

City of Leavenworth, Kansas

**2008 Catch-up Report:
(October 1, 2004 – September 30, 2008)**

Kansas Permit No. : M-MO12-SN01

Federal Permit No. : KSR044011

August 2009

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Section I. - Executive Summary:

The City of Leavenworth, Kansas has prepared this 2008 Catch-up report to outline the measures that it has taken over the last four years to reduce the discharge of pollutants from the Municipal Separate Storm Sewer System (MS4), to protect water quality through the control measures listed in the city's Storm Water Management Program, and to satisfy the city's National Pollutant Discharge Elimination System (NPDES) Permit.

The City of Leavenworth has continued to raise public awareness about the importance of storm water management and the hazards of pollution to groundwater and local streams and rivers. The City understands the value in public involvement and is aggressively working to increase participation of citizens and businesses of Leavenworth.

One aspect of the program that appeared to be especially effective at reducing pollutants in the storm water discharge was the installation of digital ground speed controls on snow removal trucks. This new equipment reduced the problem of placing excess salts and deicers on City streets that eventually washed into the storm sewer system and continue on into the local streams during snow melt and Spring rains.

Less than satisfactory results were experienced in Illicit Discharge Detection and Elimination. The City accomplished sewer testing and video camera operations in the 3 Mile Creek Basin to detect collapsed sewers and non-conforming connections to the network. However, due to budget constraints, the City was unable fund citywide inspections of the entire existing sewer system. Funding has also limited the enforcement and correction the "illegal" connections that were detected.

The most successful part of the Storm Water Management Program was the resident participation in the City's Annual Spring Clean Up Services and Activities. Every year during Spring Clean Up residents and groups come together to clean up assigned streets, streams, parks, and other sections of town. The program is gaining traction with citizens as evidenced, by the 1,131 volunteers that signed up in 2008 to clean up the City of Leavenworth. Other aspects of the Spring Clean Up that were very successful were the increased exposure of the free services offered by the City that included confidential paper shredding, City Brush & Disposal Site, City Recycling Center, disposal of Household Hazardous Waste at the Service Center, as well as the Appliance pick-up. All of these services promote to residents the importance of recycling and properly disposing of their trash and help the city meet their goals as specified in the Storm Water Management Program.

The most challenging aspects of the Storm Water Management Program were continuous public involvement, funding, and enforcement. The example of Spring Clean Up is a very successful program city wide, but Leavenworth strives for continued support throughout the year, from its residents and local organizations.

The city is determined to continue increase public awareness and involvement to satisfy the appropriate water quality requirements and goals of the Clean Water Act, by updating and improving their Storm Water Management Program as new information is available.

**KANSAS STORMWATER ANNUAL REPORT FORM
FOR MUNICIPAL SEPARATE STORM SEWER SYSTEMS
(MS4s)**

Check box if this
is a new name,
address, etc.

A. Permittee Information and Reporting Period

Permittee:	<u>City of Leavenworth, Kansas</u>		<input type="checkbox"/>
Mailing Address 1:	<u>100 N. 5th Street</u>		<input type="checkbox"/>
Mailing Address 2:	_____		<input type="checkbox"/>
City:	<u>Leavenworth</u>		<input type="checkbox"/>
State:	<u>Kansas</u>		<input type="checkbox"/>
Zip Code:	<u>66048</u>		<input type="checkbox"/>
Contact Person:	<u>Bob Patzwald</u>		<input type="checkbox"/>
Contact Phone #:	<u>913-684-0396</u>	Cell #: _____	
Kansas Permit No.:	<u>M</u> - <u>MO12</u> - <u>SN01</u>		
(Example)	M - M C 2 1 - S U 0 1		

The enclosed reports are for:

- Stormwater Management Plan
- Annual Report Year 1: Covers activities from October 1, 2004 – September 30, 2005
- Annual Report Year 2: Covers activities from October 1, 2005 – September 30, 2006
- Annual Report Year 3: Covers activities from October 1, 2006 – September 30, 2007
- Annual Report Year 4: Covers activities from October 1, 2007 – September 30, 2008
- 2008 Catch-up Report: Covers activities from October 1, 2004 - September 30, 2008
- Annual Report Year 5: Covers activities from October 1, 2008 – September 30, 2009

B. Executive Summary

Append an executive summary to this report which briefly covers the major aspects of the MS4 stormwater management program enacted during the year. In completing the executive summary, the preparer should address the following questions:

1. Were there any aspects of the program that appeared especially effective at reducing pollutants in your stormwater discharge?
2. Were there any aspects of the program that provided unsatisfactory results?
3. What was the most successful part of the program?
4. What was the most challenging aspect of the program?

The executive summary does not need to be extensive and detailed. It is anticipated the executive summaries will range from one half of a page to two pages in length depending on the scope of the program.

C. Stormwater Management Program

		Place mark in the appropriate box	
		Yes	No
1.	Has the Stormwater Management Plan (SMP) been developed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
a.	If yes, Has it been submitted to KDHE as required by the permit?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b.	If no, it needs to be developed and submitted to KDHE by February 1, 2009.		

D. Total Maximum Daily Load (TMDL) Best Management Practices

The permit requires the implementation of these BMPs prior to October 1, 2006.

		Place mark in the appropriate box.		
		Yes	No	Not Applicable
1.	Were any best management practices (BMPs) intended to attenuate the discharge of TMDL regulated pollutants implemented? See your permit to determine if TMDL regulated pollutants are listed for the receiving streams affected by your stormwater system.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.	List all of the BMPs intended to attenuate the discharge of TMDL regulated pollutants as identified in the SMP and provide the requested information on the following table.			

E. Stormwater Management Program Requirements (Six Minimum Control Measures)

1. Public Education and Outreach

The permit requires the implementation of these BMPs prior to October 1, 2005. List all of the public education and outreach BMPs as identified in the SMP and provide the requested information in the following table.

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress on Achieving Goal(s) (Measured Result)
1.1	Maintain a Library of Stormwater Educational Materials.	Provide copies of the Stormwater Master Plan for viewing at the Public Library.	The Stormwater Master plan has been and continues to be available at the Public Library during this review period.
1.2	Develop a series of educational brochures on the impacts of stormwater pollution.	Distribute brochures and make them available to the public.	The annual Leavenworth Spring Clean Up brochure is distributed to inform residents of the City Brush & Disposal Site, Household Hazardous Waste pick up locations, leaf pickup, and appliance pickup. This program has helped reduce illegal dumping in area storm drains and streams.
1.3	Provide information to citizens on City of Leavenworth Solid Waste Division.	Distribute trash bags to the citizens with proper disposal handout.	Trash bags and related handout are distributed to all households and businesses twice a year.
1.4	Issue Press Release Regarding Local Storm water Issues.	Complete and send out monthly press releases to local media outlets.	Several press releases were sent out discussing keeping grass clippings out of the city streets and storm sewers. Examples of other press releases include the City's Recycling Center for automotive oil, Annual Spring Clean up and the City Curbside Leaf pick-up program. During this review period a yearly average of 3,380 customers have utilized the city's free grass and/or leaf dumping site.

1.5	Show storm water info on local TV Station	Broadcast community forums, in which continued water quality discussions take place to discuss on going issues.	The Planning Commission and City Council meetings are shown weekly on City Channel 2 which have contained many discussions regarding storm water quantity and quality. The city has developed three 5-7 min. videos on recycling, the brush site and the city's grapple truck. The videos were aired on a recurring seasonal schedule.
1.6	Provide educational storm water information on City website.	Establish a series of informational articles addressing topics on storm water education.	The City Connections newsletter, which is published quarterly on the City's website has contained multiple storm water related articles. Some example topics include leaf pick up from drains and ditches, proper disposal of household hazardous wastes, street sweeping, and how to build rain barrels.

2. Public Involvement and Participation

The permit requires the implementation of these BMPs prior to October 1, 2005. List all of the public involvement and participation BMPs as identified in the SMP and provide the requested information in the following table.

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress on Achieving Goal(s) (Measured Result)
2.1	Hold public meetings regarding storm water issues.	Provide the public the opportunity discuss related water quality topics.	City Planning Commission and Council meetings have ongoing storm water discussions to address public concerns regarding existing storm driange as well as BMP's for new construction that address water quality and quantity.
2.2	Establish Community Hotline.	Develop a 24 hour hotline to responded to citizens concerns, and reports of illicit discharges.	The "hotline" number and email address is listed on the city web page. Phone calls are received 24 hours a day with a 2 hour response time to all emergencies regarding pollution concerns. Emails are monitored during normal business hours and are normally responded to the following business day.
2.3	Develop Storm water Stenciling Program	Advertize to the public the importance of storm water management and the need for storm drain stenciling within the city.	As part of their volunteer work local boy scouts and other groups have been responsible for stenciling approximately 35 percent of the visible storm sewer inlets throughout the city.
2.4	Continue to maintain and clean trash and debris from local streams.	Establish adopt a stream program.	The Annual Spring Clean Up has been successful with stream clean up provided by volunteers from the Boy Scouts and the Rotary Club, on 3 Mile and 5 Mile Creeks. After large flooding events, area inmates have been engaged to provide stream cleanup.

2.5	Establish a reforestation program.	Continue to promote Arbor Day to increase community involvement.	Leavenworth has been named a Tree City during each year of this review period. This is in part based on having a tree board, a tree care ordinance, a comprehensive community forestry program, and an Arbor Day observance and proclamation.
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3. Illicit Discharge Detection and Elimination

The permit requires the implementation of these BMPs prior to October 1, 2007.

		Place mark in the appropriate box.		
		Yes	No	Not Applicable
1.	Has a program/plan been developed and is it presently implemented to detect and address illicit/prohibited discharges into the MS4?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
2.	Has a map of the MS4 been developed, showing the location of all outfalls, either pipes or open channel drainage, showing the names and location of all streams or lakes that receive discharges from those outfalls?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
3.	The permit requires the permittee enact certain ordinances or resolutions if the permittee has such authority. Has an ordinance or resolution to prohibit non-stormwater discharges into the storm sewer system been enacted? Date Effective: <u>1978, 1999 update (lvks.org)</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	Has a copy of the ordinance or resolution been submitted to KDHE as required by the permit?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
5.	Have public employees, businesses, and the general public been informed of hazards associated with illegal discharges and improper disposal of waste?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.	List all of the illicit discharge detection and elimination BMPs as identified in the SMP and provide the requested information in the table on the following page.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Illicit Discharge Detection and Elimination

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress on Achieving Goal(s) (Measured Result)
3.1	Storm Sewer Mapping	Continue to update existing storm sewer structures as well as add new development structures to the City Mapping Systems.	On an annual basis the City Mapping System (in AutoCAD) is updated to include newly constructed storm structures. City wide planometrics were updated in 2005 and digital ortho photography was most recently updated in 2008.
3.2	Storm sewer maintenance and inspection.	Provide dry weather inspection storm sewer inspection.	During this period a two man crew has been assigned to all storm sewer inspections. The crew provides periodic review of storm infrastructure, responds to public complaints, and provides maintenance of storm system and stream bank stabilization.
3.3	Inspection of sanitary sewer systems.	Inspect residential and commercial sanitary systems for improper discharge into storm drains.	The City has two trucks equipped to video camera sewer lines as well as provides cleaning on a daily basis. In addition to these ongoing inspections, two failed septic systems were detected and repaired within this review period. One in July 2004 and one in October 2008. The city continues to maintain a quick response system to any and all public complaints for illicit residential and commercial discharges.
3.4	Procedural training for city staff.	City inspectors shall attend annual continuing educational programs.	Staff attends annual KCAPWA training seminars and forums regarding storm water best management practices.

3.5	Establish program for household hazardous waste disposal.	Provide pick up for household hazardous waste on a regular basis.	Each week citizens can place up to 5 gallons of household paint on the curb for City crews to collect on the homeowners weekly trash schedule. Other residential household hazardous waste can be dropped off at the Leavenworth County Transfer Station.
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4. Construction Site Stormwater Runoff Control

The permit requires the implementation of these BMPs prior to October 1, 2007.

		Place mark in the appropriate box.		
		Yes	No	Not Applicable
1.	The permit requires the permittee enact certain ordinances or resolutions if the permittee has such authority. Has an ordinance or resolution to address construction site runoff from new development and redevelopment projects been enacted? Date Effective: <u>1978, updated 1999</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	Has a copy of the ordinance or resolution been submitted to KDHE as required by the permit?	<input type="checkbox"/>	<input type="checkbox"/>	
3.	Has a procedure or program been developed which requires construction site owners or operators to implement appropriate erosion and sediment control best management practices?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
4.	Has a procedure or program been developed which requires construction site owners or operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that are likely to cause adverse impacts to water quality?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
5.	Has a procedure been developed that requires site plan review which incorporate consideration of potential water quality impacts?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
6.	Has a procedure been developed for receipt and consideration of information submitted by the public?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
7.	Has a procedure been developed for site inspection and enforcement of control measures?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
8.	List all of the construction site stormwater runoff control BMPs as identified in the SMP and provide the requested information in the table on the following page.			

Construction Site Stormwater Runoff Control

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress on Achieving Goal(s) (Measured Result)
4.1	Construction specifications and standard details.	Continue to develop and update the city specifications and design criteria.	An annual review has been completed by City staff to ensure that their 1999 storm water guidelines have been updated with any new requirements that developed during that time frame.
4.2	BMP fact Sheet	Develop BMP guidelines and distributed to developers.	The City follows generally accepted KCAPWA BMP design guidelines.
4.3	Construction Drawing Review	Require City review of all construction projects to ensure design addresses storm water concerns.	All new residential and commercial developments were reviewed by City Staff during the reporting period. Land disturbance projects met construction and post construction storm water BMP concerns. Projects disturbing more than 1-acre required evidence of an NOI permit from KDHE and a Storm Water Pollution Prevention Plan for the owner and contractor to follow.
4.4	Pre-Construction meetings with owner and contractor.	Require meetings with owner and contractor prior to commencement of grading operations.	During this review period City Staff has conducted a preconstruction meeting with contractors and developers, for all new developments, to discuss the implementations of proper erosion and sediment controls, as specified on their construction plans.
4.5	Construction site inspection and enforcement	Increase the frequency of inspections and develop a site checklist.	The city has a full time inspection staff and visits all construction sites a minimum of once a week. Each site is visited after half inch or greater rainfall events to ensure BMP's are in working condition. Owner is notified of failing

			systems. Stop work orders are issued if site erosion control measures are not in compliance and remedied in a timely manner.
4.6	Staff Training	Conduct monthly meetings with inspection staff and provide training of new staff.	Inspection staff has weekly meetings to discuss ongoing projects. Periodic r discussions are had regarding procedures for inspecting BMP facilities. New staff is trained by job shadowing senior staff.

5. Post-Construction Site Stormwater Management in New Development and Redevelopment

The permit requires the implementation of these BMPs prior to October 1, 2007.

		Place mark in the appropriate box.	
		Yes	No
1.	<p>The permit requires the permittee enact a program to address post-construction stormwater runoff from new development and redevelopment.</p> <p>The program developed to manage stormwater in new development and redevelopment projects must include the following elements:</p> <ul style="list-style-type: none">a. strategies which include a combination of structural and/or non-structural BMPs,b. measures to ensure adequate long-term operation and maintenance of BMPs.c. BMPs to prevent or minimize adverse water impacts.		
	Has a post construction stormwater runoff program been implemented?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.	List all of the post-construction site stormwater management in new development and redevelopment BMPs as identified in the SMP and provide the requested information in the table on the following page.		

Post-Construction Site Stormwater Management in New Development and Redevelopment

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress on Achieving Goal(s) (Measured Result)
5.1	Construction site inspection and maintenance of long term controls.	Increase inspections.	The city inspection staff has examined sites post construction throughout this review period to verify BMP compliance and documents all their procedures. The City has a policy of no-net increase in storm water run-off for new and re-development projects.
5.2	Protect sensitive areas, such as wetlands and riparian areas.	Maintain or increase open space.	During this review period the City has acquired several properties located within the flood plain in order to increase the buffers along sensitive bodies of water. Planning and Zoning encourages increased open space, landscaping, and buffers from streams.
5.3	Promote non-structural best management practices.	Minimize impervious surfaces and disturbance of soils and vegetation.	City staff have focused on encouraging developers to minimize grading impacts, provide tree preservation, and address project BMP's early in the plan review process.
5.4	Construction Drawing Review	Require City review of all construction projects to ensure design addresses post construction storm water concerns.	All new residential and commercial developments were reviewed by City Staff during the reporting period. Land disturbance projects met construction and post construction stormwater BMP concerns. Projects disturbing more than 1-acre required evidence of an NOI permit from KDHE and a Storm Water Pollution Prevention Plan for the owner and contractor to follow.

6. Pollution Prevention/Good Housekeeping for Municipal Operations

The permit requires the implementation of these BMPs prior to October 1, 2005. List all of the pollution prevention/good housekeeping for municipal operations BMPs as identified in the SMP and provide the requested information in the following table.

BMP ID Number	Brief BMP Description	Measurable Goal(s)	Progress on Achieving Goal(s) (Measured Result)
6.1	Storm Sewer and Catch Basin Cleaning	Inspect and clean all storm sewer inlets on a quarterly basis.	The city has two full time inspectors that utilize the city's vacuum truck to clean and remove debris from all storm sewer inlets continuously throughout each year of the reporting period.
6.2	Street Sweeping	Increase street sweeping rotations throughout the city.	During the reporting period the city has provided street sweeping operations. Beginning in 2007 an increased emphasis has been placed on this program with collector and arterial streets being swept on a monthly basis, and all residential streets being swept quarterly. In 2008 the City has upgraded street sweeping equipment.
6.3	Snow removal operations	Upgrade the city's snow removal equipment.	The city has purchased and installed digital ground speed controls to their salt trucks to ensure that excess material is not being placed during snow and ice events and subsequently washed into the storm drainage system and streams.
6.4	Leaf Pick Up	Establish a City wide program offering leaf pick up.	Due to funding the City was unable to establish a leaf pick up program for citizens until 2008. Approximately 3,500 customers have utilized the City's program offering curbside collection of leaves.

Section III

Item F - Recordkeeping and Reporting:

1. A general assessment of the appropriateness of the various BMP's included for each of the major program elements in Leavenworth's Storm Water Management Program are as follows.
 - a. **TMDL Regulated Pollutants.** Not applicable.
 - b. **Public Education and Outreach:** The City has made significant efforts to raise public awareness about pollution of the area watersheds through public service announcements on Local Channel 2, the City's website, newsletters and press releases in each year of this reporting period. Several examples of the newsletters and press releases are located in Appendix A. The City Newsletter frequently discusses current water quality issues and storm water management. The newsletter is mailed out quarterly to more than 9,000 households and made available at the Leavenworth Community Center. The City's website also provides an "e-notify" service that is used to email more than 300 current residents about community issues, including storm water management. These efforts have been well received by the public.
 - c. **Public Involvement and Participation:** The city's Annual Spring Clean Up Services and Activities are one of the most successful parts of the Storm Water Management Plan. This particular program provides BMP awareness and guidelines to city residents for recycling and properly disposing of their trash. This program has significantly reduced the amount of litter throughout the City. Over this period there has been an increased effort by area groups to functionally work towards an official adopt a stream program. As indicated in the MS4 report, portions of 3 Mile and 5 Mile Creeks have been cleaned by local boy scout groups and the Rotary Club.
 - d. **Illicit Discharge Detection and Elimination:** City inspectors will continue to play a vital role in Illicit Discharge Detection and are advantageous to the Storm Water Management Program. The city also benefits from an informed community that helps report violations.
 - e. **Construction Site Storm Water Runoff Control:** The efforts of the city plan review and inspection staff is constant reminder to all construction personal, to maintain a quality sediment and erosion control system that reduces construction site storm water runoff. The procedures followed by the plan review and

inspection staff have helped reduce principal pollutants put in the storm water by grading activities of these projects.

In 2005 the City and Geiger Concrete completed a test project that placed pervious pavement on Maple Street between 2nd and 3rd Street. This street is under evaluation to determine the effectiveness in reducing storm water runoff, and decreasing pollutant levels. Long term performance and maintenance concerns are being evaluated as well. The City currently allows pervious concrete if proposed by designers, and is considering requiring it in some circumstances.

- f. **Post-Construction Site Storm Water Management in New Development and Redevelopment:** The city has working diligently with its inspection staff to detect and repair publicly owned detention facilities. The City has also worked to improve awareness of privately owned BMPs by way of continued coordination and education of homeowners associations on how to maintain these systems. The city's assessment program of post construction BMP's will be a focus in the next review period.
 - g. **Pollution Prevention/Good Housekeeping for Municipal Operations:** The Catch Basin Cleaning and Street Sweeping programs have both been highly effective and beneficial to the city's Storm Water Management Program. The installation of digital ground speed controls has reduced the application rates of dry salt and sand during winter months.
2. *An assessment of the effectiveness of the BMP's towards achieving the statutory goal of reducing the discharge of pollutants to the Maximum Extent Practicable (MEP).*

The effectiveness of non-structural BMP's have been the most effective in reducing the discharge of pollutants. The biggest problem with BMP's is both the initial cost and subsequent maintenance cost. Most permanent structural BMP's are cost prohibitive for local government to consider. As such the installation of non-structural BMP's during construction has been the most effective in reducing erosion from leaving project areas.

- 3. Summary of results of information collected and analyzed are not available as no tests were taken.
- 4. A few of the minor changes that the City intends to accomplish the Storm Water Management Program during the next reporting period include:

- a. Encourage more public awareness by completing and presenting a storm water management lesson in the local school system, adding increased storm water information on the City's website
 - b. Improving the level of documentation for all inspection services.
 - c. Increased focus on inspecting restaurants to verify that grease and other pollutants are not being discharged to the municipal storm drains.
 - d. Provide added attention to post construction BMP's. Work with homes associations and owners of private ponds and detention facilities in an effort to resolve troublesome maintenance issues related to erosion and outlet issues.
5. A major change to the Storm Water Management Program is to formally adopt BMP design guidelines for new development by the end of the first quarter of 2010. Currently design consultants are directed to follow common practices in the KC Metro APWA Design Guidelines. An official City document would provide more uniform rules in the installation of BMP's that can be more readily be monitored for their effectiveness.
6. *List of other municipalities/contractors, if any, which will be responsible for implementing any of the program areas of the SMP.*

City of Leavenworth Public Works

G. Certification

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

Signature of Permittee (legally responsible person)

Date Signed

Name (printed)

Title

40 CFR 122.22 Signatories to permit applications and reports.

(a) Application. All permit applications shall be signed by either a principal executive officer or ranking elected official. All reports required by permits, and other information requested by the Director shall be signed by a person described in paragraph (a) of this section, or by a duly authorized representative of that person.

Submit this report to:

KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT
Technical Services Section
1000 SW Jackson Street, Suite 420
Topeka, KS 66612-1367

APPENDIX A

EXAMPLE PUBLICATIONS

CITY OF LEAVENWORTH SOLID WASTE DIVISION

Visit our website for more information on your city services - www.lvks.org.

Welcome to the City of Leavenworth. The City of Leavenworth staff hopes this information can assist you in making Leavenworth a "Quality City". The City of Leavenworth **Solid Waste Division** provides residential trash collection by City crews once each week. The charge for the service as of December 1, 2008 is \$15.09 per unit (residence) and appears on your water bill each month. Please review your water bill to ensure you are paying for the appropriate number of refuse units. If you have any questions please call our office at 682-0650. Trash bags must be on the curb by 7:00 a.m. on your collection day, but never out more than 24 hours early. No trash cans are allowed on the curb; trash cans will not be emptied or taken. All bags, boxes or disposable containers must be 60 pounds or less in weight.

Special Items of Note:

- ✓ Disposal of syringes, broken glass or other sharp objects: replace the protective cover on syringes after use and place them or other sharp items in a sealed box or can. Mark the container of the contents and place beside the refuse (not in a bag) at the curb for collection. You may also call the Service Center (682-0650) the day prior to your collection and we will post a notice for the crews collecting your addresses.
- ✓ Loose items as brush, tree limbs, wood and carpet will be collected with other refuse provided they are cut into **five foot lengths** and either boxed, bagged or securely tied into bundles of **less than 60 pounds**.
- ✓ Ask your moving company to come back for empty packing boxes or break them down and bundle them for removal with your regular trash. The Recycling Center accepts flattened cardboard.
- ✓ Almost everything, except large appliances, will be picked up with your regular refuse. To discard a large appliance, please call the Municipal Service Center at 682-0650 by Thursday 4:00 P.M. pick up on Friday. The appliance must be on the curb by 7:00 A.M. Friday morning in the place where you normally put your refuse bags. **All appliances must be empty; refrigerators or freezers must have the doors removed or secured before being placed face down at the curb.**
- ✓ A package of 50 trash bags is delivered to your home twice a year (March and September). If you should run out of bags between deliveries, you may use comparable bags purchased from a store, or you can purchase a roll of 50 bags for \$6.00 at the City Clerk's Office in City Hall located at 100 North 5th Street (5th & Shawnee).

RECYCLING CENTER & ACCEPTED ITEMS

The City of Leavenworth operates a "Recycling Center" at Lawrence Avenue and Halderman Streets (One block west of the City Service Center). This site is open Tuesday through Saturday from 8:30 a.m. to 12:30 p.m. The Recycling Center is a self-help drop off point. An attendant will be on site to help those patrons who require assistance.

- ✓ **CANS:** Aluminum or steel, food or drink. Please rinse all cans, plastics & glass.
- ✓ **PLASTIC:** Types 1 through 7 except for plastic bags, auto products as oil, brake, transmission & windshield fluids, plastic toys, PVC pipe, polystyrene material as packing "peanuts", blocks or sheets.
- ✓ **GLASS:** Clear, green and brown, food or beverage containers
- ✓ **PAPER:** Newsprint, office paper, computer paper, brown grocery bags, magazines, telephone books, catalogs, slick paper and cardboard acceptable. (Please flatten boxes.)
- ✓ **OIL/BATTERIES:** Waste oil and automobile batteries (residential only).
- ✓ **E-Waste:** Televisions, VCRs, computer, video game machines.

TREE & BRUSH DISPOSAL SITE

The City operates a Brush Disposal Site at 1803 S. 2nd Street. The site is open March through November, Tuesday through Saturday from 8:00 a.m. to 4:00 p.m. (last load accepted at 3:50 p.m.). Closed on all major holidays. Fees are based on vehicle/trailer size; please call 682-0650 for a rate schedule. December through February, the site is open only on Saturdays and for two weeks following Christmas for Christmas tree disposal on the same days & hours as above.

- ✓ **Acceptable material:** Trees less than 12" in diameter and brush. (Leaves & grass are free)
- ✓ **Unacceptable material:** Boards, pressboard, Masonite, roofing, treated lumber or plywood, timbers, R.R. Ties, stumps, plastic, disassembled wooden boxes, packing crates or pallets.

GATE ATTENDANT MUST INSPECT ALL LOADS BEFORE DUMPING!

"FREE FIRST SATURDAYS"

On the first Saturday of each month, the City has dumpsters available for Leavenworth City residents only (no contractors) to discard almost any unwanted item (no household hazardous waste or asbestos). The dumpsters are available one block east of 10th Avenue on Pennsylvania and then one block west on Lawrence Avenue from 8:30 a.m. to 12:30 p.m. NO BRUSH PLEASE! Limbs (12" or less in diameter), brush and organic materials will be accepted free of charge at the City's Brush Disposal Site on the first Saturday of each month to Leavenworth City residents only (no contractors). If first Saturday of month falls on holiday, the "Free First Saturday" will be the second Saturday of the month. In 2009, May to September the City will also conduct a Free Third Saturday on the third Saturday of each month as a test project.

ALL FEES AND SCHEDULES IN THIS FLYER ARE SUBJECT TO CHANGE

City Department Listing & Key Services

Department	Phone	Key Services
Emergency Services	911	Police, Fire, Emergency Medical Services
City Manager's Office	(913) 682-4232	Performs administrative duties for the City and coordinates departmental operations.
City Clerk's Office	(913) 682-9201	Issues dog licenses, alarm permits, food handler's permits, garage sale permits, all permits/licenses, elderly rebate program, and prepares all the City Commission agendas and minutes.
Human Resources Department	(913) 680-2637	Handles all employee issues ensuring compliance with Federal & State regulations.
Finance Department	(913) 682-9201	The Finance Department administers the city's financial planning and budgeting systems.
Community Development & Planning and Zoning Department	(913) 680-2626	The Community Development/Planning and Zoning Department is a multifunctional agency responsible for the orderly development and redevelopment of private property in Leavenworth; includes Code Enforcement, Zoning and Planning.
Engineering Department	(913) 684-0375	The Engineering office is primarily responsible for the coordination of capital projects related to the development and reconstruction of the City's infrastructure.
Inspection Division	(913) 684-0378	The purpose of the Inspection Division is to assist the City Commission and the City Manager in the enforcement of the adopted Building Codes.
Police Department	(913) 651-2260	The Police Department acts as the law enforcement branch of the city government.
Animal Control Division	(913) 682-0268	Animal Control Officers are responsible for enforcing various city ordinances regarding animals including the leash law, vaccination and licensing requirements, and checking on neglected or abused animals.
Municipal Court	(913) 758-2900	Traffic violations and violations of Leavenworth City Ordinances are handled in this court.
Fire Department	(913) 682-3346	Fights fires, issues burn permits, and performs building inspections for violations of fire codes.
Municipal Service Center	(913) 682-0650	The solid waste, street maintenance (including snow removal, ice control, and storm drain functions), parks maintenance and traffic control division are all housed at the Municipal Service Center.
Parks & Recreation Department	(913) 651-2203	Provides parks and recreational activities for area residents to enjoy.
Wastewater Pollution Control	(913) 682-1090 7 days a week, 24 hours a day for sewer emergencies.	Provides treatment of sanitary sewer water prior to re-release back into the local environment. Ensures all environmental regulations are met for sanitary sewer treatment.



P R E S S R E L E A S E

**City of Leavenworth
100 N. 5th Street
Leavenworth, KS 66048**

Contact: Megan Gilliland, (913) 680-2610

FOR IMMEDIATE RELEASE

LEAVENWORTH NAMED TREE CITY FOR A 15th CONSECUTIVE YEAR; ARBOR DAY PLANS ANNOUNCED

Leavenworth has been named a Tree City USA community by the Arbor Day Foundation to honor its commitment to community forestry. It is the fifteenth year Leavenworth has received this national recognition.

The Tree City USA program is sponsored by the Arbor Day Foundation in cooperation with the National Association of State Foresters and the USDA Forest Service.

“Leavenworth has consistently met the four standards to become a Tree City USA community,” said Julie Anderson, Director of Parks and Recreation. “The standards we met are having a tree board or department, a tree care ordinance, a comprehensive community forestry program, and an Arbor Day observance and proclamation.”

Communities that receive Tree City USA recognition not only have taken the time to meet these four standards, they recognize that:

- Trees promote healthier communities. Leaves filter the air we breathe by removing dust and other particles.
- Trees moderate climate, conserve water and provide habitat for wildlife.
- Trees in urban areas reduce the heat island effect caused by pavement and buildings.
- Properly placed trees can increase property values, and buildings in wooded areas rent more quickly and tenants stay longer.

“A community, its elected officials and its citizens that provide needed care for its trees deserves recognition and thanks,” said John Rosenow, chief executive of the Arbor Day Foundation. “Trees are a vital component of the infrastructure in our cities and towns, and they also provide environmental and economical benefits. Cities that are recognized with a Tree City USA designation go to great lengths to plant and care for the community forest.”

The City of Leavenworth will celebrate Arbor Day this year with a tree planting at the trailhead to Three Mile Creek (near 7th and Cherokee Streets) at 10:00 a.m. on Friday, April 24th. The public is invited and welcome to attend.

###

Choosing the Right Tree for the Right Place

Planting a tree may seem like an easy task. After all, you just choose a spot you like and plunk it into the ground, right? Wrong! It's actually a lot more complex than that. If you don't want to keep replanting your trees year after year, it is important to consider many factors to ensure that the tree will thrive and grow. Before planting, you should always consider the tree's needed environmental requirements such as light, water and hardiness as well as the form and shape of the tree, its size at maturity and the tree's intended role or function in your landscape.

"One of the biggest mistakes property owners make when planting a tree is that they don't think about how a tree will look in 50 years," says Steve Grant, Parks Superintendent for the City of Leavenworth. "It is important for the homeowner to select the right tree species considering how it will look at maturity."

That rule should always be followed when planting around overhead power lines. In order to ensure that the power lines are kept free of potential problematic branches, power companies will trim branches from their lines - and sometimes that results in a not-so-appealing tree pruning.

The best way to avoid having your beloved pin oak topped or severely cut is to think about where it was placed in the first place. Since Leavenworth has many trees that are a century or more old, we can't do anything about those trees but

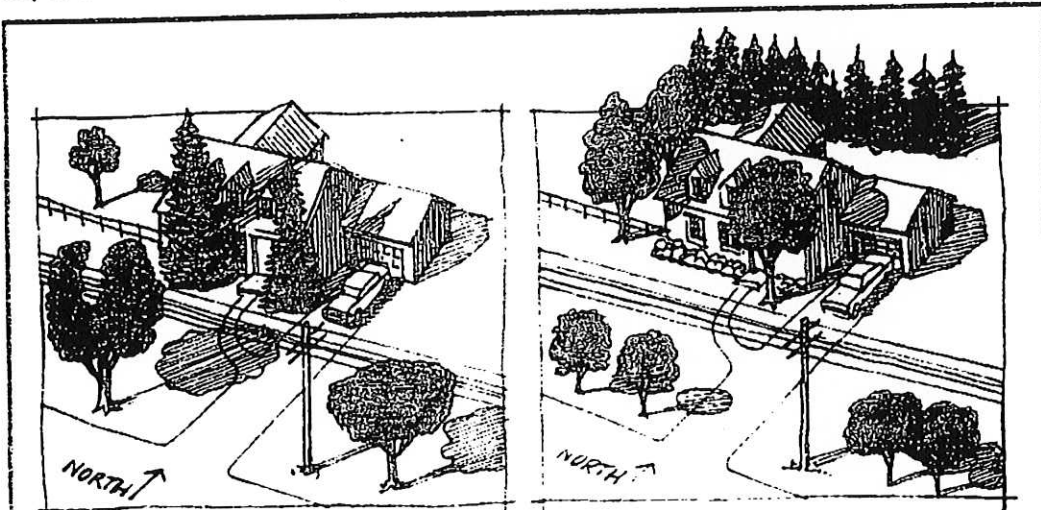
we can stop improper tree placement from happening now and in the future. The Kansas Forest Service recommends trees such as the American Plum, Black Hills Spruce, Eastern Burningbush, Eastern Redbud, Flowering Crabapple, Flowering Dogwood, Washington Hawthorn and Winterberry Euonymous for planting under utility lines.

Another factor you should consider when planting trees is the tree's purpose. Is the tree intended for shade, aesthetics, windbreaks or privacy? If shade is your ultimate outcome, consider planting the tree where you want the shadow during the hottest time of the year - and the time of day you desire the shade.

You should also think about the appearance of the tree before you plant. Think about the tree's color and foliage, form and shape, size and texture. Another important aspect you should consider is whether the tree bears fruit. Or, does the tree produce thorns? These are all things you should think about before planting.

Trees, if planted correctly, can provide homeowners with windbreaks against the harsh winter winds. They can also be used to screen out unsightly areas or provide privacy, too. Low-branching conifers that hold their foliage are most effective for screening unsightly areas and providing privacy. Noise is best reduced by tall, densely planted trees with fleshy, broad leaves. If combined with conifers, some noise

reduction can be obtained throughout most of the year. If you live on a gravel road, dust can be filtered by this combination of plantings, too. Windbreaks can be made most effective through a dense, step-like arrangement of both conifers and deciduous trees. However, for protection on the south and east sides of a house, deciduous species work best because they allow incoming solar radiation in the winter. For more information on proper planting techniques, go to www.arborday.org.



WRONG Planting large trees under utility lines often means mutilated trees. Large evergreens close to the house on the south block warm winter sunlight.

RIGHT Short flowering tree's don't clash with overhead utility lines. Large deciduous trees on the southeast, southwest and west provide cooling shade in the summer, and don't obstruct the low winter sun. An evergreen windbreak on the north blocks cold winter winds.

Consider "Sewer Safer" Trees for Your Landscape

Municipal sanitary sewer systems are one of the most important public health assets of a city, second only to the drinking water system. When they are properly operating, that is, carrying the wastewater and sewage away from homes and businesses and to the treatment plant, they protect the public from the potential health hazards associated with human waste. However, when blockages in the pipes cause backups into homes or businesses or overflows in streets or right-of-ways, the health of citizens is at risk. One of the factors that contributes to sewer line blockages is the intrusion of tree roots.

"Tree roots are perhaps one of the most damaging forces we see when it comes to sewer lines," says Tim Flora, Leavenworth Wastewater Treatment Plant Superintendent. "They can be very destructive and persistent."

First, you should know that sanitary sewer lateral lines are the responsibility of the property owner. The City of Leavenworth maintains the main lines up to the point of the lateral connection. These lateral lines are susceptible to intrusion from tree roots in your landscape. Typically, especially in older neighborhoods, lateral lines are built with sections of concrete or tile pipe which can leak at the seams. Tree roots invade sewer lines because the lateral lines contain three elements necessary for tree growth: water, nutrients and oxygen. The tree roots, while searching for food and water, will grow into the lateral line plugging and sometimes even breaking the sewer line. Cottonwoods, willows and poplar trees tend to cause the most damage when planted near sewer lines.

How can you minimize your risk of damage from tree roots to your lateral lines? The general recommendation is to choose small, slow-growing species with a less-aggressive root system, such as the examples below. If you decide to plant a faster-growing species, plan to replace it every eight-to-ten years before it can develop a fully-integrated root system.

Lastly, if you begin to notice sluggish drains, you probably want to call a plumber and have your lines checked for roots. Plumbers can cut roots from the sewer system but this is only a temporary fix and it will have to be done repeatedly to keep the lines clear.

Landowners and landscape professionals should be aware of the location of sewer lines when planning landscapes. If you are in doubt about the location of the main sewer lines contact the Leavenworth Wastewater Treatment Plant at 682-1090. The city staff cannot locate your lateral lines but they can provide you with helpful information regarding your main line and general sewer line maintenance information.

How to Plant a Tree

Dig the hole as deep as the rootball and twice as wide. Loosen the soil around the planting hole with the shovel. Remove the tree from the container.

Place the tree in the hole, making sure the soil is at the same level on the tree as when the tree grew in the garden center. If your tree has burlap around the rootball, place the tree in the hole and then carefully untie the burlap. Leave the burlap lying in the bottom of the hole - the burlap will simply turn into organic matter over a period of time.

Fill in around the rootball with soil and pack the soil with your hands and feet to make sure that there are no air pockets.

Make a little dam around the base of the tree as wide as the hole with left over soil or grass clumps to hold in the water. Give your new tree a good soaking of water to help settle it into its new home.

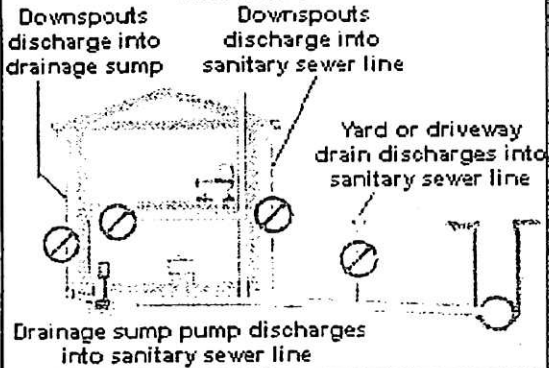
Recommended Trees for Planting Near Sewer Lines

Japanese Maple	Flowering Dogwood	Golden Raintree	Crapemyrtle
Many selections are available with red or green foliage and various leaf forms. This tree needs good drainage and some protection from western sun. Slow growing.	This tree can be quite particular to growing conditions. Blooms in early spring before leafing out with showy flower bracts. Many varieties are available.	This tree can reach heights of up to 30 feet. This is one of the few yellow-flowering trees. Blooms in May and June and is tolerant to harsh conditions.	This hardy tree is available in an array of colors ranging from white, red, pink and lavender. It usually grows as a multi-stem shrub or tree. Can be susceptible to winter damage.

Cities Work to Decrease Inflow and Infiltration Simple Steps by Citizens Can Make a Big Difference

Improper Connections

All water from rainstorms and underground seepage should be discharged onto the ground or into a drainage ditch. Some of the common improper connections are shown here.



Make sure to check your downspouts, sump pumps and yard drains to be sure they are not discharging water into the sanitary sewer.

The quality of our water is one of the most important aspects of health and public safety. To most people, the words inflow and infiltration (I & I) mean very little. However, inflow/infiltration can make a big difference in the efficiency and longevity of a city's sanitary sewer systems.

Inflow is water that is dumped into the sewer system through improper connections, such as downspouts and groundwater sump pumps. Infiltration is groundwater that enters the sewer system through leaks or breaks in the pipes. Inflow/infiltration affects the quality of wastewater (used water from homes and businesses) that needs to be treated, the capacity of sewer pipes, pump stations, wastewater treatment plant facilities and, ultimately, the rate businesses and residents pay to operate and maintain the sewer system. When I & I water gets into the sanitary sewer system, it must be transported and treated like sanitary waste. Too much I & I causes sewer backups and overflows when it rains.

The adverse effects of I & I are not just a problem for municipal entities. Overflow within the sanitary sewer system can cause basement flooding. Since the water in an overloaded sewer flows at a higher level than normal, floor drains can allow backflow from the sanitary sewer lines into the home.

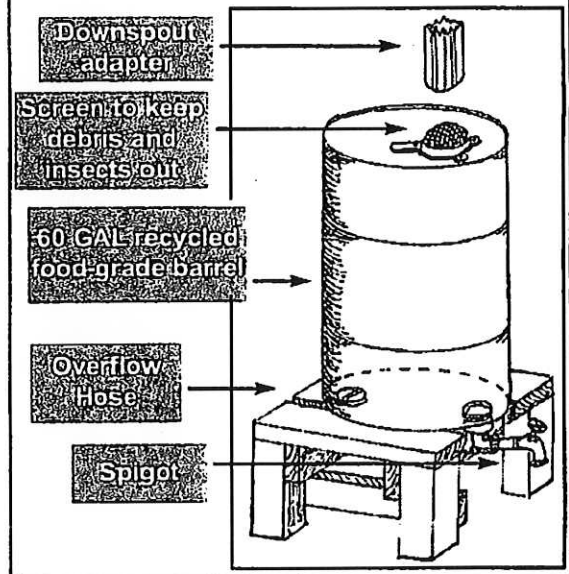
There are many simple things homeowners can do to limit the amount of stormwater infiltrating the sanitary sewer systems. Disconnecting your downspout from improperly connecting to the sanitary sewer line is the easiest way to limit inflow. If you have other drains discharging into the sanitary sewer line, you should disconnect those as well. For more information, visit www.marc.org.

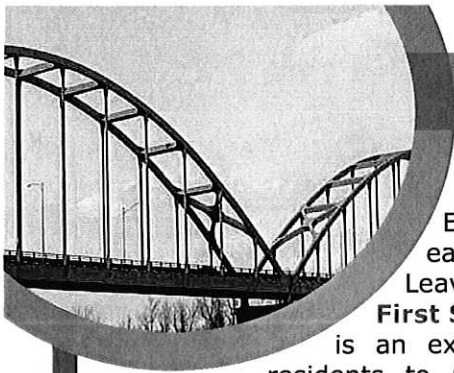
Rain Barrels Conserve Water, Lessen Impact on Sewers

A rain barrel connected to your downspout - also known as a rain bank - is a great way to keep stormwater out of the system and to cut down your water bill! Because you are collecting water right off the roof, it has few contaminants and is perfect for watering the garden. Rain barrels have many benefits. Diverting water from your downspout into a rainwater catchment system has several advantages. Rain banks reduce the volume of water flowing to the sewer treatment facility and decreases the percentage of roof-top rainfall and urban runoff. Barrels serve as a backup source of water during times of drought or between rain showers. They help to keep our creeks and waterways clean and provide naturally softened water - great for delicate houseplants, auto cleaning and window washing. By reducing the amount of excess stormwater, it can reduce the need for additional tax dollars earmarked for sewer expansion.

Residential irrigation can account for 40% of domestic water consumption in a given municipality. Rain barrels not only store water, they help decrease demand during the sweltering summer months. Only 1/4 inch of rainfall runoff from the average roof will completely fill the typical barrel. Construction of a rain barrel is easy. For complete instructions, go to www.rainkc.com/rainbanks.

How to Build A Rain Barrel





FREE First Saturdays in Leavenworth

Every first Saturday of each month, the City of Leavenworth offers "FREE First Saturdays." This event is an excellent opportunity for residents to utilize the City's Solid Waste Services for no charge. On "FREE First Saturdays," the Recycling Center is open normal hours (8:30 a.m. to 12:30 p.m.) for drop-off of recyclable items. The Brush Site is open during regular hours (8:00 a.m. to 4:00 p.m.) - all materials dropped off by residents will not be charged on

"FREE First Saturdays." Commercial contractors, however, will still be required to pay the nominal fees. At the Municipal Service Center (790 Thornton), residents can drop off materials such as large appliances, furniture and other trash between the hours of 8:30 a.m. to 12:30 p.m. on "FREE First Saturdays." To drop off items at the Municipal Service Center on the first Saturday of each month, enter off Pennsylvania Street at Lawrence Avenue.



Three Mile Creek Trail Project Slated for 2008 Construction

Miles Moore in his "Early History of Leavenworth City and County" talks about the area of 3 Mile Creek and Water Street as being the early hub of business and community activities for the City of Leavenworth in the first years of the city. The area is already beginning to reflect improvements which will once again make this a hub of community activities.

The 3 Mile Creek Trail project is scheduled to bid in early May of 2008. The plans and specifications are nearly complete. The easements are in hand and with final approval of the Kansas Department of Transportation,

expected in the next couple of weeks, the project is now ready to advertise for bid.

The project will begin at the southern end of Leavenworth Landing Park. The restoration improvements for this park are also nearing completion and the entire walking trail within the park should be reopened in the next 30 days. The 3 Mile Creek Trail will join with the existing trail and cross on an existing bridge to the southern banks of 3 Mile Creek. A second bridge in poor condition will be removed.

The trail will leave the top of the creek bank and cross beneath the 2nd Street Bridge. The trail is designed for bike access and will not cross vehicular traffic until it rises back to street level at 7th Street where it will connect with Haymarket Square at the Trail Head.

The project is estimated to cost \$2,263,881 with KDOT funding \$1,350,000 of the cost through Transportation Enhancement Funding.



Artist rendering of Three Mile Creek Trail.

Fire Department Utilizing New Technology

Most people use global positioning devices (GPS) in their everyday lives. Many cars carry a GPS system to help drivers find their way. Online, we use mapping to find directions or to search satellite imagery. And, now, the Leavenworth Fire Department is using geographic information systems (GIS) to locate fire hydrants quickly and subsequently fight fires quicker.

"The fire department has been working with the GIS department in getting all the City's fire hydrants located," said Fire Chief Steve Moody. "You may have seen fire department personnel standing next to a fire hydrant holding what looks like a kid's electronic game. What they were doing was locating the fire hydrant with a GPS (global positioning system) unit."

Once the hydrant is located through GIS, the department can print maps that show the exact loca-

tion of the hydrants, in a color dot indicative of the maximum water flow. The fire trucks will soon be able to access this hydrant information via a vehicle computer.

Another way the LVPD is using new technology is in training.

"The fire department recently signed up with a company named CentreLearn for web-based training," said Moody. "Firefighters will be able to take CentreLearn training classes in the fields of fire, medical and OSHA. The training is designed to be taken individually, but the department plans on utilizing it in both the group and the individual setting."

The department can also post classes of their own on CentreLearn. The department will still continue delivering new training and skills-based training with live instructors in a group setting.

City of Leavenworth Solid Waste Services

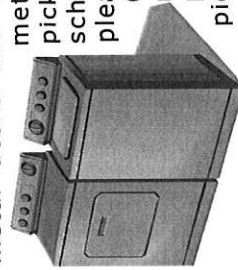
Weekly Garbage & Trash Pick-Up

Garbage and household trash cannot be left in the yard and must be disposed of properly. This includes auto parts, appliances, furniture, building materials, tires, cardboard, plastics, or any other materials. Tree trimming and fallen limbs must be disposed of within a week. Trash cannot be set out prior to 24 hours in advance of your regular trash day. It is unlawful to burn garbage within the city.



Special Item & Bulk Pick-Up

The City of Leavenworth will pick up most furniture items, TV's, mattresses and box springs with the regular trash. Large, metal items such as appliances, metal desks and miscellaneous heavy metal items will be picked up on Fridays. To schedule pick-up, please call the Service Center at 682-0650 no later than 3:00 p.m. on Thursday for pick up on Friday.



For questions regarding your weekly trash pick-up, call the Municipal Service Center at (913) 682-0650.



Recycling Center

The City of Leavenworth operates a Recycling Center one block west of the Municipal Service Center, 790 Thornton, at the intersection of Lawrence and Halderman Streets. The Recycling Center is open Tuesday through Saturday from 8:30 a.m. to 12:30 p.m.

The Recycling Center is open to the public all year and accepts the following items:



- Steel, tin & aluminum cans
- Rechargeable Batteries (i.e. 9-volt batteries and batteries from hand tools) Battery sizes D, C, A, AA and AAA batteries are accepted at the Leavenworth County Transfer Station on Gilman Road in Lansing.
- Old cell phones
- Used Automotive oil
- Car batteries
- Plastics - We cannot accept motor oil bottles, pesticide/herbicide bottles, automotive product bottles (brake fluid, windshield waster fluid, etc.), plastic bags, plastic toys, expanded #6 polystyrene materials (packing materials such as peanuts or packaging sheets/blocks), PVC pipe or plastic sheet material.
- Clear glass
- Paper products (cardboard, magazines, paper, etc.)

We ask that you remove all lids and neckrings and clean and rinse any cans, plastic bottles and glass items. The Recycling Center is free, but cannot accept commercially generated materials. Commercial contractors may drop off their materials at the Leavenworth County Recycling Facility and Transfer Station located at 13523 Gilman Road in Lansing (south of Lansing and east of Highway 7773). For additional information about the County Transfer Station, please call (913) 727-2858 or (913) 727-3200. The County Transfer Station's operational hours are Tuesday through Saturday from 7:30 a.m. to 5:00 p.m.

E-Waste Recycling

The City of Leavenworth is the first city in Kansas to offer e-waste recycling through our popular "Free Saturdays" at the Municipal Service Center. Citizens can drop off materials such as televisions, VCRs, computers and video game machines on the first Saturday of each month at the Municipal Service Center. E-waste recycling containers are located at the Service Center's north gate on Lawrence Avenue, one block south of Pennsylvania just east of 10th Avenue. This site is open the first Saturday of every month from 8:30 a.m. to 12:30 p.m. for residential customers.

To report a sewer problem, call the Wastewater Treatment Plant at (913) 682-1090, 24 hours a day, 7 days a week. The on-call staff will come out anytime, day or night, to check the line in question. The City of Leavenworth can only verify the City main lines. A lateral line is the line that runs from your residence or business to the City mains. We cannot verify blockages in lateral lines, this must be done by a licensed plumbing company.

Sec. 102-197. Owner to keep abutting gutters clean.

Every owner or occupant of any lot or piece of ground in the city shall keep the guttering adjacent to or in front of the premises owned or occupied or under control of such person clean and free from all dirt, filth, snow, ice, standing water, garbage or other matter of every kind and description. Every person who shall fail to comply with the provisions of this section shall, for each failure, after a reasonable time for such compliance, be guilty of a misdemeanor.

(Code 1978, § 32-144)

Leavenworth, Kansas
Stormwater Master Plan
Storm Drainage Design Criteria

B&V Project 26529.110
May 28, 1999

Drainage Criteria Manual, City of Leavenworth, Kansas

I. General Design Criteria

I.1. General. The following design criteria are the minimum standards to be used in the design and construction of drainage system improvements for the City of Leavenworth.

I.2. Policies. The drainage design criteria are based on the following policies adopted by the City and developed as part of the Stormwater Master Plan completed in 1999.

I.2.1. A drainage report must be submitted by a professional engineer registered in the State of Kansas. The report shall be signed and sealed.

I.2.2. Subdivision plans shall include plans for the conveyance of stormwater and shall be signed and sealed by a professional engineer registered in the State of Kansas. The stormwater facilities shall be designed in accordance with design criteria set forth in "Drainage Criteria Manual, City of Leavenworth, Kansas," (Design Criteria) developed as part of the Stormwater Master Plan.

I.2.3. Easements shall be granted to the City for access to underground drainage improvements and along open channels where the flow is greater than what could be contained in a 72 inch diameter pipe. Minimum easement requirements are listed in the Design Criteria.

I.2.4. Curb and gutter shall be provided on all new roadways.

I.2.5. Off-site drainage improvements shall be provided if peak flow rates are greater than those shown in the Stormwater Master Plan.

I.2.6. Underground drainage systems shall be installed in all areas where the flow can be contained in a 72 inch diameter pipe.

I.2.7. Systems shall be designed to address State and Federal regulations regarding stormwater quality.

I.2.8. Runoff resulting from a 100 year design storm shall be routed through the major drainage system, which consists of the drainage system designed to pass the design storm plus surface routing such as swales, open channels, and roadways. The 100 year design storm shall be routed through the major system without causing structural flooding.

Section II. Design Requirements

II.1. Runoff Calculations. Peak runoff rates shall be calculated using the Rational method for areas smaller than 300 acres. For areas greater than or equal to 300 acres and where detention/retention storage will affect peak runoff rates, a hydrograph method shall be used to calculate peak flow rates.

MEMORANDUM

Page 3

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 Stormwater Master Plan
 Storm Drainage Design Criteria

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II.1.1. Rational method. The Rational equation consists of the following formula:

$Q = k * C * i * A$ where,

Q = Peak rate of runoff in cubic feet per second
 k = Antecedent precipitation coefficient
 C = Runoff coefficient
 i = Rainfall intensity in inches per hour
 A = Tributary area in acres

II.1.1.1. Antecedent precipitation coefficient (k). The antecedent precipitation coefficient is used to adjust the runoff coefficient (C) for less frequent design storms. The following k factors shall be used:

Antecedent Precipitation Factor, k	
Return Period Design Storm, Years	k Factor
10 and less	1.0
25	1.1
50	1.2
100	1.25

The product of C and k shall not exceed 1.0.

II.1.1.2. Runoff coefficient (C). The runoff coefficient is a ratio of the rate of runoff to rate of precipitation. The table below shall be used to determine C values.

Runoff Coefficient, C and Percent Impervious				
Land Use	Average Runoff Coefficient	Range for Runoff Coefficient	Average Percent Impervious	SCS Curve Number
Business	0.87	0.70-0.95	95	92-94
Downtown	0.81	0.5-0.7	85	92-94
Neighborhood				

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 Stormwater Master Plan
 Storm Drainage Design Criteria

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Residential Single- family	0.51	0.3-0.6	35	75-83
Multi- family	0.66	0.4-0.8	60	85-90
Apartments	0.6	0.5-0.7	60	85-90
Churches and schools	0.75	0.7-0.9	75	88-92
Industrial Light	0.66	0.5-0.8	60	88-91
Heavy	0.78	0.6-0.9	80	88-91
Parks, Cemet- aries	0.30	0.1-0.30	10	61-86
Railroad yard	0.40	0.2-0.4	25	70-80
Undeveloped	0.3	0.1-0.3	0	61-86
Impervious	0.9	0.8-0.95	100	98
Turf	0.3	0.1-0.3	0	61-86
Agricultural	0.3	0.1-0.3	0	61-91

II.1.1.3 Rainfall Intensity. Intensity-duration-frequency curves are tabulated in Table 1. The duration of the design storm shall be equal to the time of concentration of the tributary area.

Time of concentration shall be calculated using the following formula:

$$T_c = T_i + T_t$$

Where: T_c = Time of concentration
 T_i = Inlet time
 T_t = Travel time

Inlet time is the time required for runoff to be conveyed from the most remote location in the watershed to the channelized system. Inlet time shall be calculated using the following formula:

$$T_i = (1.8 * (1.1 - C) * D^{1/2}) / S^{1/3}$$

Where: C = Rational method runoff coefficient
 D = Overland flow distance (300 feet maximum)
 S = Slope of tributary area in percent

Inlet time shall be greater than or equal to 5 minutes and less than 15 minutes.

Leavenworth, Kansas
 Stormwater Master Plan
 Storm Drainage Design Criteria

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Travel time is the time required for runoff to be conveyed through the channelized system within the watershed. Travel time shall be calculated using Manning's equation. Travel time may include flow in street gutters, swales, open channels, and enclosed pipe systems.

II.1.2 Hydrograph Methods. Numerous hydrograph methods and computer programs are available and it is not the intention of these criteria to include an approved list. Developer shall use methods acceptable to the City.

The design storm duration shall be of adequate length to evaluate the entire watershed area. If detention/retention basins are being considered, the design storm duration shall be a minimum of 24 hours. If detention/retention basins are not being evaluated, the design storm shall be of adequate length to calculate a peak flow rate assuming the whole watershed is contributing runoff. Generally, the duration must be greater than two times the time of concentration of the watershed.

The design storm distribution shall be acceptable to the City. A composite storm developed from the intensity-duration-frequency curves in Table 1 was used to estimate peak flows in the Stormwater Master Plan and is shown in Table 2. Another widely used distribution is the SCS Type II distribution shown in Table 3.

II.2. Drainage System Design

II.2.1. Return Frequencies. Drainage system components shall be designed to convey peak flow rates and volumes resulting from the following design storm return frequencies:

Design Storm Return Frequencies	
10 or 25 year	Enclosed drainage systems
50 year	Crossings of collector roads
100 year	Open channels, crossings of arterials, overflow channels, and emergency spillways

II.2.2 Capacities. Drainage system capacities shall be calculated as follows.

II.2.2.1. Gravity Flow Conditions. New enclosed drainage systems shall be designed for gravity flow conditions. Capacity shall be calculated using Manning's equation:

$$Q = (1.49 * A * R^{2/3} * S^{1/2}) / n$$

Where:

Q = Flow in cubic feet per second

Leavenworth, Kansas
 Stormwater Master Plan
 Storm Drainage Design Criteria

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A = Cross-sectional area of flow in square feet
 R = Hydraulic radius which is the cross-sectional area
 divided by the wetted perimeter in feet
 S = Slope of the energy grade line in feet per feet
 n = Manning's roughness coefficient, see below

Manning's Roughness Coefficient, n	
Type of Channel	n
Closed Conduits	
Reinforced Concrete Pipe	0.013
Reinforce Concrete Elliptical Pipe	0.013
22/3 x 1/2 inch Annular Corrugations Metal Pipe, unpaved	0.024
22/3 x 1/2 inch Annular Corrugations Metal Pipe, paved invert	0.021
3 x 1 inch Annular Corrugations Metal Pipe, unpaved	0.027
3 x 1 inch Annular Corrugations Metal Pipe, paved invert	0.023
6 x 2 inch Annular Corrugations Metal Pipe, unpaved	0.033
6 x 2 inch Annular Corrugations Metal Pipe, paved invert	0.028
Vitrified Clay Pipe	0.013
Asbestos Cement Pipe	0.012
Stone Arch	0.025
Open Channels (Lined)	
Gabions	0.025
Concrete trowel finish	0.013
Concrete float finish	0.015
Concrete, unfinished	0.017
Concrete, bottom float finished with sides of Dressed Stone	0.017

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Concrete, bottom float finished sides of Random Stone	0.020
Concrete, bottom float finished sides of Cement Rubble masonry	0.025
Concrete, bottom float finished sides of Dry Rubble or Riprap	0.030
Gravel bottom, sides of Random Stone	0.023
Gravel bottom, sides of Riprap	0.030
Grass (Sod)	0.030
Riprap	0.035
Grouted Riprap	0.030
Open Channels (Unlined) Excavated or Dredged	
Earth, straight and uniform	0.027
Earth, winding and sluggish	0.035
Channels, not maintained, weeds and brush uncut	0.090
Natural Stream	
Clean stream, straight	0.030
Stream with pools, sluggish reaches, heavy underbrush	0.100
Flood Plains	
Grass, no brush	0.030
With some brush	0.090
Street Curbing	0.014

For materials or conditions not included above, refer to Chow's Open Channel Hydraulics.

II.2.2.3. Surcharge Systems. Existing systems may be evaluated for surcharge conditions, if the following conditions are met:

1. The Hydraulic Grade Line (HGL) must be 0.5 feet below any openings to the ground or street at all locations.
2. Pipe joints are capable of withstanding internal surcharge pressure.

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Surcharge capacity shall be determined using Bernoulli's equation accounting for friction losses and minor losses.

II.2.3. Enclosed System Size Requirements. Minimum pipe diameter shall be 15 inches.

Enclosed pipe systems shall be used to convey runoff when peak flows can be conveyed in a 72 inch or smaller diameter concrete pipe. If larger pipe sizes are required, flows can be conveyed either in an enclosed system or open channels.

II.2.3.1. Enclosed System Velocities. Velocities shall be a minimum of 3 feet per second and a maximum of 15 feet per second.

II.2.3.2. Outlet Velocities. The following tables shall be used to determine allowable outlet velocities and erosion control requirements.

II.2.3.2.1. Unimproved (Natural) Receiving Channels. Soil types in Leavenworth are predominantly silty or clay loam, with some sandy loam. For unimproved receiving channels, the following table shows allowable velocities.

Maximum Permissible Velocities for Unimproved Channels of Small Slope			
Soil Type	Manning's n	Permissible Clear Water Velocity, ft/s	Permissible Silty Water Velocity, ft/s
Silt loam, noncolloidal	0.020	2.00	3.00
Stiff clay, very colloidal	0.025	3.75	5.00
Sandy loam, noncolloidal	0.020	1.75	2.50
Ordinary firm loam	0.020	2.50	3.50
Alluvial silts, colloidal	0.025	3.75	5.00
Shales and hardpan	0.025	6.00	6.00
Fine sand, colloidal	0.020	1.50	2.50
Fine gravel	0.0205	2.50	5.00

Graded loam to cobbles when noncolloidal	0.030	3.75	5.00
Graded silts to cobbles when colloidal	0.030	4.00	5.50
Coarse gravel, noncolloidal	0.025	4.00	6.00
Cobbles	0.035	5.00	5.50

Where outlet velocities exceed permissible velocities shown above, energy dissipation or channel lining will be required.

II.2.3.2.2. Improved Receiving Channels. If the receiving stream is an improved channel with lining, the following tables shall be used to determine permissible outlet velocities.

II.2.3.2.3. Grass Lined

Permissible Velocities for Channels Lined with Grass		
Cover	Slope Range, %	Permissible Velocity, ft/s
Bermuda grass	0-5	6
	5-10	5
	>10	4
Buffalo grass, Kentucky bluegrass, blue grama	0-5	5
	5-10	4
	>10	3
Grass mixture	0-5	4
	5-10	3
	>10	do not use

II.2.3.2.2.1. Other Types of Channel Lining. This table provides general guidelines for permissible outlet velocities for the various types of channel lining. The lining material shall be designed specifically for the conditions encountered.

Permissible Velocities for Other Types of Channel Lining	
Material	Permissible Velocity, ft/s
Riprap	5-10

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Grouted riprap, gabion revetment, or paved concrete	10-15
Paved concrete or sound in situ bedrock	Over 15

II.2.3.2.3 Easements. Permanent easements shall be dedicated to the City for operation and maintenance of the storm drainage facilities. Easement width shall not be less than 15-feet, or the outside width of the pipe or conveyance structure plus 10 feet; whichever is greater. Easements shall be centered on the pipe. The City Engineer may require wider easements when other utilities are located within the same easement and/or when the depth of cover is greater than 4 feet. Temporary construction easements of sufficient width to provide access for construction shall be acquired when the proposed work is located in areas developed prior to construction.

II.2.3.3 Materials

Pipes shall be constructed of reinforced concrete unless otherwise approved by the City.

II.2.3.3.1. Pipe thickness. Thickness shall be determined based on loading conditions.

II.2.3.3.2. Bedding. Pipe bedding shall be as recommended by pipe manufacturer.

II.2.3.3.3. Trenching and Backfill. Trenching and backfill shall be in accordance with KDOT standards.

II.2.3.3.4. Cover. Minimum cover shall be 30 inches.

II.2.4. Open Channels. Open channel capacities shall be determined using Manning's equation. Constrictions such as bridges and culverts tend to create nonuniform flow conditions; and therefore, design of open channels should include evaluation of backwater conditions. Backwater conditions shall be evaluated using the standard-step backwater procedure or computer models such as HEC-2, SWMM, or other models acceptable to the City.

II.2.4.1. Natural Channels. Drainage improvements may include the use of unimproved natural channels provided the improvements do not significantly alter peak flow rates, velocities, or alignment of the channel, and the provisions of Section II.2.3.1 are met. Existing conditions and post development conditions shall be evaluated. If peak flow rates or velocities are increased significantly, an improved channel shall be provided.

II.2.4.2. Improved Channels. Improved channels shall be used when development will cause significant erosion in existing natural channels.

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II.2.4.2.1. Channel Lining. The allowable velocities summarized in Section 2.2 shall apply to improved open channel design.

II.2.4.2.2. Side slopes. Side slopes for improved channels shall not be steeper than:

1. 3 horizontal to 1 vertical for turf lining.
2. 2 horizontal to 1 vertical for other lining materials.
3. Flatter if necessary for slope stability.

II.2.4.2.2.1. Vertical walls. Channels shall be designed to avoid the use of vertical walls. If conditions require the use of vertical walls, they shall be constructed of reinforced concrete, to act as retaining walls, and provisions shall be made for access for maintenance equipment and pedestrians.

II.2.4.2.3. Alignment Changes. Alignment changes shall be achieved by a curve having a minimum radius of:

$$R = (V^2 * W) / (8 * D) \text{ where:}$$

- R = Minimum radius of curve along the center line in feet.
- V = Design velocity of flow in feet per second
- W = Width of channel at water surface in feet
- D = Depth of flow in feet

II.2.4.2.4. Freeboard. Channels shall be designed to provide one foot of freeboard for the 100 year flow.

II.2.4.3 Easements. Permanent easements shall be dedicated to the City for operation and maintenance of open channels.

A. Improved Open Channels. Easements shall be as wide as the top of bank width; plus 10 feet on each side. Easements shall be continuous between street right-of-ways. When an improved channel begins or ends at a point other than the right-of-way of a dedicated street, a 15-foot or wider easement graded so as to permit access by truck shall be dedicated from the end of the channel to a street right-of-way.

B. Natural Channels. Natural open channels easements shall be the area between the lines of intersection of the natural ground with a plane 12 inches above the design water surface, plus 10 feet measured horizontally on each side thereof; however the width of the easement shall not be less than 30 feet and the width shall be increased if necessary to permit access by truck along the entire length of the channel.

II.2.5. Manholes and Junction Boxes.

II.2.5.1. Location. Manholes or junction boxes shall be installed at the following locations:

- a. All changes in alignment and grade.

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- b. Changes in conduit size.
- c. Branch connections.
- d. Probable future connections.
- e. Maximum spacing shall be 400 feet for 15 inch pipe, 500 feet for 18 to 36 inch pipe, 600 feet for 42 to 48 inch pipe, and 700 feet for 54 inch and larger pipe.

II.2.5.2. Size. Minimum inside dimensions shall be as follows:

- a. 4 feet for 24 inch or less diameter pipe.
- b. 5 feet for 27 to 36 inch diameter pipe.
- c. 6 feet for 42 to 48 inch diameter pipe.
- d. For larger diameter pipe, junction boxes shall be cast-in-place and shall be detailed on the engineering plans.

II.2.6. Culverts.

II.2.6.1. Capacities. Culverts shall be evaluated for both inlet and outlet control. Capacities shall be determined using Federal Highway Administration nomographs or by other means acceptable to the City.

II.2.6.2. Headwalls, Endwalls, and End Sections. Headwalls, endwalls, and/or end sections shall be installed to anchor the culvert and to prevent erosion.

II.2.6.3. Materials. Culverts shall be constructed of reinforced concrete unless otherwise approved by the City.

II.2.6.4. Structural. Culverts shall be designed for the appropriate loading conditions.

II.2.6.5. Bedding. Proper bedding and foundation shall be provided.

II.2.6.6. Trenching and Backfill. Trenching and backfill shall be in accordance with KDOT standards.

II.2.7. Inlets, Curbs, and Gutters

II.2.7.1. Allowable Spread. The following table shall be used to determine the allowable spread of runoff in roadways for the appropriate design storm event.

Allowable Spread	
Type of Road	Allowable Inundation
Residential and Lateral	Maximum 6 inches deep at crown
Collector	One lane open
Arterial and Highways	One lane open each direction

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II.2.7.2. Curb Capacity. Curb capacity shall be calculated using Izzard's formula:

$$Q=(0.56*z*S^{1/2}*D^{8/3})/n \text{ where:}$$

- Q = Flow in cubic feet per second
- z = Reciprocal of the average cross-slope, including gutter section, in feet per foot
- S = Longitudinal slope of roadway in feet per foot
- D = Depth of flow at curb face in feet
- n = Manning's "n"

II.2.7.3. Inlets. Inlets shall be designed according to Detail 1 unless otherwise approved by the City. Only curb opening type inlets shall be permitted unless otherwise approved by the City.

II.2.7.3.1. Inlet Capacity. Inlet capacity shall be 80 percent of the theoretical capacity provided in Tables 4-6 and/or Nomographs A through D.

II.2.7.3.2. Inlet Spacing. Maximum inlet spacing shall be 400 feet.

II.2.7.3.4. Inlet Location. Inlets shall be located in sumps where possible. Inlets shall be placed at intersections of cul-de-sacs.

II.2.7.3.5. Hydraulic Grade Line. The hydraulic grade line within the storm drainage system shall be a minimum of 0.5 feet below the minimum inlet opening elevation.

II.2.8. Stormwater Detention. Detention storage can be provided in lieu of off-site drainage improvements. Storage shall be provided so that peak discharge rates are equal to or less than those shown in the Master Plan.

II.2.8.1. Size. Detention basin volume shall be determined by routing a 24-hour design storm. An SCS Type 2 24-hour storm shall be the required storm hyetograph.

II.2.8.2. Principal Spillway. The principal spillway shall be designed to function without requiring attendance or operation of any kind or requiring use of equipment or tools, or any mechanical devices. At least 80 percent of the detention storage volume shall be discharged within 24 hours after the peak flow has entered the basin.

II.2.8.3. Emergency Spillway. The emergency spillway may either be combined with the principal spillway or be a separate structure or channel. Emergency spillways shall be designed so that their crest elevation is 0.5 feet or more above the maximum water surface elevation in the detention facility attained by the 100-year storm.

II.2.8.4. Outlet Works. Outlet works consisting of valves, gates, pipes, and other devices as necessary to completely drain the facility in 72 hours or less shall be provided.

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II.2.8.5. Access. Provision shall be made to permit access and use of auxiliary equipment for maintenance.

II.2.8.6. Underground Storage. Underground detention facilities shall be designed with adequate access for maintenance. Such facilities shall be provided with positive gravity outlets. Venting shall be provided.

References:

1. Urban Hydrology for Small Watersheds, Soil Conservation Service, 1986.
2. Section 5600 Storm Drainage Systems and Facilities Kansas City Metropolitan Chapter of the American Public Works Association, March 1990.
3. City of Topeka Design Criteria and Drafting Standards, January 1993.
4. City of Lee's Summit Design and Construction Manual, September 1992.
5. KDOT idf curves
6. Standard Specifications for State Road and Bridge Construction, Kansas Department of Transportation, 1990.
7. Hydraulic Design of Highway Culverts, Federal Highway Administration, September 1985.

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MEMORANDUM

Leavenworth, Kansas
Stormwater Master Plan
New Development Plan Review Criteria

B&V Project 26529.110
B&V File W
May 24, 1999

To: Mike McDonald

From: Jeff Henson

New Development Plan Review Policies and Procedures

I. OBJECTIVE

This document lists the policies and procedures to be used by the City in reviewing drainage plans associated with new developments. A new development is defined as a tract of land containing four (4) or more lots to be developed.

II. POLICIES

The following policies relating to storm drainage were adopted by the City as part of the development of a Stormwater Master Plan (Master Plan).

II.1. A drainage report must be submitted by a professional engineer registered in the State of Kansas. The report shall be signed and sealed.

II.2. New Development plans shall include plans for the conveyance of stormwater and shall be signed and sealed by a professional engineer registered in the State of Kansas. The stormwater facilities shall be designed in accordance with design criteria set forth in "Drainage Criteria Manual, City of Leavenworth, Kansas," (Design Criteria) developed as part of the Master Plan.

II.3. Easements for drainage shall be granted to the City for access to underground drainage improvements and along open channels where the flow is greater than which could be conveyed by a 72 inch diameter pipe. Minimum easement requirements are listed in the Design Criteria.

II.4. Curbs and gutters shall be provided on all new roadways.

II.5. Off-site drainage improvements or detention storage shall be provided if peak flow rates resulting from the new development are greater than those shown in the Master Plan.

II.6. Underground drainage systems shall be installed in all areas where the flow can be contained in a 72 inch diameter pipe.

II.7. Systems shall be designed to address State and Federal regulations regarding stormwater quality.

III. PLAN REVIEW PROCEDURES

As part of the site plan approval process, Drainage Plans shall be reviewed by the Engineering staff. The drainage plan submittal shall consist of a Drainage Report and Drainage System Plans.

III.1. Drainage Report. The drainage report shall be submitted by the developer and it shall be signed and sealed by a professional engineer

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Subdivision Plan Review Criteria

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in the State of Kansas. The Drainage Report shall consist of the following:

III.1.1. Assumptions. A listing of the assumptions used in calculation of peak runoff rates and capacities of the proposed system and the existing receiving system.

III.1.2. Topographic Map. A topographic map showing the location of the site. The map shall include a plan of the existing surface features; the proposed development; the proposed drainage system location, size, and capacity; the existing receiving system location, size, and capacity; delineation of tributary areas to points of concentration in the drainage system; and delineation of individual lot drainage patterns. The map shall be at a scale of 1"=100' with 2 foot ground elevation contour lines.

III.1.3. Watershed Information. A table showing the land use, soil type, area, and slope of each tributary area.

III.1.4. Runoff Information. Tables summarizing the runoff characteristics shall be provided. The Rational method shall be used for estimating peak runoff for areas less than 300 acres. A hydrograph method for estimating peak runoff shall be used for areas larger than 300 acres. Computer models such as TR-55, TR-20, HEC-1, or SWMM are acceptable.

III.1.4.1. Rational Method Runoff Information. A table shall be provided showing the Rational method calculations including: cumulative area to the point of concentration, cumulative C value, time of concentration, rainfall intensity, and peak flow rate, drainage system size, and drainage system capacity. These calculations should be provided for both the pre-development and post-development conditions.

III.1.4.2. Hydrograph Method Runoff Information. A table shall be provided showing the runoff information including: drainage areas to each point of concentration, cumulative percent impervious, time of concentration for the watershed, design storm, peak flow rates, drainage system size, and drainage system capacity. These calculations should be provided for both the pre-development and post-development conditions.

III.1.5. Receiving System Information. A comparison of the ultimate development peak flow rate shown in the Master Plan versus the peak flow rate calculated in the report should be made. If the new development increases peak flows above those shown in the Master Plan, then off-site drainage improvements or a detention basin will be required.

III.1.5.1. Off-Site Drainage. Off-site drainage improvements required in section III.1.5. shall be identified in the Drainage Report. A topographic map, watershed information, and runoff information shall be provided for off-site drainage improvements in accordance with sections III.1.1. through III.1.4.

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III.1.5.2. Detention Storage. Detention storage can be provided in lieu of off-site drainage improvements. Storage shall be provided so that peak discharge rates are equal to or less than those shown in the Master Plan. A topographic map meeting the requirements of III.1.2 shall be included. Additional items shall include stage-storage-discharge curves, inflow and outflow hydrographs, and spillway configuration and capacity.

III.2. Drainage System Plans. Plan and profile of the drainage system shall be submitted. The drainage system drawings shall be in conformance with the following.

Plan:	1-inch =	50-feet
Profile:		
Vertical:	1-inch =	10-feet
Horizontal:	1-inch =	50-feet
Cross-Sections:		
Vertical:	1-inch =	10-feet
Horizontal:	1-inch =	50-feet

III.3. City Review. Drainage Plans shall be reviewed by Engineering staff. Comments shall be provided to the developer within 60 days of receipt. Building permits shall not be granted until final approval of the Drainage Plans is obtained.

III.4. Construction Inspection. City building inspectors shall verify that the drainage system and site grading are constructed according to plans. Any changes in the plan during construction shall be approved by the City.

III.5. Permit to Occupy. The developer must show proof that the drainage system and site grading were constructed in accordance with plans to receive the permit to occupy. Proof shall consist of a final site survey including spot elevation checks. Verification of any changes to the plans during construction shall also be submitted with the final site survey and shall show altered drainage patterns. Comments shall be provided to the developer within 30 days of receipt of the final site survey.

Table 4
**CURB INLET CAPACITY
 FOR
 12.0-FOOT GUTTER SPREAD**

GUTTER SLOPE IN PERCENT	GUTTER CAPACITY C.F.S.	CURB INLET DESIGN CAPACITY C.F.S. FOR INLET LENGTH						
		4 FOOT	5 FOOT	6 FOOT	8 FOOT	10 FOOT	11 FOOT	12 FOOT
0.5	2.7	G	G	G	G	G	G	G
1	3.7	G	G	G	G	G	G	G
2	5.3	5.3	G	G	G	G	G	G
3	6.5	5.4	5.6	5.7	G	G	G	G
4	7.5	5.4	5.9	6.0	6.8	7.1	7.3	7.4
6	9.1	5.6	6.4	6.5	7.4	8.1	8.5	8.9
8	10.6	5.7	6.8	6.9	8.0	9.0	9.4	9.8
10	11.8	6.4	7.2	7.9	9.1	10.1	10.6	11.1
12	12.9	7.1	7.9	8.6	10.0	11.2	11.7	12.2
14	14.0	7.6	8.6	9.4	10.8	12.1	12.7	13.2

NOTES & REFERENCES:

1. Inlet capacities derived from "The Design of Stormwater Inlets" Johns Hopkins University, 1956
2. Gutter capacity calculated by Izzard's Equation
3. Inlet capacity is for 1/4" per foot street crown and inlet throat and transition geometry per Figure 8-0
4. Gutter deflectors are required for inlets on slopes of 4 percent and steeper.
5. Linear interpolation within the range of the table is permitted for slopes and corresponding capacities not shown.
6. Reduce above theoretical capacities by 20% for clogging allowance per Section 5603.1.B.
7. "G" indicates inlet capacity is greater than gutter capacity and the 20% capacity reduction is not required.

From Kansas City Metropolitan Chapter of the
 American Public Works Association
 Section 5600 Storm Drainage Systems and Facilities

Table 5
**CURB INLET CAPACITY
 FOR
 11.5-FOOT GUTTER SPREAD**

GUTTER SLOPE IN PERCENT	GUTTER CAPACITY C.F.S.	CURB INLET DESIGN CAPACITY C.F.S. FOR INLET LENGTH						
		4 FOOT	5 FOOT	6 FOOT	8 FOOT	10 FOOT	11 FOOT	12 FOOT
0.5	2.4	G	G	G	G	G	G	G
1	3.3	G	G	G	G	G	G	G
2	4.7	G	G	G	G	G	G	G
3	5.7	5.5	G	G	G	G	G	G
4	6.6	5.3	5.9	6.0	6.3	6.6	6.6	6.6
6	8.1	5.1	6.1	6.5	7.2	7.9	8.1	8.1
8	9.4	5.7	6.3	6.9	8.0	8.9	9.1	9.2
10	10.5	6.3	7.0	7.7	8.9	9.9	10.1	10.3
12	11.5	6.9	7.7	8.4	9.7	10.8	11.1	11.4
14	12.4	7.6	8.5	9.3	10.8	12.0	12.4	12.4

NOTES & REFERENCES:

1. Inlet capacities derived from "The Design of Stormwater Inlets"
Johns Hopkins University, 1956
2. Gutter capacity calculated by Izzard's Equation
3. Inlet capacity is for 1/4" per foot street crown and inlet throat and transition geometry per Figure 8-0
4. Gutter deflectors are required for inlets on slopes of 4 percent and steeper.
5. Linear interpolation within the range of the table is permitted for slopes and corresponding capacities not shown.
6. Reduce above theoretical capacities by 20% for clogging allowance per Section 5603.1.B.
7. "G" indicates inlet capacity is greater than gutter capacity and the 20% capacity reduction is not required.

From Kansas City Metropolitan Chapter of the
 American Public Works Association
 Section 5600 Storm Drainage Systems and Facilities

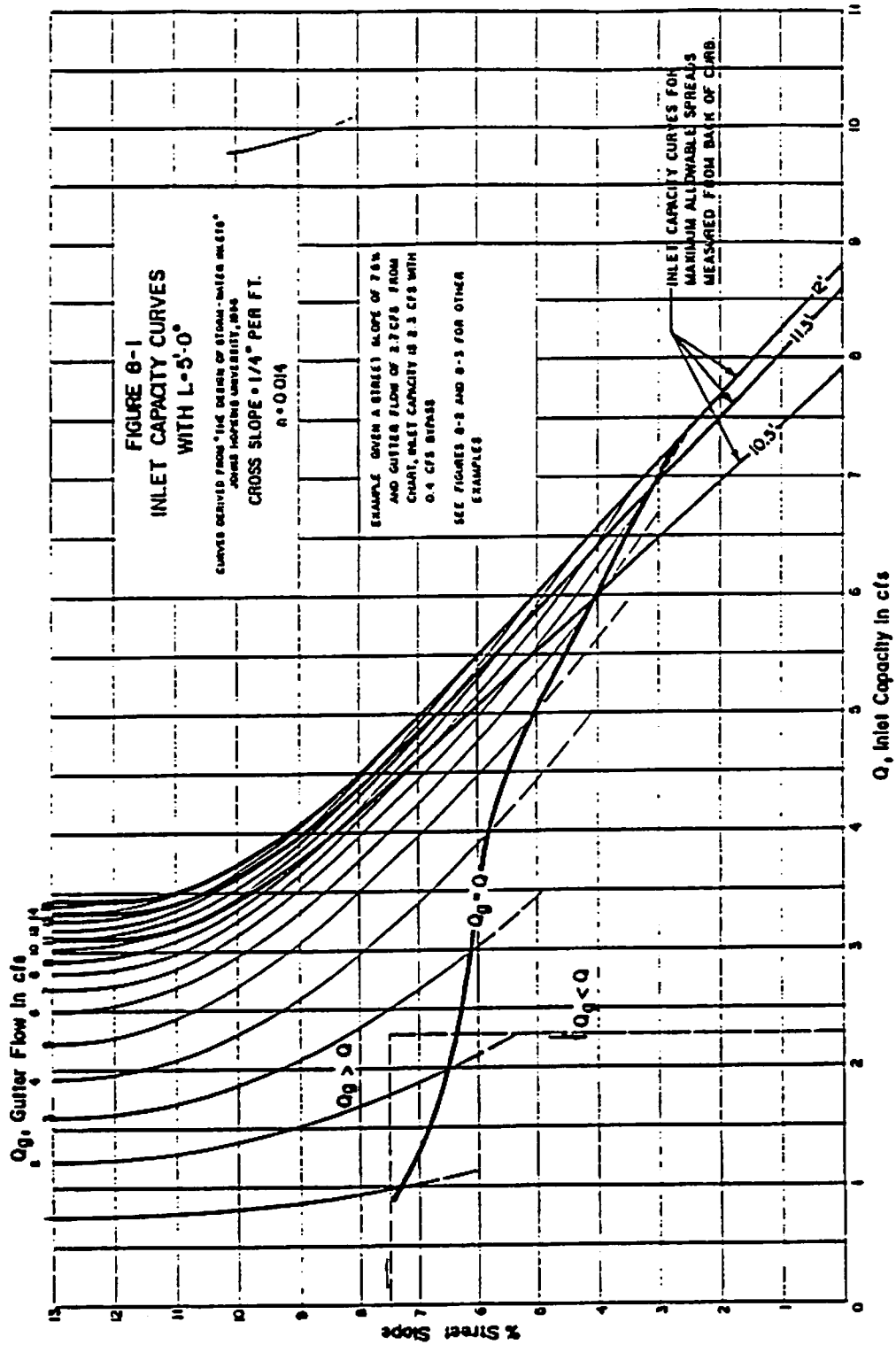
Table 6
**CURB INLET CAPACITY
 FOR
 10.5-FOOT GUTTER SPREAD**

GUTTER SLOPE IN PERCENT	GUTTER CAPACITY C.F.S.	CURB INLET DESIGN CAPACITY C.F.S. FOR INLET LENGTH							
		4 FOOT	5 FOOT	6 FOOT	8 FOOT	10 FOOT	11 FOOT	12 FOOT	
0.5	1.8	G	G	G	G	G	G	G	G
1	2.6	G	G	G	G	G	G	G	G
2	3.7	G	G	G	G	G	G	G	G
3	4.5	G	G	G	G	G	G	G	G
4	5.1	4.6	4.8	5.1	G	G	G	G	G
6	6.3	4.9	5.3	5.7	6.3	7.2	G	G	G
8	7.3	5.1	5.7	6.3	7.2	G	G	G	G
10	8.2	5.9	6.6	7.2	8.1	G	G	G	G
12	8.9	6.3	7.1	7.8	8.9	G	G	G	G
14	9.6	6.9	7.7	8.4	9.6	G	G	G	G

NOTES & REFERENCES:

1. Inlet capacities derived from "The Design of Stormwater Inlets" Johns Hopkins University, 1956
2. Gutter capacity calculated by Izzard's Equation
3. Inlet capacity is for 1/4" per foot street crown and inlet throat and transition geometry per Figure 8-0
4. Gutter deflectors are required for inlets on slopes of 4 percent and steeper.
5. Linear interpolation within the range of the table is permitted for slopes and corresponding capacities not shown.
6. Reduce above theoretical capacities by 20% for clogging allowance per Section 5603.1.B.
7. "G" indicates inlet capacity is greater than gutter capacity and the 20% capacity reduction is not required.

From Kansas City Metropolitan Chapter of the
 American Public Works Association
 Section 5600 Storm Drainage Systems and Facilities



Reduce above theoretical capacities by 20% for clogging allowance per Section 5603.1.B.

Nomograph A

From Kansas City Metropolitan Chapter of the
American Public Works Association
Section 5600 Storm Drainage Systems and Facilities

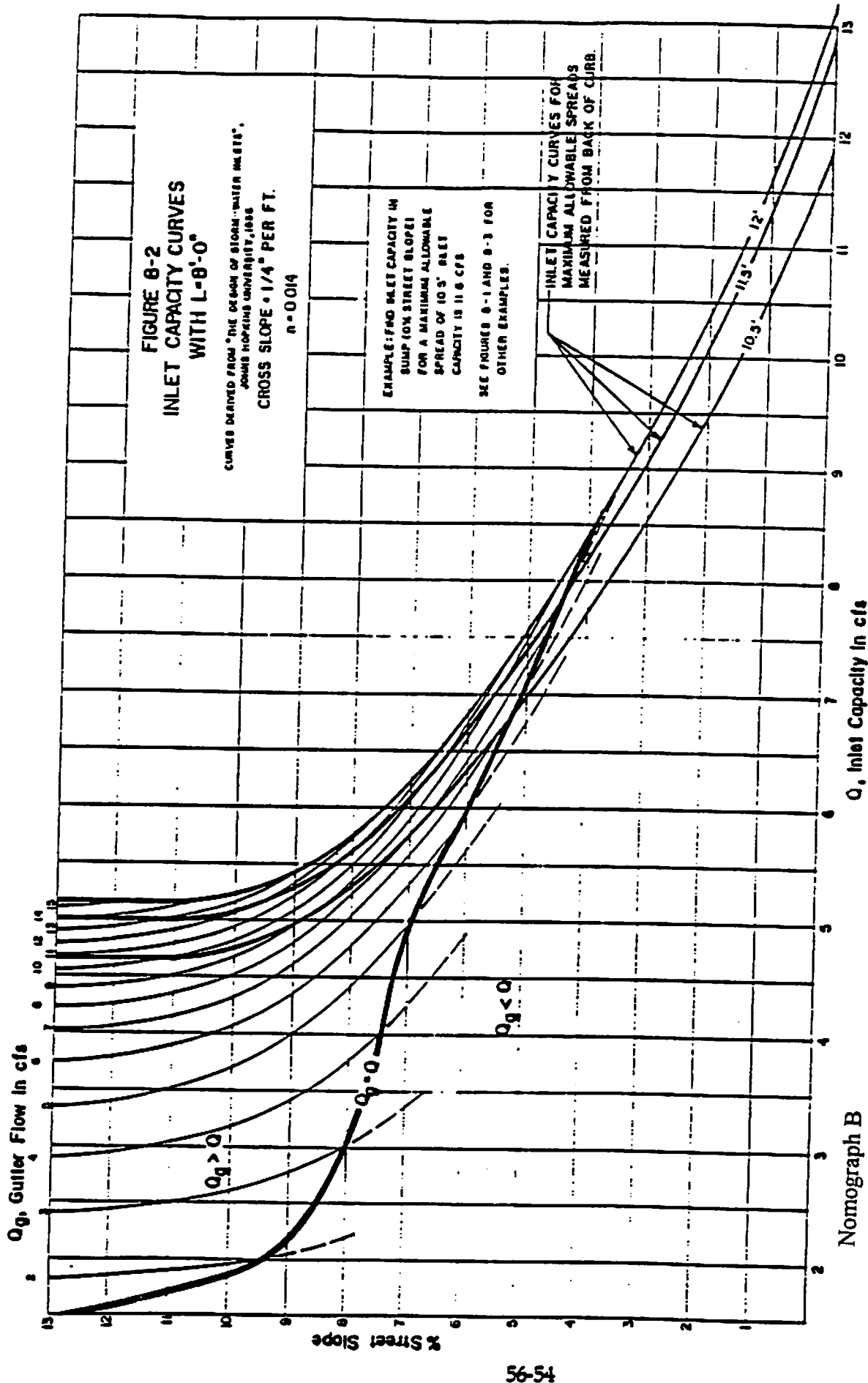


FIGURE 8-2
INLET CAPACITY CURVES
WITH L=8'-0"

CURVES DERIVED FROM "THE DESIGN OF STORM-WATER WEIRS",
 JOHN HOPKINS UNIVERSITY, 1956
 CROSS SLOPE = 1/4" PER FT.
 n = 0.014

EXAMPLE: FWD WLET CAPACITY IN
 SUMP (ON STREET SLOPE)
 FOR A MAXIMUM ALLOWABLE
 SPREAD OF 10.3' WLET
 CAPACITY IS 11.6 CFS
 SEE FIGURES 8-1 AND 8-3 FOR
 OTHER EXAMPLES.

INLET CAPACITY CURVES FOR
 MAXIMUM ALLOWABLE SPREADS
 MEASURED FROM BACK OF CURB.

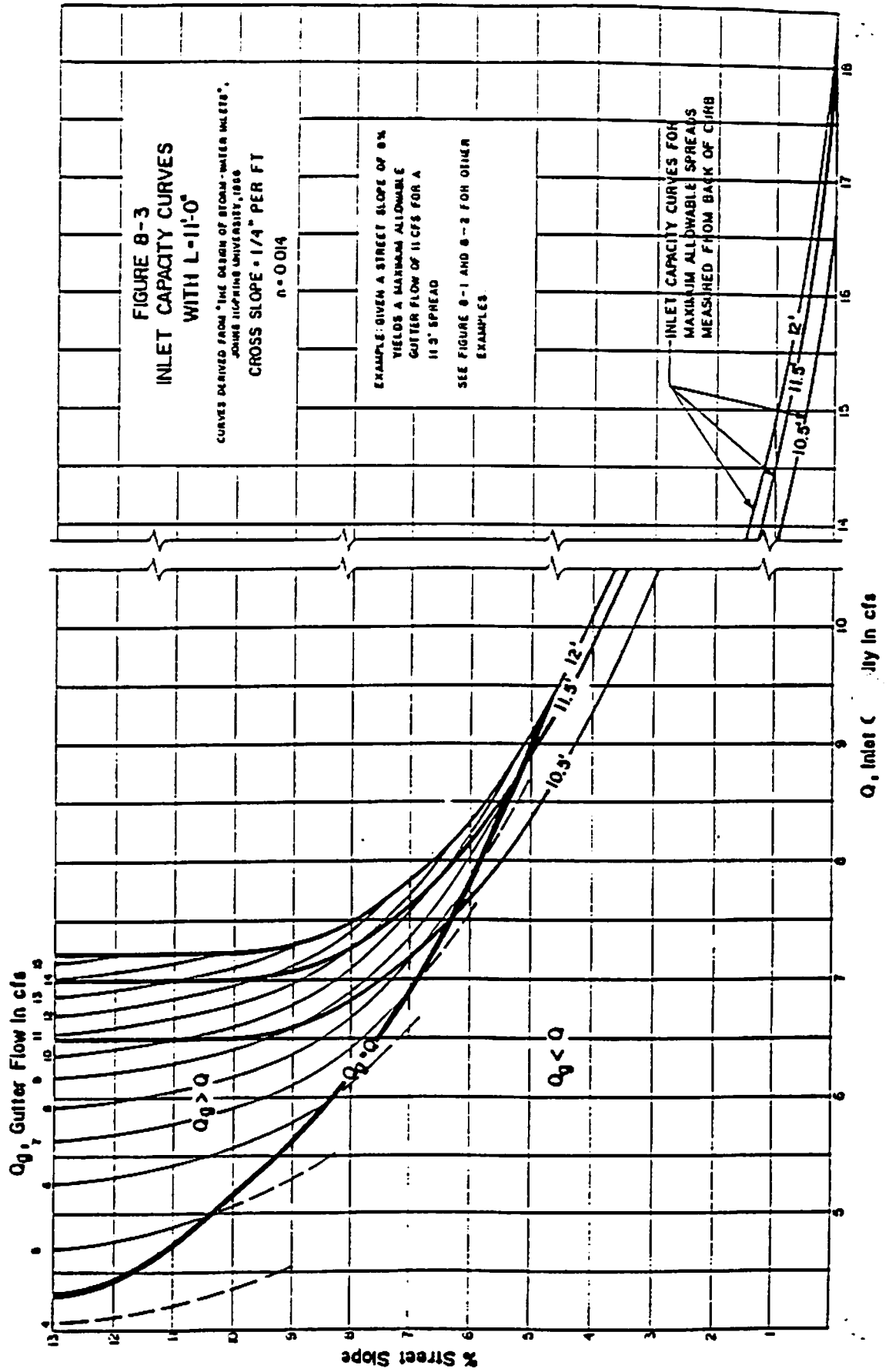
Nomograph B

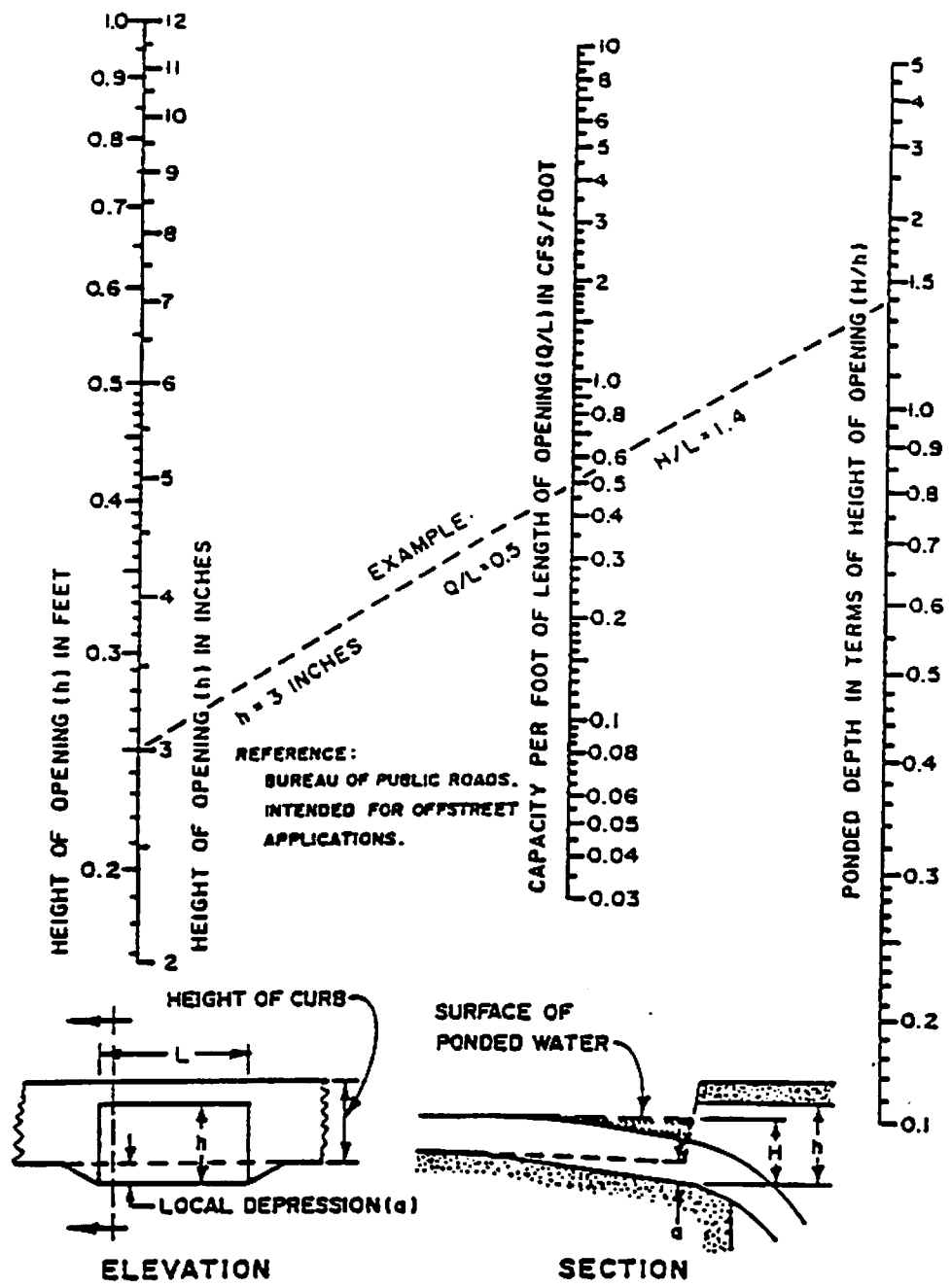
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Reduce above theoretical capacities by 20% for clogging allowance per
 Section 5603.1.B.

Nomograph C

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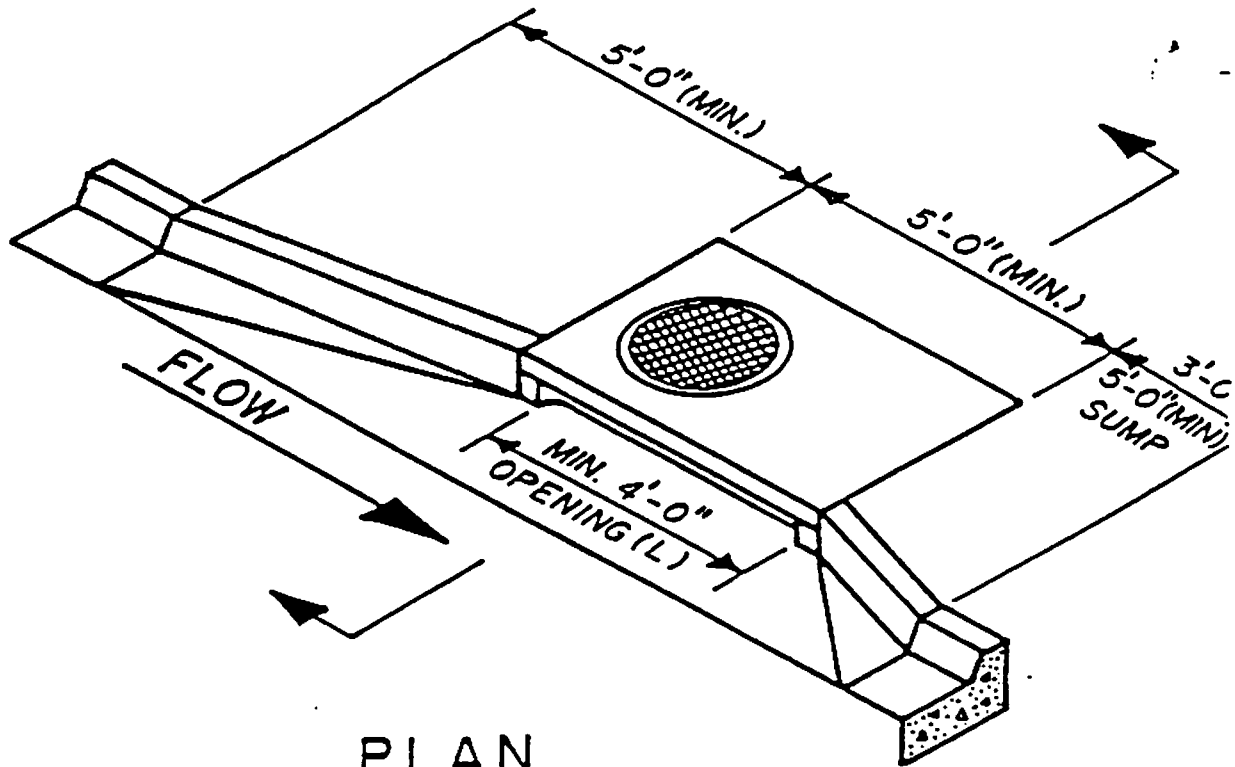


CAPACITY OF CURB OPENING INLET AT LOW POINT IN GRADE.

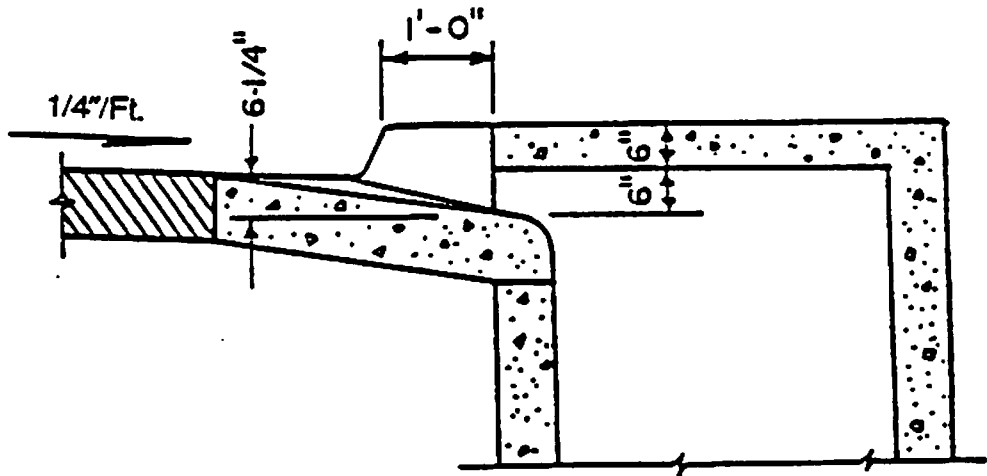
FIGURE 8-4

Nomograph D

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PLAN
NO SCALE



Detail 1

SECTION
NO SCALE

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FIGURE
8-0

**CURB INLETS
MINIMUM HYDRAULIC DIMENSIONS**