal separation of 1/8-inch or more from adjacent concrete will be replaced. If less than 1/8-inch, then it can be sawcut and Polyurethane Joint Sealer (Sonoborn or Sika) used to fill, with temperatures between 40° and 100° F at time of placement. For temperatures outside this range, an extended warranty may be accepted for the effected section(s). Sidewalk with vertical separation of 1/16-inch or more will be replaced. Any sections of sidewalk that have settled more than1/2-inch from grade will be removed and replaced. Where expansion joints are used, expansion material can not be more than 1/16-inch higher than top of sidewalk or 1/16-inch lower. Standard sidewalks in driveways will need to be removed and replaced with 6-inches of road base and six 6-inches of concrete.

DIVISION 5d

REINFORCING STEEL

5d.01 GENERAL:

All reinforcing bars shall be grade 40. Wire fabric shall conform to ASTM A185.

Before supply of steel, all order lists and bending diagrams shall be provided by the Developer for approval of the City Engineer. The approval of such lists and diagrams shall in no way relieve the Developer of responsibility for the correctness of reinforcing supplied and all expenses incidental to revision of furnished reinforcing steel shall be carried by the Developer.

5d.02 FABRICATION AND PLACING REINFORCEMENT:

A. Fabrication: Reinforcement shall be cold bent to the shapes shown in accordance with ACI Standard Code, latest edition Chapter 7.

B. Clearances: All bars shall be of the size specified and shall be placed in the positions shown on the Drawings in such a manner as to be firmly held during the placing of the concrete. Where not otherwise indicated, the following minimum concrete cover shall be provided for reinforcement, as required by the ACI Standard Code, latest edition, Chapter 7.

C. Support: Bars shall be tied at all intersections except where the spacing is less than 12-inches when alternate intersections shall be tied. Distance from supports shall be by means of ties, hangers, or other approved supports. Metal chairs of approved design shall be used to hold reinforcement from contact with the forms. Metal chairs which are in contact with the exterior surface of the concrete shall be galvanized. Layers of bars or when placing concrete directly on a prepared subgrade, reinforcing shall be separated by precast mortar blocks or by other equally suitable devices. The use of pebbles, pieces of broken stone or brick, metal pipe and wooden blocks shall not be permitted. Reinforcement in any member shall be placed and then inspected and approved by the City Engineer or Representative before the placing of concrete begins. Concrete placed in violation of this provision may be rejected and removal required.

   If the fabric reinforcement is shipped in rolls, it shall be straightened into flat sheets before being placed.

D. Splicing: All splices shall be staggered so that splices in adjacent bars shall be not less than 4-feet apart, and shall conform to ACI Standard Code, latest edition, Chapter 12.

DIVISION 6

FENCING

6.01 GENERAL:

All reinforcing bars shall be grade 40. Wire fabric shall conform to ASTM A185.

Before supply of steel, all order lists and bending diagrams shall be provided by the Developer for approval of the City Engineer. The approval of such lists and diagrams shall in no way relieve the Developer of responsibility for the correctness of reinforcing supplied and all expenses incidental to revision of furnished reinforcing steel shall be carried by the Developer.

Fencing 6-feet in height shall be installed at locations designated by the Planning Commission for the separation of non-compatible uses. Fences shall be chain link, including opaque privacy slats where required by the Planning Commission; solid board; or masonry. Chain link fence and gates shall be constructed as indicated on the Drawings and/or herein specified.

Type “D” Construction fencing may be required where conditions warrant the installation of a temporary fence. Where permanent fencing is required, the temporary fencing may be eliminated if the permanent fencing is installed prior to the start of other construction. The fence shall be protected against damage and, if damaged, it shall be repaired to the satisfaction of the City Engineer or Representative prior to final acceptance.

6.02 CHAIN LINK FENCE:

A. MATERIALS:

The chain link fence and gates shall be USS Cyclone-Type I, Anchor Post Products, Inc., or SS40-Type I, Allied Tube & Conduit, or equivalent. The components shall be as listed and specified below.

Fabric	
Height	6' - 0"
Mesh	2-inch
Size Wire	9-gauge
Coating	Zinc coating
Coating specifications	ASTM a-392-Class 1
Tensile strength	80,000 psi minimum
Top Rail	
Size	1-5/8" OD - galvanized

Weight	2.27 pounds per LF
Tension Wire coil spring wire	7-gauge galvanized
Line Posts	4.10 pounds "H" section or 2-3/8" OD - 3.65-pounds per LF - galvanized

Terminal, Corner, and Pull Posts

Size	2-7/8" OD round
Weight	5.79 pounds per LF

Except where shown differently on the Drawings, gate posts and concrete foundations for gate posts shall be as determined by the following schedule:

Gate Leaf Width (feet)	O.D. Size (inches)	Weight (lb/ft)	Concrete Diameter (inch)	Foundation Depth (ft)
0 to 6	2-7/8	5.79	12	4
6 to 13	4	9.11	18	3
13 to 18	6-5/8	18.97	18	4
Over 18	8-5/8	24.7	18	4.5

All posts, rails, and appurtenances shall be hot-dipped zinc coated steel per ASTM A-120, A-121, or A-153, whichever is applicable. Pipe posts shall have tops which exclude moisture. Fence corner, pull, and gate posts shall be braced with the same material as top rail and trussed to line posts with 3/8-inch rods and tighteners.

The fabric shall be connected to the line posts with 6-gauge hot-dip galvanized wire clips every 14-inches, to terminal, corner, and gate posts by using 1/4-inch x 3/4-inch tension bars tied to posts every 14-inches with 11-gauge, 1-inch wide, hot-dip galvanized steel bands and 38-inch diameter bolts and nuts, and to tension wires with 11-gauge hog rings every 24-inches.

A 7-gauge, galvanized, coiled spring tension wire shall be installed along the bottom of the fence fabric.

B. CONSTRUCTION:

The chain link fence shall be located as indicated on the Drawings. Finished fence shall be plumb, taut, true to line and grade, and complete in

all details. End, corner, slope, and gate posts shall be braced to the mid-point of the nearest line post or posts with horizontal braces used as compression members and the said brace posts trussed from the brace back to the bottom of the end, corner, slope, or gate post with 3/8-inch steel truss rods with turnbuckles or other suitable tightening devices used as tension members.

Fence shall be installed with a top rail and a bottom tension wire. Top rail shall provide allowance for expansion and contraction due to temperature differential in the coupling devices.

The fabric shall be placed on the outward facing side of the posts and shall be installed so that the top edge projects over the top rail of the fence. The fabric shall be stretched taut and securely fastened to the posts, the top rail and the bottom tension wire. The tension wire shall be installed parallel to the line of the fabric.

The fence shall follow the general finished grade of the ground and shall have pull posts at all points where required to conform to a change in ground line. The distance between the bottom of the fence and the finished ground line shall not exceed 3-inches. The ground shall be graded before fence posts are located to permit the grade of the fence to remain constant over any local elevation or depressions in the ground line. The surplus dirt, concrete, etc. shall be cleaned up and the grade dressed up upon completion of the work. Fence posts shall be set in concrete foundations at least 3-feet into the ground and shall be spaced not over 10-feet apart. Concrete shall be a minimum of 10-inches in diameter for line posts and 12-inches in diameter for corners and gates. Exposed concrete fence post caps shall be finished off in a workmanlike manner. A minimum of 1-inch of concrete shall be above the finished grade and shall be sloped to drain away from the post.

C. SWING GATES:

Except as shown or specified, all chain link fence gates shall be swing gates. Gate frames shall be made of 1.9-inch galvanized pipe weighing 2.7-pounds per linear foot. Corner fittings shall be heavy pressed steel or malleable castings.

The corners of gate frames shall be fastened together and reinforced with a fitting designed for the purpose or by welding. All welds shall be ground smooth.

Chain link fence fabric shall be attached to the gate frame by the use of tension bars and tie wires as specified for fence construction, and suitable tension connectors spaced at approximately 16-inch intervals.

Gates shall be provided with a combination steel or malleable iron catch and locking attachment submitted to the City Engineer for review. Stops to hold gates open and a center rest with catch shall be provided where required.

6.03 WOOD FENCE:

A. MATERIALS:

(1) Slats – Redwood, cedar, combed spruce or other wood covering acceptable to the City Engineer.

(2) Bottom and Top Rail – Minimum 2-inch by 4-inch, 8-foot long cedar stud.

(3) Corner, Gate, End, or Line Posts – Minimum size 4-inch by 4-inch cedar wood post.

B. CONSTRUCTION:

All corner, gate, end, or line posts shall be set in concrete. The cedar posts shall be set true to line and grade with concrete bases at least 2-feet in depth. A minimum of 6-inches of concrete shall be provided below the bottom of each post. The minimum diameter for the concrete base for any post shall be 12-inches.

Posts shall be sound and free from decay, splits, multiple cracks, or any other defect which would weaken the posts or otherwise cause them to be structurally unsuitable for the purpose intended. The maximum distance between posts in any section shall not exceed 8-inches. The top and bottom railings shall be securely fastened to the posts with galvanized nails or other acceptable means. Changes in line of 30° or more shall be considered as corners.

Fence slats shall be placed on the roadway side of posts unless otherwise approved by City Engineer. The slats shall be placed approximately 1-inch above the ground and on a straight grade between posts by excavating the high points as required. Filling depressions will be permitted only upon approval of the City Engineer.

The slats shall be sound and free from all major decay or defects which would weaken or otherwise cause them to be unsuitable for fence slats. Fastening to top and bottom railings shall be done with two galvanized nails at both the top and bottom rail.

6.04 CONSTRUCTION FENCE SPECIFICATIONS – TYPE "D":

A. MATERIALS:

(1) The fabric shall be Class II wire mesh which conforms to ASTM Designation A-116, nominal 0.099-inch Farm Grade with standard 6-inch graduated spacing. The wire mesh shall have a Class 1 zinc coating. Polyethylene mesh fabric may be substituted when approved by the City Engineer.

(2) Corner, gate, end, or line posts shall be painted metal Tee, U or Y channel, Angular, or other approved shapes 6.5-feet in length.

B. CONSTRUCTION

Metal fence posts shall be spaced at a maximum of 16-feet. Post spacing measurements shall be made parallel to the ground slope. All posts shall be placed vertically. Metal posts may be installed by driving, if this can be done without damage to the post. Otherwise, they shall be installed to the specified depth (2.5-feet) in larger drilled or dug holes and backfilled and compacted.

Corner posts shall be brace in two directions. End and gate posts shall be braced in one direction. Wire mesh fabric shall be drawn tight enough to eliminate all sag without causing the "tension crimps" to fail to function.

Any high points along the ground surface which interfere with the placing of wire mesh shall be excavated to provide at least 2-inches of ground clearance. Every alternate lateral wire in the mesh fabric shall be fastened to each post by means of a clamp.

6.05 MASONRY FENCE:

Because of the variable nature of masonry fences, both with regards to materials desired and also with the condition of the foundation soils, no standard specification is given. The Developer, or others desiring to install the masonry fence, shall be responsible to submit engineered drawings for review. No masonry walls will be allowed until the plans have been reviewed and approved by the City Engineer.

DIVISION 7

COMMUNICATION UTILITY SERVICES

7.01 SCOPE OF WORK:

This division defines and covers the requirements and responsibilities for the installation of City owned communication utility systems. For information regarding requirements for communication utility systems not owned by the City, please refer to the standard drawings and specifications of the applicable utility.

The underground conduit installed to provide communication service shall be furnished and installed by the Developer. In the event of a request for relocation of communication facilities, the associated costs shall be the responsibility of the requestor. All new communication utility systems shall be constructed underground, unless otherwise authorized by the City Engineer. No overhead communication lines will be allowed unless authorized by the Power Department Superintendent.

Developer shall furnish and install all communication facilities except for the following, which shall be completed by the Utility:

A. Pulling underground or overhead cable;

B. Installing communication cable terminations;

C. Setting of large communications pedestals which house Nodes, and Fiber Optic Equipment;

D. Installing communication connections and terminations;

E. All overhead facilities, including extension of risers as shown in the standard drawings.

7.02 ATTACHING TO EXISTING CITY FACILITIES PROHIBITED:

There shall be no installation on or connection to poles or other equipment owned by the City unless specifically authorized, in writing, by the City. Unauthorized, or incorrect, connections to or installations on City owned poles or equipment shall either be removed or corrected, as directed by the City Engineer.

7.03 PERMITS AND INSPECTIONS:

Service shall not be established until all necessary permits have been obtained and until the wiring installation has been inspected and approved by the City. The City reserves the right to inspect wiring and to refuse service to any installation that is, in the opinion of the City, unsafe or if the operation of the same may be detrimental to the service furnished to other Customers or the City.

7.04 CONSTRUCTION DRAWINGS:

Communication utility plan drawings must be approved by the City Engineer in order to be considered valid for construction and to be authorized to proceed with construction. Revisions, if needed, must also include the date the revision was approved.

7.05 CONDUIT:

All conduit shall be orange 4-way microduct SDR 11 HDPE pipe meeting ASTM-3035 specifications, unless otherwise directed by the City Engineer or their designee. All bends or sweeps in conduit must be made with manufactured parts and fittings; no deformations or alterations shall be allowed to conduit to make such bends or sweeps. The minimum radius for any bend or sweep in the conduit shall be 24-inches. The total number of bends in any conduit run shall not exceed 360°, unless otherwise authorized by the City Engineer.

All conduit shall be buried at a minimum depth of 24-inches and a maximum depth of 30-inches, unless otherwise approved by the City Engineer, and must have a 3- foot minimum separation from City Power. All conduit must maintain at least a 4- inch separation from all concrete and asphalt surfaces. Trenches may not be shared with City Power, unless otherwise approved by the City Power Superintendent.

7.06 HANDHOLES, PULL BOXES AND OTHER ENCLOSURES:

All handholes or pull boxes shall be polymer concrete or HDPE with lids inscribed with "KAYSVILLE FIBER", and must be level and installed in accordance with the Kaysville City standard drawings. Ground sleeves, pads, handholes, pull boxes and other enclosures shall be installed in such a manner as to avoid movement or settlement; any movement or settlement beyond 1/2-inch, or that adversely impacts the utility or its surroundings, shall require correction by the Developer.

The ends of conduits in handholes or pull boxes shall have bell ends, and enter the box vertically at +/-30°. Conduit ends shall be at least 2-inches above the bottom of the box, and at least 8-inches below the top of the box.

Ground rods shall be required and installed in boxes as called out in the Kaysville City standard drawings. Ground rods shall be 5/8-inch by 8-foot copper clad.

7.07 LOCATING WIRE, TAPE AND LABELS

All conduits shall have a 6-inch tape buried 12-inches above the conduit, reading: “CAUTION: FIBER OPTIC BURIED.” The end of each stubbed conduit, including service laterals, shall be marked to the surface according to the standard drawings.

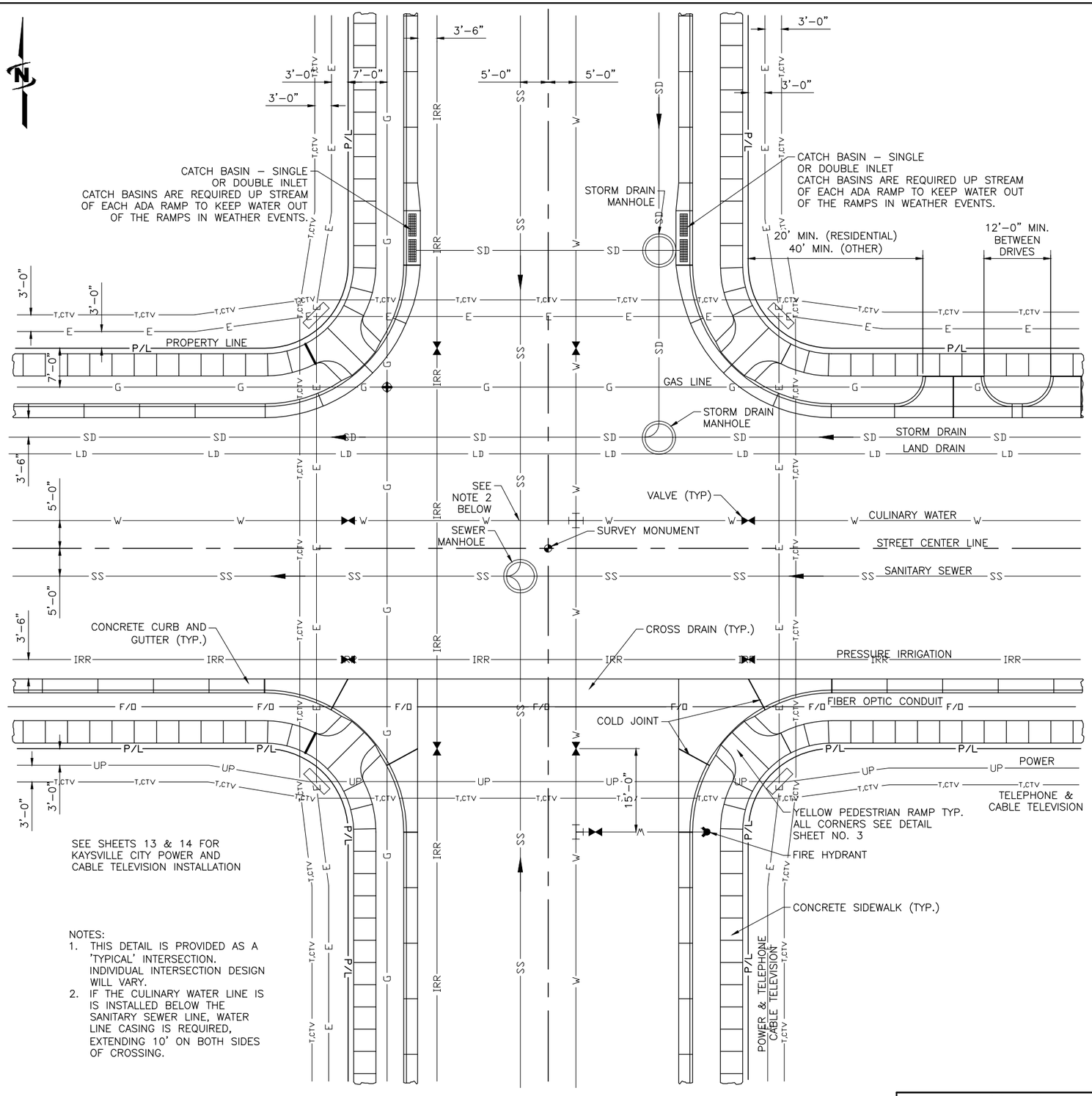
All conduit shall require a tracer wire (12-gauge) for locating purposes placed on top of the pipe. Where splices are to be made, a water tight splice kit must be used. See the Kaysville City standard drawings for additional detail. All conduits shall have a pull string in the conduit securely tied off in each pad or enclosure.

An imprinted, plastic label shall be securely taped to the end of each conduit run. The label shall indicate the location of where the run ends.

7.08 SERVICES

Service conduits shall be 1-inch PVC or approved equivalent having no bends greater than 90° shall be run from the site being served to a City handhole or pull box.

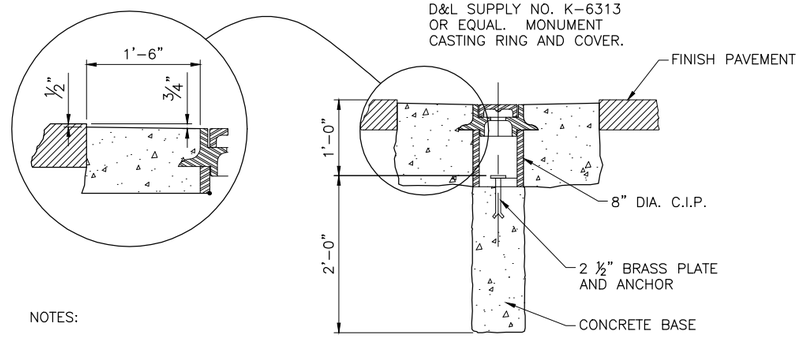
The City Engineer or their designee will determine the point of delivery for all developments and will decide if the multiple buildings, business and residential, or portions of buildings will be serviced using single or multiple distribution unit (MDU) enclosures.



NOTES:

1. THIS DETAIL IS PROVIDED AS A 'TYPICAL' INTERSECTION. INDIVIDUAL INTERSECTION DESIGN WILL VARY.
2. IF THE CULINARY WATER LINE IS IS INSTALLED BELOW THE SANITARY SEWER LINE, WATER LINE CASING IS REQUIRED, EXTENDING 10' ON BOTH SIDES OF CROSSING.

TYPICAL STREET IMPROVEMENT PLAN
SCALE: N.T.S.



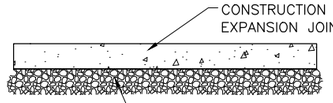
NOTES:

1. CONCRETE COLLAR TO HAVE 12" MIN. THICKNESS.
2. CONCRETE TO BE CLASS A 5½ OR 6 BAG MIX.

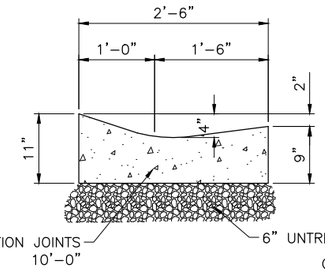
1 SURVEY MONUMENT SECTION
SCALE: N.T.S.

NOTES:

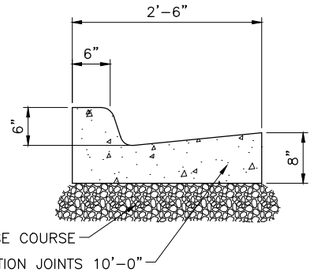
1. SIDEWALK TO BE 6" THICK OVER 6" BASE IN RESIDENTIAL AND COMMERCIAL DRIVE APPROACHES
2. 1" MINUS WASHED ROCK WHEN REQ'D BY KAYSVILLE CITY (WET CONDITIONS).
3. BASE COURSE TO BE AT 96% COMPACTION (TYP).
4. IF CRACKS ARE ⅛" OR LARGER, SIDEWALK OR CURB AND GUTTER WILL NEED TO BE REPLACED.



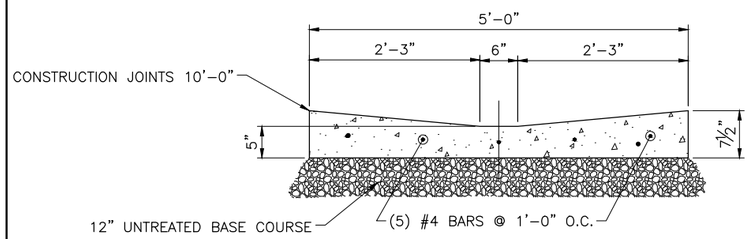
2 SIDEWALK SECTION
SCALE: N.T.S.



3 STANDARD ROLLED GUTTER*
SCALE: N.T.S.
*USE OF ROLLED GUTTER MUST BE APPROVED BY ENGINEER



4 STANDARD CURB
SCALE: N.T.S.



5 CROSS DRAIN SECTION
SCALE: N.T.S.

NO.	REVISION DESCRIPTION	BY	APP.	DATE

FILE:
PROJ. #:
PLOT DATE: 1/20/2021
LAST UPDATED: 1/19/2021
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DESIGN BY:
CHECKED BY:

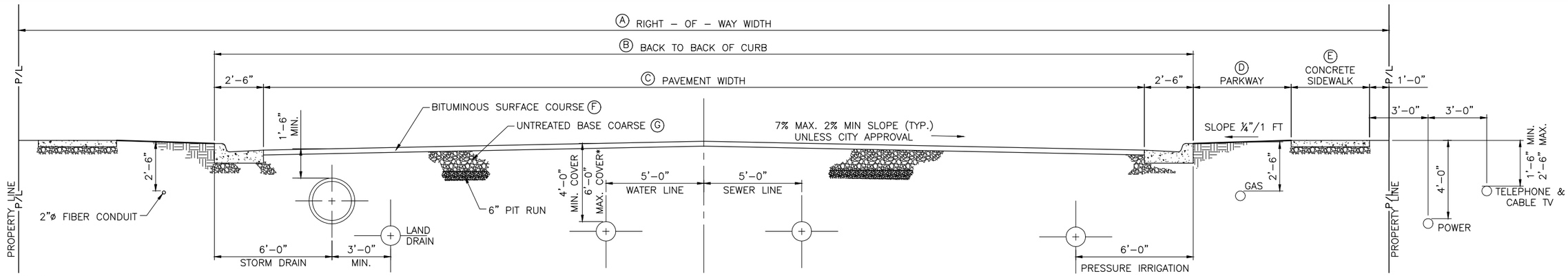
Kaysville City

KAYSVILLE CITY CORPORATION DEVELOPMENT STANDARDS

STANDARD STREET IMPROVEMENTS

SHEET 1

Plot Date:1/20/2021 4:12 PM Plotted By: Mark Jenkins
Date Created:1/19/2021 \\KAYSPUBLIC\PROJECTS\JUB\KAYSVILLESTANDARDS\CAD\01-STANDARD STREET IMPROVEMENTS.DWG



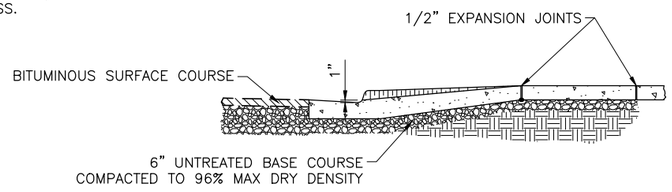
NOTES:
1. TOP BACK OF CURB ON BOTH SIDES OF ROAD TO BE SAME ELEVATIONS.
2. ON MAJOR STREETS, THE CITY ENGINEER SHALL APPROVE PAVEMENT DESIGN. (SEE SPECIFICATIONS)
3. ALL UTILITIES STUBBED PAST PROPERTY LINE MUST BE AT 4' MINIMUM DEPTH.
4. POWER LINES TO MAINTAIN 30" MIN. COVER IN STREETS.
5. ROAD BASE TO BE COMPACTED TO 96% MAX DRY DENSITY.
6. AN ALTERNATIVE 6' SIDEWALK AT BACK OF CURB WITH EXPANSION MATERIAL BETWEEN CURB AND SIDEWALK, MUST BE APPROVED BY CITY ENGINEER.

* UNLESS VARIANCE APPROVED BY CITY ENGINEER

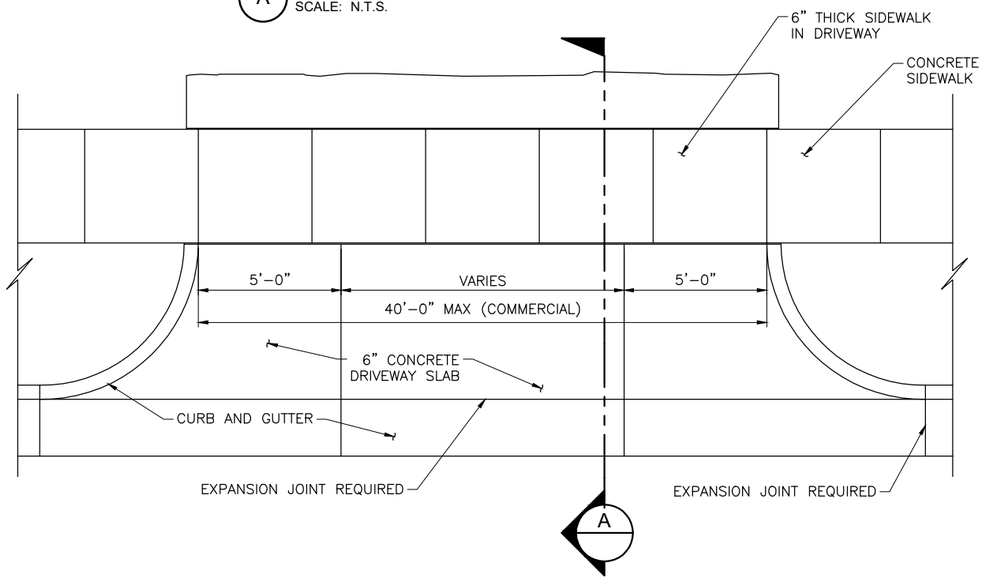
STANDARD STREET SECTION
SCALE: N.T.S.

Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ	Ⓖ
100'–0"	80'–0"	75'–0"	5'–0"	4'–0"	NOTE 2	NOTE 2
80'–0"	60'–0"	55'–0"	5'–0"	4'–0"	NOTE 2	NOTE 2
70'–0"	50'–0"	45'–0"	5'–0"	4'–0"	NOTE 2	NOTE 2
66'–0"	46'–0"	41'–0"	5'–0"	4'–0"	0'–3"	1'–0"
60'–0"	40'–0"	35'–0"	5'–0"	4'–0"	0'–3"	1'–0"
55'–0"	35'–0"	30'–0"	5'–0"	4'–0"	0'–3"	1'–0"

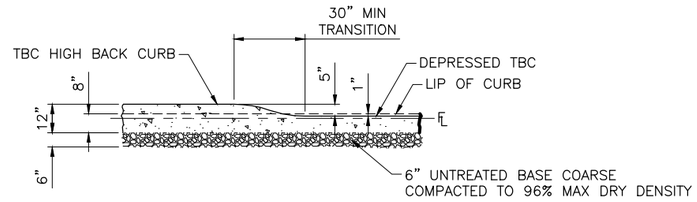
NOTES:
1. SCRIBE SIDEWALK 1/2" DEPTH AT EACH 4'–0"
2. EXPANSION JOINT REQ'D AT NEW AND OLD INTERFACE AND/OR AT CHANGE IN CONC. THICKNESS.



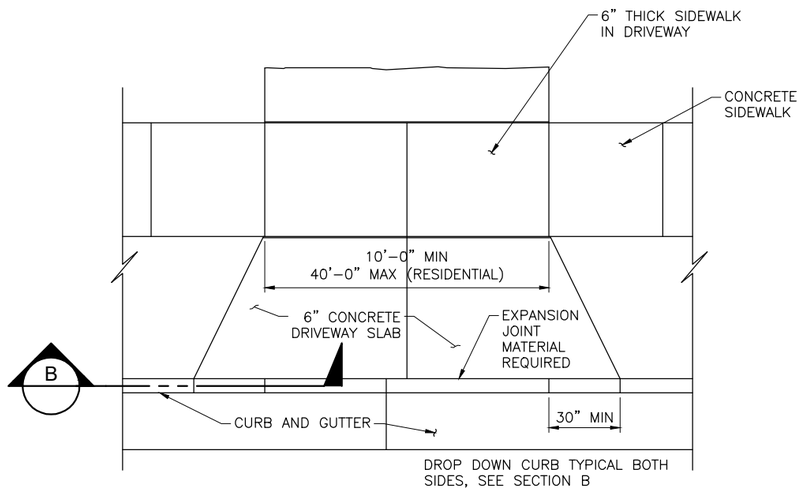
A DRIVE APPROACH SECTION
SCALE: N.T.S.



1 TYPE 1 - COMMERCIAL DRIVEWAY APPROACH
SCALE: N.T.S.



B CURB SECTION
SCALE: N.T.S.



2 TYPE 2 - RESIDENTIAL DRIVEWAY APPROACH
SCALE: N.T.S.

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PROJ. #:
PLOT DATE: 1/20/2021
LAST UPDATED: 1/19/2021
DRAWN BY: KEF
DESIGN BY:
CHECKED BY:

Kaysville City

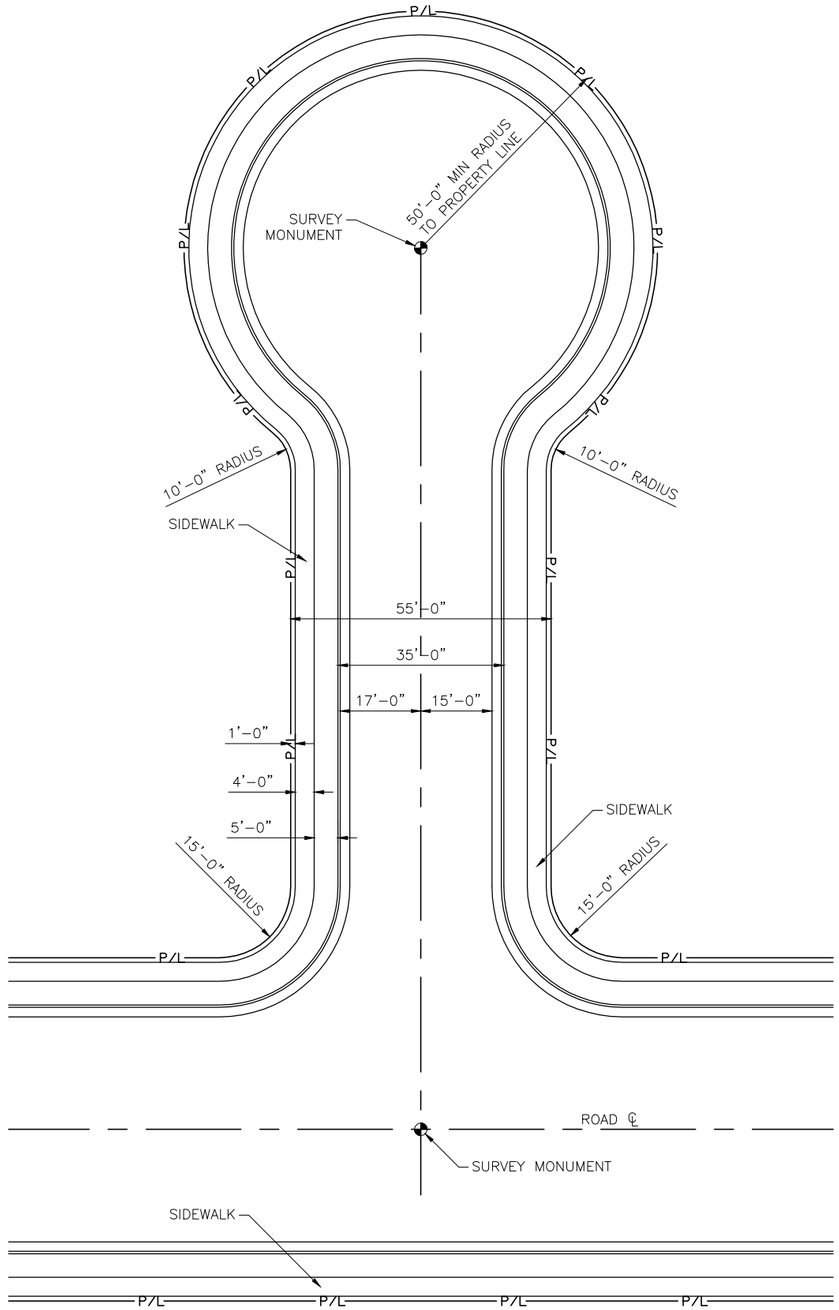
KAYSVILLE CITY CORPORATION DEVELOPMENT STANDARDS

STANDARD STREET SECTIONS AND DRIVEWAY DETAILS

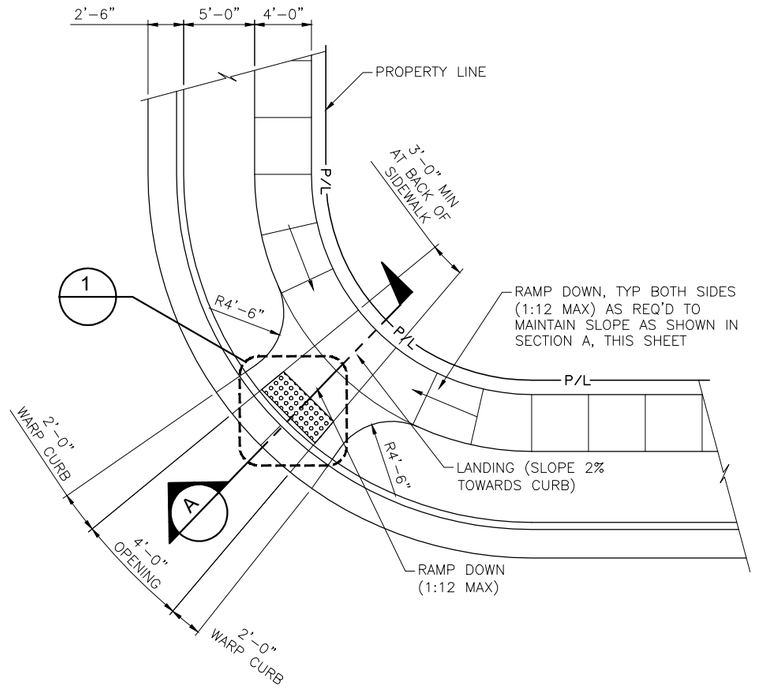
SHEET 2

Plot Date:1/20/2021 4:11 PM Plotted By: Mark Jenkins
Date Created:1/19/2021 I:\KAYS\PUBLIC\PROJECTS\JUB\KAYSVILLE\STANDARDS\CAD\02-STANDARD STREET SECT_DRIVEWAY DETAILS.DWG

NOTES:
1. 600'–0" MAX DISTANCE FROM CENTERLINE OF ADJOINING STREET TO RADIUS OF CUL–DE–SAC.
2. CUL–DE–SAC SHOULD BE USED ONLY WHERE UNUSUAL CONDITIONS EXIST.
3. MAX GRADE IN CUL–DE–SAC AREA IS TO BE 2.5%.

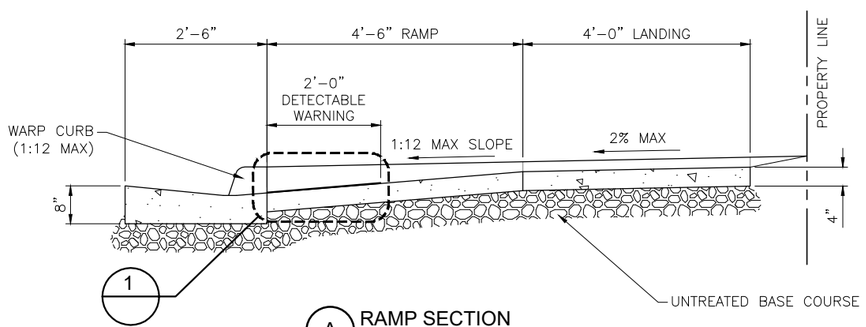


CUL-DE-SAC PLAN VIEW
SCALE: N.T.S.

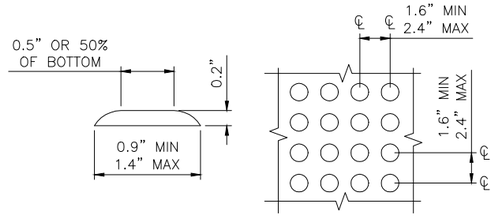


NOTES:
1. LOCATE RAISED TRUNCATED DOMES SO THAT THE EDGE NEAREST THE CURB LINE IS WITHIN 6 TO 8 INCHES FROM THE CURB LINE. PROVIDE 2–FEET OF TRUNCATED DOME PATTERN AT THE LOWER END OF ALL CURB RAMPS EXTENDING THE FULL WIDTH OF THE CURB RAMP.
2. CHANGES IN ELEVATION GREATER THAN ¼" SHALL BE BEVELED WITH A SLOPE NO GREATER THAN 1:2 (MAXIMUM ½ INCH).
3. THE DETECTABLE WARNING SURFACE DOMES SHALL BE ORIENTED SUCH THAT THE ROWS ARE PARALLEL WITH THE DIRECTION OF PEDESTRIAN TRAVEL TO THE RAMP ON THE OPPOSITE SIDE OF THE STREET.
4. THE DETECTABLE WARNING SHALL BE A YELLOW CONTRASTING COLOR.
5. WHEN A DETECTABLE WARNING SURFACE DOME IS CUT, THE REMAINING PORTION OF THE DOME SHALL BE BEVELED TO A MAXIMUM SLOPE OF 1:2 WITH A MAXIMUM OF ½ INCH.
6. INSTALLATION SHALL BE DONE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION.
7. DOMES THAT ARE LOOSE OR DAMAGED TO BE REPAIRED.
8. NO SECTIONS SHALL HAVE MORE THAN 1/16 INCH SEPARATION VERTICALLY.
9. IF CRACKS ARE ⅛" OR LARGER, RAMP WILL NEED TO BE REPLACED.

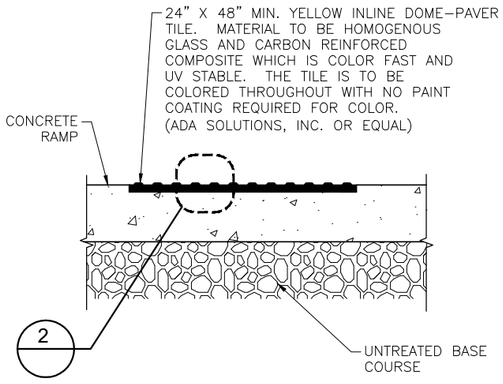
TYPICAL RAMP PLAN
SCALE: N.T.S.



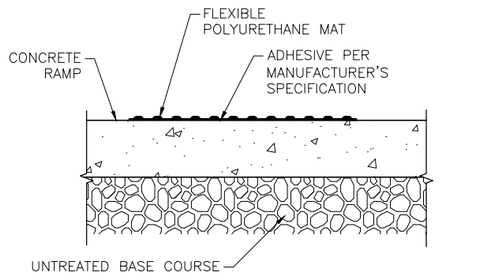
A RAMP SECTION
SCALE: N.T.S.



2 RAISED TRUNCATED DOME DETAIL
SCALE: N.T.S.



INLINE DOME-PAVER TILE



FLEXIBLE POLYURETHANE MAT
(FOR RETROFIT OF EXISTING RAMPS ONLY)

1 DETECTABLE WARNING SYSTEM DETAIL
SCALE: N.T.S.

NO.	REVISION DESCRIPTION	BY	APR.	DATE

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PROJ. #:
PLOT DATE: 1/20/2021
LAST UPDATED: 12/3/2020
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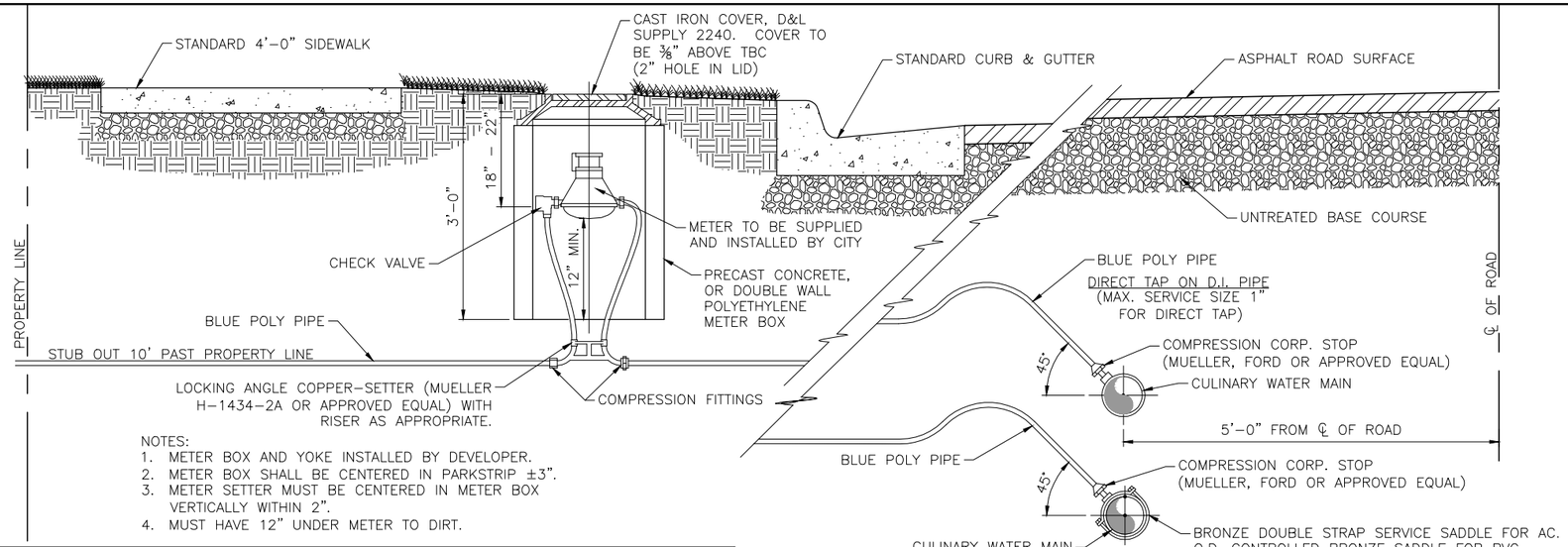
KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS

TYPICAL CUL-DE-SAC AND PEDESTRIAN RAMP

SHEET 3

Plot Date:1/20/2021 4:14 PM Plotted By: Mark Jenkins
Dialo Created:12/3/2020 \\KAYSPUBLIC\PROJECTS\JUB\KAYSVILLE\STANDARDS\CAD\03-TYP CUL-DE-SAC & WHEELCHAIR RAMP.DWG



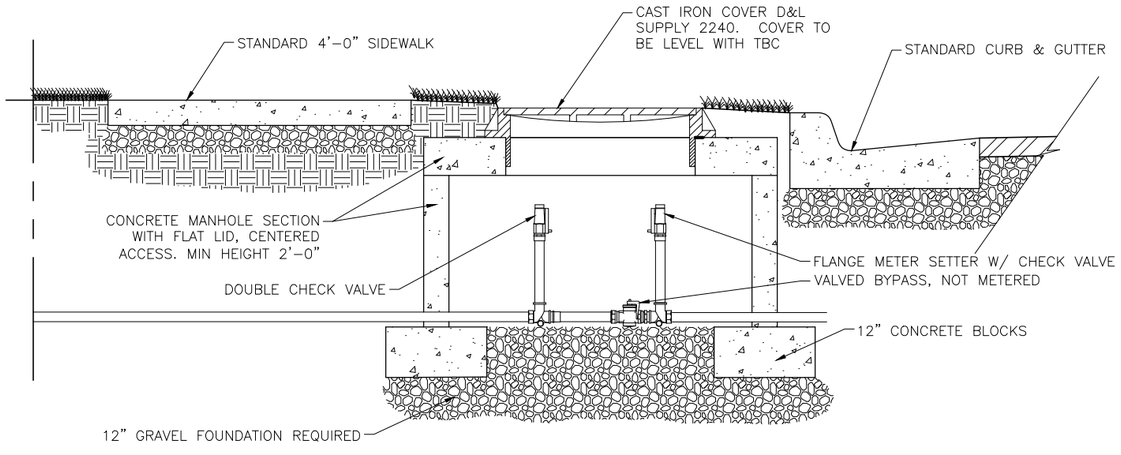
NOTES:
1. METER BOX AND YOKE INSTALLED BY DEVELOPER.
2. METER BOX SHALL BE CENTERED IN PARKSTRIP ±3".
3. METER SETTER MUST BE CENTERED IN METER BOX VERTICALLY WITHIN 2".
4. MUST HAVE 12" UNDER METER TO DIRT.

KAYSVILLE CITY CORPORATION WATER SERVICE INFORMATION

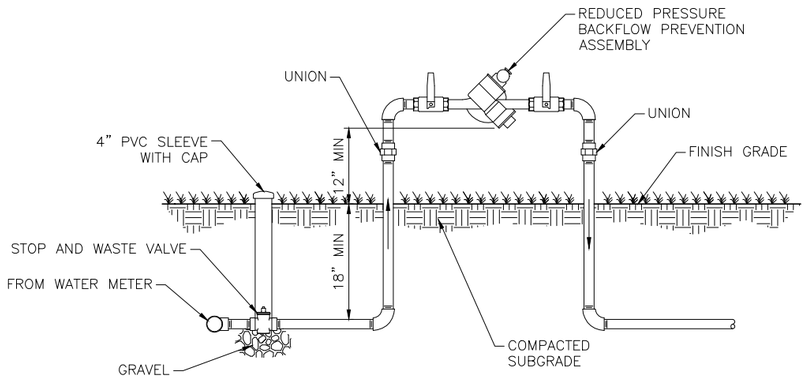
SERVICE SIZE	METER BOX SIZE	TYPE OF MATERIAL FOR METER BOX	WATER METER	CONNECTION TYPE	BYPASS	DIST. BETWEEN FLANGE
3/4"	18" DIA	CONCRETE, GALVANIZED, POLYETHYLENE	BY CITY	NPT	NO	---
1"	24" DIA	CONCRETE, GALVANIZED, POLYETHYLENE	BY CITY	NPT	NO	---
2"	48" DIA	CONCRETE	OCTAVE (TURBINE METER)	FLANGE	1"	15 ¼"
3"	60" DIA	CONCRETE	OCTAVE (TURBINE METER)	FLANGE	1"	*
4"	4'X6' BOX	CONCRETE	OCTAVE (TURBINE METER)	FLANGE	2"	*

*CONTACT KAYSVILLE CITY

3 TYPICAL WATER CONNECTION
SCALE: N.T.S.



1 TYPICAL FLANGED METER SETTER WATER CONNECTION
SCALE: N.T.S.



NOTE:
ALL FITTINGS AND NIPPLES FROM POINT OF CONNECTION TO MAINLINE SHALL BE BRASS.

2 REDUCED PRESSURE BACKFLOW PREVENTION ASSEMBLY
SCALE: N.T.S.

NO.	REVISION DESCRIPTION	BY	APR.	DATE

FILE:
PROJ. #:
PLOT DATE: 1/20/2021
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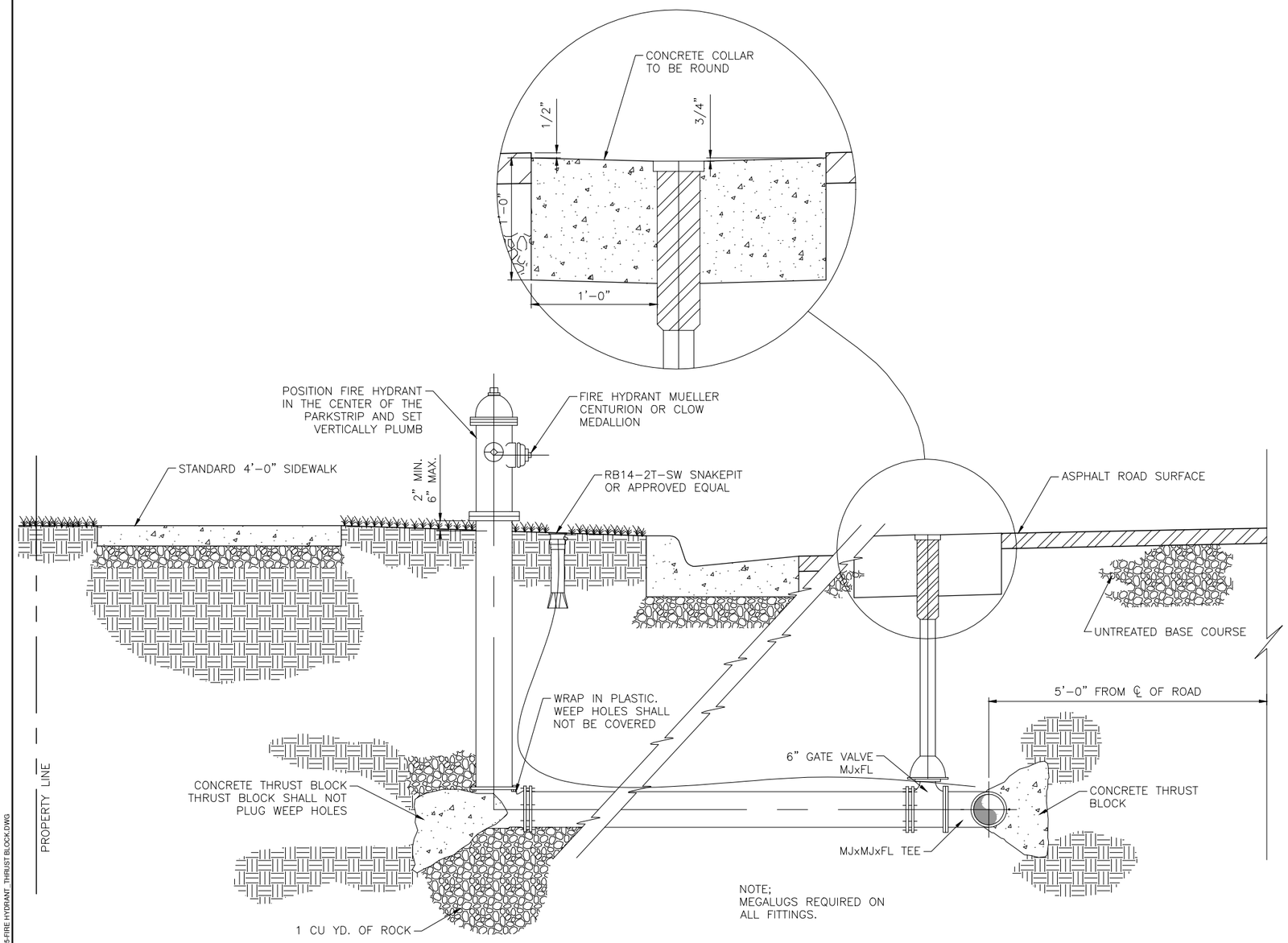
Kaysville City

KAYSVILLE CITY CORPORATION DEVELOPMENT STANDARDS

TYPICAL WATER SERVICE CONNECTION DETAILS

SHEET 4

Plot Date:1/20/2021 4:21 PM Plotted By: Mark Jenkins
Date Created:12/3/2020 \KAYS\PUBLIC\PROJECTS\JUB\KAYSVILLESTANDARDS\CAD\04-WATER SERVICE CONNECTION DETAILS.DWG

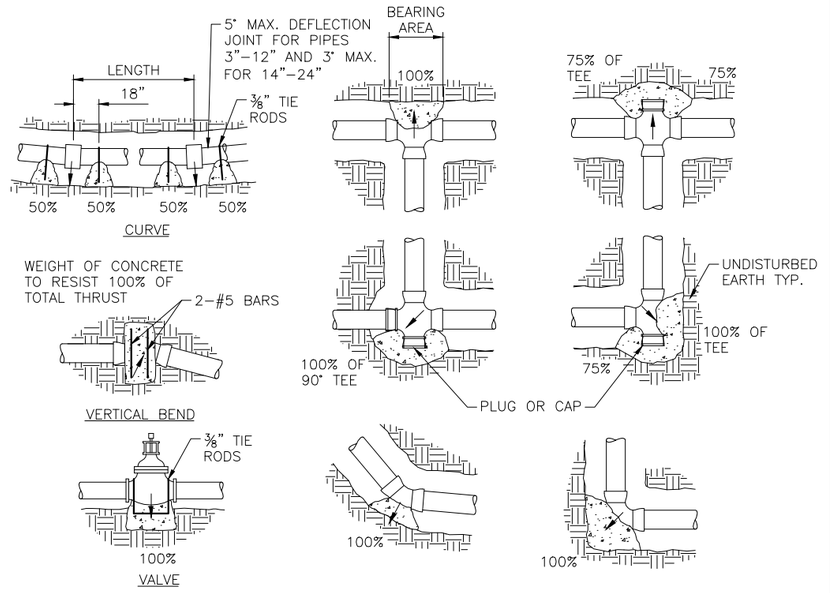


TYPICAL FIRE HYDRANT CONNECTION

SCALE: N.T.S.

EXAMPLE THRUST BLOCK CALCULATION:

1. 8" 90° ELBOW, PRESSURE = 200 PSI
2. FROM TABLE, THRUST = 94 X 200 = 18,800 LBS
3. ASSUME BEARING STRENGTH OF SOIL = 2000 PSF
4. $\frac{18800}{2000}$ = 9.4 FT² = AREA OF BEARING REQ'D FOR THRUST BLOCK



DETAIL NOTES:

1. ALL MJ AND FLANGED FITTINGS TO BE WRAPPED WITH POLYETHYLENE WRAP PRIOR TO POURING THRUST BLOCK.
2. FIGURE (100%) AT THRUST BLOCK INDICATES PERCENT OF TOTAL THRUST TO BE APPLIED FOR BEARING AREA.
3. ARROW INDICATES THRUST DIRECTION
4. CONCRETE FOR THRUST BLOCKS TO BE 2000 PSI MIX.

SIDE THRUST PER 100 PSI PRESSURE PER DEGREE OF DEFLECTION			
PIPE SIZE - IN	SIDE THRUST - LBS	PIPE SIZE - IN	SIDE THRUST - LBS
4	35	14	377
6	72	16	486
8	122	18	665
10	197	20	790
12	278	24	1150

NOTE: MULTIPLY THRUST BY DEGREE OF DEFLECTION TO OBTAIN TOTAL THRUST

SIDE THRUST PER 100 PSI PRESSURE PER DEGREE OF DEFLECTION				
PIPE SIZE - IN	DEAD END OR TEE	90° ELBOW	45° ELBOW	22.5° ELBOW
4	19	27	15	7
6	39	55	30	15
8	67	94	51	26
10	109	154	84	43
12	155	218	119	61
14	210	296	161	82
16	272	383	209	106
18	351	494	269	137
20	434	611	333	169
24	623	878	478	244

TABLE NOTES:

1. USE THE MAXIMUM INTERNAL PRESSURE ANTICIPATED (I.E. HYDROSTATIC TEST PRESSURE, POSSIBLE SURGE PRESSURE DUE TO PUMP SHUT-OFF, ETC.)
2. SEE SOILS REPORT FOR BEARING STRENGTH OF SOIL. IN THE ABSENCE OF A SOILS REPORT, AN AVERAGE SOIL (SPADABLE MEDIUM CLAY) CAN BE ASSUMED TO HAVE A BEARING STRENGTH OF 2000 PSF.

THRUST BLOCK DETAILS

SCALE: N.T.S.

NO.	REVISION DESCRIPTION	BY	APP.	DATE

FILE:
PROJ. #:
PLOT DATE: 1/20/2021
LAST UPDATED: 1/20/2021
DRAWN BY: KEF
DESIGN BY:
CHECKED BY:

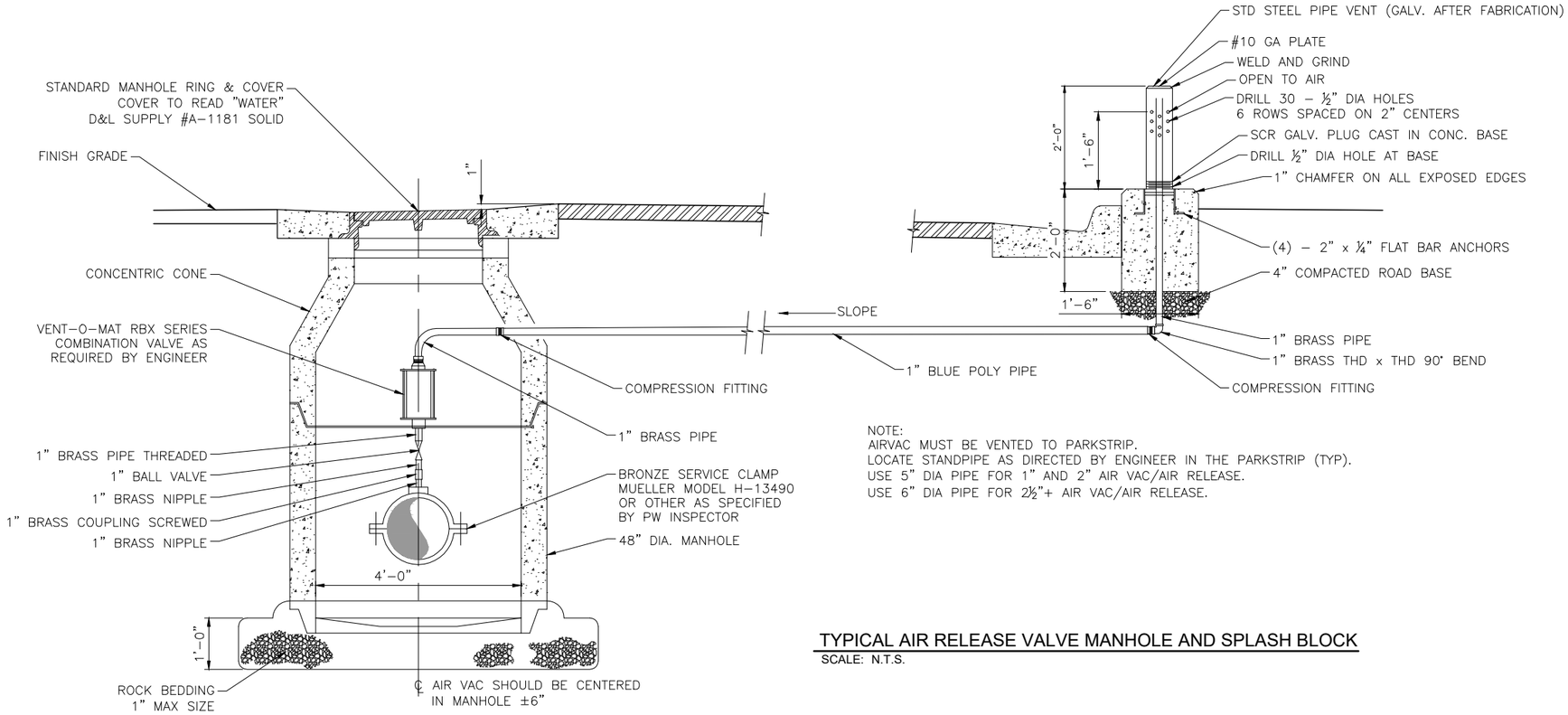
Kaysville City

KAYSVILLE CITY CORPORATION DEVELOPMENT STANDARDS

TYPICAL FIRE HYDRANT AND THRUST BLOCK DETAILS

SHEET 5

Plot Date:1/20/2021 4:21 PM Plotted By: Mark Jankins
Date Created:1/19/2021 \\KAYSVILLE\PUBLIC\PROJECTS\JUB\KAYSVILLESTANDARDS\CAD\05-FIRE HYDRANT_THRUST BLOCK.DWG

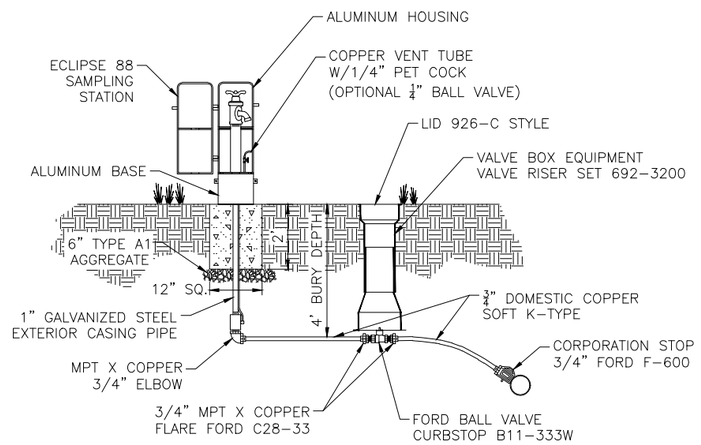


NOTE:
AIRVAC MUST BE VENTED TO PARKSTRIP.
LOCATE STANDPIPE AS DIRECTED BY ENGINEER IN THE PARKSTRIP (TYP).
USE 5" DIA PIPE FOR 1" AND 2" AIR VAC/AIR RELEASE.
USE 6" DIA PIPE FOR 2½"+ AIR VAC/AIR RELEASE.

TYPICAL AIR RELEASE VALVE MANHOLE AND SPLASH BLOCK

SCALE: N.T.S.

ECLIPSE NO. #88 SAMPLING STATION



TYPICAL ECLIPSE SAMPLING STATION

SCALE: N.T.S.

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FILE:
PROJ. #:
PLOT DATE: 2/11/2021
LAST UPDATED: 2/11/2021
DRAWN BY: KEF
DESIGN BY:
CHECKED BY:

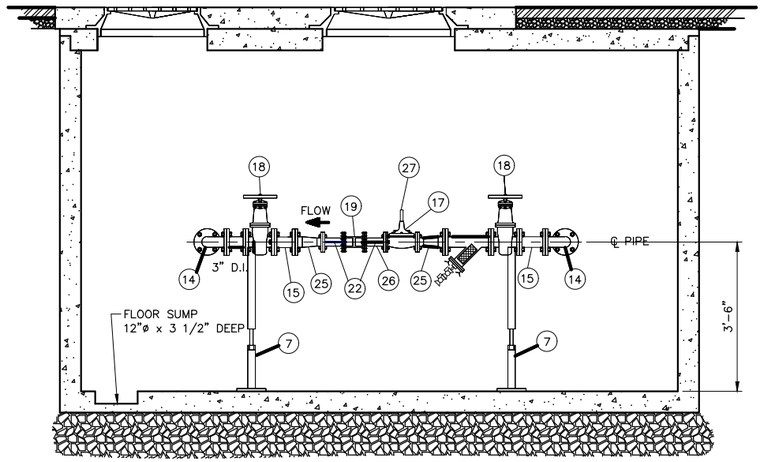
Kaysville City

KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS

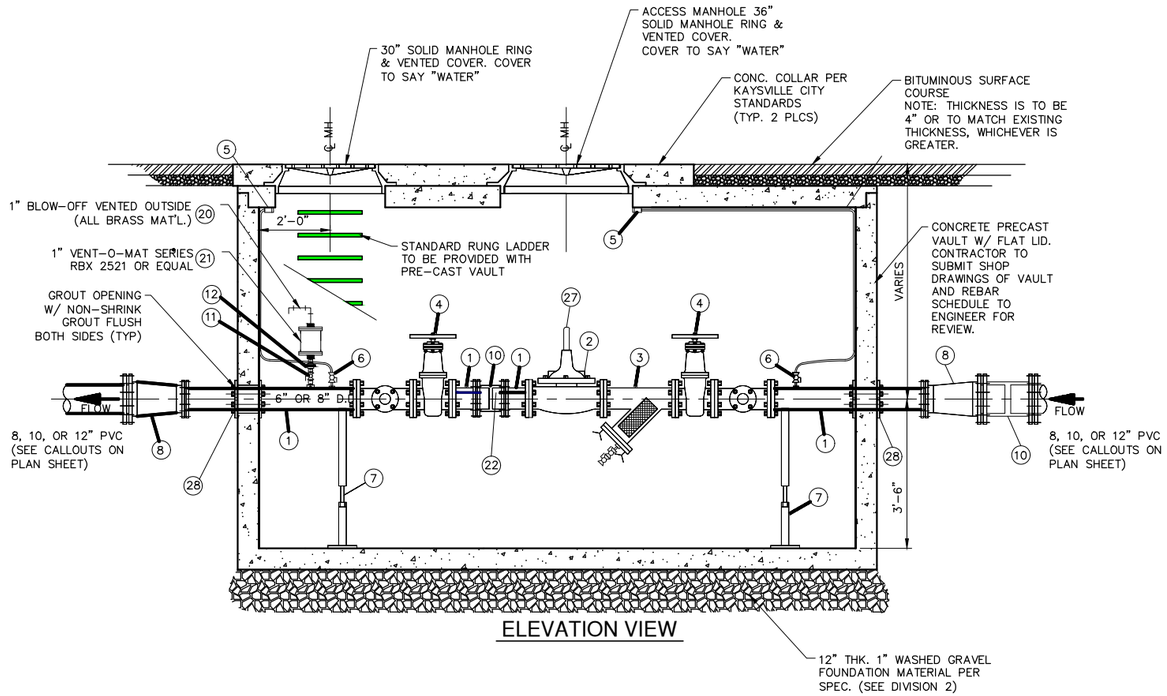
AIR RELEASE VALVE DETAILS

SHEET 6

Plot Date/2/11/2021 2:53 PM Plotted By: Mark Jenkins
Date Created:12/7/2021 \\KAYSFILE\PUBLIC\PROJECTS\JUB\KAYSVILLE\STANDARDS\CAD\06-AIR RELEASE, BLOWOFF VALVE DETAILS.DWG



3" BYPASS ELEVATION VIEW

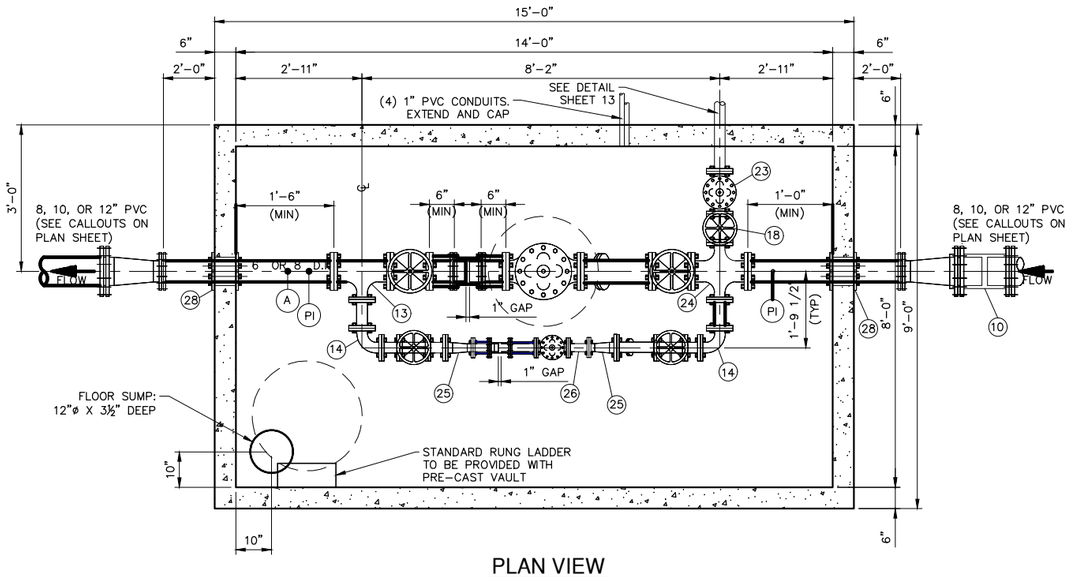


ELEVATION VIEW

MATERIAL LIST

MARK	DESCRIPTION	JOINT	SIZE IN INCHES	QUANTITY
1	DUCTILE IRON PIPE	FLxPE	6" OR 8"	AS REQ'D.
2	PRESSURE REDUCING VALVE [CLA-VAL #90-01]	FL	6" OR 8"	**1**
3	CAST IRON "Y" STRAINER - MUELLER STEAM SPECIALTY #752 WITH BALL VALVE & FAUCET/HOSE BIB TO FLUSH OUT SYSTEM	FL	6" OR 8"	1 1
4	GATE VALVE	FLG	6" OR 8"	**2**
5	ANCHOR FEMALE AIR HOSE QUICK CONNECT TO CEILING WITH ACCESS NEAR LID	SCR	–	2
6	BALL VALVE; CONNECT TO 1/4" AIR HOSE	SCR	1"	2
7	PIPE SUPPORT		N/A	4
8	DUCTILE IRON REDUCER	MJ/MJ	8,10, OR 12" X 6, OR 8"	2
9	BOLTS, NUTS, GASKETS, FOLLOWERS	AS REQ'D.	PER PLANS	AS REQ'D.
10	SLEEVE	MJ/MJ	6,8,10, OR 12"	2
11	BALL VALVE	SCR	1"	1
12	UNION	SCR	1"	1
13	REDUCING TEE	FL	6" OR 8" X 3"	1
14	90^ ELBOW	FL	3"	2
15	DUCTILE IRON PIPE	FLxPE	3"	AS REQ'D.
16	CAST IRON "Y" STRAINER - MUELLER STEAM SPECIALTY #752 WITH BALL VALVE & FAUCET/HOSE BIB TO FLUSH OUT SYSTEM	FL	3"	1
17	PRESSURE REDUCING VALVE [CLA-VAL #90-01]	FL	2"	1
18	GATE VALVE	FLG	3"	3
19	SLEEVE	MJ/MJ	2"	1
20	BLOW-OFF (ALL BRASS MATERIAL)		1"	1
21	COMBINATION AIR VALVE, VENT-O-MAT SERIES RBX 2521 OR EQUAL		1"	1
22	RESTRAINING BOLT (TYP. 2 180^ OFFSET)			8
23	PRESSURE RELIEF VALVE [CLA-VAL #50-01]		3"	1
24	REDUCING CROSS		6" OR 8" X 3"	1
25	DUCTILE IRON REDUCER		3" X 2"	2
26	DUCTILE IRON PIPE		2"	AS REQ'D
27	VALVE POSITION INDICATOR [CLA-VAL #X101]		FIT A 2",6"OR 8" VALVE	2
28	MEGA LUG FOLLOWERS W/1/4" STEEL PLATES ON BOTH SIDES OF WALL		6"OR 8"	4

TYPICAL NOTE: ALL SMALL PIPE FITTINGS AT INSTRUMENTS AND AIR-VAC, ETC. NEED TO BE BRASS OR BRONZE



PLAN VIEW

NO.	REVISION DESCRIPTION	BY	APR.	DATE

FILE:
PROJ. #:
PLOT DATE: 3/4/2021
LAST UPDATED: 3/4/2021
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Kaysville City

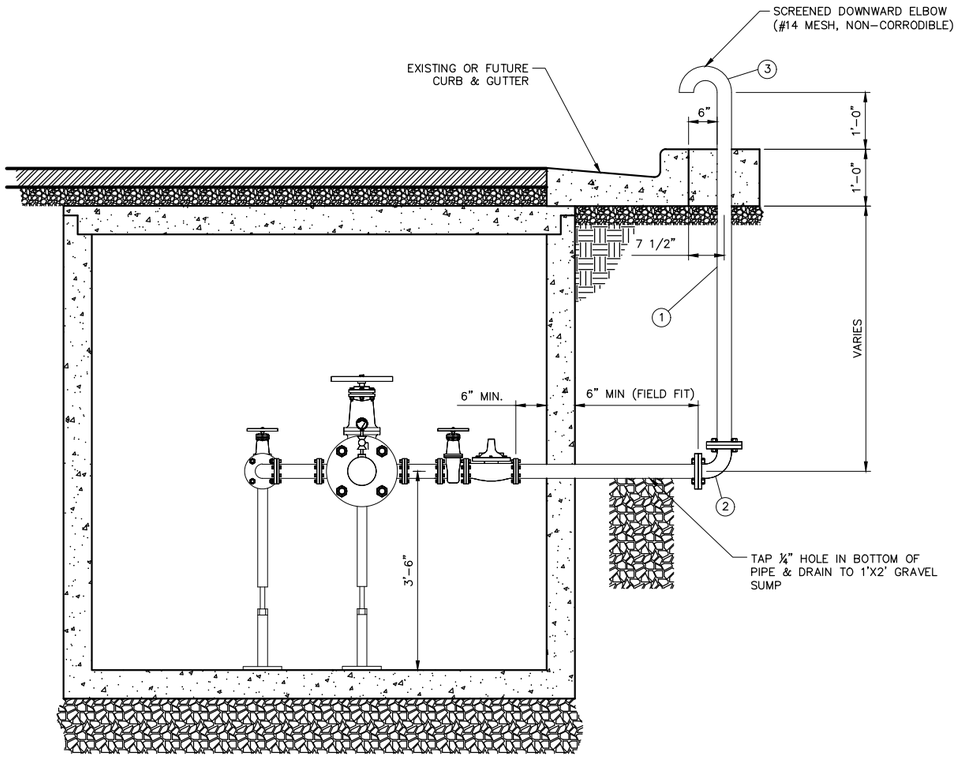
KAYSVILLE CITY CORPORATION DEVELOPMENT STANDARDS

TYPICAL PRESSURE RELIEF VAVLE

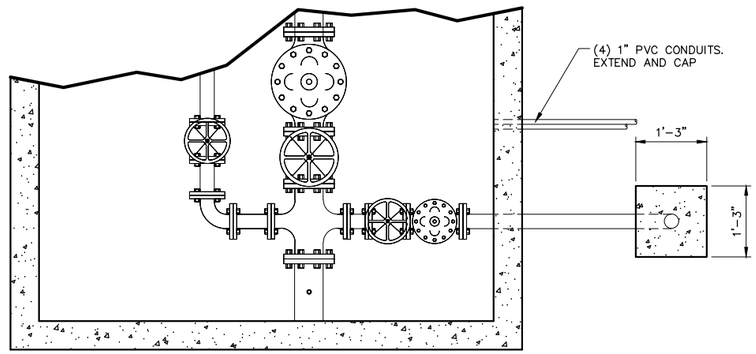
SHEET 7

MATERIAL LIST

MARK	DESCRIPTION	JOINT	SIZE IN INCHES	QUANTITY
1	DUCTILE IRON PIPE	FLxPE	3"	AS REQ'D.
2	90° ELBOW	FL	3"	1
3	SCREENED DOWNWARD (180°) ELBOW (#14 MESH, NON-CORRODIBLE)	FL	3"	1
4	BOLTS, NUTS, GASKETS, FOLLOWERS	AS REQ'D.	PER PLANS	AS REQ'D.



3" PRESSURE RELIEF ELEVATION VIEW



PLAN VIEW

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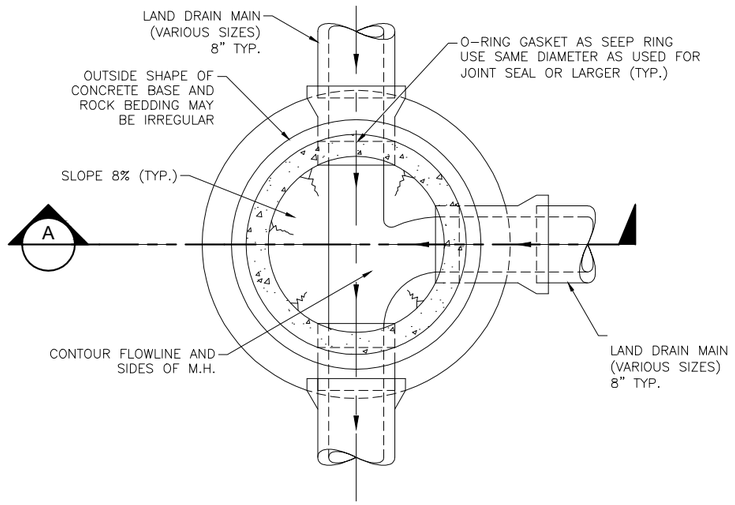
Kaysville City

KAYSVILLE CITY CORPORATION DEVELOPMENT STANDARDS

TYPICAL PRESSURE RELIEF VALVE DETAILS

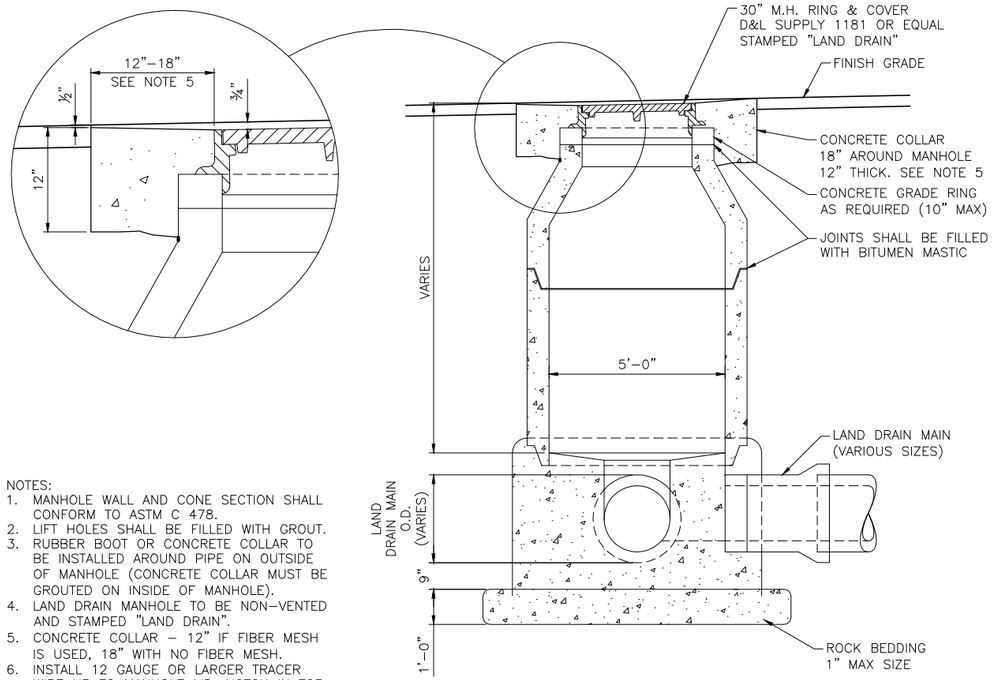
SHEET 8

Plot Date:2/11/2021 3:37 PM Plotted By: Mark Jenkins
Data Created:2/11/2021 I:\KAYSVILLE\CAD\DETAILS\STANDARDS\CAD\09-PRESSURE RELIEF VALVE DETAILS.DWG



LAND DRAIN MANHOLE DETAIL

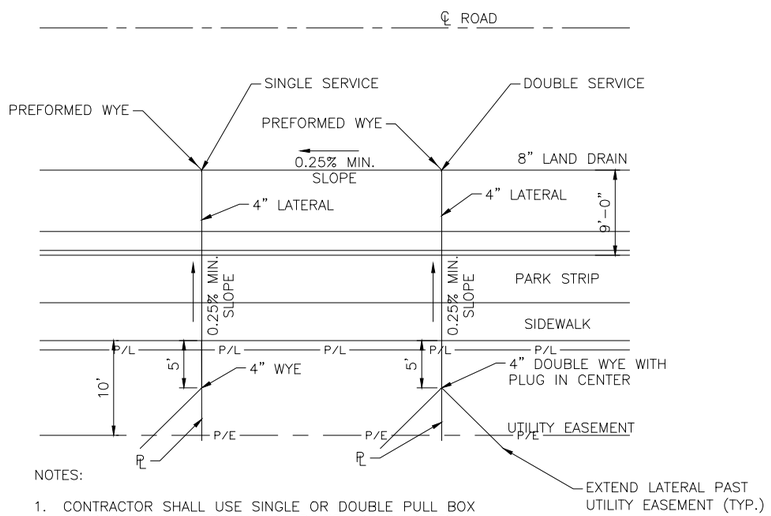
SCALE: N.T.S.



NOTES:
1. MANHOLE WALL AND CONE SECTION SHALL CONFORM TO ASTM C 478.
2. LIFT HOLES SHALL BE FILLED WITH GROUT.
3. RUBBER BOOT OR CONCRETE COLLAR TO BE INSTALLED AROUND PIPE ON OUTSIDE OF MANHOLE (CONCRETE COLLAR MUST BE GROUTED ON INSIDE OF MANHOLE).
4. LAND DRAIN MANHOLE TO BE NON-VENTED AND STAMPED "LAND DRAIN".
5. CONCRETE COLLAR – 12" IF FIBER MESH IS USED, 18" WITH NO FIBER MESH.
6. INSTALL 12 GAUGE OR LARGER TRACER WIRE UP TO MANHOLE LID. NOTCH IN TOP OF CONE OR MANHOLE SECTION ¼" WIDE x 1" DEEP SAWCUT FROM EXTERIOR TO INTERIOR OF MANHOLE

LAND DRAIN MANHOLE SECTION

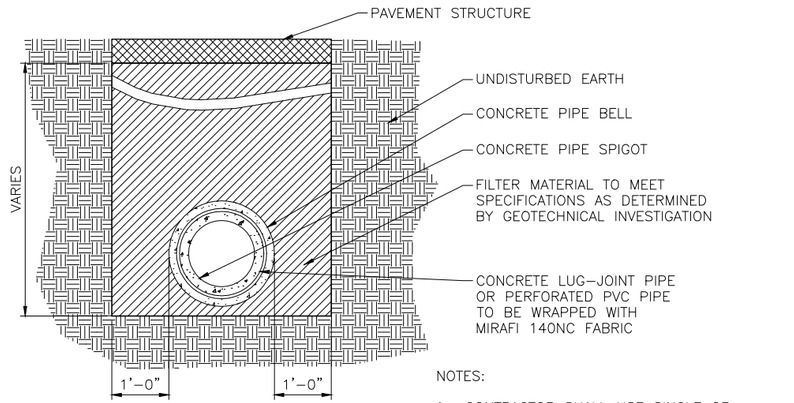
SCALE: N.T.S.



NOTES:
1. CONTRACTOR SHALL USE SINGLE OR DOUBLE PULL BOX TO PROTECT WORKERS AND STABILIZE TRENCH SIDES.
2. ALL CONNECTIONS SHALL BE MADE USING PREFORMED FITTINGS CONFORMING TO ASTM D-3034.
3. LAND DRAIN LATERALS TO BE GREEN COLOR PVC WITH TAPE ON THE LATERALS AND WRAPPED AROUND END OF PIPE AND LAND DRAIN MAIN TO DIFFERENTIATE FROM SANITARY SEWER LATERALS. MARK END WITH A 2x4.
4. MAXIMUM MANHOLE SPACING SHALL BE 500 FEET.

LAND DRAIN PLAN VIEW

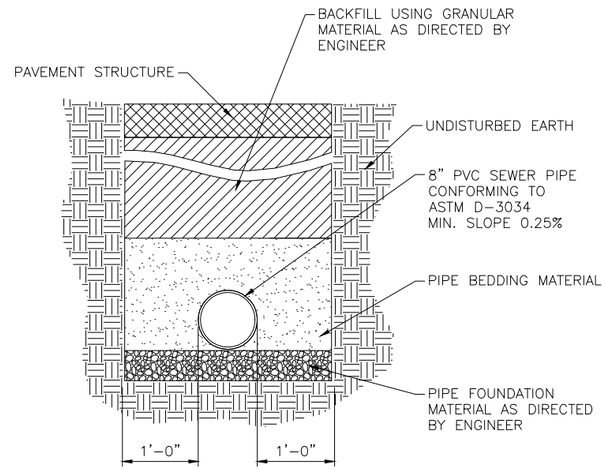
SCALE: N.T.S.



NOTES:
1. CONTRACTOR SHALL USE SINGLE OR DOUBLE PULL BOX TO PROTECT WORKERS AND STABILIZE TRENCH SIDES.
2. DEWATERING SHALL NOT ALLOW PIPING OF FINES.
3. 500' MAX. MANHOLE SPACING
4. BACKFILL USING GRANULAR FILTER MATERIAL TO MAXIMUM GROUNDWATER ELEVATION AS DIRECTED BY THE ENGINEER.

LOOSE-JOINT LAND DRAIN SECTION

SCALE: N.T.S.



TIGHT-JOINT LAND DRAIN SECTION

SCALE: N.T.S.

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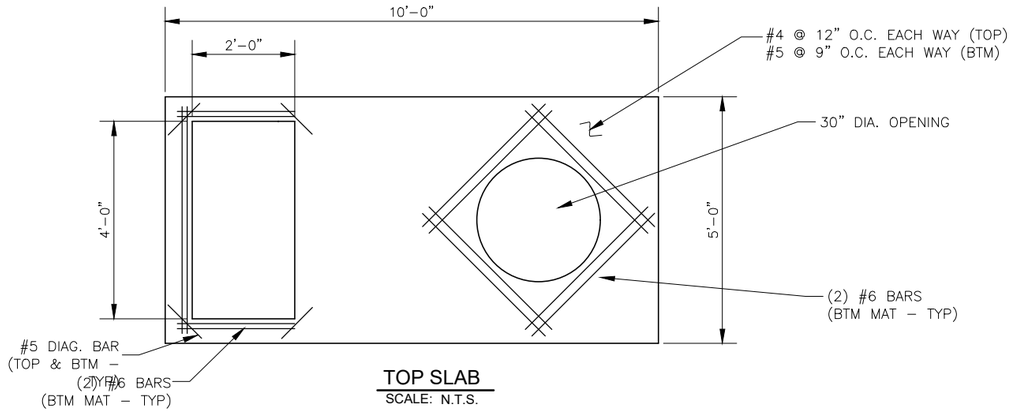
KAYSVILLE CITY CORPORATION DEVELOPMENT STANDARDS

TYPICAL LAND DRAIN DETAILS

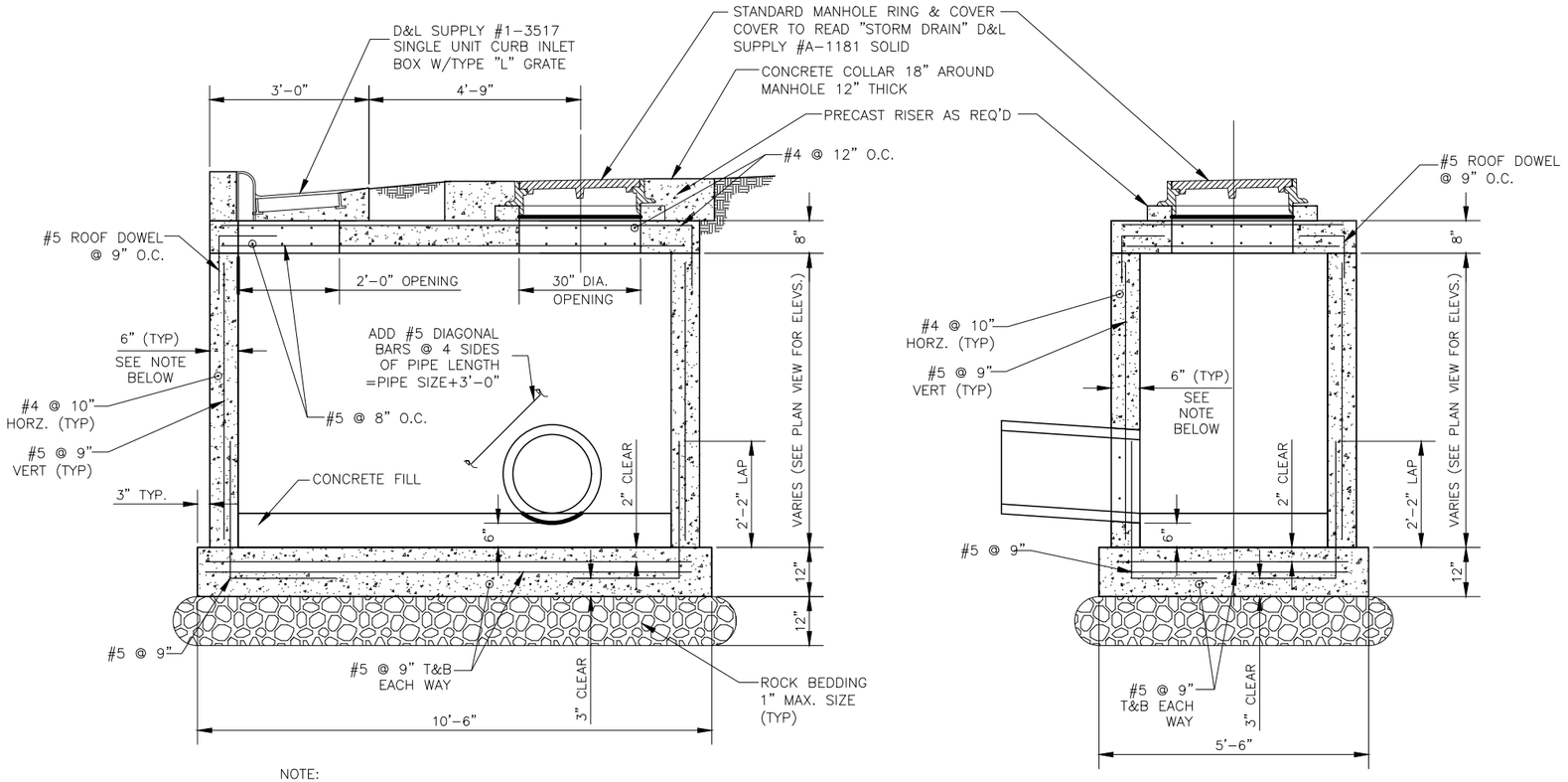
SHEET 9

Plot Date:2/11/2021 3:11 PM Plotted By: Mark Jenkins
Date Created:2/11/2021 \\KAYSPUBLIC\PROJECTS\JUB\KAYSVILLE\STANDARDS\CAD\09-SUBSURFACE DRAIN DETAILS.DWG



TOP SLAB

SCALE: N.T.S.



NOTE:
USE 6" THICK WALLS FOR WALL HEIGHT UP TO 5'-0". FOR WALL HEIGHT GREATER THAN 5'-0", USE 8" THICK WALLS.

COMBINATION INLET/CLEANOUT

SCALE: N.T.S.

GENERAL NOTES:

1. ALL STRUCTURAL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI IN 28 DAYS.

2. REINFORCEMENT STEEL SHALL BE DEFORMED BARS CONFORMING IN QUALITY TO THE REQUIREMENTS OF ASTM DESIGNATION A-615, GRADE 60, INCLUDING SUPPLEMENTARY REQUIREMENTS (S1).

3. ALL DETAILING, FABRICATION AND PLACING OF REINFORCING BARS SHALL BE IN ACCORDANCE WITH THE "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" ACI-315, LATEST EDITION.

4. TOLERANCES IN PLACING REINFORCEMENT SHALL BE:

   ±⅜ INCH FOR MEMBERS WITH D < 8 INCHES
   ±½ INCH FOR MEMBERS WITH D >= 8 INCHES

5. DOWELS, PIPES, WATERSTOPS AND OTHER INSTALLED MATERIALS AND ACCESSORIES SHALL BE HELD SECURELY IN POSITION WHILE CONCRETE IS BEING PLACED.

6. UNLESS OTHERWISE SHOWN, ASIDE FROM NORMAL ACCESSORIES USED TO HOLD REINFORCING BARS FIRMLY IN POSITION, THE FOLLOWING SHALL BE ADDED:

   A) IN SLABS #5 RISER BARS AT 36 INCHES O.C. MAXIMUM TO SUPPORT TOP REINFORCING BARS.

   B) IN WALLS WITH 2 CURTAINS #3 U OR Z SHAPE SPACES AT 6 FEET O.C. EACH WAY.

7. METAL CLIPS OR SUPPORTS SHALL NOT BE PLACED IN CONTACT WITH THE FORMS OR THE SUBGRADE. CONCRETE BLOCKS (OR DOBBIES) SUPPORTING BARS ON SUBGRADE SHALL BE IN SUFFICIENT NUMBERS TO SUPPORT THE BARS WITHOUT SETTLEMENT, BUT IN NO CASE SHALL SUCH SUPPORT BE CONTINUOUS.

8. DOWELS SHALL BE WIRED OR OTHERWISE HELD IN POSITION. THEY SHALL NOT BE SHOVED INTO FRESHLY PLACED CONCRETE.

9. REINFORCED BARS AND ACCESSORIES SHALL NOT BE IN CONTACT WITH ANY PIPE, PIPE FLANGE OR METAL PARTS EMBEDDED IN CONCRETE. A MINIMUM OF 2 INCHES CLEARANCE SHALL BE PROVIDED AT ALL TIMES.

10. STRUCTURES SHALL BE BACKFILLED WITH GRANULAR SOIL.

11. ALL CONSTRUCTION JOINTS SHALL BE ROUGHED AND CLEANED AND FREE OF LAITANCE.

12. STRUCTURES HAVE BEEN DESIGNED FOR THE FOLLOWING; IF CONDITIONS ARE EXCEEDED THE ENGINEER SHALL BE NOTIFIED.

   A) AASHTO HS-20 TRUCK LOAD

   B) 1'-6" MAX. SOIL ABOVE THE ROOF OF THE STRUCTURE

   C) GROUND WATER TO TOP OF STRUCTURE

   D) "AT-REST" LATERAL SOIL PRESSURE OF 60 PCF FOR DRY SOIL CONDITIONS AND 92.4 PCF WHEN GROUND WATER IS PRESENT.

13. A DOUBLE COMBINATION INLET/CLEANOUT BOX SHALL BE THE WIDTH OF THE DOUBLE CATCH BASIN, WITH ONE MANHOLE, RING & COVER. ALL OTHER APPLICABLE DETAILS ON THIS SHEET SHALL APPLY.

NO.	REVISION DESCRIPTION	BY	APR.	DATE

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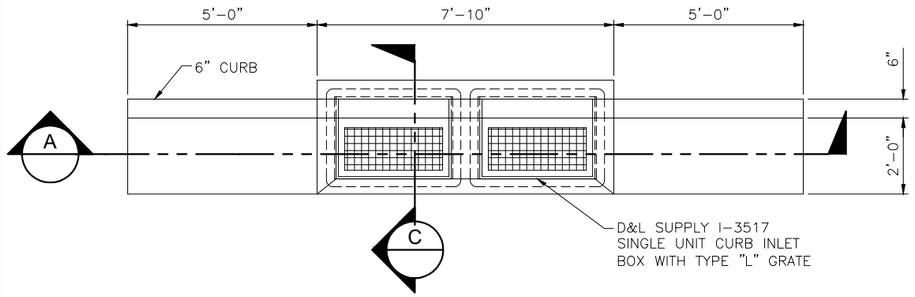
KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS

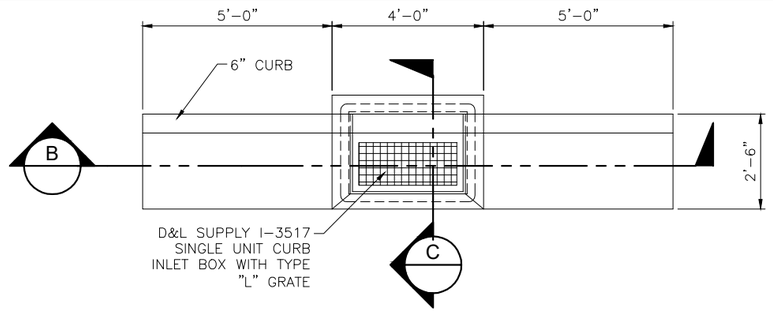
STORM DRAIN COMBINATION INLET/CLEANOUT BOX DETAILS

SHEET 10

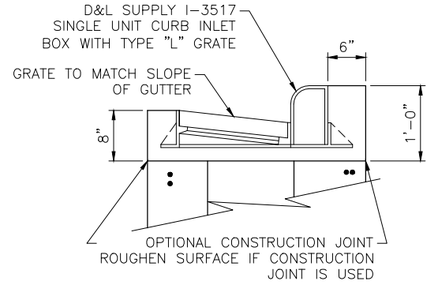
Plot Date:2/11/2021 3:12 PM Plotted By: Mark Jenkins
Date Created:1/20/2021 \\KAYS\PUBLIC\PROJECTS\JUB\KAYSVILLESTANDARDS\CAD\10-SD COMBO BOX.DWG



1 PLAN AT DOUBLE CATCH BASIN
SCALE: N.T.S.



2 PLAN AT SINGLE CATCH BASIN
SCALE: N.T.S.



3 CATCH BASIN DETAIL
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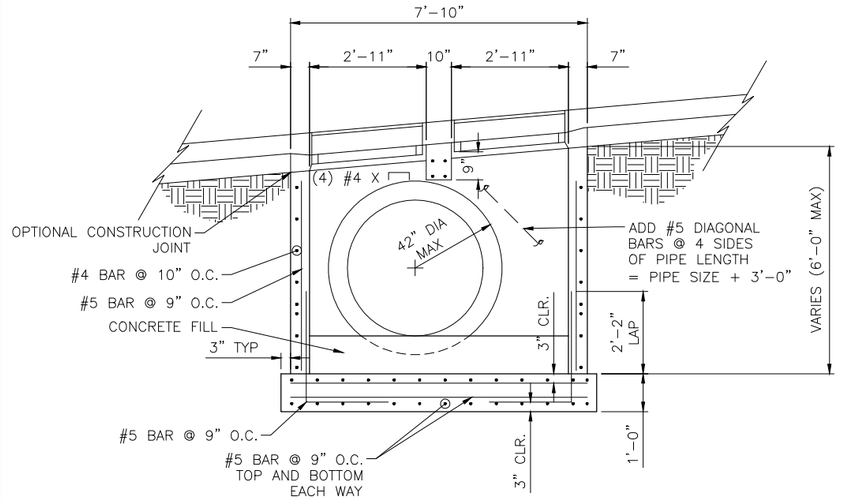
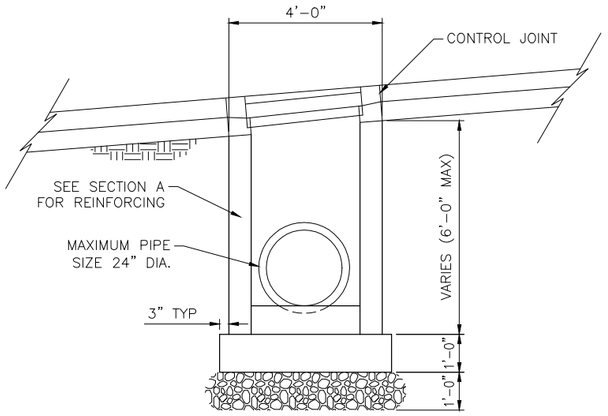
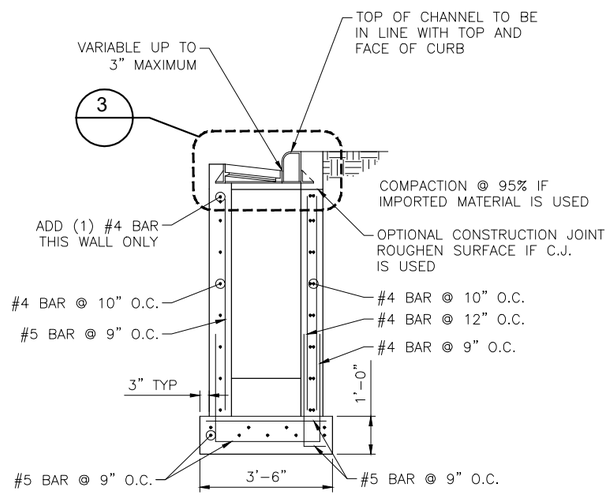


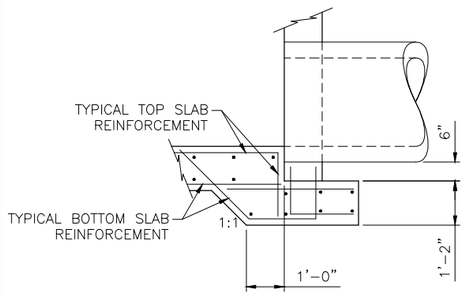
A DOUBLE CATCH BASIN SECTION
SCALE: N.T.S.



B SINGLE CATCH BASIN SECTION
SCALE: N.T.S.



C DOUBLE CATCH BASIN SECTION
SCALE: N.T.S.



4 OPTIONAL FOOTING DETAIL AT WALL-PIPE CONNECTION
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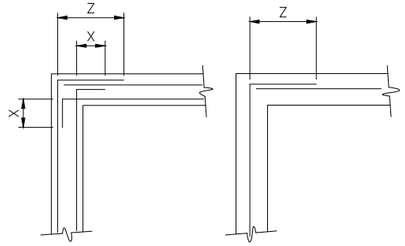

BAR SIZE	X	Z
#4	8"	1'-8"
#5	10"	2'-2"

5 HORIZONTAL REINF. @ WALL INTERSECTION
SCALE: N.T.S.

GENERAL NOTES:

1. ALL STRUCTURAL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI IN 28 DAYS
2. REINFORCEMENT STEEL SHALL BE DEFORMED BARS CONFORMING IN QUALITY TO THE REQUIREMENTS OF ASTM DESIGNATION A-615, GRADE 60, INCLUDING SUPPLEMENTARY REQUIREMENTS (S1).
3. ALL DETAILING, FABRICATION AND PLACING OF REINFORCING BARS SHALL BE IN ACCORDANCE WITH THE "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" ACI-315, LATEST EDITION.
4. TOLERANCES IN PLACING REINFORCEMENT SHALL BE
   4.1. ±3/8 INCH FOR MEMBERS WITH D < 8 INCHES
   4.2. ±1/2 INCH FOR MEMBERS WITH D >= 8 INCHES
5. DOWELS, PIPES, WATERSTOPS AND OTHER INSTALLED MATERIALS AND ACCESSORIES SHALL BE HELD SECURELY IN POSITION WHILE CONCRETE IS BEING PLACED.
6. UNLESS OTHERWISE SHOWN, ASIDE FROM NORMAL ACCESSORIES USED TO HOLD REINFORCING BARS FIRMLY IN POSITION. THE FOLLOWING SHALL BE ADDED
   6.1. IN SLABS #5 BARS AT 36 INCHES O.C. MAXIMUM TO SUPPORT TOP REINFORCING BARS.
   6.2. IN WALLS WITH 2 CURTAINS #3 U OR Z SHAPE SPACES AT 6 FEET O.C. EACH WAY.
7. METAL CLIPS OR SUPPORTS SHALL NOT BE PLACED IN CONTACT WITH THE FORMS OR THE SUBGRADE. CONCRETE BLOCKS (OR DOBBIES) SUPPORTING BARS ON SUBGRADE SHALL BE IN SUFFICIENT NUMBERS TO SUPPORT THE BARS WITHOUT SETTLEMENT, BUT IN NO CASE SHALL SUCH SUPPORT BE CONTINUOUS.
8. DOWELS SHALL BE WIRED OR OTHERWISE HELD IN POSITION. THEY SHALL NOT BE SHOVED INTO FRESHLY PLACED CONCRETE.
9. REINFORCED BARS AND ACCESSORIES SHALL NOT BE IN CONTACT WITH ANY PIPE, PIPE FLANGE OR METAL PARTS EMBEDDED CONCRETE. A MINIMUM OF 2 INCHES CLEARANCE SHALL BE PROVIDED AT ALL TIMES.
10. STRUCTURES SHALL BE BACKFILLED WITH GRANULAR SOIL.
11. ALL CONSTRUCTION JOINTS SHALL BE ROUGHED, CLEANED AND FREE OF LAITANCE.
12. STRUCTURES HAVE BEEN DESIGNED FOR THE FOLLOWING: (IF CONDITIONS ARE EXCEEDED THE ENGINEER SHALL BE NOTIFIED)
   12.1. AASHTO HS-20 TRUCK LOAD
   12.2. 1'-6" MAXIMUM SOIL ABOVE THE ROOF OF THE STRUCTURE
   12.3. GROUND WATER TO TOP OF STRUCTURE
   12.4. "AT-REST" LATERAL SOIL PRESSURE OF 60 PCF FOR DRY SOIL CONDITIONS AND 92.4 PCF WHEN GROUND WATER IS PRESENT

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PROJ. #:
PLOT DATE: 2/11/2021
LAST UPDATED: 1/20/2021
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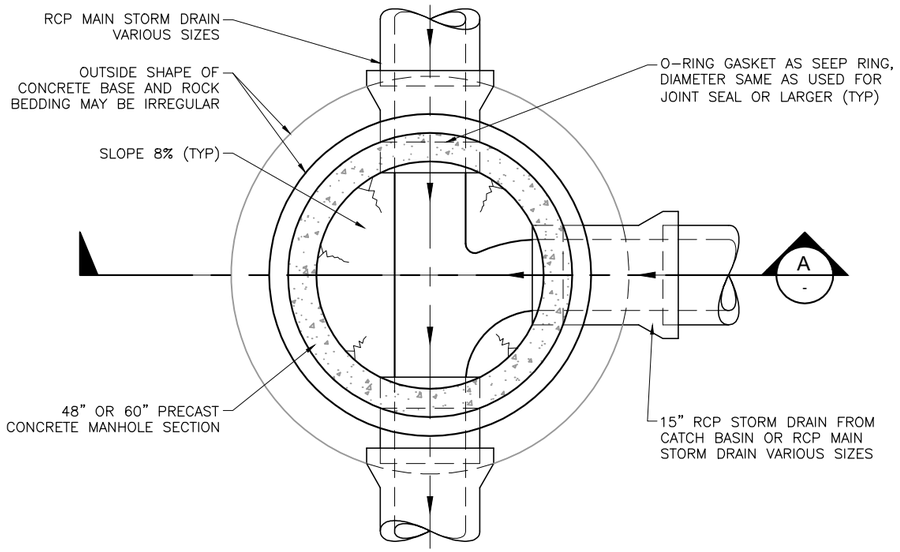
Kaysville City

KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS

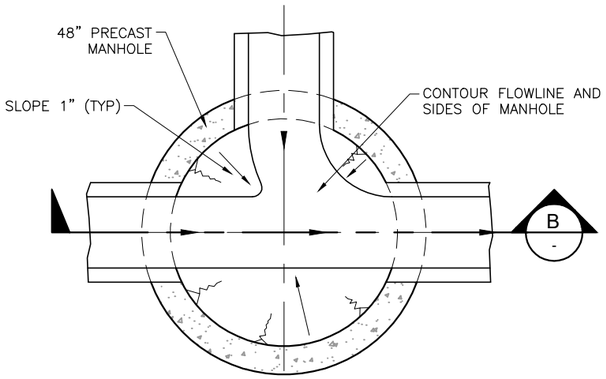
STANDARD CATCH BASIN DETAILS

SHEET 11

Plot Date:2/11/2021 3:15 PM Plotted By: Mark Jenkins
Date Created:1/20/2021 \\KAYSPUBLIC\PROJECTS-UJB\KAYSVILLE\STANDARDS\CAD\11-STANDARD CATCH BASINS.DWG

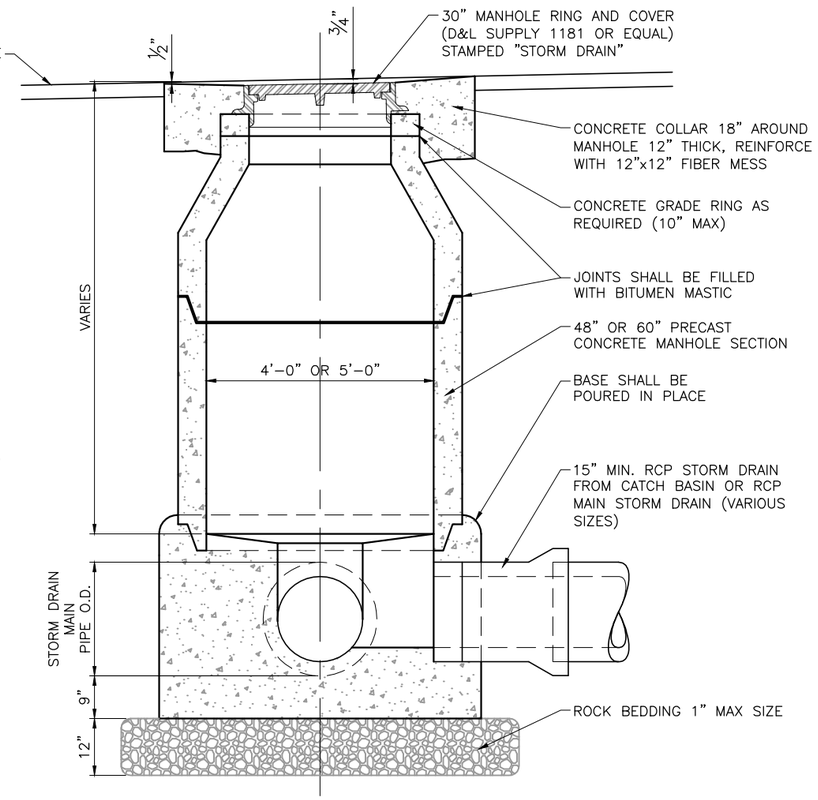


1 TYPICAL STORM DRAIN MANHOLE PLAN
SCALE: N.T.S.

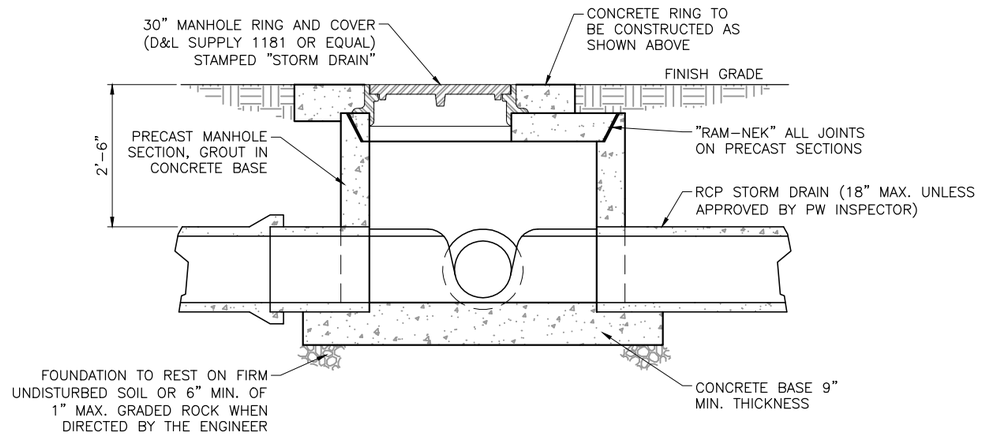


2 FLAT LID STORM DRAIN MANHOLE PLAN
SCALE: N.T.S.

NOTES:
1. MANHOLE WALL AND CONE SECTION SHALL CONFORM TO ASTM C 478
2. LIFT HOLES SHALL BE FILLED WITH GROUT
3. IF MANHOLES ARE TOO SHALLOW FOR CONE SECTION, USE FLAT CONCRETE LID INSTEAD
4. MAXIMUM MANHOLE SPACING IS 500 FT.
5. UPON COMPLETION OF CONSTRUCTION MANHOLE TO BE CLEAN AND FREE OF DEBRIS.
6. STEPS INSIDE MANHOLE TO BE ALIGNED.
7. INSTALL 12 GAUGE OR LARGER TRACER WIRE UP TO MANHOLE LID. NOTCH IN TOP OF CONE OR MANHOLE SECTION ¼" WIDE x 1" DEEP SAWCUT FROM EXTERIOR TO INTERIOR OF MANHOLE.



A TYPICAL STORM DRAIN MANHOLE SECTION
SCALE: N.T.S.



B FLAT LID STORM DRAIN MANHOLE SECTION
SCALE: N.T.S.

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PROJ. #:
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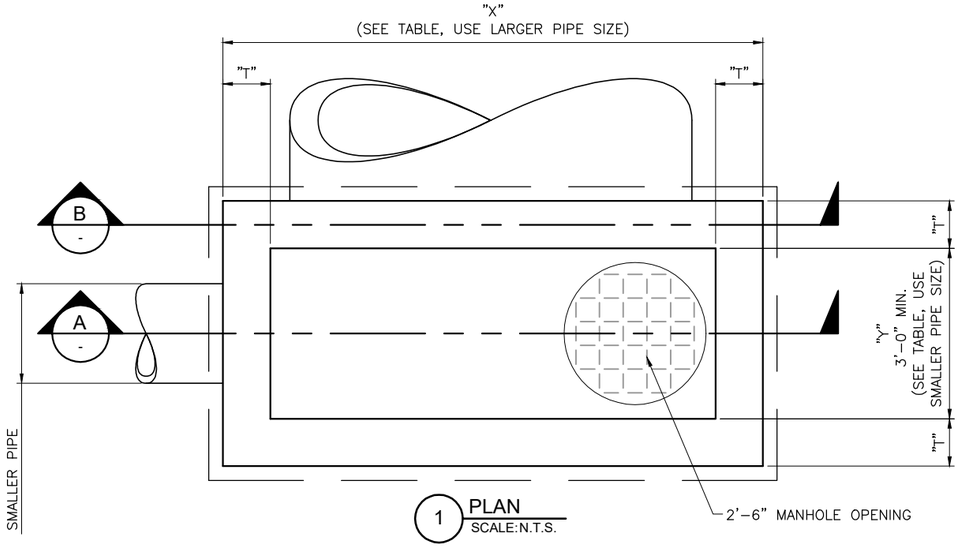
CHECKED BY:

KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS

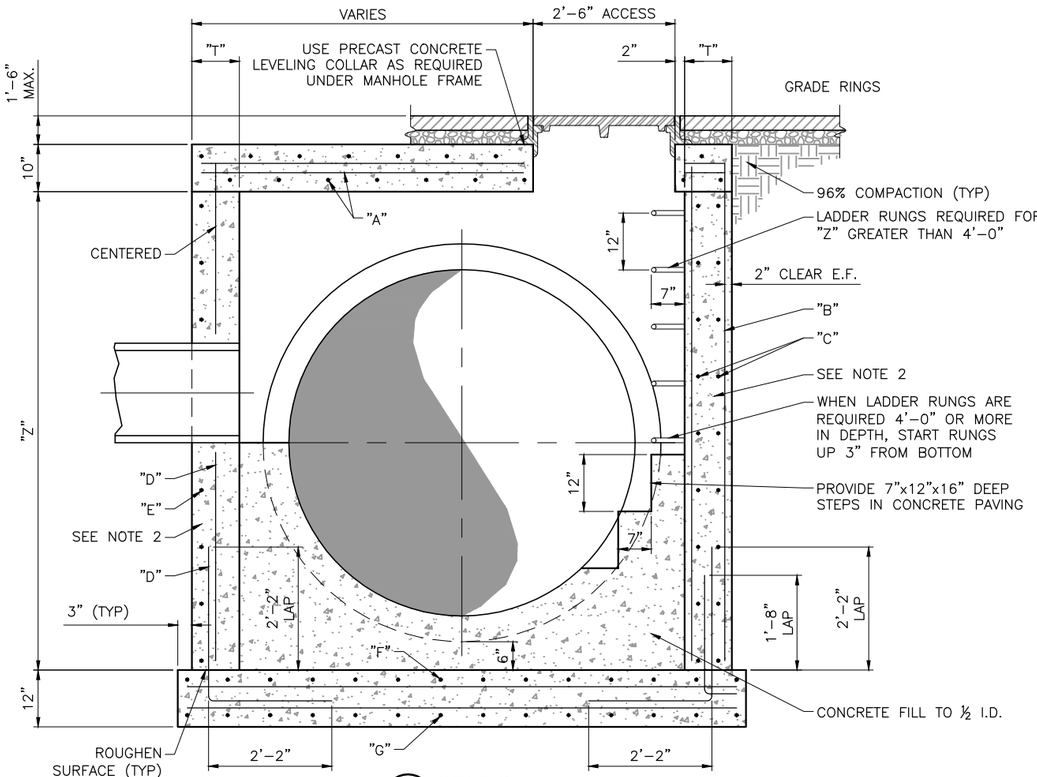
STANDARD STORM DRAIN MANHOLES

SHEET 12

Plot Date:2/11/2021 3:15 PM Plotted By: Mark Jenkins
Date Created:4/1/2020 \\KAYS\PUBLIC\PROJECTS\JUB\KAYSVILLESTANDARDS\CAD\12-STORM DRAIN MANHOLES.DWG



1 PLAN
SCALE:N.T.S.

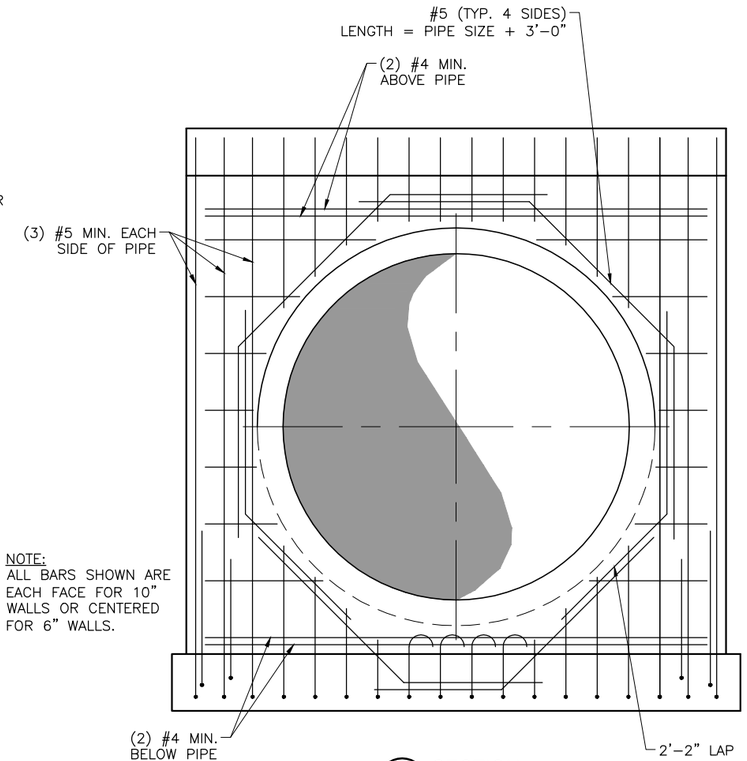


A SECTION
SCALE:N.T.S.

NOTE:
UPON COMPLETION OF CONSTRUCTION, BOX TO BE CLEAN AND FREE OF DEBRIS.

PIPE SIZE (IN.)	USE LARGEST PIPE SIZE FOR THESE DIMENSIONS AND REBAR EXCEPT DIMENSION "Y"									
	"X" "Y"	"Z"	"T"	"A"	"B"	"C"	"D"	"E"	"F"	"G"
18	3'-0"	3'-3"	6"	#4 @ 12"	---	---	#5 @ 9"	#4 @ 12"	#4 @ 12"	#5 @ 9"
21	3'-3"	3'-6"	6"	#4 @ 12"	---	---	#5 @ 9"	#4 @ 12"	#4 @ 12"	#5 @ 9"
24	3'-6"	3'-9"	6"	#4 @ 12"	---	---	#5 @ 9"	#4 @ 12"	#4 @ 12"	#5 @ 9"
27	3'-9"	4'-0"	6"	#4 @ 12"	---	---	#5 @ 9"	#4 @ 12"	#4 @ 12"	#5 @ 9"
30	4'-2"	4'-5"	6"	#4 @ 12"	---	---	#5 @ 9"	#4 @ 12"	#4 @ 12"	#5 @ 9"
33	4'-5"	4'-8"	6"	#4 @ 12"	---	---	#5 @ 9"	#4 @ 12"	#4 @ 12"	#5 @ 9"
36	4'-8"	4'-11"	6"	#4 @ 12"	---	---	#5 @ 9"	#4 @ 12"	#4 @ 12"	#5 @ 9"
42	5'-3"	5'-6"	6"	#4 @ 12"	---	---	#5 @ 9"	#4 @ 12"	#4 @ 12"	#5 @ 9"
48	5'-10"	6'-1"	10"	#4 @ 12"	#5 @ 12"	#4 @ 12"	---	---	#4 @ 12"	#5 @ 12"
54	6'-5"	6'-8"	10"	#4 @ 12"	#5 @ 12"	#4 @ 12"	---	---	#4 @ 12"	#5 @ 12"
60	7'-0"	7'-3"	10"	#4 @ 12"	#5 @ 12"	#4 @ 12"	---	---	#4 @ 12"	#5 @ 12"
66	7'-7"	8'-10"	10"	#4 @ 12"	#5 @ 12"	#4 @ 12"	---	---	#4 @ 9"	#5 @ 12"
72	8'-2"	8'-5"	10"	#4 @ 12"	#5 @ 12"	#4 @ 12"	---	---	#4 @ 9"	#5 @ 12"

NOTES:
1. THE "H" REBAR IS BASED ON THE SMALL PIPE. WHEN THE SMALLER PIPE IS 18" TO 36" USE #4 @ 6". WHEN THE SMALLER PIPE IS 24" TO 60" USE #5 @6". WHEN THE SMALLER PIPE IS 66" OR 72" USE #6 @ 6".
2. WALL THICKNESS IS BASED ON THE LARGEST OF THE PIPES. FOR 10" WALLS, USE 2 LAYERS OF STEEL, FOR 6" WALLS, USE A SINGLE LAYER OF STEEL.
3. WHEN "Z" IS LESS THAN 4'-0", THE VERTICAL REBAR LAP MAY BE ELIMINATED AND DOWELS EXTENDED TO THE TOP OF THE WALL.



NOTE:
ALL BARS SHOWN ARE EACH FACE FOR 10" WALLS OR CENTERED FOR 6" WALLS.

B SECTION
SCALE:N.T.S.

GENERAL NOTES:
1. ALL STRUCTURAL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI IN 28 DAYS.
2. REINFORCEMENT STEEL SHALL BE DEFORMED BARS CONFORMING IN QUALITY TO THE REQUIREMENTS OF ASTM DESIGNATION A-615, GRADE 60, INCLUDING SUPPLEMENTARY REQUIREMENTS (S1).
3. ALL DETAILING, FABRICATION AND PLACING OF REINFORCING BARS SHALL BE IN ACCORDANCE WITH THE "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" ACI-315, LATEST EDITION.
4. TOLERANCES IN PLACING REINFORCEMENT SHALL BE:

   ±⅜ INCH FOR MEMBERS WITH D < 8 INCHES
   ±½ INCH FOR MEMBERS WITH D >= 8 INCHES

5. DOWELS, PIPES, WATERSTOPS AND OTHER INSTALLED MATERIALS AND ACCESSORIES SHALL BE HELD SECURELY IN POSITION WHILE CONCRETE IS BEING PLACED.
6. UNLESS OTHERWISE SHOWN, ASIDE FROM NORMAL ACCESSORIES USED TO HOLD REINFORCING BARS FIRMLY IN POSITION, THE FOLLOWING SHALL BE ADDED:

   A. IN SLABS #5 RISER BARS AT 36 INCHES O.C. MAXIMUM TO SUPPORT TOP REINFORCING BARS.
   B. IN WALLS WITH 2 CURTAINS #3 U OR Z SHAPE SPACES AT 6 FEET O.C. EACH WAY.

7. METAL CLIPS OR SUPPORTS SHALL NOT BE PLACED IN CONTACT WITH THE FORMS OR THE SUBGRADE. CONCRETE BLOCKS (OR DOBBIES) SUPPORTING BARS ON SUBGRADE SHALL BE IN SUFFICIENT NUMBERS TO SUPPORT THE BARS WITHOUT SETTLEMENT, BUT IN NO CASE SHALL SUCH SUPPORT BE CONTINUOUS.
8. DOWELS SHALL BE WIRED OR OTHERWISE HELD IN POSITION. THEY SHALL NOT BE SHOVED INTO FRESHLY PLACED CONCRETE.
9. REINFORCED BARS AND ACCESSORIES SHALL NOT BE IN CONTACT WITH ANY PIPE, PIPE FLANGE OR METAL PARTS EMBEDDED IN CONCRETE. A MINIMUM OF 2 INCHES CLEARANCE SHALL BE PROVIDED AT ALL TIMES.
10. STRUCTURES SHALL BE BACKFILLED WITH GRANULAR SOIL.
11. ALL CONSTRUCTION JOINTS SHALL BE ROUGHED AND CLEANED AND FREE OF LAITANCE.
12. STRUCTURES HAVE BEEN DESIGNED FOR THE FOLLOWING; IF CONDITIONS ARE EXCEEDED THE ENGINEER SHALL BE NOTIFIED.

    A. AASHTO HS-20 TRUCK LOAD
    B. 1'-6" MAX. SOIL ABOVE THE ROOF OF THE STRUCTURE
    C. GROUND WATER TO TOP OF STRUCTURE
    D. "AT-REST" LATERAL SOIL PRESSURE OF 60 PCF FOR DRY SOIL CONDITIONS AND 92.4 PCF WHEN GROUND WATER IS PRESENT.

STANDARD CLEANOUT
SCALE: N.T.S. (TYPE 1)

NO.	REVISION DESCRIPTION	BY	APR.	DATE

FILE:
PROJ. #:
PLOT DATE: 2/11/2021
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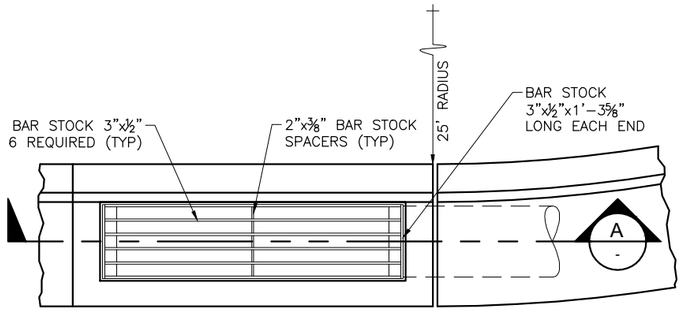
DESIGN BY:
CHECKED BY:

Kaysville City

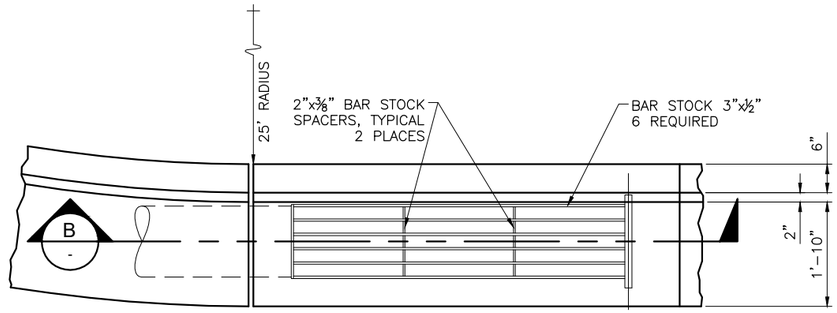
KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS
STANDARD STORM DRAIN CLEANOUT

SHEET 13

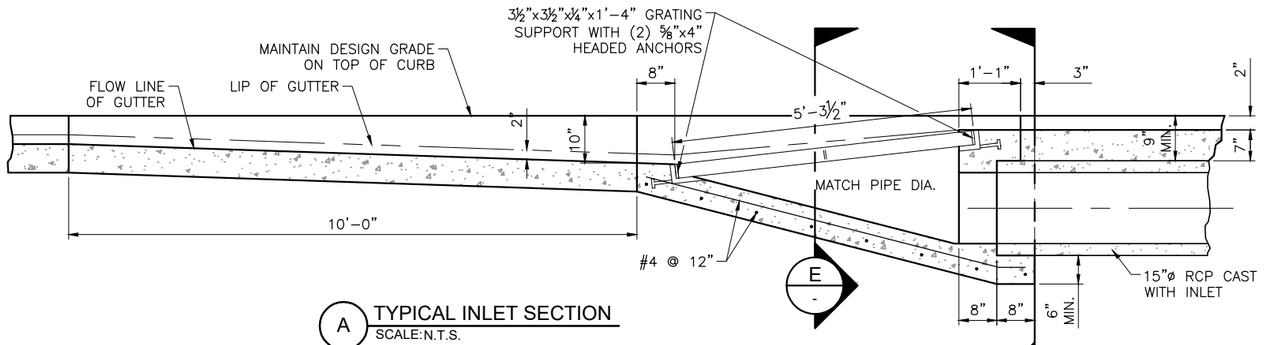
Plot Date:2/11/2021 3:18 PM Plotted By: Mark Jenkins
Date Created:4/1/2020 I:\KAYS\PUBLIC\PROJECTS\JUB\KAYSVILLESTANDARDS\CAD\13-STORM DRAIN CLEANOUT.DWG



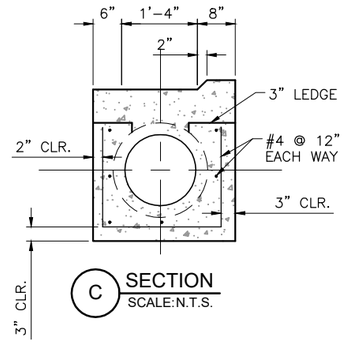
1 TYPICAL INLET PLAN
SCALE:N.T.S.



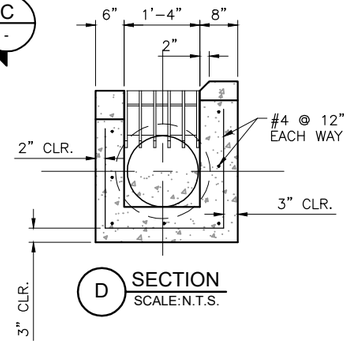
2 TYPICAL OUTLET PLAN
SCALE:N.T.S.



A TYPICAL INLET SECTION
SCALE:N.T.S.



C SECTION
SCALE:N.T.S.



D SECTION
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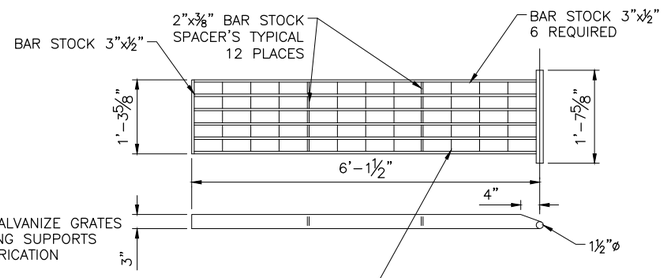
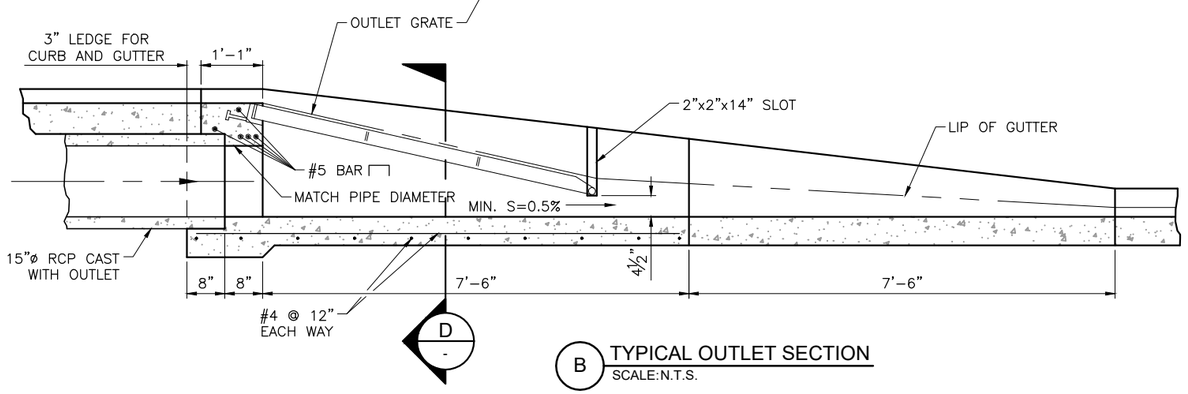
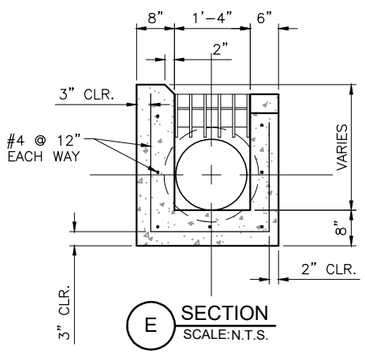




B TYPICAL OUTLET SECTION
SCALE:N.T.S.



E SECTION
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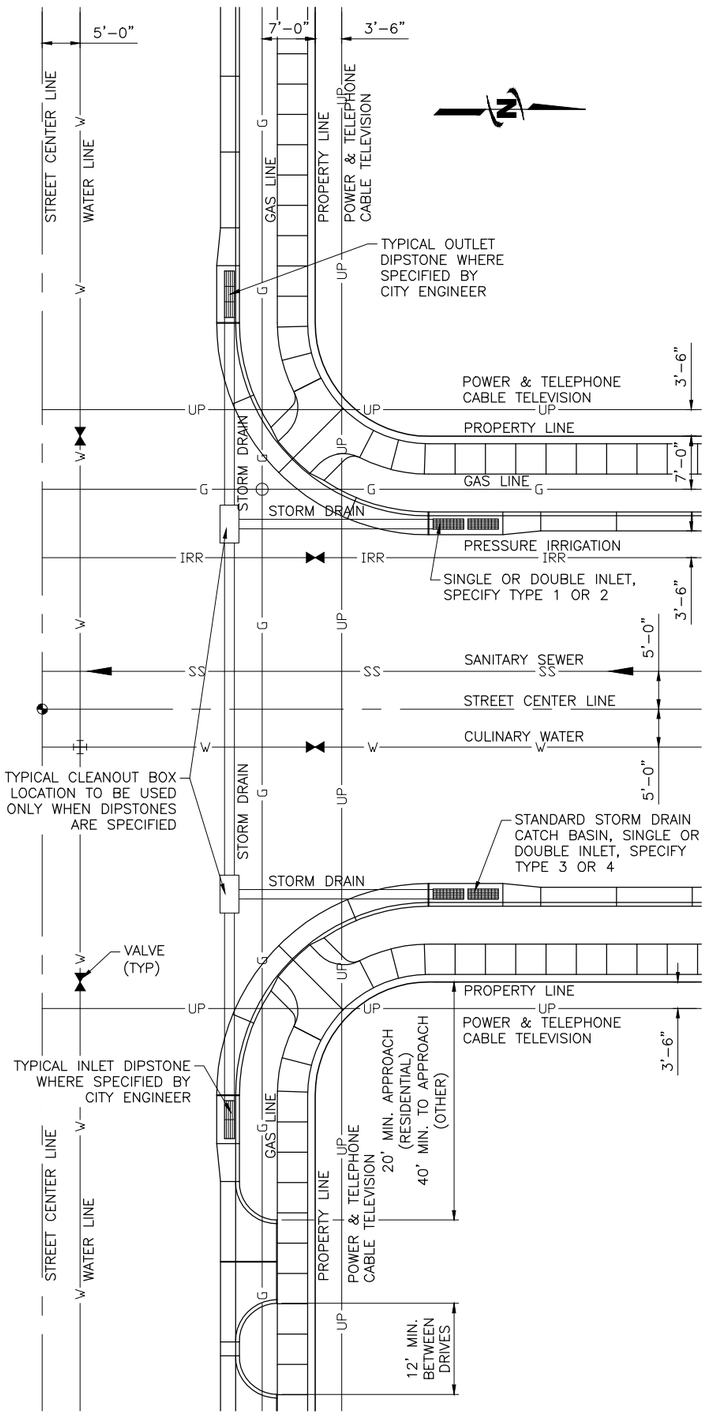

DIPSTONE STYLE DRAINAGE CROSSING

REUSE OF DRAWINGS
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PROJ. #:
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LAST UPDATED: 2/1/2021
DRAWN BY: KEF
DESIGN BY:
CHECKED BY:

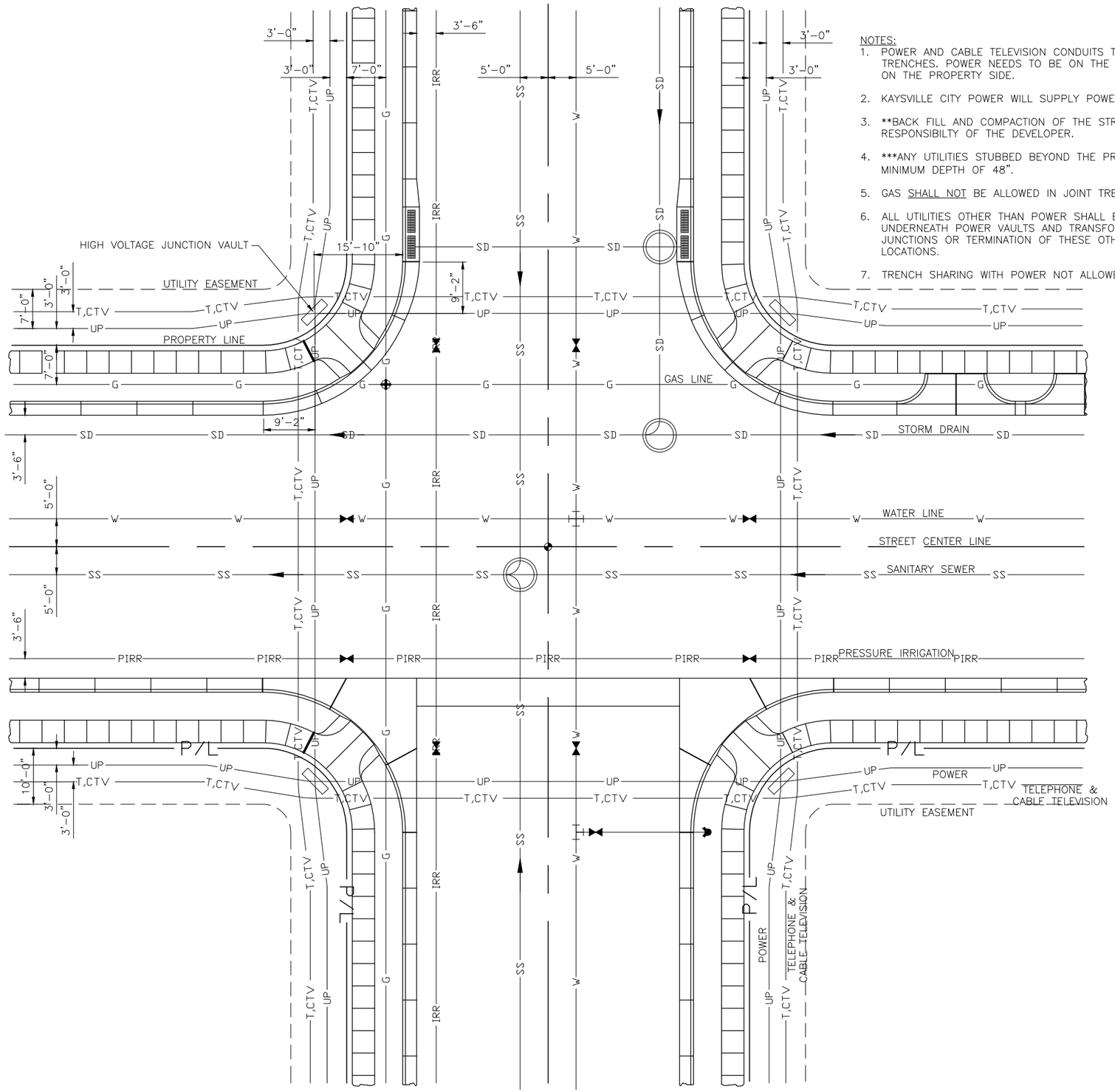
Kaysville City

KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS

STANDARD INLET-OUTLET DIPSTONE DETAILS
ONLY ALLOWED WITH SPECIFIC APPROVAL FROM ENGINEER

SHEET
14

Plot Date/2/11/2021 3:21 PM Plotted By: Mark Jenkins
Date Created/4/1/2020 \\KAYS\PUBLIC\PROJECTS\UBI\KAYSVILLE\STANDARDS\CAD\14-DIPSTONE.DWG



NOTES:

1. POWER AND CABLE TELEVISION CONDUITS TO BE INSTALLED IN SEPARATE TRENCHES. POWER NEEDS TO BE ON THE STREET SIDE. ALL OTHER UTILITIES ON THE PROPERTY SIDE.
2. KAYSVILLE CITY POWER WILL SUPPLY POWER CONDUIT.
3. **BACK FILL AND COMPACTION OF THE STREET CROSSING IS THE RESPONSIBILTY OF THE DEVELOPER.
4. ***ANY UTILITIES STUBBED BEYOND THE PROPERTY LINE MUST MAINTAIN A MINIMUM DEPTH OF 48".
5. GAS SHALL NOT BE ALLOWED IN JOINT TRENCH.
6. ALL UTILITIES OTHER THAN POWER SHALL BE ROUTED AROUND AND NOT UNDERNEATH POWER VAULTS AND TRANSFORMERS. THERE SHALL BE NO JUNCTIONS OR TERMINATION OF THESE OTHER UTILITIES IN THESE LOCATIONS.
7. TRENCH SHARING WITH POWER NOT ALLOWED UNLESS ELEVATION STAGGERED.

TYPICAL STREET IMPROVEMENT PLAN

SCALE: N.T.S.

NO.	REVISION DESCRIPTION	BY	APR	DATE

FILE:
PROJ. #:
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CHECKED BY:

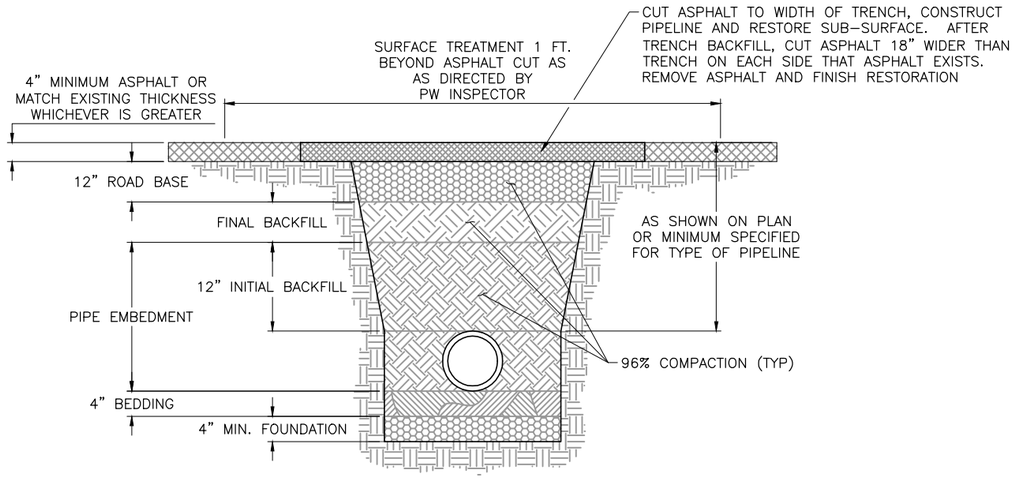
Kaysville City

KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS

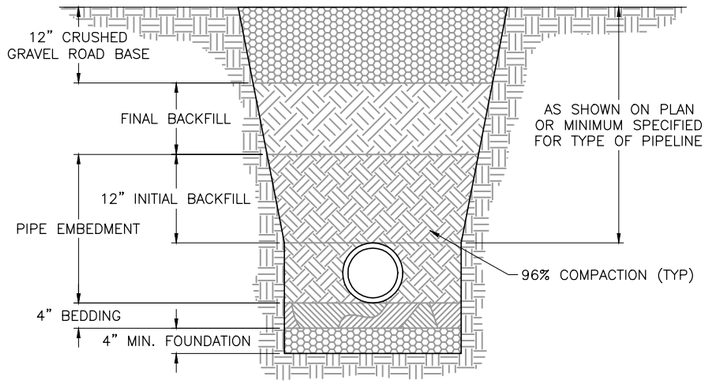
STANDARD STREET IMPROVEMENTS
POWER AND CABLE TELEVISION LINES

SHEET 15

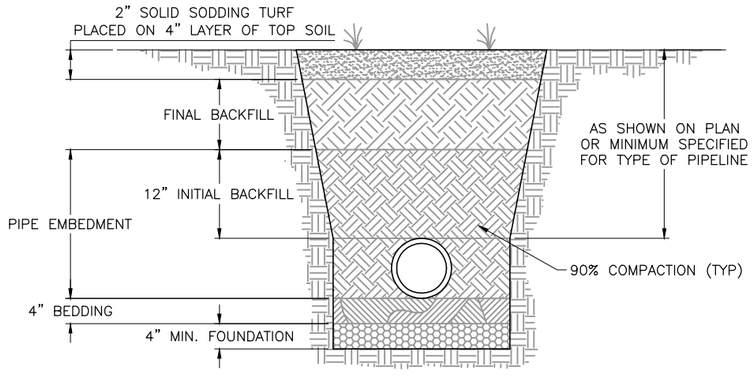
Plot Date:2/11/2021 3:21 PM Plotted By: Mark Jenkins
Date Created:4/1/2020 \\KAYSPUBLIC\PROJECTS\UB\KAYSVILLE\STANDARDS\CAD\15-STREET IMPROVEMENTS-POWER-CABLE.DWG



1 ASPHALT SURFACE
SCALE:N.T.S.



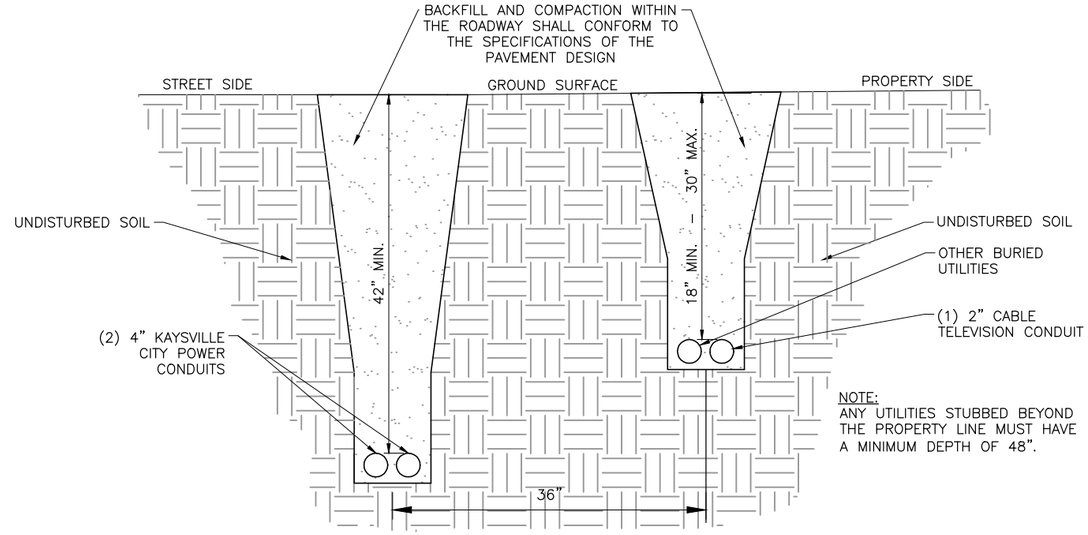
2 GRAVEL SURFACE
SCALE:N.T.S.



3 TURF SURFACE
SCALE:N.T.S.

NOTES:

1. SLOPE TRENCH TO MEET OSHA REQUIREMENTS (LATEST EDITION) OR USE TRENCH BOX.
2. FOUNDATION AND BEDDING MATERIAL AS REQUIRED.
3. INSTALL PIPELINES ON STABLE FOUNDATION WITH UNIFORM BEARING FOR FULL LENGTH OF BARREL, EXCAVATE IN BEDDING FOR ALL PIPE JOINTS.
4. IF GRAVEL MATERIAL IS USED FOR PIPE EMBEDMENT, FABRIC IS TO BE USED ON TOP OF GRAVEL BEFORE BACKFILLING TRENCH.
5. FOR POTHOLES: USE STATE SPEC. FLOWABLE FILL PER SECTION 03575 UDOT SPECS. UP TO ASPHALT GRADE AND THEN PAVE PROPER ASPHALT DEPTH
6. THE INDIVIDUAL RESPONSIBLE FOR THE COMPLETE REPAIR OF ALL ASPHALT SURFACES SHALL ALSO CRACK SEAL AND SURFACE TREATMENT THE ENTIRE EXCAVATED AREA AS DETERMINED BY KAYSVILLE CITY. ALL JOINTS SHALL BE CRACK SEALED PRIOR TO SLURRY SEAL. CRACK SEAL MUST BE INSPECTED BEFORE SLURRY SEAL IS APPLIED. SLURRY SEAL SHALL BE A TYPE 2 SLURRY WITH SAND.



POWER AND CABLE T.V. TRENCH SECTION

TYPICAL TRENCH SECTIONS

NO.	REVISION DESCRIPTION	BY	APR.	DATE

FILE:
PROJ. #:
PLOT DATE: 2/11/2021
LAST UPDATED: 2/1/2021
DRAWN BY: KEF
DESIGN BY:
CHECKED BY:

KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS
TYPICAL TRENCH SECTIONS

SHEET 16

Plot Date/2/11/2021 3:29 PM Plotted By: Mark Jenkins
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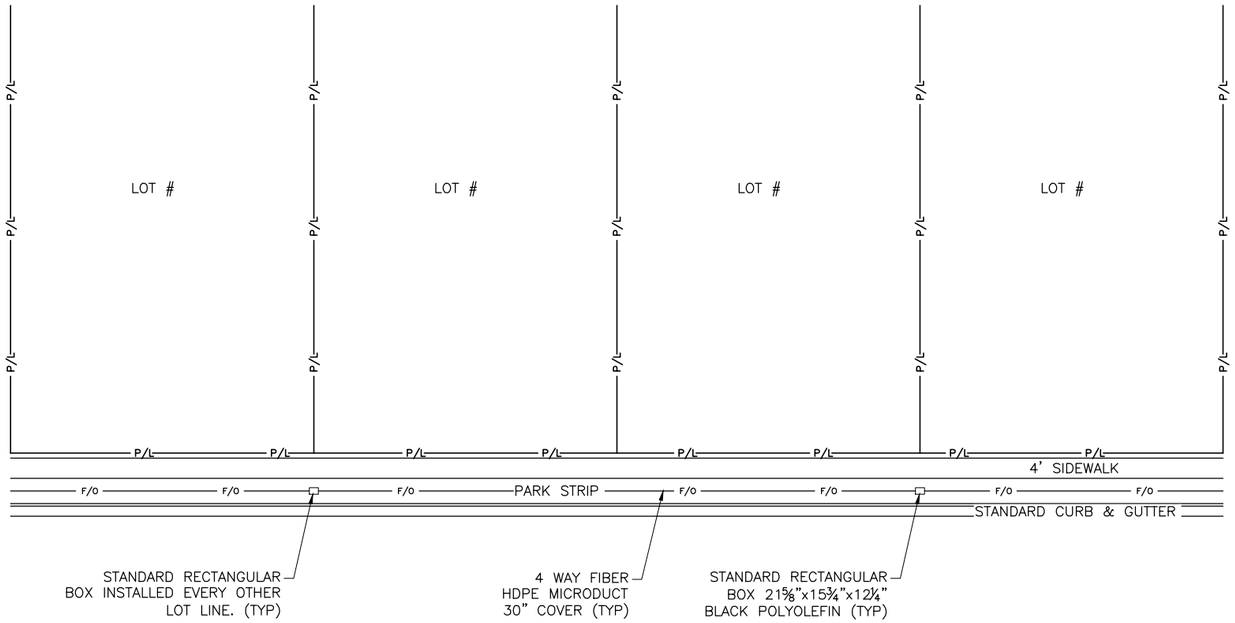
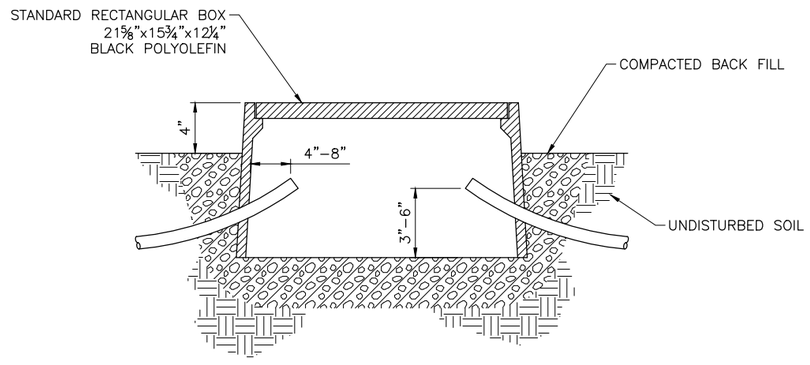


TYPICAL LOT LAYOUT

SCALE: N.T.S.



PROFILE BOX VIEW

SCALE: N.T.S.

NO.	REVISION DESCRIPTION	BY	APR.	DATE

FILE:
PROJ. #:
PLOT DATE: 2/11/2021
LAST UPDATED: 2/1/2021
DRAWN BY: JDM
DESIGN BY: SRM
CHECKED BY: SRM

Kaysville City

KAYSVILLE CITY CORPORATION
DEVELOPMENT STANDARDS

STANDARD FIBER DETAILS

SHEET
17

Plot Date:2/11/2021 3:25 PM Plotted By: Mark Jenkins
Date Created:5/7/2020 \\KAYSPUBLIC\PROJECTS\JUB\KAYSVILLESTANDARDS\CAD\17-FIBER.DWG

Stormwater System Operations & Maintenance Plan

for:

{All blue text temporary instruction text and needs to be deleted from the final plan}
{Replace the following text with}
Insert Development Name
Address
City, State, Zip Code

Company Name on legal records
Owner of Record Name (at time of recording)
Address
City, State, Zip Code
Phone
Email

{Stormwater System Operations and Maintenance contact for addressing regular site operations, inspections, and annual reporting regarding this property. Contacts will often require updating as property staff or ownership changes}
Site Manager, Company Representative, Property Agent, HOA Representative, responsible for operations and maintenance etc.
Phone Number:
Email:

Contents

PURPOSE AND RESPONSIBILTY

The Clean Water Act (CWA) is the principal law governing pollution control and water quality of the nation's waterways. The law is necessary because urbanization has increased the volume of pollution and runoff that reach waterways. Runoff rates and volumes that were previously reduced by natural processes before development, now runs off roads, driveways and roofs carrying everything that collect on these impervious surfaces directly to our waterways in increased rates and volumes resulting in damage to the environment. The regulation governs new development drainage system designs that reduce these impacts from urban runoff.

The Utah Department of Environmental Quality, Division of Water Quality has the responsibility to enforce the CWA in Utah resulting in the Municipal Separate Storm Sewer System Permit (MS4) for municipalities. The Utah Stormwater Advisory Committee (USWAC) which is made up of all the Utah municipalities was formed to support the Utah DEQ in developing practical MS4 programs that protect our water resources and foster better uniformity across the State. USWAC developed the Stormwater System Operations and Maintenance Plan program to help property owners understand how their property can impact water resources and provide a common template for Operations and Maintenance procedures necessary to manage their properties impacts.

The Stormwater System Operations and Maintenance Plan was prepared by the project designers to manage the site's unique flood and water quality systems, written specifically for the site staff and service contractors. Ultimately, good maintenance helps manage and contain polluted runoff, improving the quality of life in our communities where we live and visit.

Any activities or site operations on this property that contaminate water entering the City's stormwater system, groundwater and results in loose litter must be prohibited.

The Stormwater System Operations and Maintenance Plan is aimed at preventing the [INSERT YOUR LOCAL WATERBODY(S)] impairments.

1. [LIST YOUR LOCAL TMDL'S AND OTHER REGULATING DOCUMENTS]
2. Etc

SECTION 1: SITE DESCRIPTION, USE AND IMPACT

[The intent is to keep section 1 simple and to the point but with enough information that explains how the site infrastructure when improperly maintained will impact water resources. The key to successful maintenance is understanding why.]

By living in urban communities, every property generates runoff that can potentially affect the quality of water that drains to waterways and the ground. To manage flooding, control water pollution and manage cost, it is vital we understand how our flood and water quality system works.
When our property and operations are managed improperly, we will contaminate local water resources. Our Stormwater System Operations and Maintenance Plan includes standard operations procedures intended to help us responsibly manage our grounds. Standard Operation Procedures are filed in appendix B.

Parking, Sidewalk and Pavements

[Describe the impervious infrastructure and how it and its maintenance practices can impact surface and groundwater water quality. Acknowledge how poor maintenance can increase risks to flood and water quality and increase maintenance cost. Identify the necessary SOPs and include them in Appendix B]

[The following text is suggested for your convenience. If used the property owner and design team are expected modify the suggested text to represent the sites unique impervious infrastructure, operations and conditions]
Any sediment, leaves, debris, spilt fluids or other waste that collects on our parking areas, sidewalks and other pavements, will be carried by runoff to our flood and water quality control system. Any solids will fill in our system requiring removal and cleaning.
Any solid material, dissolved solids and liquids mixed with runoff can contaminate surface and potentially groundwater for which we are responsible.

Landscaping

[Describe the landscape infrastructure and how it and its maintenance practices impact our flood and water quality system. Also include description of any LID if used to help manage the retention standard. Acknowledge poor maintenance impacts of 80th percentile infrastructure. If LID is used describe its benefit and the effects of poor maintenance practices. Identify the necessary SOPs and include them in Appendix B]

[The following text is suggested for your convenience. If used the property owner and design team are expected modify the suggested text to represent the sites unique landscape infrastructure and conditions]
Our landscape operations can result in grass clippings, sticks, branches, dirt, mulch, fertilizers, herbicides, pesticides to collect on our paved areas. When left on pavements, these solids will fill in our flood and water quality system requiring removal and cleaning.
Any dissolved solids and liquids mixing with runoff can contaminate surface and potentially groundwater for which we are responsible.

Flood and Water Quality Control System

[Describe the stormwater system including surface grading, conveyance system, runoff storage, retention and detention storage, manufactured treatment devices and when used any LIDs. For design and planning assistance visit; https://www.epa.gov/npdes/stormwater-planning

[Flood and water quality systems can usually be separated into 3 primary approaches or variations of each scenario.

1. *Directly connected chamber/drywell systems in combination with a manufactured treatment device (MTD). Scenario (1) appears to be the current trend. Generally, these systems concentrate runoff and pollution into a smaller space, increasing the risk for inadequate infiltration rates and groundwater contamination. Maintenance frequency is likely more frequent and spill mitigation of contaminated ground can also be significantly more expensive.*
2. *Surface pocket retention/detention pond Low Impact Development(LID) systems. These systems are usually legacy high-back curb, inlets, pipe, detention systems with a water quality retention volume. Many times, these systems can warrant an MTD. Generally, these systems concentrate runoff and pollution into a smaller space increasing risk for inadequate infiltration resulting in long-term surface water ponding.*
3. *LID approaches. The better LID approaches more evenly distribute runoff across the site and usually pretreat runoff with natural processes prior to discharging to retention/detention areas for managing excess flood control volume or can be combined. Better LID designs can sometimes replace the need for an MTD. Generally, these systems distribute runoff and pollution better, decreasing inadequate infiltration and groundwater contamination risk. Spill mitigation cost risk are also likely less.]*

Tweak the suggested language to fit your unique flood and water quality control design.]

[This paragraph is suggested language for the directly connected chamber/drywell approaches. Scenario 1]

Our flood and water quality control system collects runoff directly from pavements with inlets and pipes. The pipes carry runoff and anything washed off our pavement directly to our manufactured treatment device and to our underground chamber retention/detention system designed to retain and infiltrate the first [INSERT 80TH PERCENTILE DEPTH"] of runoff. Our manufactured treatment device is a [INSERT MANUFACTURED TREATMENT DEVICE] and only captures sediments and floating material. Pollution that dissolves in water is not treated and anything else that can bypass runoff events will drain into the ground. The runoff in excess of the retention volume is released to the City system at [INSERT DISCHARGE RATE] cfs. The entire system is designed to manage the peak volume runoff for the [INSERT STORM EVENT RETURN PERIOD] storm event.

[This paragraph is suggested for the surface pocket retention/detention pond LID approach. Scenario 2]

Our flood and water quality control system collects runoff and anything washed off our pavements directly into our pocket retention/detention pond system. Directing runoff to surface retention/detention ponds reduces our impact by trapping solids on the surface

and treating dissolved pollutants using plants and soil biology. The first [INSERT 80TH PERCENTILE DEPTH"] of runoff is retained and infiltrated into the ground. The runoff in excess of the retention volume is released to the City system at [INSERT DISCHARGE RATE] cfs. The entire system is designed to manage the peak runoff volume for the [INSERT STORM EVENT RETURN PERIOD] storm event.

[This paragraph is suggested for the LID approach, scenario 3]
Our flood and water quality control system carries runoff directly into landscaping swales, rain gardens and open landscaping areas. Directing runoff to surface areas reduces our impact by trapping solids on the surface and treating dissolved pollutants using plants and soil biology. Evenly distributing runoff across our property also reduces the time runoff will pond on the surface. The first [INSERT 80TH PERCENTILE DEPTH"] of runoff is retained and infiltrated into the ground within the swales, rain gardens and landscape system and the excess treated runoff spills into our underground chamber system/above ground detention pond where it is detained and release to the City system at [INSERT DISCHARGE RATE] cfs. The entire system is designed to manage the peak runoff volume for the [INSERT STORM EVENT RETURN PERIOD] storm event.

[The following 2 paragraphs are common for all 3 scenarios']
Treating and infiltrating runoff from our property is required by the Clean Water Act intended to protect streams, rivers and groundwater. It is important we regularly maintain our system and diligently follow our standard operation procedures to manage and prevent pollution with potential to dissolve and mix with runoff, damaging surface and subsurface water resources for which we are responsible.

Also, anything we allow to reach our surface low impact system, manufactured treatment device and underground chamber system will fill it with sediment and debris increasing maintenance cost. It is important to follow our standard operation procedures to help manage site maintenance cost and ensure our system is working properly.

Waste Management

[Describe the waste management system infrastructure and how it and its maintenance practices impact our system and water quality. Provide necessary trash management SOPs and include them in Appendix B]
[The following text is suggested for your convenience. If used the property owner and design team are expected modify the suggested text to represent the sites unique waste management infrastructure and operations]
Good waste management systems, if managed improperly, can become the source of the very pollution it was intended to manage. Closing the lids of our dumpster and trash receptacles are necessary to prevent light weight trash carried off by wind and precipitation exposure preventing liquids that can leak to our pavement and from haul trucks. In addition, our dumpster pad slopes toward our pavement and any leaks can leach into runoff, staining our pavement, increasing odors and increasing risk to water resources.

Utility System

[Describe the utility infrastructure and how it and its maintenance practices impacts our system and water quality. Identify the necessary SOPs and include them in Appendix B]
[The following text is suggested for your convenience. If used the property owner and design team are expected modify the suggested text to represent the sites unique infrastructure and conditions]
Our roof top utility system is exposed to our roof drains which drain to our pavements. This heating and air conditioner unit contains oils and other chemicals that can harm surface and groundwater if allowed to reach our flood and water quality system.

Snow and Ice Removal Management

[Describe the snow and ice operations and how it can impact our system and water quality. Identify the necessary SOPs and include them in Appendix B]
[The following text is suggested for your convenience. If used the property owner and design team are expected modify the suggested text to represent the sites unique infrastructure and conditions]
Salt is a necessary pollutant and is vital to ensuring a safe parking and pedestrian walkways. However, salt and other ice management chemicals, when improperly managed will unnecessarily increase our salt impact to our own vegetation and local water resources. In addition, we need to minimize salt to maintain healthy root systems needed for optimum infiltration rates.

Equipment / Outside Storage

[Describe any outside storage facilities or operations and how it can impact our system and water quality. Delete when not applicable. Identify the necessary SOPs and include them in Appendix B]

Add infrastructure or operations that are unique to this site

[*Describe any other site infrastructure or operations unique to this property which impacts our system and water quality. Identify the necessary SOPs and include them in Appendix B*]

SECTION 2: TRAINING

Ensure that all employees and maintenance contractors know and understand the standard operations procedure specifically written to manage and maintain the property. Maintenance contractors must use the stronger of their Company and the Stormwater System Operations and Maintenance Plan standard operations procedures. File all training records in Appendix C.

SECTION 3: RECORDKEEPING

Maintain records of operation and maintenance activities in accordance with standard operations procedures.
Mail a copy of the record to [NAME OF MUNICIPALITY annually.

SECTION 4: APPENDICES

APPENDIX A – SITE DRAWINGS AND DETAILS

[Insert Final Grading & Drainage Plan Sheets of the site Civil Drawings and Details following this page. Include, any specific notes or markers to assist with inspection and maintenance requirements.]

APPENDIX B – Standard Operation Procedures (SOPs)

[Insert the sites unique SOPs following this page]

Instruction for writing SOPs
The purpose of the SOPs is to provide site managers, staff maintenance personnel and maintenance contractor's adequate instruction necessary to maintain the property in an environmentally responsible manner.

Low Impact Development and 80th percentile infrastructure is not only new to many people, but it will also likely need regular maintenance to adequately provide long-term flood and environmental protection.

On the following pages are suggested SOPs templates for typical development. However, every site's conditions and operations are usually unique in many ways. The property owner and design team are expected to determine template applicability and modify the suggested text to the unique site infrastructure, its limitations and operations. Ultimately, it is the property owners and design teams responsibility to ensure the SOPs are adequate for managing their runoff impacts.

The City also encourages the use of existing company SOPs modified and geared for this sites unique system operations. The use of the suggested SOPs and equivalent caliber company SOPs can reduce review iterations.

Pavement Sweeping

General:
These SOPs are not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in these SOPs.

1. Purpose:

a) One of the primary contaminates in the [INSERT CRITICAL WATER BODIES] is organic material.
b) Any sediment, leaves, debris, spilt fluids or other waste that collects on our parking areas and sidewalks will fill in our low impact drainage system, retention/detention storage, manufactured treatment device and underground retention/detention infiltration system increasing our maintenance cost. Removing these debris after they have washed to our flood and water quality system is very expensive.

2. Regular Procedure:

a) Remain aware of minor sediment/debris and hand sweep or remove material by other means as needed. Significant deposits will likely collect in autumn with leaf fall and early spring after winter thaw. Usually sweeping machinery is the best tool for this application.
b) Regularly manage outside activities that spread fugitive debris on our pavements. This involves outside functions including but not limited to: Yard sales, yard storage, fund raisers, etc.
c) Do not allow car wash fund raiser or other related activities. Detergents will damage water resources and washed pollutants will fill our storm drain system and drain into the ground which we are responsible.

4. Disposal Procedure:

a) Dispose of hand collected material in dumpster
b) Use licensed facilities when haul off is necessary

5. Training:

a) Annually and at hire
b) Inform staff and service contractors when incorrect SOP implementation is observed.

Landscape Maintenance

General:
This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

a) One of the primary contaminates in the [INSERT CRITICAL WATER BODIES] is organic material.
b) Grass clippings, sticks, branches, dirt, mulch, fertilizers, pesticides and other pollutants will fill our low impact drainage system, retention/detention storage, manufactured treatment device and underground retention/detention infiltration system increasing our maintenance cost. Removing these debris after they have washed to our flood and water quality system is very expensive.

2. Maintenance Procedure:

a) Maintain healthy vegetation root systems. Healthy root systems will help improve permeable soils maintaining more desirable infiltration rates of our landscape areas receiving runoff from our pavements.
b) Grooming
   - Lawn Mowing – Immediately following operation sweep or blow clippings onto vegetated ground.
   - Fertilizer Operation – Prevent overspray. Sweep or blow granular fertilizer onto vegetated ground immediately following operation.
   - Herbicide Operation – Prevent overspray. Sweep or blow granular herbicide onto vegetated ground immediately following operation.
   - Trash and Debris – Remove trash and debris collecting within landscaping.
c) Remove or contain all erodible or loose material prior to forecast wind and precipitation events, before any non-stormwater will pass through the property and at end of work period. Light weight debris and landscape materials can require immediately attention when wind or rain is expected.
d) Landscape project materials and waste can usually be contained or controlled by operational best management practices.
   - Operational; including but not limited to:
     - Strategic staging of materials eliminating exposure, such as not staging on pavement

- Avoiding multiple day staging of landscaping backfill and spoil on pavements
- Haul off spoil as generated and daily
- Scheduling work when weather forecast are clear.

e) Cleanup:
- Use dry cleanup methods, e.g. square nose shovel and broom. Conditions are usually sufficient when no more material can be swept onto the square nosed shovel.
- Power blowing tools

3. Waste Disposal:

a) Dispose of waste according to General Waste Management SOP, unless superseded by specific SOPs for the operation.

4. Equipment:

a) Tools sufficient for proper containment of pollutants and removal.

5. Training:

a) Annually and at hire
b) Inform staff and service contractors when incorrect SOP implementation is observed.
c) Landscape Service Contractors must use equal or better SOPs.

Waste Management

General:
This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

a) Trash can easily blow out of our dumpster and trash receptacles.
b) Liquids can leak from our dumpster polluting waterways, subsurface soils, leak from haul trucks, stain pavements and increase odors.

2. Procedure:

a) Remain aware of the lids and keep them closed.
b) Remain aware of leaking and fix. Minimize allowing disposal of liquids in our receptacles and dumpster.
c) Beware of dumpster capacity. Solve capacity issues. Leaving bags outside of dumpster is not acceptable.

3. Waste Disposal Restrictions for all waste Scheduled for the [INSERT LOCAL LANDFILL FACILITY]:

a) Generally, most waste generated at this property, and waste from spill and cleanup operations can be disposed in our dumpsters under the conditions listed in this SOP. Unless specific disposal requirements are identified by the product SDS or otherwise specified in other SOPs.
b) Know the facility disposal requirements and restrictions. It should not be assumed that all waste disposed in collection devices will be disposed at the [INSERT LOCAL LANDFILL FACILITY].
c) Review [INSERT LOCAL LANDFILL FACILITY] regulations for additional restrictions and understand what waste is prohibited in the [INSERT LOCAL LANDFILL FACILITY]. Ensure the SDS and [INSERT LOCAL LANDFILL FACILITY] regulations are not contradictory.

   Generally, the waste prohibited by the [INSERT LOCAL LANDFILL FACILITY] is*: [it is suggested to provide local landfill requirements to assist private development applicants]*
   - List local prohibitions: …
     -
     -
     -
     -

-
-
-

(provide local landfill facility contacts*)*.

4. Training:

a) Annually and at hire
b) Inform staff and service contractors when incorrect SOP implementation is observed.

Flood and Water Quality System

General:
These SOPs are not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in these SOPs.

1. Purpose:

a) Our flood and water quality system will collect anything we leave in the way of runoff which will fill in our low impact drainage system, retention/detention storage, manufactured treatment device and underground retention/detention infiltration system increasing our maintenance cost. Removing these debris after they have washed to our flood and water quality system is very expensive.
b) Any liquids or dissolved pollutants can increase the risk for contaminating groundwater for which we are responsible.
c) During very intense storm events pollutants in excess runoff can bypass our system increasing risk of contaminating groundwater and the [INSERT LOCAL WATER BODY].

2. Inspections:

a) Inspect Manufactured Treatment Device. Remove any floating trash at each inspection interval with rake or other means. Remove oil sheen with absorbent materials. Remove sediments with accumulations 6” and more. This will usually require hydro-vacuum machinery.
b) Inspect Manufactured Treatment Device for mosquito larvae. Contact the [INSERT LOCAL MOSQUITO ABATMENT DISTRICT] when necessary.
c) Inspect underground retention/detention infiltration system for liquid or solid pollutants that can pollute subsurface soils. Find sources and prevent. There is no vegetation, and less soil biology to break down harmful chemicals at these depths.
d) Inspect underground retention/detention infiltration system for sediment and debris accumulations. Remove sediment and debris accumulation when volume capacities drop below 90%. Removal will require hydro-vacuum machinery.
e) Inspect sediment accumulations in above ground detention/retention infrastructure. Remove sediment accumulation when volume capacities drop below 90%.
f) Regularly remove trash and debris from landscaping areas and above ground low impact flood control systems with regular grooming operations. Inspect

sediment accumulations in low impact flood control systems. Remove accumulations when volumes within the swales, rain gardens and landscape areas drop below 90%.

g) Inspect low impact flood control system for adequate drainage and vegetation coverage. Poor drainage can be improved by maintaining healthy plant root systems.

h) Inspect flood design and retention system high water levels following significant storm events. The retention and detention depths should not exceed the depths shown on the plans for the respective storm event volumes. Contact an engineer when high water depths shown with plans are not consistent with the storm event.

i) Inspect surface water ponding. Water should not remain for more than 48 hours. Contact an engineer when the system is not draining. We should reduce site irrigation overspray as this could keep our pond wet all the time.

j) Inspect all flood and water quality systems for damage and tampering.

2. Disposal Procedure:

a) Remove and dispose sediment and debris at licensed facilities. Also, dry waste can be disposed in your dumpster as permitted by the [INSERT LOCAL LANDFILL FACILITY].

b) Disposal of hazardous waste

1. Dispose of hazardous waste at regulated disposal facilities. Follow SDS Sheets. Also see Waste Management and Spill Control SOP

3. Training:

a) Annually and at hire

b) Inform staff and service contractors when incorrect SOP implementation is observed.

Add manufactures O&M literature for proprietary flood and water quality systems behind this SOP and address any differences with minimums of this Flood and Water Quality system SOP template.

Pavement Washing

General:
These SOPs are not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in these SOPs.

1. Purpose:

a) Pavement washing involving detergents can potentially contaminate groundwater with phosphates and with whatever we are washing from pavements.
b) Pavement washing can fill our low impact drainage system, retention/detention storage, manufactured treatment device and underground retention/detention infiltration system increasing our maintenance cost. Removing these debris after they have washed to our flood and water quality system is very expensive.

2. Procedure:

a) Prevent waste fluids and any detergents if used from entering storm drain system. The following methods are acceptable for this operation.
   - Dam the inlet using a boom material that seals itself to the pavement and pick up the wastewater with shop-vacuum or absorbent materials.
   - Collect wastewater with shop-vacuum simultaneous with the washing operation.
   - Collect wastewater with vacuum truck or trailer simultaneous with the washing operation.
b) This procedure must not be used to clean the initial spills. First apply the Spill Containment and cleanup SOP following by pavement washing when desired or necessary.

3. Disposal Procedure:

a) Small volumes of diluted washing waste can usually be drained to the local sanitary sewer. Contact the [INSERT NAME OF LOCAL SEWER DISTRICT].
b) Large volumes must be disposed at regulated facilities.

4. Pavement Cleaning Frequency:

a) There is no regular pavement washing regimen. Pavement washing is determined by conditions that warrant it, including but not limited to: prevention of slick or other hazardous conditions or restore acceptable appearance of pavements.

5. Training:

a) Annually and at hire

b) Inform staff and service contractors when incorrect SOP implementation is observed.

Snow and Ice Removal Management

General:
This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

a) Salt and other ice management chemicals if improperly managed will unnecessarily increase our salt impact to our own vegetation and local water resources.
b) We need to maintain healthy root systems to help maintain optimum infiltration rates.

2. De-Icing Procedure:

a) Do not store or allow salt or equivalent to be stored on outside paved surfaces.
b) Minimize salt use by varying salt amounts relative to hazard potential.
c) Sweep excessive piles left by the spreader.
d) Watch forecast and adjust salt amounts when temperatures are expected to increase the risk is low, the same day.

3. Training:

a) Annually and at hire.
b) Require snow and ice service contractors to follow the stronger this SOP and their company SOPs.

General Construction Maintenance

General:
This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

a) Any sediment, debris, or construction waste will fill our low impact drainage system, retention/detention storage, manufactured treatment device and underground retention/detention infiltration system increasing our maintenance cost. Removing these debris after they have washed to our flood and water quality system is very expensive.

2. Construction Procedure:

a) Remove or contain all erodible or loose material prior forecast wind and precipitation events or before non-stormwater will pass through the project site. For light weight debris maintenance can require immediately attention for wind and runoff events. Many times, daily maintenance is necessary or as needed per random, precipitation or non-stormwater events.
b) Project materials and waste can be contained or controlled by operational or structural best management practices.
   - Operational; including but not limited to:
     - Strategic staging of materials eliminating exposure, such as not staging on pavement
     - Avoiding multiple day staging of backfill and spoil
     - Haul off spoil as generated or daily
     - Schedule work during clear forecast
   - Structural; including but not limited to:
     - Inlet protection, e.g. wattles, filter fabric, drop inlet bags, temporary covers
     - Gutter dams, e.g. wattles, sandbags, dirt dams
     - Boundary containment, e.g. wattles, silt fence
     - Dust control, e.g. water hose,
     - Waste control, e.g. construction solid or liquid waste containment, dumpster, receptacles
c) Inspection often to insure the structural best management practices are in good operating condition and at least prior to the workday end. Promptly repair damaged best management practices achieving effective containment.
d) Cleanup:

- Use dry cleanup methods, e.g. square nose shovel and broom.
- Wet methods are allowed if wastewater is prevented from entering the stormwater system, e.g. wet/dry vacuum, disposal to our landscaped areas.

e) Cleanup Standard:
- When a broom and a square nosed shovel cannot pick any appreciable amount of material.

3. Waste Disposal:

a) Dispose of waste according to General Waste Management SOP, unless superseded by specific SOPs for the operation.
b) Never discharge waste material to storm drains

4. Equipment:

a) Tools sufficient for proper containment of pollutants and cleanup.
b) Push broom and square blade shovel should be a minimum.

5. Training:

a) Annually and at hire.
b) Require snow and ice service contractors to follow the stronger this SOP and their company SOPs.

Spill Control

General:

This SOP is not expected to cover all necessary procedure actions. Operators are allowed to adapt SOPs to unique site conditions in good judgment when it is necessary for safety, and the proper, and effective containment of pollutants. However, any changes of routine operations must be amended in this SOP.

1. Purpose:

a) Spilt liquids and solids will reach our, retention/detention storage system potentially contaminating groundwater which we are responsible.
b) It is vital we contain all spills on the surface. Spills reaching waterways and permeable surfaces can result in expensive spill mitigation, including waterway restoration and potential tear out and replacement permeable drainage systems.

2. Containment Procedure:

a) Priority is to dam and contain flowing spills.
b) Use spill kits booms if available or any material available to stop flowing liquids; including but not limited to, nearby sand, dirt, landscaping materials, etc.
c) Hazardous or unknown waste material spills
    1. Critical Emergency constitutes large quantities of flowing uncontained liquid that people at risk or reach storm drain systems. Generally, burst or tipped tanks and containment is still critical. Call HAZMAT, DWQ, [INSERT LOCAL HEALTH DEPARTMENT], City.
       Also report spills to DWQ of quantities of 25 gallons and more and when the spill of lesser quantity causes a sheen on downstream water bodies
    2. Minor Emergency constitutes a spill that is no longer flowing but has reached a storm drain and adequate cleanup is still critical. Call [INSERT LOCAL HEALTH DEPARTMENT], City
    3. Spills that are contained on the surface, typically do not meet the criteria for Critical and Minor Emergencies and may be managed by the responsible implementation of this SOP.
    4. Contact Numbers:
       NATIONAL RESPONSE CENTER (NRC) 800-424-8802
       HAZMAT - 911
       DWQ HOTLINE –801-536-4123, 801-231-1769, 801-536-4300
       [INSERT LOCAL HEALTH DEPARTMENT AND # – XXX-XXX-XXXX]
       City – [INSERT CITY #]

3. Cleanup Procedure:

a) NEVER WASH SPILLS TO THE STORM DRAIN SYSTEMS.

b) Clean per SDS requirements but generally most spills can be cleaned up according to the following:
   - Absorb liquid spills with spill kit absorbent material, sand or dirt until liquid is sufficiently converted to solid material.
   - Remove immediately using dry cleanup methods, e.g. broom and shovel, or vacuum operations.
   - Cleanup with water and detergents may also be necessary depending on the spilled material. However, the waste from this operation must be vacuumed or effectively picked up by dry methods or vacuum machinery. See Pavement Washing SOP.
   - Repeat process when residue material remains.

4. DISPOSAL:

a) Follow SDS requirements but usually most spills can be disposed per the following b. & c.
b) Generally, most spills absorbed into solid forms can be disposed to the dumpster and receptacles. Follow Waste Management SOP.
c) Generally, liquid waste from surface cleansing processes may be disposed to the sanitary sewer system after the following conditions have been met:
   - Dry cleanup methods have been used to remove the bulk of the spill and disposed per the Waste Management SOP.
   - The liquid waste amounts are small and diluted with water. This is intended for spill cleanup waste only and never for the disposal of unused or spent liquids.

5. Documentation:

a) Document all spills in Appendix C.

6. SDS sheets:

a) SDS Manual is filed in break room.

7. Materials:

a) Generally, sand or dirt will work for most cleanup operations and for containment. However, it is the responsibility of the owner to select the absorbent materials and cleanup methods required by the SDS Manuals for chemicals used by the company.

8. Training:

a) Annually and at hire.
b) Require snow and ice service contractors to follow the stronger this SOP and their company SOPs.

APPENDIX C – PLAN RECORDKEEPING DOCUMENTS

MAINTENANCE/INSPECTION SCHEDULE

Frequency	Site Infrastructure.
	Replace text with the infrastructure / system that must be maintained; repeat

Inspection Frequency Key: A=annual, Q=Quarterly, M=monthly, W=weekly, S=following appreciable storm event, U=Unique infrastructure specific (specify)

RECORD INSPECTIONS IN THE MAINTENANCE LOG

Inspection Means: Either; Traditional walk through, Awareness/Observation, and during regular maintenance operations while noting efficiencies/inefficiencies/concerns found, etc.

MAINTENANCE LOG

Date	Maintenance Performed/Spill Events. Perform Maintenance per SOPs	Observation Notes, including but not limited to; Inspection results, Observations, System Performance (effectiveness/inefficiencies), SOP Usefulness, Concerns, Necessary Changes…	Initials

Annual Summary of operations and maintenance effectiveness, inefficiencies, problems, necessary changes etc.

*You may create your own form that provides this same information or request a word copy of this document.

Annual SOP Training Log per Section 2

SOP	Trainer	Employee Name / Maintenance Contractor Co	Date

*You may create your own form that provides this same information or request a word copy of this document.

APPENDIX D – Maintenance Agreement and Support Design Reports and Documents

1. Long-Term Stormwater System Operations and Maintenance Plan Agreement
2. [Insert Drainage Report, Geotechnical Reports, LID feasibility analysis, UIC registration etc.]

UPDES STORM WATER EVALUATION FORM
FOR
STORMWATER SYSTEM OPERATIONS AND MAINTENANCE COMPLIANCE

Site Name:	Inspection Date:	Stormwater System #
Site Address:		

Facility/Owner Contact Information

	NAME	PHONE #	E-MAIL
CONTACT:			
CONTACT:			

BUSINESS TYPE: INSTITUTION ☐ COMMERCIAL ☐ INDUSTRIAL ☐ HOA ☐

Items Inspected	**Checked**		**Maintenance**		**Write Observations and Remarks on maintenance issues to be corrected by the property owner.**
	Yes	No	Required	Not Required	
1. SITE DRAWINGS current w/Plan					
2. Operator O&M Plan Awareness					
3. REPORT, DOCUMENTATION (General compliance/maintenance)					
4. DUMPING EVIDENCE (Piles, stains, smells near inlets)					
5. SPILL EVIDENCE (Soiled areas, history of spill kit use)					
6. GENERAL SITE EXPOSURE (Long term stockpiles, uncovered unmaintained equipment/storage)					
7. OTHER POLLUTION SOURCES					
8. GENERAL MAINTENANCE STATUS					Measure sediment/debris/volume, Maintenance records/ Soil Conditions
Inlet/Outlet					
Water Conveyance Systems					
Manholes					
Manufactured Treatment Devices					
Regulation Retention Systems					
Surface LID Systems (Low Impact Development)					
Flood Control Systems					
Parking/Pavements					
Waste Collection					
Landscaping					
9. OTHER SITE SOP ITEMS					

Notes:

Inspector:

Print Name	Title	Signature	Date

When recorded, mail to:
Kaysville City Recorder
23 East Center Street
Kaysville, Utah 84037

Subdivision/Development _____

Affects Parcel No(s):_____

KAYSVILLE CITY
STORM WATER FACILITIES
MAINTENANCE AGREEMENT

This Storm Water Facilities Maintenance Agreement ("Agreement") is made and entered into this _____ day of _____, 20___ , by and between Kaysville City, a Utah municipal corporation ("City"), and _____, a _____ _____ ("Owner").

RECITALS

WHEREAS, the City is authorized and required to regulate and control the disposition of storm and surface waters within the City pursuant to the Utah Water Quality Act, as set forth in *Utah Code Ann.* §§ 19-5-101, *et seq.,* as amended ("Act"); and

WHEREAS, the Owner hereby represents and acknowledges that it is the owner in fee simple of certain real property more particularly described in Exhibit "A," attached hereto and incorporated herein by this reference ("Property"); and

WHEREAS, the Owner desires to build or develop the Property and/or to conduct certain regulated construction activities on the Property which will alter existing storm and surface water conditions on the Property and/or adjacent lands; and

WHEREAS, in order to accommodate and regulate these anticipated changes in existing storm and surface water flow conditions, the Owner desires to build and maintain at Owner's expense a storm and surface water management facility or improvements ("Storm Water Facilities"); and

WHEREAS, the Storm Water Facilities are more particularly described and shown in the final site plan or subdivision approved for the Property and related engineering drawings, and any amendments thereto, which plans and drawings are on file with the City and are hereby incorporated herein by this reference ("Development Plan"); and

WHEREAS, as a condition of Development Plan approval, and as required as part of the City's Small MS4 UPDES General Permit from the State of Utah, Owner is required to enter into this Agreement addressing the maintenance requirements for the Storm Water Facilities and control measures installed on the Property.

NOW, THEREFORE, in consideration of the benefits received and to be received by the Owner, its successors and assigns, as a result of the City's approval of the Development Plan, and the mutual covenants contained herein, the parties agree as follows:

1. Owner's Obligations to Construct, Maintain and Inspect Storm Water Facilities. The Owner Shall, at its sole cost and expense:

   (a) Construct the Storm Water Facilities in strict accordance with the plans and specifications identified in the Development Plan, and any amendments thereto which have been approved by the City.

   (b) Adequately maintain the Storm Water Facilities. Owner's maintenance obligations shall include all pipes and channel built to convey storm water, as well as all structures, improvements, and vegetation provided to control the quantity and quality of the storm water. Adequate maintenance, for purposes of this Agreement, is defined as good working condition so that the Storm Water Facilities are performing their design functions. The Owner shall, at its sole cost and expense, perform all work necessary to keep the Storm Water Facilities in good working condition. In the event that a maintenance schedule is set forth in the Development Plan, such maintenance schedule shall be followed.

   (c) Inspect the Storm Water Facilities and submit an inspection report and certification to the City annually. The purpose of the inspection and certification is to assure safe and proper functioning of the Storm Water Facilities. The annual inspection shall cover all aspects of the Storm Water Facilities, including, but not limited to, the structural improvements, berms, outlet structure, pond areas, access roads, vegetation, landscaping, etc. Deficiencies shall be noted in the inspection report. The report shall also contain a certification as to whether adequate maintenance has been performed and whether the structural controls are operating as designed to protect water quality. The annual inspection report and certification shall be due by June 30th of each year and shall be on forms acceptable to the City.

2. City Oversight Inspection Authority. The Owner hereby grants permission to the City, its authorized agents and employees, to enter upon the Property and to inspect the Storm Water Facilities whenever deemed necessary by the City. Such inspections shall be conducted in a reasonable manner and at reasonable times, as determined appropriate by the City. The purpose of the inspection shall be to determine and ensure that the Storm Water Facilities are being adequately maintained, are continuing to perform in an adequate manner, and are in compliance with the Act, the Ordinance, and the Development Plan.

3. Notice of Deficiencies. If the City finds that the Storm Water Facilities contain any defects or are not being maintained adequately, the City shall send Owner written notice of the defects or deficiencies and provide Owner with a reasonable time to cure such defects or deficiencies. Such notice shall be hand-delivered to the Owner or sent certified mail to the Owner at the Property address.

4. Owner to Make Repairs. The Owner shall, at its sale cost and expense, make such repairs, changes or modifications to the Storm Water Facilities as may be determined as reasonably necessary by the City within the required cure period to ensure that the Storm Water Facilities are adequately maintained and continue to operate as designed and approved.

5. City's Corrective Action Authority. In the event the Owner fails to adequately maintain the Storm Water Facilities in good working condition acceptable to the City, after due notice of deficiencies as provided in Section 5, the City may enter upon the Property and take whatever steps necessary to correct deficiencies and to charge the costs of such repairs to the Owner. It is expressly understood and agreed that the City is under no obligation to maintain or repair the Storm Water Facilities, and in no event shall this Agreement be construed to impose any such obligation on the City. The actions described in this Section are in addition to and not in lieu of any and all legal remedies available to the City as provided by law for Owner's failure to remedy deficiencies or any other failure to perform under the terms and conditions of this Agreement.

6. Reimbursement of Costs. In the event the City, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Owner shall reimburse the City upon demand, within thirty (30) days of receipt thereof for all actual costs incurred by the City. After said thirty (30) days, such amount shall be deemed delinquent and shall be subject to interest at the rate of ten percent (10%) per annum. Owner shall also be liable for any collection costs, including attorneys' fees and court costs, incurred by the City in collection of delinquent payments.

7. Successor and Assigns. This Agreement shall be recorded in the Davis County Recorder's Office and the covenants and agreements contained herein shall run with the land and whenever the Property shall be held, sold, conveyed or otherwise transferred, it shall be subject to the covenants, stipulations, agreements and provisions of this Agreement which shall apply to, bind and be obligatory upon the Owner hereto, its successors and assigns, and shall bind all present and subsequent owners of the Property described herein.

8. Severability Clause. The provisions of this Agreement shall be severable and if any phrase, clause, sentence or provision is declared unconstitutional, or the applicability thereof to the Owner, its successors and assigns, is held invalid, the remainder of this Covenant shall not be affected thereby.

9. Utah Law and Venue. This Agreement shall be interpreted under the laws of the State of Utah. Any and all suits for any claims or for any and every breach or dispute arising out of this Agreement shall be maintained in the appropriate court of competent jurisdiction in Davis County, Utah.

10. Indemnification. This Agreement imposes no liability of any kind whatsoever on the City, and the Owner agrees to hold the City harmless from any liability in the event the Storm Water Facilities fail to operate properly. The Owner shall indemnify and hold the County harmless for any and all damages, accidents, casualties, occurrences, or claims which might arise or be asserted against the City from the construction, presence, existence, or maintenance of the Storm Water Facilities.

11. Amendments. This Agreement shall not be modified except by written instrument executed by the City and the Owner of the Property at the time of modification, and no modification shall be effective until recorded in the Davis County Recorder's Office.

[Signature page to follow]

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first set forth above.

OWNER:

_____

OWNER'S SIGNATURE
(Signature must be notarized on following pages)

_____

OWNER'S NAME & TITLE

KAYSVILLE CITY:

_____

JOSHUA D. BELNAP
PUBLIC WORKS DIRECTOR

CITY ACKNOWLEDGMENT

STATE OF UTAH

:ss.

COUNTY OF DAVIS

On this _____ day of _____, 20____, personally appeared before me JOSHUA D. BELNAP, who being duly sworn, did say that he/she is the PUBLIC WORKS DIRECTOR of KAYSVILLE CITY, a municipal corporation of the State of Utah, and that the foregoing Storm Water Facilities Maintenance Agreement was signed in his/her capacity as land use authority on behalf of the City for approval of Storm Water Facilities Maintenance Agreements.

_____

Notary Public

****

OWNER NOTARY

(Complete only if signing as an Individual)

STATE OF _____

:ss.

COUNTY OF_____

On this _____ day of _____, 20____, personally appeared before me _____, who being duly sworn, did say that he/she is the legal property owner of record of the property subject to this Storm Water Facilities Maintenance Agreement and that he/she has executed this Agreement with full authority to do so.

_____

Notary Public

****

(See Following Page for Corporation/Partnership and Limited Liability Company Notaries)

(Complete only if signing on behalf of a Corporation/Partnership)

STATE OF _____
:ss.
COUNTY OF_____

On this _____ day of_____, 20 ___, personally appeared before me _____ who being by me duly sworn did say that he/she is the _____ of_____, a _____ corporation/partnership, and that _____ is the legal property owner of record of the property subject to this Storm Water Facilities Maintenance Agreement and that the foregoing Storm Water Facilities Maintenance Agreement was signed in behalf of said corporation/partnership by authority of its Board of Directors/by-laws, and he/she acknowledged to me that said corporation/partnership executed the same.

_____
NOTARY PUBLIC

****

(Complete only if signing on behalf of a Limited Liability Company)

STATE OF _____
:ss.
COUNTY OF_____

On this _ day of_____, 20____, personally appeared before me _____ who being by me duly sworn did say that he/she is the _____of_____, a limited liability company, and that the foregoing Storm Water Facilities Maintenance Agreement was signed in behalf of said company by authority, and he/she acknowledged to me that said company executed the same.

_____
NOTARY PUBLIC

****IF ADDITIONAL SIGNERS AND/OR NOTORIAL WORDING ARE NECESSARY, PLEASE NOTATE ANY ADDITIONS ON THIS NOTARY PAGE AND ATTACH A STATE APPROVED NOTARIAL CERTIFICATE, WHICH IDENTIFIES THE DOCUMENT THE ATTACHED NOTARIAL CERTIFICATE RELATES TO, AS WELL AS, THE NUMBER OF PAGES IN THE DOCUMENT****

Exhibit "A": Property Legal Description

KAYSVILLE CITY STORM WATER MANAGEMENT PROGRAM

APPENDIX B

SUPPLEMENTAL GUIDE TO STORM WATER MANAGEMENT
FOR PUBLIC WORKS DEPARTMENTS

Standard Operating Procedures
BMP Fact Sheets
Process for Including Water Quality in City Projects

STANDARD OPERATING PROCEDURES

Kaysville City

Adapted from Davis County Storm Water Coalition SOPs

Created: February 2010
Last Revision: August 2025

TABLE OF CONTENTS

STREETS/STORM DRAIN – Snow Removal and De-icing
STREETS/STORM DRAIN – Street Sweeping
WATER – Planned Waterline Excavation Repair/Replacement
WATER – Emergency Waterline Excavation Repair/Replacement
WATER – Waterline Flushing for Routine Maintenance
WATER – Waterline Flushing after Construction/System Disinfection with Discharge to Storm Drain
WATER – Waterline Flushing after Construction/System Disinfection with Discharge Collected and Hauled to Off-Site Location
WATER – Chemical Handling/Transporting and Spill Response

Municipalities are required to publicize a hotline or other local telephone number for public reporting of spills and other illicit discharges. A written record shall be kept of all calls received, all follow up actions taken, and any feedback received from public education efforts.

RESPONDING TO IDDE/SPILL RESPONSE HOTLINE

In the event of an observed spill or IDDE phone call, follow these response and cleanup procedures:

1) Incoming IDDE phone call
    a) Gather all available information including: date, time, duration of spill, address of discharge, responsible party (if possible), name and number of person making the call, chemical or substance name, where the spill has spread (storm drain, waterways, soil), etc.
2) Notify appropriate authorities and parties using incident response flow chart
    a) Contact storm drain manager and notify of spill;
    b) Contact health department (if necessary);
    c) Contact fire department (if necessary);
    d) Contact any other affected parties such as sewer district, businesses, property owners, etc.
3) Determine plan of action
    a) Based on substance spilled determine the appropriate PPE and equipment needed to safely and effectively contain substance;
    b) If substance is hazardous or has potential health risks for exposed individuals, defer cleanup to appropriately equipped authorities such as health department or fire department;
    c) determine the source of the spill and identify the responsible party.
4) Prevent additional discharge and clean up spill
    a) If possible stop the flow at the source;
    b) Protect all drains and/or catch basins and contain the spill to prevent further pollution using socks, booms, absorbent, storm drain inlet covers, pipe plugs, or any other mechanical mechanism;
    c) Clean up spill using appropriate equipment including granular absorbents, pads, socks, pillows, booms, etc.;
    d) Dispose of all contaminated products in accordance with applicable federal, state and local regulations.
        i) Waste oil contaminated products:
            a) Heavily saturated absorbents should be placed in separate metal containers with tight fittings lids, labeled “Oily Waste Absorbents Only”.
            b) Lightly saturated absorbents may be discarded in the trash, unless contaminated with another hazardous waste.
            c) It is acceptable to mix the following fluids and handle them as waste oil: motor oil, hydraulic fluid, power steering fluid, transmission fluid, brake fluid, gear oil.
            d) Do not mix the following materials with waste oil, store each separately: gasoline, antifreeze, brake and carburetor cleaners, diesel fuel, solvents, other hazardous wastes.

5) Document findings and discuss further action or remediation

a) Fill out spill response form; include any additional information such as photos, witness statements, agency reports, etc.
b) Discuss with the health department, or other authority, further action or remediation needed.

Procedures for Reporting Spill Response

The storm water manager or public works foreman will determine appropriate authorities to notify of incident.

1) The following scenarios are exempt from Utah DEQ reporting requirements:
   a) Spills of less than 10 gallons of petroleum that do not impact a water body;
   b) Spills of less than one pound of hazardous chemicals and do not present an imminent health or safety hazard;
   c) Spills from passenger vehicle accidents;
   d) Spills within a vault or building with a watertight floor and walls that completely contain all released chemicals.
2) When contacting emergency response personnel or a regulatory agency, or when reporting the contaminant release, be prepared to provide the following information:
   a) Your name and the phone number
   b) The exact address and location of the contaminant release
   c) Specifics of release including substance identity, quantity released, affected properties
   d) Responsible party and cause of the release
   e) Containment and clean up status

Maintenance and Prevention Guidance

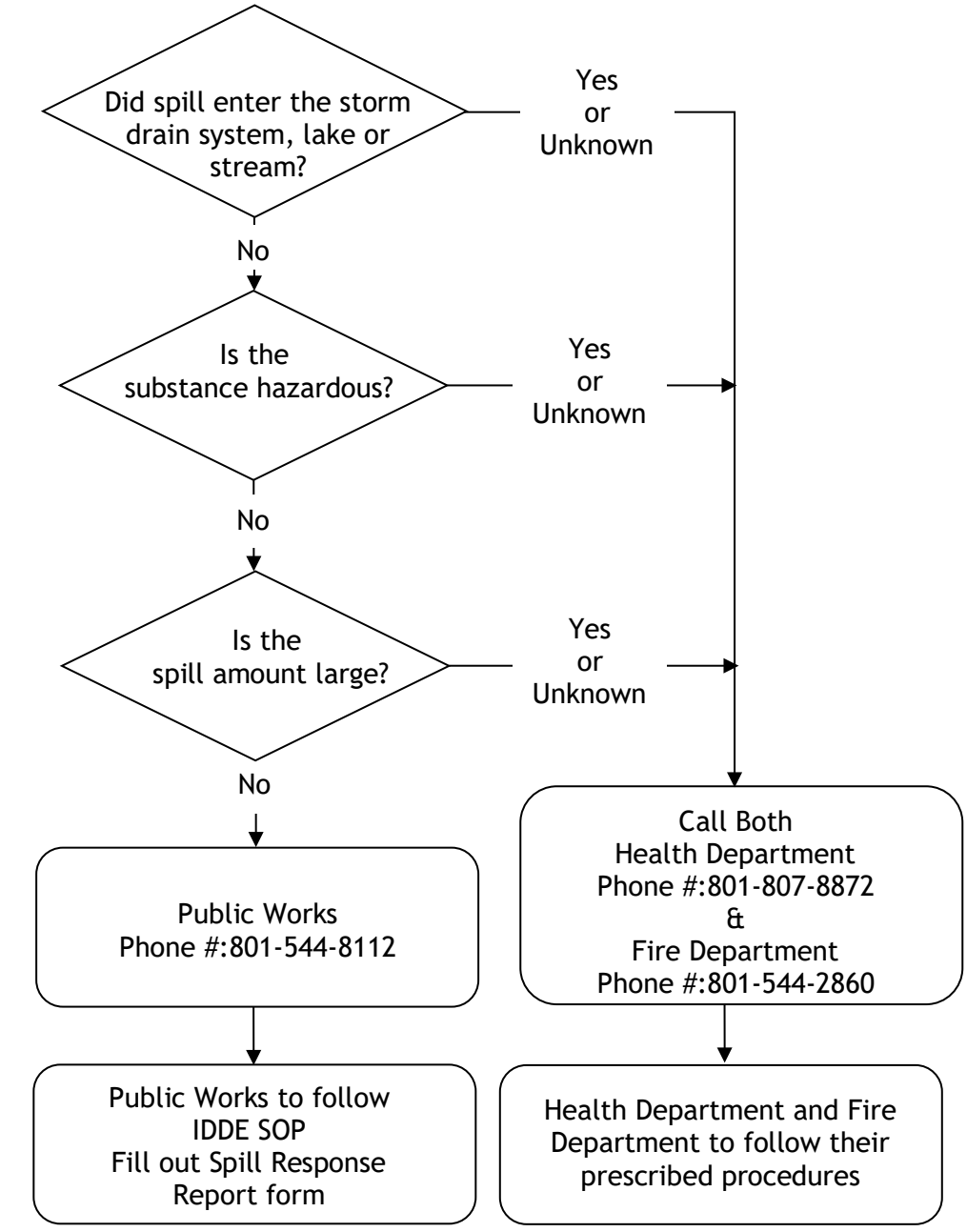
Prevention of spills is preferable to even the best response and cleanup.
To protect against contaminant release adhere to the following guidance:

1) Ensure all employees are properly trained to respond in the case of a spill, understand the nature and properties of the contaminant and understand the spill control materials and personnel safety equipment.
   a) Maintain a spill response kit with the following materials in each vehicle: 5 gallon bucket with screw top lid and handle, Floor Dry absorbent, Static dissipative socks & pads, Oil absorbent socks & pads, Safety glasses, Nitrile gloves, Disposable bags, Laminated contacts list, etc.

INCIDENT RESPONSE FLOW CHART

Kaysville City

IF INCIDENT POSES AN IMMEDIATE THREAT TO LIFE OR HEALTH CALL 911



SPILL RESPONSE – Report Form

REPORTED INFORMATION

Reported By _____ Date: _____ Time: _____

Location of Discharge _____

Description of Discharge _____

_____

Substance Name _____

Estimated Discharge Amount _____

Responsible Party _____

Report Taken by _____

INVESTIGATION INFORMATION

Date Investigation Began _____ Was Source of Discharge Identified? □ Yes □ No

Any Discharge to Storm Drain? □ Yes □ No

Any Discharge to Water Body? □ Yes □ No

Responsible Party_____

Method(s) Used to Discover Source of Discharge _____

_____

_____

Agencies Discharge was Reported To: _____ Date _____

_____ Date _____

_____ Date

_____

ILLICIT DISCHARGE REMOVAL INFORMATION

Description of Actions Taken to Remove and Contain the Discharge

_____

_____

_____

Materials Used _____

Has Illicit Discharge Been Eliminated? □ Yes Date_____

□ No

Future Scheduled Follow-Up Action: _____ Date: _____

ENFORCEMENT INFORMATION

List Enforcement Action(s) Taken

Date: _____

Enforcement Action_____

_____

_____

Date: _____

Enforcement Action_____

_____

_____

ADDITIONAL COMMENTS/DOCUMENTATION

Attach any pictures, contact information, documentation, etc.

Spill Response Contact List

Contact	Department	Phone	Comments
Josh Belnap	PW Director	801-867-5372	Notify of major incidents
Cody Thompson	PW Foreman	801-940-2450	Notify of major incidents
Logan Barker	PW Storm Water Manager	801-726-9492	Notify with any spill/incident
Gary Hatch	Power Director	801-430-1855	Notify if affected
Cole Stephens	Parks & Recreation Director	801-430-2869	Notify if affected
Kaysville Fire Department	Emergency Response	801-544-2860	Notify if assistance needed
Kaysville Police Department	Emergency Response	801-546-1131	Notify if assistance needed
Davis County Dispatch	Emergency Response	801-451-4150	Call this number for spills needing immediate response from multiple entities
Davis County Environmental Health (main office)	Emergency Response	801-525-5128	Call this number for spills needing health department consultation Monday-Friday 8-5
Davis County Health Department 24/7 Environmental Response	Emergency Response	801-807-8872	Call this number for spills needing immediate response from health department (for city personel only)
Utah Department of Environmental Quality 24/7 Response (UDEQ)	Emergency Response	801-536-4123	Call this number for major environmental incidents needing immediate attention from UDEQ
National Response Center (NRC)	Emergency Response	800-424-8802	EPA hotline for pollutant releases to water 24/7

IF INCIDENT POSES AN IMMEDIATE RISK TO LIFE OR HEALTH CALL 911

GENERAL – City-Sponsored Festivals and Parades

1. Preparation

   a. Schedule crews to facilitate clean-up during and/or after event (Parks Department)

   b. Consider and plan for additional waste receptacles (Parks Department)

   c. Consider and plan for any necessary porta-johns, *porta-johns must be staked down at least 5 feet from curb so no accidental discharge to storm drain is possible (Parks Department)

2. Process

   a. Hand collect loose trash material and animal waste (Parks Department.)

   b. Empty waste receptacles; remove extra receptacles (Parks Department)

   c. Sweep streets, parking areas, and other areas impacted by the event according to SOP: STREETS/STORM DRAIN – Street Sweeping (Storm Water Department)

   d. Dispose of waste according to SOP: GENERAL – Debris Disposal

3. Follow-Up

   a. Ensure any porta-johns used for the event are promptly removed following the event

4. Documentation

   a. Document streets and parking areas that were swept in the storm drain maintenance log

GENERAL – Debris Disposal

1. Preparation

   a. Know the location of the approved disposal facilities:

      - Concrete/Asphalt Debris – Stockpiles in southeast corner of operations center yard
      - Concrete Excess/Wash Water – Concrete Washout next to Wash Bay #2 on the East side of Operations Center
      - Clean Excavation Spoils – Burton Lane storage yard
      - Hydro-Excavation waste – Drying bed on east side of Burton Lane storage yard
      - Street Sweepings – Temporarily store in dump truck bed covered with tarp, or in bin at Operations Center labeled “Street Sweepings” until taken to Landfill
      - Storm Drain Flushing Waste – Central Davis Sewer District drying beds (south bay) Drying bed will be cleaned out annually and taken to Landfill
      - General waste – Dumpsters located at operations center
      - General Waste/Green Waste - Davis County Landfill – 1997 E 3500 N Layton
      - Other facility as arranged for specific project, and approved by Public Works Director

   b. Check, cover and secure load as necessary to minimize loss of debris during transport;

2. Process

   a. Transport the material to one of the above-listed facilities

   b. Unload the debris into the facility

3. Clean-up

   a. Clean off loose material from vehicle

GENERAL – Inlet Protection

1. Preparation

   a. Have inlet protection material on hand, and make sure it is in good condition

      - gravel bags (preferred), or
      - wattles
      - filter fabric

   b. Determine best location for placing the inlet protection, typically at the nearest downstream inlet(s) subject to receiving flow from the activity

      - Note: in some cases, inlet protection may be placed in gutter upstream of inlet if it is subject to receiving flow from activity

2. Process

   a. Place inlet protection in a way to avoid unintended bypass of flow; wattles may need to be weighed down

   b. Periodically check the inlet protection for placement and condition, particularly after receiving runoff; replace if it is not in good working condition

   c. Remove accumulated sediment

3. Clean-up

   a. Clean accumulated sediment and debris; dispose according to SOP: GENERAL – Debris Disposal

   b. Remove Inlet protection when activity is completed

GENERAL – Painting

1. Preparation

   a. Calculate the amount of paint required for the job

   b. Determine locations of storm drain inlets and provide protection as needed according to SOP: GENERAL – Inlet Protection

   c. Set up traffic and pedestrian control, as necessary

   d. Prepare surfaces to be painted using dry methods (e.g. scraping, brushing)

   e. Have available absorbent material ready in case of an accidental spill

2. Process

   a. Use drip pans and drop clothes in areas of mixing paints and painting

   b. Use care to prevent over-spraying of paints

   c. Store latex paint rollers and brushes in airtight bags to be reused later with the same color when practical.

3. Clean-up

   a. Paint out brushes and rollers as much as possible. Squeeze excess paint from brushes and rollers back into the containers prior to cleaning them.

   b. Pour excess paint from trays and buckets back into the paint can containers and wipe with cloth or paper towels. Dispose of the towels according to the recommendations on the paint being used.

   c. Remove traffic and pedestrian controls at appropriate times

   d. Rinse water-based paint brushes in the sink after pre-cleaning. Never pour excess paint or wastewater from cleanup of paint in the storm drain.

   e. Clean applicators of oil based paints with paint thinner using buckets; never clean oil based brushes in a sink or over a storm drain. Store used solvents in approved container indoors. Dispose at a hazardous waste disposal facility. (Contact Storm water Manager or Lead Mechanic for proper disposal locations and contact info).

GENERAL – Transporting Saturated Soils / Materials

1. Preparation

   a. Determine destination, truck to use, and a haul route

2. Process

   a. Load and Transport in manner to minimize spillage & tracking of material

      - Clean surface between tailgate and truck bed to allow good seal to minimize leakage
      - Load truck such that the top of the saturated soils is at least one foot below bed walls
      - Clean off loose material* from outside of truck that may fall on road during transport
      - Cover load using tarping system on truck
      - Ensure that tailgate locks are properly engaged
      - Drive slowly to prevent spillage when turning, slowing, and accelerating

   b. Haul the material utilizing one route

3. Clean-up

   a. Clean any spilled material from loading area

   b. Examine transport route; arrange for cleaning of any loose material along route

   c. NOTE: For Washing Truck see SOP: GENERAL – Vehicle and Equipment Washing

GENERAL – Transporting Unsaturated Soils / Materials

1. Preparation

    a. Determine destination, truck to use, and haul route

2. Process

    a. Load Truck

    b. Clean off loose material from outside of truck that may fall on road during transport

    c. Cover load using tarping system on truck

    d. Ensure that tailgate locks are properly engaged

    e. Utilize one route for transporting multiple loads

3. Clean-up

    a. Clean loading area

    b. NOTE: For Washing Truck see SOP: GENERAL – Vehicle and Equipment Washing

GENERAL – Vehicle and Equipment Storage

1. Preparation

    a. Take notice of fluids on parking areas that may indicate a leak

    b. Provide drip pans and absorbents for leaking vehicles

2. Process

    a. Whenever possible, store vehicles inside where floor drains are connected to sanitary sewer system

    b. When inside storage is not available, park vehicles and equipment in designated areas

    c. When a leak is detected, place a drip pan under the leaking vehicle to collect the drip, and arrange to get the leak repaired as soon as possible

4. Clean-up

    a. Clean up any spills using dry cleanup methods: absorbent materials and sweeping; dispose of soiled sorbents in the garbage

GENERAL – Vehicle and Equipment Washing

1. Preparation

   a. Be aware that washing must be done in designated locations only:

      - Wash Bay #1 – Bay marked “Wash Bay #1”, along the East side of the Operations Center Building, for washing of all vehicles, mowers, and equipment
      - Wash Bay #2 – Bay marked “Wash Bay #2” along the east side of operations center storage yard, for washing of dump trucks, Vactor, street sweeper, and snow plow equipment
      - Concrete Washout – Labeled “Concrete Washout” , lined depression on the south side of wash bay #2
      - Any commercial wash bay

      *Note: Other inside bays may also be used if it is know that the floor drain flows to a separator that is connected to a sanitary sewer

   b. Transport vehicle/equipment to one of the approved locations

2. Process

   a. Remove any loose debris such as grass, dirt, salt, etc. from equipment and dispose of in dumpster before washing

   b. Clean the vehicle/equipment inside the designated area

   c. Take care to avoid wash water from running away from wash-area drain

3. Clean-up

   a. Clean up as much loose debris left behind as possible and dispose of in dumpster, spray remaining debris into wash drain

4. Preparation

a. Be aware that whenever practical fueling must be done in designated locations:

- Operations Center Fueling Station
- Fire Station Fueling Station
- Mobile fueling must be done away from storm drain inlets and water bodies

b. Spill kits must be available at both fuel stations and must be kept on any vehicle used for mobile fueling

c. Transport vehicle/equipment to one of the approved locations

5. Process

a. Shut off engine, remove fuel cap and identify proper type of fuel for the vehicle/equipment

b. When fueling small equipment from a portable container, fuel in an area away from storm drains and water bodies

c. Nozzles used in vehicle/equipment fueling shall be equipped with an automatic shutoff to prevent overfill

d. Fuel vehicle/equipment carefully to minimize drips to the ground

e. Do not “TOP OFF” fuel tank

f. Shut off fuel pump, return nozzle to pump and replace fuel cap

6. Clean-up

a. Immediately clean up any spills using dry absorbent or static dissipative pads/socks and properly dispose of contaminated materials

b. In the event of a large spill follow procedures in SOP: SPILL INCIDENT – Response and Reporting

GENERAL – Waste Receptacles

1. Preparation

a. Ensure each site has a sufficient number and size/type of waste containers. Parks allowing pets are to have signs with bags available for collecting pet waste. These are to be placed near select waste receptacles

b. Strategically locate containers to be in a location where easily identifiable yet not prone to being accidently tipped or damaged

c. Use containers that are covered (protected from precipitation) and have no drainage holes in bottom

2. Process

a. Empty receptacles regularly

- Large bins to be emptied every week
- Smaller receptacles (at parks, etc.) to be emptied according to seasonal needs as often as daily in summer
- Stock bags for pet waste
- Keep lids closed on all garbage cans and dumpsters and do not overfill them

b. Notice areas where un-collected litter is accumulates to consider changing size, location, and/or schedule for emptying containers at facility

3. Clean-up

a. Dispose according to SOP: GENERAL – Debris Disposal

b. Perform an annual cleaning of smaller receptacles (at parks, etc.) according to SOP: GENERAL – Vehicle and Equipment Washing

c. Any cleaning of large containers according to SOP: GENERAL – Vehicle and Equipment Washing

*Note: Large receptacles are not normally cleaned, but rather replaced with new containers; old containers are placed in landfill for final disposal.

1. Preparation

   a. Make sure you are adequately trained on any chemical you'll be handling and understand the SDS

   b. Store chemicals indoors, away from hazards that would accidently tip or damage container

   c. Maintain and provide accurate MSDS information for all stored materials

   d. Make sure containers are in good condition and properly labeled (any chemical-holding containers in poor condition are to be placed in chemical storage area with secondary containment)

   e. Have necessary containment and spill kits materials at location of chemical handling, suitable for the material to be handled

   f. Have appropriate PPE available

2. Process

   a. Wear appropriate PPE

   b. Perform chemical-handling activity according to manufacturer's recommendations and SDS

   c. If an accidental spill occurs, respond according to SOP: SPILL INCIDENT: Response & Reporting

3. Clean-Up

   a. Use dry cleanup methods

   b. Dispose of waste material according to manufacturer's recommendations

   c. Ensure that any spills are cleaned up according to SOP: SPILL RESPONSE AND CLEANUP FOR CITY FACILITIES. If spilled material is hazardous, it must be handled by a licensed hazardous waste handler and disposed at a hazardous waste disposal site. (Contact Storm water Manager or Lead Mechanic for proper disposal locations and contact info).

BUILDINGS – Pressure Washing Building Exteriors

1. Preparation

   a. Consider using dry cleaning methods first; use this procedure for cases when dry methods are inadequate

   b. Plan to use only water and pressure; do not use detergents with this procedure

   c. Perform process only during dry weather

   d. Have storm drain inlet protection device available, See SOP: GENERAL - Inlet Protection

   e. Determine whether cleaning activity will potentially generate runoff. If so, place inlet protection device(s) down gradient in order to capture wash water

2. Process

   a. Pressure wash the building exterior, ensuring any wash water runoff flows toward inlet protection devices

   b. Allow accumulated wash water to evaporate or filter through inlet protection devices

3. Clean-Up

   a. Clean impervious walking surfaces around building

      i. Sweep up large fragments;

      ii. Sweep or spray residual fragments onto pervious landscaped surfaces

   b. Remove inlet protection once accumulated wash water has evaporated and/or filtered through inlet protection

   c. Clean around inlet protection according to SOP: GENERAL – Inlet Protection

   d. Dispose of waste according to SOP: GENERAL – Debris Disposal

IDDE – Dry Weather Outfall Screening

1. Preparation

   a. Check weather conditions. (Outfall Screening should be done after two weeks of no precipitation and after secondary water is shut off/drained)

   b. Determine outfalls to be screened (all outfalls are to be inspected at least once during 5 year permit cycle)

   c. Make sure you have the following supplies for the field work:

      i. Camera, flashlight, nitrile gloves, waterproof boots or waders, tape measure, phone or 2-way radio, watch (with stopwatch), GPS, marker, masking tape and map(s) showing drainage system and outfalls in the area you plan to screen

      ii. Clear sample jars

      iii. Dry Weather Screening/Visual Storm Water Discharge Report Form, and Outfalls Inventory List

   d. Notify private property owners whose property you'll need to be crossing

2. Process

   a. Upon arrival at each outfall/discharge, take photo(s), and gather information to complete inspection form

   b. Follow flow chart to collect and document findings:

      i. if outfall is non-flowing/dry, complete inspection form and move on to next outfall

      ii. if outfall is flowing, collect sample in jar and complete inspection form. *(sample must be examined at time of collection and after one hour of settling)

      iii. if illicit discharge is suspected or present initiate SOP – IDDE Tracing Source of Discharges as soon as possible

3. Documentation

   a. Submit all completed inspection forms to supervisor and document properly

   b. Record any further actions taken for suspected or confirmed illicit discharges

   c. Note any discrepancies in the storm drain system maps from what is found in the field. Make sure that the maps get updated to correctly reflect actual conditions

DRY WEATHER SCREENING AND VISUAL STORM WATER DISCHARGE EXAMINATION REPORT

Date of Examination: _____ Permit No. UTR _____

Outfall location or ID number: _____

Nature of Discharge (i.e., runoff, land drain, irrigation or snowmelt) _____

Type of Monitoring:

☐ Dry Weather Screening Date of last Rainfall Event:_____	Wet Weather Screening (Quarterly Min.) ☐ Rainfall Event Date of Rainfall Event:_____ Time of Event:_____ Precipitation:_____- _____ ☐ Unable to collect sample due to adverse conditions or inadequate runoff.

Visual Quality of Storm Water Discharge: (circle response)

At Time of Sampling:

Color: clear brown green rust other: _____

Odor: Yes / No

Clarity: ☐ ☐ ☐ ☐ ☐

Floating Solids: Yes / No

Foam: Yes / No

After One Hour of Settling:

Settled Solids: Yes / No

Suspended Solids: Yes / No

Oil Sheen Yes / No

Other obvious indicators of storm water pollution: _____

_____

Probable sources of any observed storm water contamination: _____

_____

Name of Examiner_____ Title_____

Signature_____Date_____

IDDE – Tracing Source of Discharges

1. Preparation

   a. Review map(s) showing drainage system and area contributing to location of the discharge

   b. Bring traffic –control devices and safety equipment for entering manholes and inlet boxes

   c. Bring water-quality screening equipment and sample containers

2. Process

   a. Drive around the streets of the area contributing to the discharge point and look for anything that may help reveal the source of the discharge (if the source is found, skip to step c.)

   b. From the point of discharge, check the nearest up-stream manhole or inlet box for a similar discharge.

      i. Put on safety equipment and set up traffic controls

      ii. Remove manhole or box cover (if necessary). Make an observation of any flow present. Use water-quality screening equipment and sample containers, if needed, to determine whether the discharge is similar in nature to the discharge present below.

      iii. Progress up the system, repeating the previous step until the source of the discharge is found or the segment of the drainage system where the discharge enters the system is isolated

      iv. If the source is not found, yet the segment of the drainage system where the discharge enters is isolated, make arrangements to get a video with distance measurements of that segment of the drainage system to trace the source.

         1. If further investigation is needed, consider using smoke tests, dye testing, or sampling for additional water quality parameters, and requesting assistance from the Davis County Health Department

   c. Determine whether the source is an illicit discharge (review list of allowed non-storm discharges in city ordinance) and if so, report according to Spill Incident Response and Reporting Procedures and implement SOP – IDDE Removing Illicit Discharges

   d. Determine whether the source of the discharge is likely to need a separate UPDES discharge permit. If so, report to the Utah Division of Water Quality (see SOP – Spill Incident Response and Reporting Procedures for phone number).

      i. Note: Most likely discharges in Kaysville City that may need a separate UPDES permit are from: Construction Activities and Construction Dewatering/Hydrostatic Testing

3. Documentation

   a. Add relevant information to Spill Response Report Form

   b. Note any discrepancies in the storm drain system maps from what is found in the field. Make sure that the maps get updated to correctly reflect actual conditions

IDDE – Removing Illicit Discharges (not associated with construction activity)

1. Preparation

    a. Make sure reporting has been done according to spill incident response and reporting procedures

    b. Begin completing a Spill Response Report Form

2. Process

    a. If the discharge is due to a sewer cross connection:

        i. Notify Central Davis Sewer District and Davis County Health Department Immediately

        ii. Determine responsible party

        iii. Issue a Notice of Violation to the violator requiring the problem to be corrected within two weeks to avoid further enforcement action

    b. For other discharges contact the Davis County Health Department - Environmental Division for removing the discharge and bringing enforcement action to violator

        i. Assist county personnel as needed in determining the responsible party, providing utility information, and providing other screening or investigation information gathered regarding the discharge

    c. Offer technical assistance to the violator; help them understand how to go about correcting the problem

    d. Follow-up as needed to ensure that the discharge has been removed. If violator fails to remove the discharge, follow health departments recommendations to apply appropriate and effective enforcement action

    e. If unable to immediately contain and/or cease the discharge, record the circumstances and submit a written rationale to the Division of Water Quality (see 2010 MS4 permit 4.2.3.6)

3. Documentation

    a. Complete Spill Response Report Form and/or obtain a copy of the discharge report from the Davis County Health Department - Environmental Division

    b. If unable to immediately contain and cease the discharge, write a rationale describing the circumstances and submit it to the Utah Division of Water Quality (e.g. for failing septic system)

Standard Operating Procedure for MS4 Construction Oversight
Inspections of Permitted Construction Sites SOP

Last Reviewed: May 07, 2025

Introduction

This SOP was written for Utah MS4s to help them meet the requirements of their MS4 Permit and to provide guidance to abide by Utah State Code. This SOP references the *Construction Site Storm Water Runoff Control* section of the MS4 Permit. The overarching goal of this SOP is to standardize storm water construction program practices across all MS4s in the State of Utah.

From **Utah Code 19-5-108.3:**

"The applicant shall allow construction site inspections by the authority. Except as provided in Subsection (12), the authority shall conduct an oversight inspection[1] through an electronic site inspection[2]."

"The authority may conduct an on-site inspection if the authority: has a documented reason for justifying an on-site oversight inspection."

To differentiate between the two types of oversight inspections, the terms "on-site oversight" and "electronic oversight" inspection are used.

- "On-site oversight inspection" is an inspection in which MS4 staff physically visit(s) a construction site to determine a site's compliance with construction storm water permits as has been done historically.
- "Electronic oversight inspection" is an offsite inspection in which MS4 conducts a review of the operator's submitted electronic site inspection to determine a site's compliance with construction storm water permits.

Each of these types of oversight inspections will be described in the *During Construction* portion within the *Process* section of this SOP.

1. Purpose:

The purpose of this SOP is to describe how all MS4s will conduct inspections for construction sites that require construction storm water permit coverage under the Construction General Permit (CGP) or Common Plan Permit (CPP). For purposes of this SOP, "operator" means the person responsible for the Storm Water Pollution Prevention Plan (SWPPP) implementation.

2. Responsibilities:

[1] "Oversight inspection" means a construction site inspection performed by the authority to impose compliance with the permit. (Utah Code 19-5-108.3)

[2] "Electronic site inspection" means geo-located and time-stamped photographs the applicant takes, evaluates, and submits electronically to the authority. (Utah Code 19-5-108.3)

Each MS4's permit staff are responsible for implementing the requirements and may not differ from this SOP. The operator is responsible for abiding by all requirements of the UPDES CGP or CPP, and the MS4 is responsible for oversight.

- The position responsible for oversight inspections is the Storm Water Inspector.
- The position(s) who has authority to implement enforcement procedures is the Storm Water Official, Storm Water Inspector, as well as the Division of Water Quality (DWQ).

This SOP is to be followed and updated according to State and municipal requirements.

3. MS4 Permit Requirements:

1. Oversight Inspection
    a. Required to be completed by the MS4 on any construction site that is greater than or equal to one acre or is part of a common plan of development or sale which collectively disturbs land greater than or equal to one acre.
    b. MS4 must inspect all phases of construction, including prior to land disturbance, during active construction, and following active construction.
    c. Oversight inspections are required to be completed monthly for non-priority construction sites and biweekly for priority construction sites.
2. Qualified Personnel
    a. The oversight inspection must be performed by a "qualified person" as described in the DWQ MS4 Permit.
    b. Anyone having a job duty related to implementing the construction storm water program must receive annual training. New hires must be trained within 60 days of hire.
3. Record Retention
    a. All MS4s must maintain records for at least five years of all applicable construction project documents which could include:
        i. Site plan reviews
        ii. SWPPPs
        iii. Inspections
        iv. Enforcement Actions (notices of violation, fines, stop work orders)

4. Process:

1. Pre-construction
    a. The MS4 will perform a pre-construction SWPPP review and meeting which at minimum will include:
        i. A review of the site design
        ii. Planned operations at the construction site
        iii. Planned Best Management Practice(s) (BMPs) during the construction phase
        iv. Planned long-term storm water run-off BMPs
        v. Documentation:
            1. SWPPP Review Checklist: Document the SWPPP Review Checklist through the City Inspect Program.

2. Pre-construction Meeting: Document the meeting through the City Inspect Program or the Community Development Record Keeping Process.

b. The MS4 will determine the frequency at which oversight inspections will be performed.
c. The MS4 must provide the operator the procedure for notifying the MS4 of their completion of active construction.
d. The MS4 will perform a pre-construction electronic oversight inspection or on-site oversight inspection with the operator(s).
    i. This pre-construction inspection must occur before land disturbance and will verify that the operator has placed all site specific construction BMPs prescribed by the SWPPP.
    ii. Documentation:
        1. Pre-construction inspection: Document the inspection through the City Inspect Program.
e. The operator should be notified of the option to opt-out of electronic site inspection requirements and signify that election to the MS4.
f. The operator will submit a Notice of Intent (NOI) through the NeT NPDES eReporting Tool online (NeT) *before* earth disturbing activities.

2. During Construction
    a. Electronic Oversight Inspection
        i. The MS4 will perform the required electronic oversight inspections through access to the operator's SWPPP, electronic site inspection(s), and operator's self inspection(s).
            1. The operator's report must use geo-located and time-stamped photos of all BMPs implemented at the construction site.
            2. All photos must be sufficient to depict that the BMP(s) is meeting its proper function to eliminate or control pollutants on site.
            3. The operator's report should show compliance with the CGP or CPP if applicable, and the site specific SWPPP.
                a. This includes all documentation regarding corrections taken as a result of the operator's self inspection.
    b. On-site Oversight Inspection
        i. An on-site oversight inspection may be conducted after the MS4 inspector has provided a 48-hours advance notice of an on-site inspection.
            1. Exceptions: If there is an imminent threat of discharge or the operator has formally opted-out of electronic site inspections.
        ii. An on-site oversight inspection may be warranted under the following conditions:
            1. Inadequate characterization in electronic site inspections of site conditions or portions of a site
            2. Verified complaints
            3. Failure to submit an electronic site inspection at the appropriate time
            4. Alterations of electronic photographs
            5. The construction site is within one-half mile of a river, a stream, or a lake

6. Compliance with the CGP, CPP if applicable, and site specific SWPPP cannot be reasonably determined during an electronic oversight inspection
7. A perceived or reported threat to water quality that is immediate[3] and/or imminent[4]
8. Failure to install BMPs prior to land disturbance
9. Illicit discharge, unknown/unidentified non-storm water discharge, or prohibited discharge per CGP/CPP permits
10. The operator opts out of the electronic site inspection and instead elects an on-site inspection
11. Any other oversight inspection step listed below that cannot be fulfilled

c. An oversight inspection, both electronic and on-site, is performed by following these steps:
    1. Review the SWPPP
    2. Review the SWPPP signage for compliance with the CGP or CPP
        a. Placed in a safe, conspicuous, and publicly accessible location near the entrance
        b. Includes UPDES permit tracking number, contact information, and method of SWPPP access
    3. Review the operator self SWPPP inspection reports
    4. Review the entire perimeter and any downgradient areas
    5. Review points of vehicle/equipment exit
    6. Review any discharge points (keep in mind that these are not always piped inlets)
    7. Review all BMPs installed to mitigate or prevent sediment, erosion, and pollution
    8. Review all stabilizing areas (especially steep slopes)
    9. Review all pollutant generating activities such as fueling areas, washout areas, etc.
    10. Observe all discharges (if prohibited or unauthorized this is an immediate and/or imminent threat to water quality)
    11. Observe all conditions that could result in polluted storm water discharge (including sediment in the street/gutter)
    12. Determine if any additional sediment, erosion, and/or pollution prevention controls are needed
    13. Verify that all above activities are accounted for and updated in the site's SWPPP and Map
    14. Any deficiencies must be noted in the oversight inspection form

d. For oversight inspections, MS4 staff must use the *Oversight Construction Inspection Form* provided by the Division of Water Quality.

[3] Immediate threat means contaminants are entering a river, a stream, or a lake.

[4] Imminent threat means contaminants are anticipated to be discharged into a river, a stream, or a lake within 48-hours.

i. MS4 staff sends a copy of the oversight inspection to the operator.
ii. MS4 staff maintains record of all oversight inspections through the City Inspect Program.

e. If the storm water BMPs on a construction site are found to be deficient by the MS4 inspector, steps will be taken to address the deficiencies as outlined in the *Enforcement for Construction Sites SOP*.
    i. Violations could include:
        1. Failure to maintain BMPs
        2. Failure to install BMPs
        3. An illicit discharge
        4. Failure to conduct inspections
        5. Failure to document corrections
        6. Failure to update SWPPP
        7. Any other CGP and/or CPP requirements that are deficient

3. After Construction
    a. The operator will request through NeT, a Notice of Termination (NOT) once these conditions have been met:
        i. Has the site achieved final stabilization?
        ii. Have all construction materials, waste and waste handling devices been removed?
        iii. Have all temporary storm water controls been removed?
        iv. Have all pollutants and pollutant-generating activities been removed?
        v. If landscaping will be completed by the homeowner, have temporary sediment and erosion controls been installed?
    b. MS4 staff who have 'MS4 Authority' will be notified of the request to approve the operator's NOT via an email notification from NeT.
    c. MS4 staff will verify through an electronic oversight inspection (or on-site oversight inspection if applicable described in the *Enforcement for Construction Sites SOP*) if all NOT requirements have been met and approve or deny the NOT submission via NeT.
    d. MS4 staff will document the NOT inspection through the State's Storm Water NOT Inspection Form and maintain a record of it through the City Inspect Program.
    e. All documents related to each applicable construction site must be retained for five years or until construction is completed, whichever is longer.

***Note to the MS4:*

It is recommended that MS4s use this template to facilitate their construction storm water program requirements and should add specific information for each MS4 relevant to the program.

Standard Operating Procedure for MS4 Construction Oversight

Enforcement for Construction Sites SOP

Last Reviewed: May 13, 2025

Introduction

This SOP was written for Utah MS4s to help them meet the requirements of their MS4 Permit and to provide guidance to abide by Utah State Code. This SOP references the *Construction Site Storm Water Runoff Control* section of the MS4 Permit. The overarching goal of this SOP is to standardize storm water construction program practices across all MS4s in the State of Utah.

From **Utah Code 19-5-108.3:**

"The authority may conduct an on-site inspection if the authority has a documented reason for justifying an on-site oversight inspection." (Utah Code 19-5-108.3)

1. Purpose:

The purpose of this SOP is to describe how MS4s will implement standards from the MS4 Permit in conjunction with Utah State Code 19-5-108.3 in regard to sites that do not comply with their SWPPP and state issued Construction General Permit (CGP) or Common Plan Permit (CPP) if applicable. For purposes of this SOP, "operator" means the person responsible for SWPPP implementation.

2. MS4 Responsibilities:

Each MS4's permit staff are responsible for implementing the requirements and may not differ from this SOP. The operator is responsible for abiding by all requirements of the CGP or CPP and the MS4 is responsible for oversight.

- The position responsible for oversight inspections is the Storm Water Inspector.
- The position(s) who has authority to implement enforcement procedures is the Storm Water Official, Storm Water Inspector, as well as the Division of Water Quality (DWQ).

This SOP is to be followed and updated according to State and municipal requirements.

3. MS4 Permit Requirements:

1. Enforcement procedures and regulatory authority must be written and documented in the SWMP of each MS4.
    a. The procedures of this SOP should be summarized or referenced in the MS4's SWMP which is accessible by the public. Regulatory authority is described in the *Inspections of Permitted Construction Sites SOP*.
2. Each MS4 permit staff with responsibility over the SWPPP program must be trained in proper documentation of inspections, follow-up, and enforcement actions.

a. Documentation of routine maintenance, corrective action, follow-up inspections, and enforcement actions should all be included with citations in the *Oversight Construction Inspection Form* provided by the DWQ.
    i. Any communication between the operator and the MS4 should be recorded and retained through the City Inspect Program.
    ii. Verbal communication alone is not advised. If important communication does occur verbally (such as agreement on BMP improvement, corrective action deadline, etc) between the operator and the MS4, restating the conversation afterwards via email to the operator is advised so that a record can be retained.

3. For construction sites that have been issued multiple escalating enforcement actions , the construction site could now be designated as a "priority construction site". Oversight inspection frequency would then increase to at least biweekly due to the past record of non-compliance by the operator and potential to threaten water quality.

4. Process:

1. Oversight Inspections
    a. If violations of the CGP/CPP are determined after conducting an inspection (electronic or on-site) as identified in the *Oversight Inspections SOP*, the MS4 must document each violation as part of completing the *Oversight Construction Inspection Form* provided by DWQ. *If the inspection was conducted on-site, justification for an on-site oversight inspection must be documented on the inspection form.*
2. Violation and Follow-up Procedures
    a. First Notice of Violation (NOV 1)
        i. The MS4 must notify the operator of the violation(s) in writing as part of completing the *Oversight Construction Inspection Form*. The violation notation at minimum must include:
            1. Explanation/Identification of each violation
            2. Associated citation from the CGP/CPP
            3. Deadline to correct each violation.
                a. The deadline to correct violations should be no sooner than one business day.
        ii. Reinspection
            1. The MS4 shall verify (i.e., reinspection photos, documentation) that each violation has been corrected as soon as is practicable after the deadline given by the MS4.
                a. If the follow up electronic inspection submitted by the operator is not sufficient for MS4 staff to determine that the specific violation has been corrected, an on-site oversight inspection may be conducted to determine that each violation has been corrected. *If the inspection was conducted on-site, justification for an on-site oversight inspection must be documented on the inspection form.*
                b. The MS4 should describe to the operator how and when verification of correction will be performed.

2. If the operator has not corrected the violation(s), the MS4 will notify the operator that the violation hasn't been corrected in writing as described in NOV 2.
3. If the operator has corrected the violation(s), the operator will be notified by the MS4 that the project is in compliance.

b. Second Notice of Violation (NOV 2)
   i. The MS4 must notify the operator of the violation(s) in writing as part of completing the *Construction Oversight Inspection Form*. The violation notation at minimum must include:
      1. Explanation/Identification of each remaining violation
      2. Associated citation from the CGP/CPP
      3. Written warning that fines can be issued if the violation is not corrected within the new time period specified by the MS4.
         a. The deadline to correct each violation should be no sooner than one business day.
   ii. Reinspection
      1. The MS4 shall verify (i.e., reinspection photos, documentation) that each violation has been corrected as soon as is practicable after the deadline within the time period given by the MS4.
         a. If the follow up is conducted as an electronic inspection submitted by the operator and is not sufficient for MS4 staff to determine that the violation has been corrected, an on-site oversight inspection may be conducted. *If the inspection was conducted on-site, justification for an on-site oversight inspection must be documented on the inspection form.*
         b. The MS4 should describe to the operator how and when verification of correction will be performed.
      2. If the operator has not corrected the violation(s), the MS4 will notify the operator that the violation hasn't been corrected in writing as described in NOV 3.
      3. If the operator has corrected the violation(s), the operator will be notified by the MS4 that the project is in compliance.

c. Third Notice of Violation (NOV 3)
   i. The MS4 may issue a fine as outlined in Utah Code 19-5-108.3 until the MS4 performs an oversight inspection to verify that the violation has been corrected or the operator shows the violation has been corrected through photos or documentation.

d. Documentation:
   i. The results of all enforcement notices, communications, and inspections including follow-up or reinspections, must be documented through the City Inspect Program.

3. Administrative Fines
   a. If the operator does not correct the specific violation within the timeline set by the MS4 indicated in NOV 2, the MS4 shall notify the operator in writing that the specific violation has not been corrected and **may** impose an administrative fine for each occurrence* as follows:

i. $500 per occurrence for working without an approved storm water permit;
ii. $300 per occurrence for tracking mud on road;
iii. $250 per occurrence for failure to clean up or report spills;
iv. $100 per occurrence for failure to conduct storm water inspections;
v. $100 per occurrence for failure to maintain storm water records; and
vi. $500 per site, per occurrence, for failure to use general best management practices, as determined by the authority;

** "each* occurrence" i.e. "per occurrence" *means that for each specific violation there is a separate fine associated with that violation each time that it occurs. For example, with two separate spills in different areas of the site, after the violation and follow up process has been exhausted for each spill, the MS4 could impose an administrative fine on the operator at $250 for each spill.*

b. The MS4 may impose the administrative fine:
   i. for each business day the specific violation continues beginning on the day after the day on which the authority issues the administrative fine;
   ii. and within 30 days after the day on which the applicant corrects the violation.
c. When the MS4 issues an administrative fine, the MS4 shall:
   i. impose each fine in writing and clearly document the specific violation in the writing; and
   ii. deposit collected fines into a restricted account for education and outreach under a program.

4. Special Cases
   a. The MS4 may issue a stop work order if the MS4 has clear documentation of an immediate[5] threat to water quality.
   b. The MS4 can correct a specific violation for the operator, and recoup the costs associated, if the operator refuses to correct the violation after the enforcement process and there is imminent threat[6] of significant harm to water quality or the stormwater system.
   c. Except in cases of immediate threats to water quality the MS4 cannot issue a stop work order if the violation is a result of a properly installed and maintained BMP per specifications for the site conditions from the preferred BMP list.

5. Communication:

Each MS4 will utilize a method of communication for enforcement (such as a notice of violation, fines, stop work orders) to the operator.

[5] Immediate threat means contaminants are entering a river, a stream, or a lake.

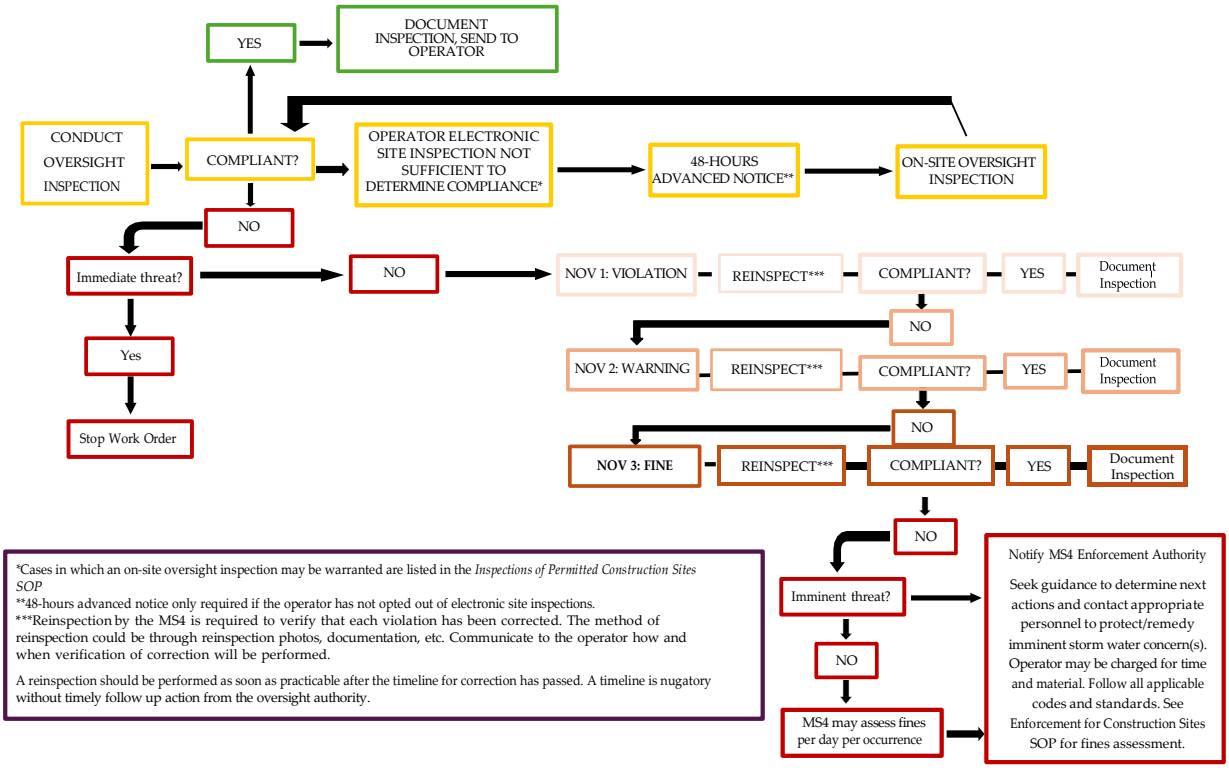
[6] Imminent threat means contaminants are anticipated to be discharged into a river, a stream, or a lake within 48-hours.

- The method used for this MS4 is [insert method of enforcement communication such as a software, email, physical letter, etc. And include any sub bullets needed to describe the process]

6. Flow Chart attached.

Enforcement for Construction Sites

Flow Chart



*Cases in which an on-site oversight inspection may be warranted are listed in the *Inspections of Permitted Construction Sites SOP*
**48-hours advanced notice only required if the operator has not opted out of electronic site inspections.
***Reinspection by the MS4 is required to verify that each violation has been corrected. The method of reinspection could be through reinspection photos, documentation, etc. Communicate to the operator how and when verification of correction will be performed.

A reinspection should be performed as soon as practicable after the timeline for correction has passed. A timeline is nugatory without timely follow up action from the oversight authority.

INSPECTION/ENFORCEMENT – Inspecting Long-Term Controls (private)

1. Preparation

   a. Check Records; review terms of maintenance agreement (if any), information about the design and function of the control, and previous inspections that are on-file

   b. Schedule the inspection; plan to inspect each control annually unless inspection is done by a third party, in which case inspect the control at least once every 5 years

   c. Notify the owner of the inspection and schedule a time when owner (or owner's representative) will be there if feasible

2. Process

   a. Use the Long-Term Stormwater Control Inspection Form as appropriate for the type of control to be inspected

   b. Inspect condition of control according to the inspection form (whether adequately maintained, operating as designed, etc.)

   c. Take photos

   d. Complete the inspection report; note any corrective actions needed for compliance and give the owner a deadline for the corrective action items. If owner (or owner's representative) is available, request that they sign the report.

   e. Email a copy of the completed inspection report to owner

3. Follow-Up

   a. Return to check corrective action items shortly after any deadline given to the owner

   b. Implement SOP: INSPECTION/ENFORCEMENT – Enforcing Long-Term Control Requirements as needed to ensure compliance

4. Documentation

   a. File inspection reports, photos, and notes on corrective actions performed

   b. Document enforcement actions taken

INSPECTION/ENFORCEMENT – Inspecting Long-Term Controls (city owned)

1. Preparation

    a. Check Records; review information about the design and function of the control, and previous inspections that are on-file

    b. Schedule the inspection; plan to inspect each city-owned long-term structural control annually

2. Process

    a. Use the Long-Term Control Inspection Form as appropriate for the type of control to be inspected

    b. Inspect condition of control according to the inspection form (whether adequately maintained, operating as designed, etc.)

    c. Complete the report; note any corrective actions needed and schedule these to be completed within a reasonable time.

3. Follow-Up

    a. Return to check corrective action items shortly after scheduled time for completion

    b. Note any corrective actions performed

4. Documentation

    a. File inspection reports and notes on corrective actions performed

1. Preparation

    a. Make sure that any problems needing corrective action have been documented

    b. Review maintenance agreement, previous inspections, warnings given, and other enforcement actions taken

2. Process

    a. Use these escalating enforcement actions:

        - Warning: give the owner a warning to correct problems with a reasonable deadline to complete corrections. Skip this step if the problems pose a serious threat to human safety or the environment.

        - Notice of Deficiency: if problems are not corrected by the deadline, of if the problem is re-occurring, issue a Notice of Deficiency by certified mail or hand delivery (with supervisor's approval). Also, provide another reasonable deadline before pursuing additional enforcement action.

        - Correct Problem and Bill Owner

        - Collection of Charges: coordinate with City Attorney and City Treasurer for collection of charges

3. Follow-Up

    a. Return to check corrective action items shortly after any deadline given to the owner.

    b. Take photos

    c. Implement further escalating enforcement action as needed to ensure compliance

4. Documentation

    a. File photos and inspection reports

    b. Document enforcement actions taken

INSPECTION/ENFORCEMENT – Inspecting High Priority Facilities (city owned) - Monthly

1. Preparation

   a. Plan to inspect sites once per month

   b. Review information about previous monthly inspections. Notice any previous corrective action needed that has not been documented as complete.

2. Process

   a. Use the Monthly High Priorities Inspection Form as a guide

   b. Inspect each item listed on the inspection form according to the standards as described on the form

   c. Complete the report noting any corrective actions needed.

3. Follow-Up

   a. Schedule any necessary corrective actions to be completed within a reasonable time

4. Documentation

   a. File inspection report

   b. Note and date all corrective actions performed on the Inspection Form

INSPECTION/ENFORCEMENT – Inspecting High Priority Facilities (city owned) - Semi-Annually

1. Preparation

   a. Plan to inspect sites every other calendar quarter and schedule each inspection accordingly

   b. Review information about previous weekly inspections, semi-annual comprehensive inspections, and annual visual monitoring events. Notice any previous corrective action needed that has not been documented as complete.

2. Process

   a. Use the Semi-annual Comprehensive Inspection Form as a guide

   b. Inspect each item listed on the inspection form according to the standards as described on the form

   c. Complete the report noting any corrective actions needed.

3. Follow-Up

   a. Schedule any necessary corrective actions to be completed within a reasonable time

4. Documentation

   a. File inspection report

   b. Note and date all corrective actions performed on the Semi-annual Comprehensive Inspection Form

5. Preparation

   a. Plan to conduct visual monitoring at least once per calendar year

   b. Watch the weather; visual monitoring should be done within the first 30 minutes of when a storm event (> 0.1" precipitation) produces runoff, yet not within 72 hours of a previous storm that produced runoff; plan to perform the visual monitoring from storms that occur during regular working hours.

   c. Know the sampling locations, which are shown in the SWPPP – Site Map Appendices.

6. Process

   a. Use the Visual Storm Water Discharge Examination form as a guide

   b. Collect enough of a sample into an open, clear container to get a good identification of color, clarity, odor, and other parameters on the form

   c. Complete observation at time of sampling and one hour after settling according to form

   d. Complete the report including the assessment portion and identify any corrective actions needed

7. Follow-Up

   a. Schedule any necessary corrective actions to be completed within a reasonable time

8. Documentation

   a. File completed visual monitoring report

   b. Note and date all corrective actions performed in the assessment portion of the visual monitoring form

1. Preparation

   a. Be trained; only those trained in landscape chemical use may apply the pesticide, herbicide, or fertilizer

   b. For chemicals requiring certification by law: Be certified or work under supervision of a someone who is certified for the chemical to be applied

   c. Calibrate chemical application equipment to avoid excessive application.

   d. Read the label; time and apply the application of chemical to coincide with the manufacturer's recommendation

   e. Know the weather conditions. Do not use the chemicals if rain is expected. Apply only when wind speeds are low(less than 5 mph).

2. Process

   a. Always follow the manufacturer's recommendations for mixing, application and disposal. ("Read the Label").

   b. Do not mix or prepare chemicals for application near storm drains, preferably mix inside a protected area with impervious secondary containment (preferably indoors) so that spills or leaks will not contact soils.

   c. Employ techniques to minimize off-target application (e.g. spray drift, over broadcasting.) of pesticides, herbicides and fertilizers.

3. Clean-up

   a. Sweep pavements or sidewalks, where solid chemicals have fallen, back onto grassy areas before applying irrigation water

   b. Triple rinse containers, and use rinse water as product

   c. Place unused chemical in designated locked storage room

4. Documentation

   a. Keep copies of MSD sheets for all pesticides, fertilizers and other hazardous products used.

   b. Record pesticide application activities.

1. Preparation

    a. Make sure equipment is properly maintained; schedule preventative maintenance

2. Process

    a. Mow and trim such that clippings are blown back onto lawn with the equipment (where possible)

    b. Blow clippings from pavement back on to grass areas

3. Clean-up

    a. Periodically scrape/brush dry spoils from mowers – sweep up the scrapings and dispose in waste bin or according to SOP: GENERAL – Debris Disposal

    b. Wash equipment according to SOP: General – Vehicle and Equipment Washing

    c. Check equipment for any fluid leaks or damage needing repair

1. Preparation

   a. Plan out planting scheme; normally plan to use native species of trees, shrubs, and perennials which are naturally tolerant to local climate

   b. Call the Blue Stakes Center of Utah (Dial 811) at least 2 working days before any digging will be done to reveal the location of any underground utilities

   c. Decide where any spoils will be taken.

2. Process

   a. Dig holes; place spoils near the hole where they may easily be placed back around roots. Avoid placing spoils in the gutter.

   b. Bring each plant near the edge of the hole dug for it.

   c. Check the depth of the hole, and adjust the depth if necessary. The depth of the hole for a tree should be as deep as the root ball, so that the top of the root ball is level with the top of the hole. d. Carefully remove pot or burlap.

   - Place the plant in the hole.
   - Backfill the hole with existing spoils, compost, and a little fertilizer if desired. Do not use excessive amendments.
   - Water the plant.
   - Stake the plant, if necessary, to stabilize it.

3. Clean-up

   a. Move any extra spoils into truck or trailer. Place the spoils on a tarp if there is likelihood that some of the dirt would be lost through openings in the bed.

   b. Sweep dirt from surrounding pavement(s) into the planter area

   c. Transport spoils to their designated fill or disposal area.

1. Preparation

   a. Call the Blue Stakes Center of Utah (Dial 811) at least 2 working days before any digging will be done to reveal the location of any underground utilities.

   b. Decide on the application rate, method, water source, and ensure adequate materials are in possession.

   c. Grade and prepare the soil to receive the seed. Place any extra soil in a convenient location to collect.

2. Process

   a. Place the seed and any cover using the pre-determined application method (and rate).

   b. Lightly moisten the seed.

3. Clean-up

   a. Move any extra spoils into truck or trailer. Place the spoils on a tarp if there is likelihood that some of the dirt would be lost through openings in the bed.

   b. Sweep dirt, seed, and any cover material from surrounding pavement(s) into the planter area

   c. Transport spoils to their designated fill or disposal area.

STREETS/STORM DRAIN – Cleaning Catch Basins and Drainage Pipe

1. Preparation:

    a. Perform pre-trip safety inspection on Vac-Truck and any necessary maintenance

    b. Fill water tank

    c. Plan cleaning route(s) that progresses down the system (if applicable)

    d. Set up traffic controls, as necessary

2. Process

    a. Clean Sediment and trash from grate

    b. Remove grate/manhole cover

    c. Check to make sure grate, frame and box is in good repair

    d. Clean sediment and debris from the box, manhole, and/or pipe

    e. Replace cover; make sure it is secure

3. Clean-up

    a. Remove traffic controls

    b. Dispose of debris and waste water removed according to SOP: GENERAL – Debris Disposal

4. Documentation

    a. Record the catch basins/lines/boxes cleaned, water used and loads dumped in maintenance log and Survey 123 database

    b. Note any apparent problems and report them to superintendent

STREETS/STORM DRAIN – Detention Pond Cleaning

1. Preparation:

   a. Plan pond cleaning activities to occur during dry weather; do not clean detention ponds during wet weather unless there is an urgent need

   b. Gather necessary tools (Pitch fork, square mouth shovel, backhoe, dump truck, safety chains, etc.)

   c. Check to make sure grates and other features are in good working order

2. Process

   a. Remove sediment and trash from grates

   b. Clean debris and accumulated sediment from pond in a manner that prevents sediment and debris from going downstream

   c. Where possible remove grate from box using safety chains/backhoe and clean as necessary

   d. Load sediment and debris into a truck for disposal

3. Clean-up

   a. After cleaning basins, clean off any pavement and loading areas

   b. Dispose of sediment and debris according to SOP: GENERAL – Debris Disposal

4. Documentation

   a. Record detention ponds cleaned in maintenance log and Survey 123 database

   b. Note any apparent problems and report them to superintendent

STREETS/STORM DRAIN – Detention Pond Inspection

1. Preparation:

    a. Plan to inspect detention ponds during rain or snow melt periods

    b. Make list of detention ponds to inspect

2. Process

    a. Visually inspect detention pond and controls to ensure proper function

    b. Remove accumulated trash/debris from grates and head gates in a manner that prevents trash/debris from going downstream and place in truck

3. Clean-up

    a. Dispose of trash/debris according to SOP: GENERAL – Debris Disposal

4. Documentation

    a. Record detention ponds inspected in maintenance log and Survey 123 database

    b. Note any apparent problems and report them to superintendent

STREETS/STORM DRAIN – Ditch Inspection and Cleaning

1. Preparation:

   a. Plan to inspect ditches on a semi-annual basis

   b. Maintain access to ditch channels whenever possible

   c. Identify access and easements and notify affected property owners of the work to be done

   d. Determine method of maintenance that will be least damaging to the channel

2. Process

   a. Perform required maintenance in a way that will be least damaging to the channel and minimize erosion

   b. Load removed sediment/debris into dump truck or equipment to be hauled away

3. Clean-up

   a. Dispose of sediment/debris according to SOP: GENERAL – Debris Disposal

   b. Stabilize all disturbed soils

   c. Remove all tracking from paved surfaces near site as necessary

4. Documentation

   a. Record maintenance performed in Survey 123 Database

   b. Make note of any future repairs that are needed

STREETS/STORM DRAIN – Slurry / Chip Seal

1. Preparation

    a. Check that drainage problems have been addressed, and that any potholes have been patched

    b. Plan to conduct slurry seal activities during dry weather; reschedule if precipitation is anticipated

    c. Notify residents at least one day in advance of the planned maintenance

    d. Remove weeds from the road

    e. Sweep pavement surface (according to SOP: STREETS/STORM DRAIN – Street Sweeping) and allow it to dry

    f. Set up traffic controls

    g. Protect storm drain inlets

    h. Cover Manhole and valve covers, and mark their locations on the curb

2. Process

    a. Apply slurry / chip material uniformly

    b. Do not allow slurry material to run into the gutter

3. Clean-up

    a. Remove any excess chips according to SOP: STREETS/STORM DRAIN – Street Sweeping

    b. Remove traffic controls

4. Documentation

    a. Make a record of the work done

STREETS/STORM DRAIN – Asphalt Paving

1. Preparation

   a. Plan to pave when weather will be at least 50 degrees F; during dry weather

   b. Make sure surface is pre-treated as follows:

      - large cracks are sealed
      - alligator cracks and potholes are removed and patched
      - rutted areas are milled level

   c. Sweep pavement surface (according to SOP: STREETS/STORM DRAIN – Street Sweeping) and allow it to dry

   d. Mark locations of manhole and valve covers on the curb

   e. Set up traffic controls

   f. Apply uniform tack coat on surface

2. Process

   a. Place hot mix asphalt uniformly to surface

   b. If raising manhole and valve lids during paving, carefully remove the material from the lid before taking the lid off of the frame, and carefully remove lid to avoid spilling the material into the manhole or valve box

   c. After the riser is in place, carefully replace the manhole lid without pushing asphalt material into the manhole or valve box.

   d. Compact the asphalt*

3. Clean-up

   a. Remove excess asphalt material from surface at start and stop points with shovels

   b. Remove Traffic Control

   c. Clean gutters from loose material

   d. Dispose of excess asphalt according to SOP: GENERAL – Debris Disposal

*Select, place, and compact hot mix asphalt according to APWA standards

1. Preparation

    a. Plan to conduct slurry seal activities during dry weather; reschedule if precipitation is anticipated

    b. Set up traffic controls

    c. Remove weeds from the road

    d. Air-blast the cracks to remove sediment and moisture from the cracks

2. Process

    a. Maintain temperature and apply crack seal according to manufacturer's specification

3. Clean-up

    a. Remove excessive sealant

    b. Remove Traffic Control

    c. Initiate the self-cleaning process on the crack seal equipment

4. Documentation

    a. Make a record of the work done

STREETS/STORM DRAIN – Concrete Work

1. Preparation

   a. Identify a location, near the worksite, for the concrete truck to washout and to clean tools; the washout location must not allow the washout to runoff into the gutter

      - Backhoe bucket
      - Concrete Washout at Operations Center
      - Portable washout
      - Lined depression

   b. Plan to conduct concrete work during dry weather conditions; do not place concrete if precipitation is expected before concrete is expected to set up

   c. Set up traffic controls

2. Process

   a. Remove old concrete, soil, and any other spoils; load them into a truck to be hauled away

   b. Place and compact base material

   c. Form area for concrete placement

   d. Pour concrete in a manner to avoid any spillage of excess material

3. Clean-up

   a. Direct concrete truck driver to washout concrete truck/cart at pre-determined washout location

   b. Clean finishing tools at pre-determined washout location

   c. Clean street, gutters, and sidewalk

   d. Remove traffic control once concrete has cured

   e. Dispose of material removed and concrete wash according to SOP: GENERAL – Debris Disposal

   f. For grinding activities: concrete chips and dust are to be swept up and disposed of in dumpster

STREETS/STORM DRAIN – Snow Removal and De-icing

1. Preparation

   a. Store de-icing material under a covered storage area

   b. Understand city policy to keep roads open and free of snow or ice pack from any storm, in a way that uses a minimum amount of salt without compromising motorists' safety

   c. Wash out vehicles (if necessary) in approved washout area according to SOP – GENERAL Vehicle and Equipment Washing

   d. Calibrate spreaders to minimize amount of de-icing material used and still be effective

2. Process

   a. Load material into trucks minimizing spillage

   b. Distribute the minimum amount of de-icing material to be effective on roads

   c. Park trucks with de-icing material inside when possible

3. Cleanup

   a. Empty excess de-icing material from spreaders back into storage area

   b. Sweep up all spilled de-icing material around loading area

   c. Clean out trucks after snow removal duty according to SOP: GENERAL – Vehicle and Equipment Washing

   d. Sweep up residual from streets when weather permits

4. Preparation

   a. Perform pre-trip inspection on street sweeper and dump truck before each use

   b. Fill water tank

   c. Perform sweeper maintenance as needed (grease components, clean water nozzles, etc.)

   d. Determine the route to be cleaned including city owned parking lots

   e. Transport dump truck to designated area near route

5. Process

   a. Operate street sweeper safely and pickup debris according to manufacturer's recommendations

   b. Dump sweeper hopper into dump truck as needed throughout day

   c. Clean up any spilled debris around dump truck at end of the day

   d. Cover dump truck load before transport

6. Clean-up

   a. Dispose of the collected waste according to SOP: GENERAL – Debris Disposal

   b. Clean the street sweepers according to SOP: GENERAL – Vehicle and Equipment Washing

7. Documentation

   a. Record streets and parking lots swept, miles, and loads dumped on map and Survey 123 database

WATER – Planned Waterline Excavation Repair/Replacement

1. Preparation
   a. Call the Blue Stakes Center of Utah 811at least 2 business days before any digging will be done, to reveal the location of underground utilities
   b. Set up temporary traffic control
   c. Determine whether there will be a discharge and where the discharge will flow
   d. Place inlet protection per SOP: GENERAL – Inlet Protection
   e. Saw cut pavement in area needing excavation
   f. Clean loose material* from gutters leading to receiving inlet
   g. Isolate waterline to be worked on by turning off valves

2. Process
   a. Drain line as much as possible from a hydrant or drain valve
   b. Direct any discharge to protected inlet (determined in step 1 c.&d.)
   c. Remove spoils from excavation and collect them in dump truck/vac truck
   d. Follow appropriate repair procedures in making the repair.
   e. Backfill and compact excavation
      i. Remove as much saturated soil as feasible
      ii. Place and compact backfill in lifts no deeper than one foot
      iii. Place and compact top lift to make it blend with surrounding pavement

3. Clean up
   a. Clean up area around excavation
   b. Clean up any material caught by inlet protection
   c. Remove inlet protection
   d. Haul off excess soil and debris according to SOP: GENERAL – Debris Disposal, Transporting Saturated/Unsaturated Materials

4. Documentation

   a. Complete Work Order

   b. Complete Excavation Permit

   c. Report any pavement patching needed to the Streets Dept., and any Concrete replacement necessary to the Public Works Foreman.

WATER – Emergency Waterline Excavation Repair/Replacement

1. Preparation

   a. Isolate waterline to be worked on by turning off valves

   b. Make sure service trucks are equipped with inlet protection materials such as wattles or gravel bags

   c. Set up temporary traffic control

   d. Contact the Blue Stakes Center of Utah 811 to notify them of the need to dig for an emergency repair. (Utilities will be marked within two hours)

2. Process

   a. Drain line as much as possible from a hydrant or drain valve

   b. Inspect flow path of discharged water

   c. Place inlet protection per SOP: GENERAL – Inlet Protection

   d. Remove Spoils from excavation and collect them in dump truck/vac truck

   e. Follow appropriate repair procedures in making the repair.

   f. Backfill and compact excavation

      - Remove as much saturated soil as feasible
      - Place and compact backfill in lifts no deeper than one foot
      - Place and compact top lift to make it blend with surrounding pavement

3. Clean-up

   a. Repair eroded areas as needed

   b. Clean up loose material from apparent tracking or spills along travel path of trucked material

   c. Clean up any material caught by inlet protection

   d. Remove inlet protection

   e. Haul off excess soil and debris according to SOP: GENERAL – Debris Disposal, Transporting Saturated/Unsaturated Materials

4. Documentation

a. Complete report for time spent on the job by crew members, equipment, and materials used

b. Report any pavement patching needed to the Streets Dept., and any Concrete replacement necessary to the Public Works Foreman.

1. Preparation

   a. Determine flow path of discharge to inlet of waterway

   b. Clean flow path

   c. Place inlet protection per SOP: GENERAL – Inlet Protection

2. Process

   a. If it appears that flushing straight from the hydrant or blow-off valve may cause a problem (such as erosion, or splash on vehicles), connect a hose or diffuser to the discharge fitting

   b. Turn on the valve to flush the water, and leave it on until enough time has passed to allow adequate flushing of the line to occur

   c. Turn off the water

3. Clean-up

   a. Clean up any material caught by inlet protection and dispose according to SOP: GENERAL – Debris Disposal

   b. Remove inlet protection

WATER – Waterline Flushing after Construction/System Disinfection with Discharge to Storm Drain

1. Preparation

   a. Determine chlorine content of discharged water for utilizing appropriate de-chlorination equipment

   b. Determine flow path of discharge

   c. Clean the flow path

   d. Place inlet protection per SOP: GENERAL – Inlet Protection

2. Process

   a. Place de-chlorination equipment on point of discharge according to manufacturer's recommendation

   b. If it appears that flushing straight from the hydrant or blow-off valve may cause a problem (such as erosion, or splash on vehicles), connect a hose or diffuser to the discharge fitting

   c. Allow water to run until line is adequately flushed, then turn off and remove de-chlorination equipment

   d. Have a sample taken for a chlorine residual test

3. Clean-up

   a. Clean up any material caught by inlet protection and dispose according to SOP: GENERAL – Debris Disposal

   b. Remove inlet protection

   c. Remove equipment from flush point

4. Documentation

   a. Record result of chlorine-residual test

WATER – Waterline Flushing after Construction/System Disinfection with Discharge Collected and Hauled to Off-Site Location

1. Preparation

   a. Determine appropriate location for application of the chlorinated water

   b. Estimate the amount of water to be flushed, and select tanker to use and number of trips that will be necessary

2. Process

   a. Flush to tanker

   b. Haul the chlorinated water to the pre-selected location

   c. Apply the chlorinated water to the soil such that the water does not run off of the site

   d. Have a sample taken for a chlorine residual test

3. Documentation

   a. Record result of chlorine-residual test

1. Preparation

    a. Understand MSDS for handling and storage of product

    b. Determine best location to handle product at destination site

    c. Have necessary containment and spill kits at handling place, suitable for the material to be handled

2. Process

    a. Make connections

    b. Begin transfer process

    c. Discontinue operations if spill or leaking occurs, and repair before continuing

    d. Disconnect and store handling equipment

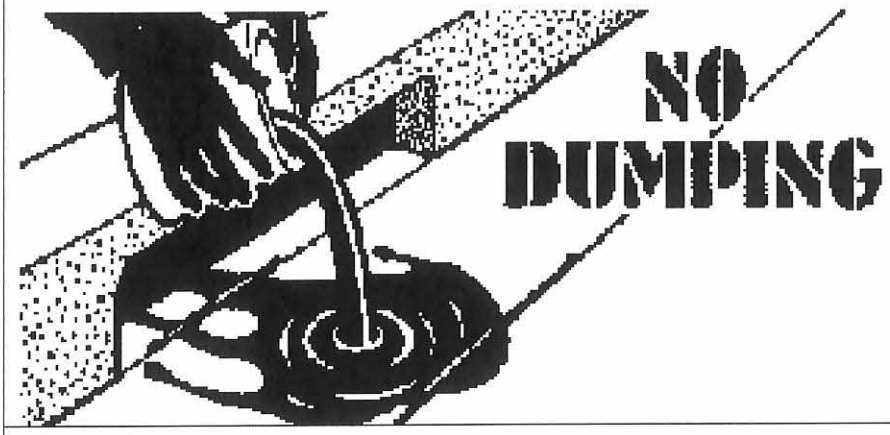
3. Clean-up

    a. Respond to and report spills according to procedure: SPILL INCIDENT – Response and Reporting

    b. Ensure that any spills are cleaned up. If spilled material is hazardous, it must be handled by a licensed hazardous waste handler and disposed of at a hazardous waste disposal site.

BMP: Illegal Dumping Controls

IDC



DESCRIPTION:

Implement measures to detect, correct, and enforce against illegal dumping of pollutants on streets, into the storm drain system, and into creeks. Substances illegally dumped on streets, into the storm drain system, and into creeks includes paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes can cause storm water and receiving water quality problems as well as clog the storm drain system.

APPROACH:

One of the keys to success is increasing the general public=s awareness of the problem and to at least identify the incident, if not correct it. There are a number of ways of accomplishing this:

< Train municipal staff from all departments to recognize and report incidents.
< Deputize municipal staff who may come into contact with illegal dumping with the authority to write illegal dumping tickets for offenders caught in the act.
< Educate the public.
< Provide the public with a mechanism for reporting such as a hot line.

Establish system for tracking incidents which will identify:

< Illegal dumping Ahot spots@,
< Types and quantities (in some cases) of wastes,
< Patterns in time of occurrence (time of day/night, month, or year),
< Mode of dumping (abandoned containers, Amidnight dumping@ from moving vehicles, direct dumping of materials, accident/spills), and
< Responsible parties.

A tracking system also helps manage the program by indicating trends, and identifying who, what, when, and where efforts should be concentrated.

LIMITATIONS

The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal.

PROGRAM ELEMENTS

9 New Development
9 Residential
9 Commercial Activities
9 Industrial Activities
9 Municipal Facilities
: Illegal Discharges

SALT LAKE COUNTY

TARGETED POLLUTANTS

: Sediment
9 Nutrients
: Heavy Metals
Toxic Materials
Oxygen Demanding Substances
Oil & Grease
Floatable Materials
: Bacteria & Viruses

■ High Impact
☒ Medium Impact
☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

9 Capital Costs
: O&M Costs
9 Regulatory
Training
: Staffing
9 Administrative

■ High ☒ Medium ☐ Low

BMP: Classroom Education On Storm Water

CESW

Students learn about storm water pollution (Source: City of Sacramento Storm Water Management Program, no date)

DESCRIPTION:

Classroom education is an integral part of any storm water pollution outreach program. Providing storm water education through schools exposes the message not only to students but to their parents as well. Topics can include Water conservation, proper lawn and garden care, and proper disposal of hazardous household wastes.

APPROACH:

- Building a strong relationship with the school district is the most important step in getting storm water education into the schools.
- When developing an outreach message for children, choose the age ranges to target.
- Many additional classroom materials are available for use free of cost. Educational materials available for downloading from the Internet at www.csu.org/water/watereducation/watereducation.html.
- Should make students aware of the potential impacts of hazardous household materials on water quality and inform residents of ways to properly store, handle, and dispose of the chemicals
- Water usage in the home can easily be reduced by 15 to 20 percent—without major discomfort—by implementing a program to conserve water in the home.
- Lawn and garden activities can result in contamination of storm water through pesticide, soil, and fertilizer runoff. Proper landscape management, however, can effectively reduce water use and contaminant runoff and enhance the aesthetics of a property.

LIMITATIONS:

- One of the limitations of classroom education is being able to incorporate storm water issues into the school curricula. With so many subjects to teach, environmental issues might be viewed as less important.

MAINTENANCE:

- Programs and educational materials can be re-used, but they must be presented on a continual basis.

APPLICATIONS

- ☐ Manufacturing
- ☒ Material Handling
- ☐ Vehicle Maintenance
- ☐ Construction
- ☐ Commercial Activities
- ☐ Roadways
- ☒ Waste Containment
- ☒ Housekeeping Practices

TARGETED POLLUTANTS

- ■ Sediment
- ■ Nutrients
- ■ Heavy Metals
- ■ Toxic Materials
- ■ Oxygen Demanding Substances
- ■ Oil & Grease
- ■ Floatable Materials
- ■ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☐ O&M Costs
- ☐ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Educational Materials

EM

DESCRIPTION:

Educational Materials to present information to the public on storm water issues and water quality awareness is an integral part of any storm water education program. Providing storm water education by sending out information with bills, newsletters, or presented at city activities, in city offices, schools, and fair booths, exposes the message to a wide variety of people, if not city-wide. Topics can include Water conservation, proper lawn and garden care, and proper disposal of hazardous household wastes. Many educational materials can be used for city personnel, contractors as well as homeowners or businesses.

APPROACH:

- Building a strong relationship with citizens is the most important step in getting storm water education city-wide.
- Educational materials can be tailored to all different age groups and technical background.
- Should make people aware of the potential impacts of hazardous household materials on water quality and inform residents of ways to properly store, handle, and dispose of the chemicals
- Water usage in the home can easily be reduced by 15 to 20 percent—without major discomfort—by implementing a program to conserve water in the home.
- Lawn and garden activities can result in contamination of storm water through pesticide, soil, and fertilizer runoff. Proper landscape management, however, can effectively reduce water use and contaminant runoff and enhance the aesthetics of a property.

LIMITATIONS:

- Not everyone will actually read or incorporate the information into their lives.
- Budgets need to have sufficient funds to obtain educational materials and their distribution.

MAINTENANCE:

- Programs and educational materials can be re-used, but they must be presented on a continual basis.

APPLICATIONS

- ☒ Manufacturing
- ☒ Material Handling
- ☒ Vehicle Maintenance
- ☒ Construction
- ☒ Commercial Activities
- ☒ Roadways
- ☒ Waste Containment
- ☒ Housekeeping Practices

TARGETED POLLUTANTS

- ■ Sediment
- ■ Nutrients
- ■ Heavy Metals
- ■ Toxic Materials
- ■ Oxygen Demanding Substances
- ■ Oil & Grease
- ■ Floatable Materials
- ■ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

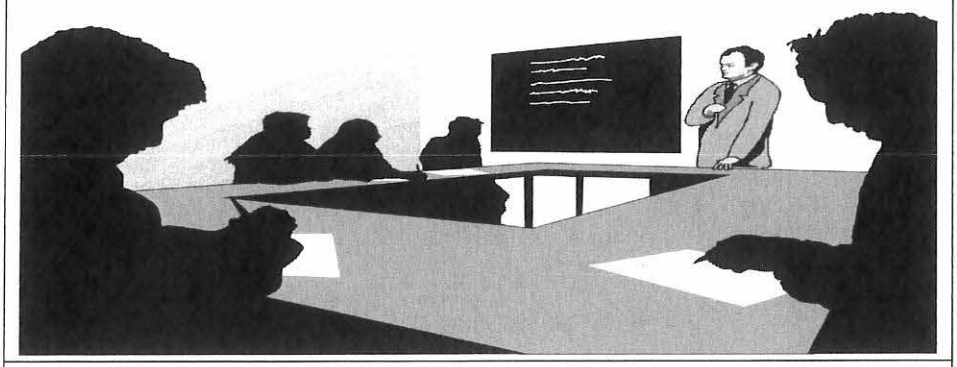
IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☐ O&M Costs
- ☐ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Employee Training

ET



DESCRIPTION:

Employee training, like equipment maintenance, is a method by which to implement BMPs. Employee training should be used in conjunction with all other BMPs as part of the facility=s SWPPP.

The specific employee training aspects of each of the source controls are highlighted in the individual information sheets. The focus of this information sheet is more general, and includes the overall objectives and approach for assuring employee training in stormwater pollution prevention. Accordingly, the organization of this information sheet differs somewhat from the other information sheets in this chapter.

OBJECTIVES:

Employee training should be based on four objectives:

< Promote a clear identification and understanding of the problem, including activities with the potential to pollute stormwater;
< Identify solutions (BMPs);
< Promote employee ownership of the problems and the solutions; and
< Integrate employee feedback into training and BMP implementation.

APPROACH:

< Integrate training regarding stormwater quality management with existing training programs that may be required for other regulations.
< Employee training is a vital component of many of the individual source control BMPs included in this manual.

PROGRAM ELEMENTS

: New Development
: Residential
: Commercial Activities
: Industrial Activities
: Municipal Facilities
: Illegal Discharges

SALT LAKE COUNTY

TARGETED POLLUTANTS

Sediment
Nutrients
Heavy Metals
Toxic Materials
Oxygen Demanding Substances
Oil & Grease
Floatable Materials
Bacteria & Viruses

■ High Impact
☒ Medium Impact
☐ Low or Unknown Impact

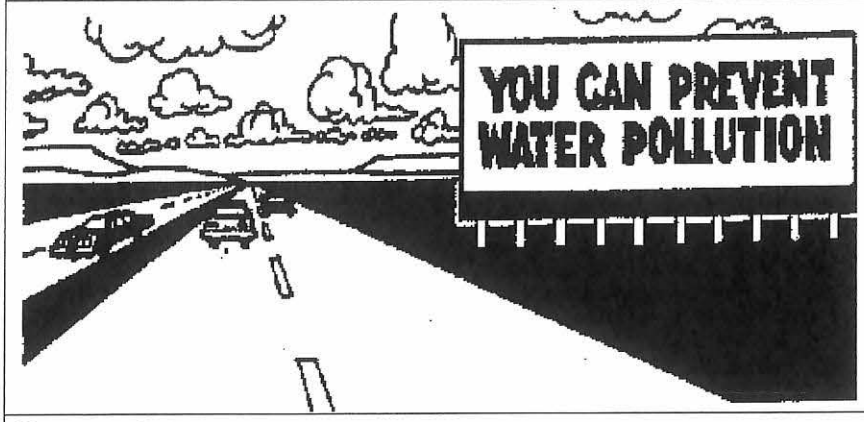
IMPLEMENTATION REQUIREMENTS

: Capital Costs
: O&M Costs
9 Regulatory
Training
: Staffing
: Administrative

■ High ☒ Medium ☐ Low

BMP: Public Education/Participation

PEP



DESCRIPTION:

Public education/participation, like an ordinance or a piece of equipment, is not so much a best management practice as it is a method by which to implement BMPs. This information sheet highlights the importance of integrating elements of public education and participation into a municipality=s overall plan for stormwater quality management.

A public education and participation plan provides the municipality with a strategy for educating its employees, the public, and businesses about the importance of protecting stormwater from improperly used, stored, and disposed of pollutants. Municipal employees must be trained, especially those that work in departments not directly related to stormwater but whose actions affect stormwater. Residents must become aware that a variety of hazardous products are used in the home and that their improper use and disposal can pollute stormwater. Increased public awareness also facilitates public scrutiny of industrial and municipal activities and will likely increase public reporting of incidents.

APPROACH:

< Pattern a new program after the many established programs around the country.
< Implement public education/participation as a coordinated campaign in which each message is related to the last.
< Present a clear and consistent message and image to the public regarding how they contribute to stormwater pollution and what they can do to reduce it.
< Utilize multi-media to reach the full range of audiences.
< Translate messages into the foreign languages of the community to reach the full spectrum of your populace and to avoid misinterpretation of messages.
< Create an awareness and identification with the local watershed.
< Use everyday language in all public pieces. Use outside reviewers to highlight and reduce the use of technical terminology, acronyms, and jargon.
< Make sure all statements have a sound, up-to-date technical basis. Do not contribute to the spread of misinformation.
< Break complicated subjects into smaller more simple concepts. Present these concepts to the public in a metered and organized way to avoid Aoverloading@ and confusing the audience.

LIMITATIONS:

None

PROGRAM ELEMENTS

9 New Development
: Residential
: Commercial Activities
9 Industrial Activities
: Municipal Facilities
: Illegal Discharges

SALT LAKE COUNTY

TARGETED POLLUTANTS

Sediment
Nutrients
Heavy Metals
Toxic Materials
Oxygen Demanding Substances
Oil & Grease
Floatable Materials
Bacteria & Viruses

■ High Impact
☒ Medium Impact
☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

Capital Costs
: O&M Costs
9 Regulatory
: Training
: Staffing
: Administrative

■ High ☒ Medium ☐ Low

BMP: Using the Media

UM

Television can be an effective means of informing the public about storm water problems and outreach events

APPLICATIONS

☒ Manufacturing
☒ Material Handling
☒ Vehicle Maintenance
☒ Construction
☒ Commercial Activities
☒ Roadways
☒ Waste Containment
☒ Housekeeping Practices

DESCRIPTION:

The media can be strong allies to a storm water pollution prevention campaign in educating the public about storm water issues. Through the media, a program can educate targeted or mass audiences about problems and solutions, build support for remediation and retrofit projects, or generate awareness and interest in storm water management. Best of all, packaging a storm water message as a news story is virtually free!

APPROACH:

- *Newspapers and Magazines.* Newspapers are powerful vehicles for delivering educational information, policy analyses, public notices, and other messages. Many displays at watershed seminars proudly post newspaper articles on the projects being presented in recognition of the importance and impact of newspaper coverage.
- Newspapers can be accessed in several ways. Depending on the message or event, the appropriate format might be a news release, news advisory, query letter, letter to the editor, or (for urgent, timely information) a news conference
- *Magazines.* Magazines, like newspapers, allow for greater length and analysis than television and provide the additional benefit of targeting specific audiences (e.g., landscapers, automobile mechanics, farmers, or recreationists).
- *Radio.* In spite of the popularity of video, radio remains a strong media contender due to its affordable production costs and creative possibilities. Further, commuters who drive to work spend much time in their vehicles.
- *Television.* Television is the primary source of news for the majority of the population, and local reporters are generally interested in covering environmental stories that pertain to their area.
- Issues will attract television coverage if they Involve local people or issues, Focus on unique or unusual attributes, Affect many people throughout a region, Involve controversy or strong emotions
- *Internet Message.* Increasingly, the Internet is becoming a powerful means of communication. It provides worldwide access to hundreds of thousands of sites containing millions of documents, chat rooms for special interest groups, and incredible database/mapping features.

LIMITATIONS:

- Working with the media is essentially free, but not always.

TARGETED POLLUTANTS

■ Sediment
■ Nutrients
■ Heavy Metals
■ Toxic Materials
■ Oxygen Demanding Substances
■ Oil & Grease
■ Floatable Materials
■ Bacteria & Viruses

■ High Impact
☒ Medium Impact
☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

☐ Capital Costs
☐ O&M Costs
☐ Maintenance
☐ Training

■ High ☒ Medium ☐ Low

BMP: Community Hotlines

CH

DESCRIPTION:

Because regulators and authorities cannot monitor all water bodies at once, they sometimes rely on the public to keep them informed of water polluters. Community hotlines provide a means for concerned citizens and agencies to contact the appropriate authority when they see water quality problems.

APPROACH:

- Once a city has determined that they need a hotline, they should choose between a telephone or an e-mail hotline.
- A party or agency responsible for maintaining the hotline and responding to incoming complaints must first be identified. The responsible party could be a division of local government, a water quality board, a public utility, or an environmental agency.
- All distributed materials should include pollution hotline numbers and information.
- Curbs should have pumping systems, instead of drainage systems, for collecting spilled materials.
- Generally, an investigation team promptly responds to a hotline call and, in most cases, visits the problem site.
- If a responsible party can be identified, the team informs the party of the problem, offers alternatives for future disposal, and instructs the party to resolve the problem.

LIMITATIONS:

- The community's ability to pay for it.
- The ability of the community to keep the hotline staffed.

MAINTENANCE:

- The most important part is the responsiveness of the hotline. If a citizen reports an illegal dumping but no action is taken by the appropriate authority, that citizen could lose faith in the hotline and might not call back with future information.

APPLICATIONS

- ■ Manufacturing
- ■ Material Handling
- ■ Vehicle Maintenance
- ■ Construction
- ■ Commercial Activities
- ☒ Roadways
- ☒ Waste Containment
- ■ Housekeeping Practices

TARGETED POLLUTANTS

- ☒ Sediment
- ☒ Nutrients
- ■ Heavy Metals
- ■ Toxic Materials
- ☒ Oxygen Demanding Substances
- ■ Oil & Grease
- ■ Floatable Materials
- ☒ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

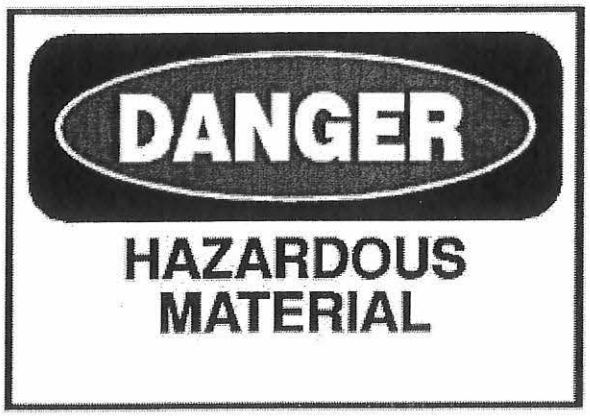
IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☒ O&M Costs
- ☒ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Hazardous Waste Management

HWM



DESCRIPTION:
Prevent or reduce the discharge of pollutants to stormwater from hazardous waste throughproper material use,waste disposal,and training of employees and subcontractors.

APPLICATION:
Many of the chemicals used on-site can be hazardous materials which become hazardous waste upon disposal. These wastes may include:

- Paints and Solvents; petroluem products sucha s oils, fuels, and grease; herbicides and pesticides; Acids for cleaning masonry; and concrete curing compounds.

In addition, sites with existing structures may contain wastes which must be disposed of in accordance with Federal, State, and local regulations, including:

- Sandblasting grit mixed with lead, cadmium, or chromium-based paints; Asbestos; and PCB's.

INSTALLATION/APPLICATION CRITERIA:
The following steps will help reduce storm water pollution from hazardous wastes:

- Use all of the product before disposing of the container.
- Do not remove the original product label, it contains important safety and disposal information.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried off-site by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with Federal and State regulations.

LIMITATIONS:
Hazardous wastethat cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.

MAINTENANCE:

- Inspect hazardous waste receptacles and area regularly.
- Arrange for regular hazardous waste collection.

OBJECTIVES

- ☐ Housekeeping Practices
- ☒ Contain Waste
- ☐ Minimize Disturbed Areas
- ☐ Stabilize Disturbed Areas
- ☐ Protect Slopes/Channels
- ☐ Control Site Perimeter
- ☐ Control Internal Erosion

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TARGETED POLLUTANTS

- ☐ Sediment
- ☐ Nutrients
- ❋ Toxic Materials
- ☐ Oil & Grease
- ☐ Floatable Materials
- ☐ Other Waste

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

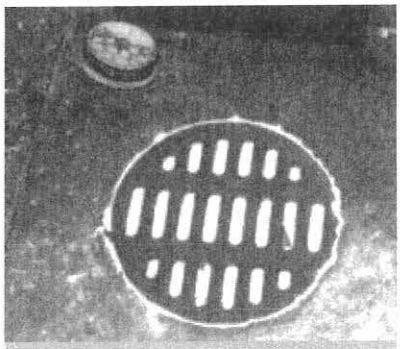
- ☐ Capital Costs
- ☐ O&M Costs
- ❋ Maintenance
- ❋ Training

■ High ☒ Medium ☐ Low

BMP: Identifying Illicit Connections

IIC

One of the ways to identify illicit connections is by inspecting storm drain system using video equipment (Source: Drain Patrol, no date)



A common source of pollution from businesses is a floor drain that is improperly connected to a storm drain (Source: Petro-Marine Company, Inc., no date)

APPLICATIONS

- ☒ Manufacturing
- ☒ Material Handling
- ☐ Vehicle Maintenance
- ☒ Construction
- ☒ Commercial Activities
- ☐ Roadways
- ☒ Waste Containment
- ☐ Housekeeping Practices

DESCRIPTION:

Involves the identification and elimination of illegal or inappropriate connections of industrial and business wastewater sources to the storm drain system. It attempts to prevent contamination of ground and surface water supplies by regulation, inspection, and removal of these connections. The large amount of storm and sanitary sewer pipes in a community creates a complex and often confusing system of utilities, so it is not unusual for improper connections to occur.

APPROACH:

- Discharges from industry and business may come from a variety of sources including process wastewater, wash waters, and sanitary wastewater. The following methods are often used for identifying improper industrial discharges to the storm drain system
- *Visual Inspection.* A physical examination of piping connections or analysis by closed circuit camera is used to identify possible illicit connection sites.
- *Piping Schematic Review.* Architectural plans and plumbing details are examined for potential sites where improper connections have occurred.
- *Smoke Testing.* Smoke testing is used to locate connections by injecting a non-toxic vapor (smoke) into the system and following its path of travel.
- *Dye Testing.* Colored dye is added to the drain water in suspect piping. Dyed water appearing in the storm drain system indicates an illegal connection, possibly between the sanitary sewer system and the storm drain.
- Instituting building and plumbing codes to prevent connections of potentially hazardous pollutants to storm drains.
- *Flow Monitoring.* Monitoring increases in storm sewer flows during dry periods can also lead investigators to sources of infiltration due to improper connections.
- *Inspection using video equipment*
- Instituting building and plumbing codes to prevent connections of potentially hazardous pollutants to storm drains.

LIMITATIONS:

- A local ordinance is necessary to provide investigators with access to private property in order to perform field tests (Ferguson et al. 1997).
- Rain fall can hamper efforts to monitor flows and visual inspections.

MAINTENANCE:

- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.

TARGETED POLLUTANTS

- ☐ Sediment
- ■ Nutrients
- ■ Heavy Metals
- ■ Toxic Materials
- ■ Oxygen Demanding Substances
- ■ Oil & Grease
- ■ Floatable Materials
- ■ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

- ■ Capital Costs
- ☒ O&M Costs
- ☒ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Illegal Solids Dumping Control

ISDC

Signs can be used to discourage dumping in sensitive areas (Source: NCDENR, 2000)

APPLICATIONS

- ☒ Manufacturing
- ☒ Material Handling
- ☐ Vehicle Maintenance
- ☒ Construction
- ☒ Commercial Activities
- ☒ Roadways
- ☒ Waste Containment
- ☒ Housekeeping Practices

DESCRIPTION:

By locating and correcting illegal dumping practices through education and enforcement measures, the many risks to public safety and water quality associated with illegal disposal actions can be prevented. Illegal dumping control is important to preventing contaminated runoff from entering wells and surface water, as well as averting flooding due to blockages of drainage channels for runoff.

APPROACH:

- Illegal dumping can occur in both urban and rural settings and can happen in all geographic regions.
- Illegal dumping control programs focus on community involvement and targeted enforcement to eliminate or reduce illegal dumping practices.
- Control programs use a combination of public education, citizen participation, site maintenance, and authorized enforcement measures to address illegal waste disposal.
- Issues that need to be examined when creating a program include the following:
  The locations of persistent illegal dumping activity
  Types of waste dumped and the profile of dumpers
- Possible driving forces behind illegal dumping such as excessive user fees, restrictive curbside trash pickup, or ineffective recycling programs, Previous education and cleanup efforts, Current control programs and local laws or ordinances addressing the problem, Sources of funding and additional resources that may be required.

LIMITATIONS:

- Illegal dumping is often spurred by cost and convenience considerations, and a number of factors encourage this practice
- A lack of understanding regarding applicable laws or the inadequacy of existing laws may also contribute to the problem.

MAINTENANCE:

- Efforts need to be continual.

TARGETED POLLUTANTS

- ☐ Sediment
- ☒ Nutrients
- ■ Heavy Metals
- ■ Toxic Materials
- ☒ Oxygen Demanding Substances
- ■ Oil & Grease
- ■ Floatable Materials
- ■ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

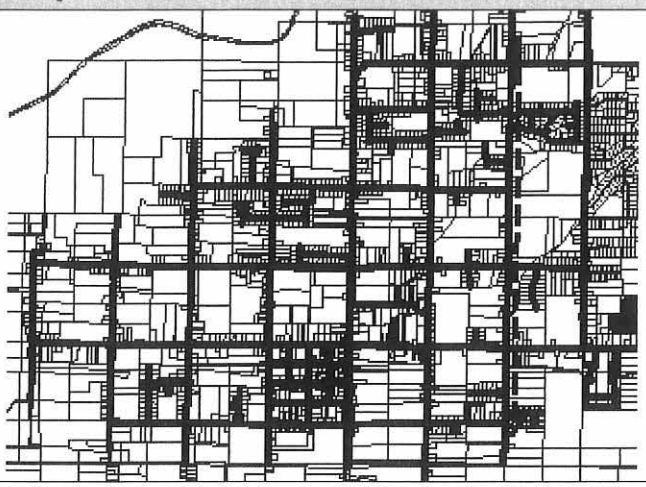
IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☒ O&M Costs
- ☒ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Map Storm Water Drains

MSWD



APPLICATIONS

☒Manufacturing
☐ Material Handling
☐ Vehicle Maintenance
☒ Construction
☒ Commercial Activities
☐ Roadways
☒ Waste Containment
☐ Housekeeping Practices

DESCRIPTION:

Develop an integrated storm water sewer system map that identifies existing piping, open cannels, storm drain outfalls, receiving water bodies and retention/detention basins.

APPROACH:

- Determine if effort will be out-sourced or completed in-house
- Compile existing drawings
- Gather drawings of new developments
- Convert drawings of new developments
- Identify any possible illegal discharges
- Use in determining possible causes of a pollution
- Require new developments to supply city with updated drainage maps to be integrated into the system.

LIMITATIONS:

- Some additional surveying may need to be done on existing structures
- Training may be required to familiarize with software

MAINTENANCE:

- Map will need to be updated constantly as new developments arise
- Checks and changes may be necessary as as-builds and differences are discovered
- Inspection

TARGETED POLLUTANTS

☒ Sediment
☒ Nutrients
☒ Heavy Metals
☒ Toxic Materials
☒ Oxygen Demanding Substances
☒ Oil & Grease
☒ Floatable Materials
☒ Bacteria & Viruses

■ High Impact
☒ Medium Impact
☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

☒ Capital Costs
☐ O&M Costs
☐ Maintenance
☐ Training

BMP: Non-Stormwater Discharges To Drains

NSWD

DESCRIPTION:
Eliminate non-stormwater discharges to the stormwater collection system. Non-stormwater discharges may include: process wastewaters, cooling waters, wash waters, and sanitary wastewater.

APPROACH:
The following approaches may be used to identify non-stormwater discharges:

- Visual inspection: the easiest method is to inspect each discharge point during dry weather. Keep in mind that drainage from a storm event can continue for three days or more and groundwater may infiltrate the underground stormwater collection system.
- Piping Schematic Review: The piping schematic is a map of pipes and drainage systems used to carry wastewater, cooling water, sanitary wastes, etc... A review of the "as-built" piping schematic is a way to determine if there are any connections to the stormwater collection system. Inspect the path of floor drains in older buildings.
- Smoke Testing: Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems. During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.
- Dye Testing: A dye test can be performed by simply releasing a dye into either the sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

LIMITATIONS:

- Many facilities do not have accurate, up-to-date schematic drawings.
- Video and visual inspections can identify illicit connections to the storm sewer, but further testing is sometimes required (e.g. dye, smoke) to identify sources.

APPLICATIONS

- ☒ Manufacturing
- ☐ Material Handling
- ☒ Vehicle Maintenance
- ☐ Construction
- ☒ Commercial Activities
- ☐ Roadways
- ☒ Waste Containment
- ☒ Housekeeping Practices

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TARGETED POLLUTANTS

- ☐ Sediment
- ■ Nutrients
- ■ Heavy Metals
- ■ Toxic Materials
- ■ Oxygen Demanding Substances
- ■ Oil & Grease
- ☒ Floatable Materials
- ■ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☐ O&M Costs
- ☐ Maintenance
- ☒ Training

■ High ☒ Medium ☐ Low

BMP: Ordinance Development

OD

APPLICATIONS

- ☒ Manufacturing
- ☒ Material Handling
- ☒ Vehicle Maintenance
- ☒ Construction
- ☒ Commercial Activities
- ☒ Roadways
- ☒ Waste Containment
- ☒ Housekeeping Practices

DESCRIPTION:

Existing ordinances relating to storm water are reviewed for compliance. New ordinances are written to prohibit non-storm water discharges into the Municipal Separate Storm Sewer System (MS4), require proper erosion and sediment controls on construction sites, require the implementation of post-construction runoff controls, and to ensure proper planning/zoning protections.

APPROACH:

- Review existing storm drain ordinances for consistency and compliance with state and federal regulations and make improvements, if necessary. Ensure that no conflicts will occur with new ordinances that will be written and adopted.
- Write and adopt an ordinance that prohibits (to the extent allowable under State, Tribal, or local law) the discharge of non-storm water discharges into the MS4 with appropriate enforcement procedures and actions.
- Write and adopt an ordinance, with sanctions to ensure compliance, requiring the implementation of proper erosion and sediment controls, and controls for other wastes, on applicable construction sites.
- Write and adopt an ordinance requiring the implementation of post-construction runoff controls to the extent allowable under State, Tribal, or local law.
- Educate the public about the new ordinances.
- Enforce the new ordinances.

LIMITATIONS:

- Wording of ordinances is often difficult. It should be specific to serve the intended purpose, but not too specific to cause potential conflicts with other ordinances or situations.
- Once an ordinance is adopted, it can be difficult to modify ordinances to meet changing needs.
- Ordinances have to be enforced to be beneficial.
- Ordinances take time to change.

TARGETED POLLUTANTS

- ☒ Sediment
- ☒ Nutrients
- ☒ Heavy Metals
- ☒ Toxic Materials
- ☒ Oxygen Demanding Substances
- ☒ Oil & Grease
- ☒ Floatable Materials
- ☒ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

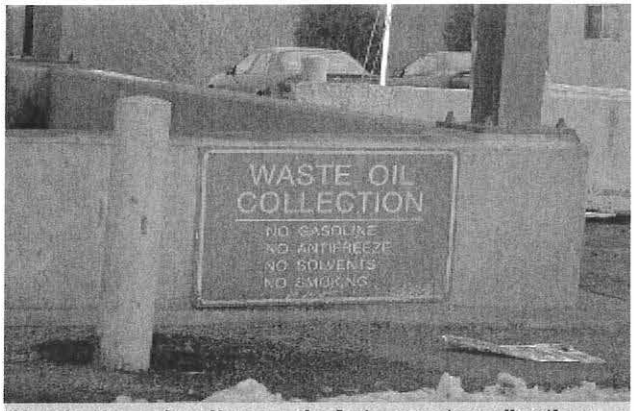
IMPLEMENTATION REQUIREMENTS

- ■ Capital Costs
- ☐ O&M Costs
- ☐ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Used Oil Recycling

UOR



Used oil can be disposed of at a waste collection facility, where it will be collected and later sent to a recycling facility

APPLICATIONS

- ☒ Manufacturing
- ☒ Material Handling
- ☒ Vehicle Maintenance
- ☒ Construction
- ☒ Commercial Activities
- ☐ Roadways
- ☒ Waste Containment
- ☒ Housekeeping Practices

DESCRIPTION:

Used motor oil is a hazardous waste because it contains heavy metals picked up from the engine during use. Since it is toxic to humans, wildlife, and plants, it should be disposed of at a local recycling or disposal facility.

APPROACH:

- When establishing oil recycling programs, municipalities should provide the public with the proper informational resources.
- The public can also call 1-800-RECYCLE or contact Earth's 911 at *www.1800cleanup.org/* for more information.
- Municipalities also need to address oil filter recycling in their recycling programs.
- To make recycling motor oil more convenient for the do-it-yourselfers, oil recycling programs should be located throughout all communities.
- Two types of programs currently in use are drop-off locations and curbside collection. Drop-off locations include service stations, recycling centers, auto parts retail stores, quick lubes, and landfills.

LIMITATIONS:

- If oil is mixed with other substances or if storage containers have residues of other substances, this can contaminate oil and make it a hazardous waste.
- It is often difficult to effectively educate the public and convince them of the importance of recycling oil. This limitation can be addressed if municipalities include recycling information in utility bill inserts, newspaper ads, and mailings.

MAINTENANCE:

- Costs for used motor oil recycling programs vary depending on whether a community has already established similar types of recycling programs.
- Major costs associated with oil recycling programs include advertisement costs and oil collection costs.

TARGETED POLLUTANTS

- ☐ Sediment
- ☐ Nutrients
- ■ Heavy Metals
- ■ Toxic Materials
- ☐ Oxygen Demanding Substances
- ■ Oil & Grease
- ☐ Floatable Materials
- ☐ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

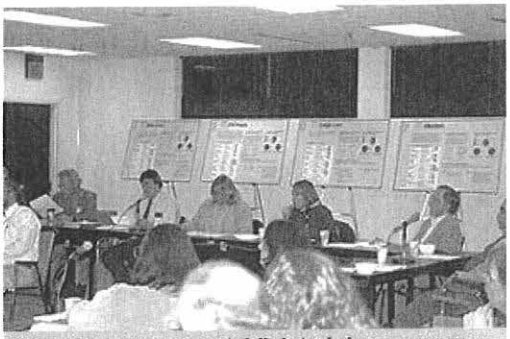
IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☒ O&M Costs
- ☒ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Contractor Certification &Inspector Training

CCIT



Municipalities can establish training programs to educate contractors about erosion and sediment control practices

Construction reviewers periodically inspect construction sites to ensure that contractors have installed and maintained their erosion and sediment controls properly (Source: University of Connecticut Cooperative Extension System, 2000)

APPLICATIONS

- ☐ Manufacturing
- ☒ Material Handling
- ☐ Vehicle Maintenance
- ☒ Construction
- ☐ Commercial Activities
- ☐ Roadways
- ☒ Waste Containment
- ☐ Housekeeping Practices

DESCRIPTION:

One of the most important factors determining whether or not erosion and sediment controls will be properly installed and maintained on a construction site is the knowledge and experience of the contractor. Many communities require certification for key on-site employees who are responsible for implementing the ESC plan. Several states have contractor certification programs. The State of Delaware requires that at least one person on any construction project be formally certified. The Delaware program requires certification for any foreman or superintendent who is in charge of onsite clearing and land-disturbing activities for sediment and runoff control associated with a construction project.

APPROACH:

- Training and certification will help to ensure that the plans are properly implemented and that best management practices are properly installed and maintained.
- Inspector training programs are appropriate for municipalities with limited funding and resources for ESC program implementation.
- Contractor certification can be accomplished through municipally sponsored training courses, or more informally, municipalities can hold mandatory pre-construction or pre-wintering meetings and conduct regular and final inspection visits to transfer information to contractors (Brown and Caraco, 1997).
- To implement an inspector training program, the governing agency would need to establish a certification course with periodic recertification, review reports submitted by private inspectors, conduct spot checks for accuracy, and institute fines or other penalties for noncompliance.
- Curb systems should be maintained through curb repair (patching and replacement).
- To minimize the amount of spilled material tracked outside of the area by personnel, grade within the curbing to direct the spilled materials to a down-slope side of the curbing, thus keeping the spilled materials away from personnel and equipment. Grading will also facilitate clean-up.

LIMITATIONS:

- Contractor certification and inspector training programs require a substantial amount of effort on the part of the municipality or regulatory agency.
- They need to develop curricula for training courses, dedicate staff to teach courses, and maintain a report review and site inspection staff to ensure that both contractors and inspectors are fulfilling their obligations and complying with the ESC program.

TARGETED POLLUTANTS

- ■ Sediment
- ■ Nutrients
- ☐ Heavy Metals
- ■ Toxic Materials
- ☐ Oxygen Demanding Substances
- ■ Oil & Grease
- ■ Floatable Materials
- ☐ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

- ■ Capital Costs
- ■ O&M Costs
- ☒ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Erosion Control Plan

ECP

Diversion dikes can be used to contain storm water onsite

DESCRIPTION:

Erosion and sediment control are generally two of the biggest problems on construction sites. Erosion control measures must be taken during a construction project. An Erosion Control Plan will be submitted and approved before work can begin on the project. An Erosion Control Plan describes what erosion control BMPs will be implemented, when and where, during the project. Erosion and sediment control measures should be installed before other construction activities begin.

APPROACH:

- Create a list of possible erosion control BMPs that could be implemented in any given project.
- Require submittal of erosion & sediment control plans for projects that are on 1 acre and larger sites.
- Develop a review checklist for plan review personnel.
- Provide the review checklist to contractors/developers so they know what is expected.
- Provide inspectors with a copy of the approved plans.
- Check to make sure erosion control measures are properly installed before beginning other construction activities.

LIMITATIONS:

- Must be enforced to be affective.
- Sometimes site conditions are different than planned on and the plans have to be modified.
- The erosion control measures have to be maintained.
- The BMPs have to be installed early on in the project.
- The BMPs have to be removed after the threat of erosion is no longer present.

APPLICATIONS

- ☐ Manufacturing
- ☐ Material Handling
- ☐ Vehicle Maintenance
- ■ Construction
- ☐ Commercial Activities
- ☒ Roadways
- ☐ Waste Containment
- ☐ Housekeeping Practices

TARGETED POLLUTANTS

- ■ Sediment
- ☒ Nutrients
- ☐ Heavy Metals
- ☐ Toxic Materials
- ☐ Oxygen Demanding Substances
- ☐ Oil & Grease
- ☐ Floatable Materials
- ☐ Bacteria & Viruses

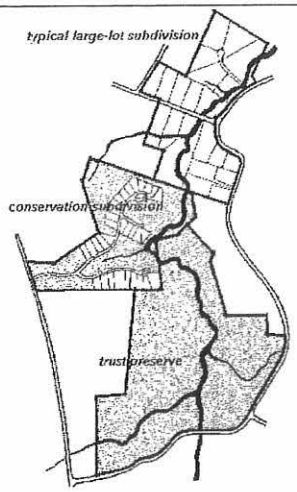
- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☒ O&M Costs
- ☐ Maintenance
- ☒ Training

BMP: Zoning

ZO



DESCRIPTION:

Zoning is a classification scheme for land use planning. Zoning can serve numerous functions and can help mitigate storm water runoff problems by facilitating better site designs. By correctly applying the right zoning technique, development can be targeted into specific areas, limiting development in other areas and providing protection for the most important land conservation areas.

APPROACH:

- Impervious Overlay Zoning: This type of overlay zoning limits future impervious areas.
- Incentive Zoning: This planning technique relies on bonuses or incentives for developers to encourage the creation of certain amenities or land use designs. A developer is granted the right to build more intensively on a property or given some other bonus in exchange for an amenity or a design that the community considers beneficial.
- Performance Zoning: Performance zoning is a flexible approach that has been employed in a variety of fashions in several different communities across the country. Some performance factors include traffic or noise generation limits, lighting requirements, storm water runoff quality and quantity criteria, protection of wildlife and vegetation, and even architectural style criteria
- Urban Growth Boundaries: Urban growth boundaries are sometimes called development service districts and include areas where public services are already provided (e.g., sewer, water, roads, police, fire, and schools).

LIMITATIONS:

- Some zoning techniques may be limited by economic and political acceptance and should be evaluated on these criteria as well as storm water management goals.

APPLICATIONS

- ☐ Manufacturing
- ☐ Material Handling
- ☐ Vehicle Maintenance
- ☒ Construction
- ☒ Commercial Activities
- ☐ Roadways
- ☐ Waste Containment
- ☐ Housekeeping Practices

TARGETED POLLUTANTS

- ☒ Sediment
- ☐ Nutrients
- ☐ Heavy Metals
- ☐ Toxic Materials
- ☐ Oxygen Demanding Substances
- ☐ Oil & Grease
- ☐ Floatable Materials
- ☐ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☒ O&M Costs
- ☒ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: BMP Inspection and Maintenance

BMPIM

APPLICATIONS

- ☐ Manufacturing
- ☒ Material Handling
- ☒ Vehicle Maintenance
- ☐ Construction
- ☐ Commercial Activities
- ☐ Roadways
- ☒ Waste Containment
- ☒ Housekeeping Practices

DESCRIPTION:

Inspect and maintain all structural BMP's (both existing and new) on a routine basis to remove pollutants from entering storm drain inlets. This includes the establishment of a schedule for inspections and maintenance.

APPROACH:

Regular maintenance of all structural BMP's is necessary to ensure their proper functionality.

- Annual inspections.
- Prioritize maintenance to clean, maintain, and repair or replace structures in areas beginning with the highest pollutant loading.
- Clean structural BMP's in high pollutant areas just before the wet season to remove sediments and debris accumulated during the summer and fall.
- Keep accurate logs of what structures were maintained and when they were maintained.
- Record the amount of waste collected.

LIMITATIONS:

- Cost
- Availability of trained staff

LINDON

TARGETED POLLUTANTS

- ■ Sediment
- ■ Nutrients
- ☐ Heavy Metals
- ■ Toxic Materials
- ☐ Oxygen Demanding Substances
- ■ Oil & Grease
- ■ Floatable Materials
- ☐ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

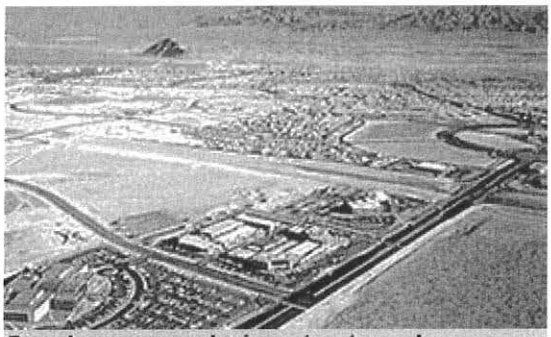
IMPLEMENTATION REQUIREMENTS

- ■ Capital Costs
- ■ O&M Costs
- ☒ Maintenance
- ☒ Staffing
- ☐ Training
- ☐ Administrative

■ High ☒ Medium ☐ Low

BMP: Infrastructure Planning

IPL



Developers can design streets and pedestrian paths to maximize convenience and safety while at the same time minimizing impervious surface area (Source: The Rouse Company, no date)

APPLICATIONS

- ☐ Manufacturing
- ☐ Material Handling
- ☐ Vehicle Maintenance
- ☒ Construction
- ☒ Commercial Activities
- ☒ Roadways
- ☐ Waste Containment
- ☐ Housekeeping Practices

DESCRIPTION:

This practice requires changes in the regional growth planning process to contain sprawl development. Sprawl development is the expansion of low-density development into previously undeveloped land. The American Farmland Trust has estimated that the United States is losing about 50 acres an hour to suburban and exurban development (Longman, 1998). This sprawl development requires local governments to extend public services to new residential communities whose tax payments often do not cover the cost of providing those services. For example, in Prince William County, Virginia, officials have estimated that the costs of providing services to new residential homes exceeds what is brought in from taxes and other fees by $1,600 per home (Shear and Casey, 1996).

Infrastructure planning makes wise decisions to locate public services—water, sewer, roads, schools, and emergency services—in the suburban fringe and direct new growth into previously developed areas, discouraging

Low-density development. Generally, this is done by drawing a boundary or envelope around a community, beyond which major public infrastructure investments are discouraged or not subsidized. Meanwhile, economic and other incentives are provided within the boundary to encourage growth in existing neighborhoods.

APPROACH:

- Sprawl development negatively impacts water quality in several ways. The most significant impact comes from the increase in impervious cover that is associated with sprawl growth. In addition to rooftop impervious area from new development, extension of road systems and additions of paved surface from driveways create an overall increase in imperviousness.
- *Urban Growth Boundaries.* This planning tool establishes a dividing line that defines where a growth limit is to occur and where agricultural or rural land is to be preserved. Often, an urban services area is included in this boundary that creates a zone where public services will not be extended.
- *Infill/Community Redevelopment.* This practice encourages new development in unused or underutilized land in existing urban areas. Communities may offer tax breaks or other economic incentives to developers to promote the redevelopment of properties that are vacant or damaged.

LIMITATIONS:

- Intense development of existing areas can create a new set of challenges for storm water program managers. Storm water management solutions are often more difficult and complex in ultra-urban areas than in suburban areas
- Infrastructure planning is often done on a regional scale and requires a cooperative effort between all the communities within a given region in order to be successful.

TARGETED POLLUTANTS

- ☒ Sediment
- ☐ Nutrients
- ☐ Heavy Metals
- ☐ Toxic Materials
- ☐ Oxygen Demanding Substances
- ☐ Oil & Grease
- ☐ Floatable Materials
- ☐ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

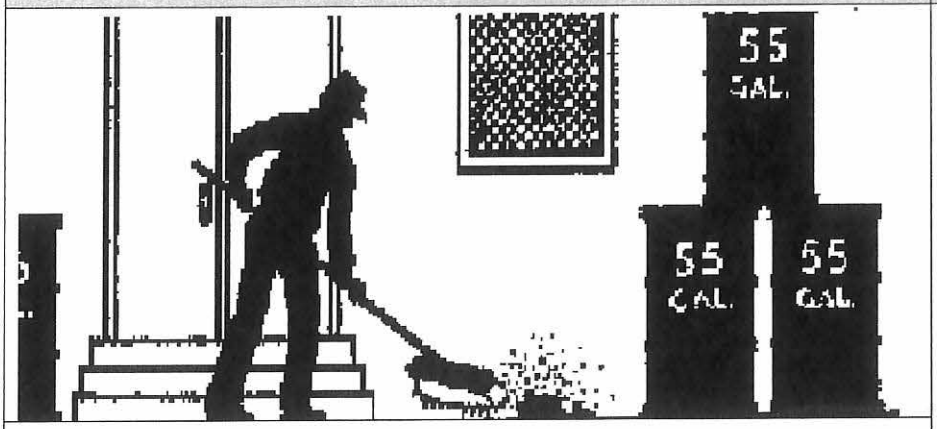
IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☒ O&M Costs
- ☒ Maintenance
- ☐ Training

■ High ☒ Medium ☐ Low

BMP: Housekeeping Practices

HP



DESCRIPTION:

Promote efficient and safe housekeeping practices (storage, use, and cleanup) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals.

APPROACH:

< Pattern a new program after the many established programs from municipalities around the country. Integrate this best management practice as much as possible with existing programs at your municipality.

< This BMP has two key audiences: municipal employees and the general public.

< For the general public, municipalities should establish a public education program that provides information on such items as storm water pollution and beneficial effects of proper disposal on water quality; reading product labels; safer alternative products; safe storage, handling, and disposal of hazardous products; list of local agencies; and emergency phone numbers. The programs listed below have provided this information through brochures or booklets that are available at a variety of locations including municipal offices, household hazardous waste collection events or facilities, and public information fairs.

Municipal facilities should develop controls on the application of pesticides, herbicides, and fertilizers in public right-of-ways and at municipal facilities. Controls may include:

< List of approved pesticides and selected uses.
< Product and application information for users.
< Equipment use and maintenance procedures.
< Record keeping and public notice procedures.

LIMITATIONS:

There are no major limitations to this best management practice.

PROGRAM ELEMENTS

☐ New Development
☒ Residential
☐ Commercial Activities
☐ Industrial Activities
☒ Municipal Facilities
☐ Illegal Discharges

SALT LAKE COUNTY

TARGETED POLLUTANTS

Sediment
Nutrients
9 Heavy Metals
Toxic Materials
Oxygen Demanding Substances
Oil & Grease
9 Floatable Materials
9 Bacteria & Viruses

■ High Impact
☒ Medium Impact
☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

9 Capital Costs
: O&M Costs
9 Regulatory
Training
: Staffing
9 Administrative

■ High ☒ Medium ☐ Low

BMP: Landscape & Irrigation Plan

LIP

DESCRIPTION:

All developers are required to submit a landscape and irrigation plan for their developments. Lawn and garden activities can result in contamination of storm water through pesticide, soil, and fertilizer runoff. Proper landscape management, however, can effectively reduce water use and contaminant runoff as well as enhance the aesthetics of a property.

APPROACH:

- Develop landscape and irrigation plan preparation guidelines.
- Require a landscape and irrigation plan for each new commercial development.
- Educate local developers on how to create effective landscape and irrigation plans for their new developments.
- Educate municipal staff to review property landscape and irrigation plans to minimize runoff.
- Check all new irrigation plans to ensure that there will be no overspray onto impervious surfaces and that the irrigation water will be contained on site.
- Uniform coverage for sprinkler systems should be checked to help minimize over watering.

LIMITATIONS:

- More time and effort will be required of the municipal staff to review new development plans.
- Some communities do note have the expertise to complete proper reviews in-house.

MAINTENANCE:

- Programs and educational materials can be repeatedly sent out or emphasized. Extension service continues to research and provide current data.

APPLICATIONS

- ☒ Manufacturing
- ☐ Material Handling
- ☐ Vehicle Maintenance
- ■ Construction
- ☒ Commercial Activities
- ☐ Roadways
- ☐ Waste Containment
- ☒ Housekeeping Practices

TARGETED POLLUTANTS

- ☐ Sediment
- ■ Nutrients
- ☐ Heavy Metals
- ☐ Toxic Materials
- ☐ Oxygen Demanding Substances
- ☒ Oil & Grease
- ☐ Floatable Materials
- ☐ Bacteria & Viruses

- ■ High Impact
- ☒ Medium Impact
- ☐ Low or Unknown Impact

IMPLEMENTATION REQUIREMENTS

- ☒ Capital Costs
- ☒ O&M Costs
- ☐ Maintenance
- ☒ Training

Process for including water quality on all projects

4.2.6.8. Small MS4 General UPDES Permit Permit No. UTR090000 The Permittee must develop and implement a process to assess the water quality impacts and the design of all new flood management structural controls that are associated with the Permittee or that discharge to the MS4. This process shall include consideration of controls that can be used to minimize the impacts to site water quality and hydrology while still meeting project objectives. A description of this process shall be included in the SWMP document.

1. Review Storm Drain Master Plan for opportunities to include water quality projects or water quality aspects to Capital Improvement Projects.
2. Review and update Master Plan as needed to include water quality issues.
3. During conceptual design review meetings - ask the questions -
    a. *Is there opportunity to include water quality aspects to this project?*
    b. *Are there any highly impacted areas?*
    c. *Are there low-impact development concepts and ideas that might work/or this project?*
    d. *Can we limit directly connected impervious areas (DCIA) on this project?*
    e. *What could be done to minimize runoff?*
4. Train all employees, contractors and developers on SOP's and BMP's for all projects.
5. Include SWPPP discussion as part of the agenda for preconstruction meetings for all projects.
6. Look for "green money" funding options for water quality aspects of all projects.
7. Follow normal SWPPP review process/checklist review for all projects.