EWSU Policy

Green Infrastructure (GI) Cost Participation

Policy Statement

The GI Cost Participation Policy provides supplemental monetary incentives to include green infrastructure storm water redirection techniques into redevelopment or rehabilitation projects within targeted sewer sub-basins to strategically reduce combination sewer overflow volumes.

Reason for the Policy

The City of Evansville and the Evansville Water and Sewer Utility entered into a Federal Consent Decree in 2011. The purpose of the Consent Decree was to eliminate sanitary sewer overflows and significantly reduce combination sewer overflows all at both an acceptable receiving stream water quality and financial level affordable to the Sewer Utility rate payers.

Several solution sets of projects were analyzed for the highly urbanized combination sewer areas of downtown. The downtown area is served primarily by three different combination sewer sheds that overflow into the Ohio River at Dress Plaza. Two solutions emerged for these sewer sheds. Either the Utility could store, convey, and treat these overflows or the Utility could redirect the storm water from the existing combination sewer system. From the concept of the second option, this policy was created.

The downtown area is comprised roughly of 65% private and 35% municipal owned property or public right-of-way. In addition, statistically 30% of the downtown privately held property will be rehabilitated or repurposed every 20 years. This policy sets forth a cost participation program for other municipal entities and possibly private organizations to consider when redeveloping or rehabilitating their property. If storm water could be redirected, reused, or removed from the combination sewer during CSO events, more costly storage requirements could be reduced or eliminated.

It would be ultimate the goal of a GI cost participation policy to provide enough storm water redirection to simply eliminate all large storage tank components and significantly reduce the conveyance needs for the residual flows of combination sewage to the treatment plant.

Applicability of the Policy

This policy applies to all construction, redevelopment, or rehabilitation opportunities located within the three sewer basins serving the downtown area, namely E-1, E2, and E-4.

Policy Elaboration

With the agreement of a signed Consent Decree, Evansville started creating solution sets to reduce or eliminate combination sewer overflows. A component of the solution set evaluation included exploring green infrastructure redirection concepts. Regionally and nationally green infrastructure has been included as part of municipal consent decrees. Cities such as Washington D.C., Philadelphia, Cincinnati, and Louisville have integrated green infrastructure into their consent decree plans. The EPA published their own Guide to Green Infrastructure in the fall of 2012.

The Engineers completing the evaluation in Evansville gleaned knowledge from lessons learned in these larger communities. They also looked at local conditions and quickly realized potential advantages to green infrastructure as a significant component in the Evansville plan. Studies such as the Relative Infiltration Potential Rating (RIPR) identified areas of geology favorable to green infrastructure concepts. Evansville is situated on a bend of the Ohio River. Underneath the two top layers of soil is glacial till wash and river sand deposits. This type of geology conducts water virtually unrestrained. Green Infrastructure implementation that was able to tap into the lower levels of geology offer high potential for redirection effectiveness.

In 2012, the Evansville Water and Sewer Utility participated in a project in the rear parking lot of the Civic Center, the area known as the Back 40. Under that project, the EWSU paid for the installation of two underground infiltration beds, rock rain gardens, and pervious concrete. The total cost of these additions was $1.1M. Post construction monitoring of the improvements revealed that the areas that had rain gardens only diverted approximately 50% of rainfall runoff and the areas that had rain gardens and underground infiltration beds diverted approximately 90% of rainfall runoff. The area of 90% storm water redirection proved that high level GI redirection application could be made in the downtown area by utilizing the river sand geology that exists underneath the downtown area. Further runoff analysis of the Back 40 project estimated 6 million gallons per year would be diverted. The cost to divert this amount of runoff was calculated at $0.18/annual gallon.

With the results from the pilot project underneath the Back 40, a cost participation draft was created to mathematically define a participation procedure. The draft calculations and sample participation amounts are attached.

Abbreviations

EPA	Environmental Protection Agency
EWSU	Evansville Water & Sewer Utility
GI	Green Infrastructure

Definitions

Combination Sewer	A sewer collection system that collects and conveys both sanitary sewer and storm water runoff.
Green Infrastructure	Any project amenity that reduces the amount of storm water in the combination sewer. Traditionally these amenities include rain gardens, infiltration beds, pervious concrete, and rain barrels; but they could also include holding tanks that release storm water back into the combination sewer system at a time when an overflow event has ceased.
Redirection	The act of removing storm water from a collection sewer during a combination sewer overflow event. This removal (or redirection) can be temporary or permanent.

Procedures

The procedures to have a project cost supplemented by this Utility policy are as follows:

1. Identify the Green Infrastructure opportunity within a project.
2. Use the attached participation calculation guidelines to create a business case for Utility participation.
3. Submit a Green Infrastructure Business Case to the Water Planning department that identifies the number of gallons of storm water that will be directed away from the combination sewer annually.
4. The Water Planning department will review the Green Infrastructure Business Case, its associated claim to storm water redirection quantities, construction components, the available participation funds, and other opportunities and constraints.
5. With agreement to the business case, the Water Planning department will recommend participation in the project at the current participation level to the Utility Board.

The Utility reserves the right to suspend this policy or any specific project participation due to regulatory restrictions, non-conformance with long term goals, or funding sources.

Forms

There are no standard forms at this time.

Contacts

Questions related to the daily operational interpretation of this policy should be directed to:

Michael Labitzke, Deputy Director Utilities – Engineering
812.421.2130 x2228

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The Director of the Evansville Water and Sewer Utility is the official responsible for the interpretation and administration of this policy.

Related Documents / Policies

There are no known related documents.

Effective Date

This policy was voted effective September 2, 2014 by the Evansville Water and Sewer Utility Board.

EVANSVILLE WATER &
SEWER UTILITY

ALLEN R. MOUNTS
UTILITY DIRECTOR

Green Infrastructure (GI) Participation Calculation Guidelines

As part of the Integrated Overflow Control Plan (IOCP) submitted to the USEPA and IDEM on May 31, 2013, the Evansville Water and Sewer Utility set forth a Green Infrastructure implementation program that includes a capital cost participation from the Utility.

The participation area is identified by sewer sub-basin number and generally includes the areas of the City bounded by the Ohio River, Lloyd Expressway, US41, Lincoln Avenue, Weinbach Avenue, to Covert & US41, then Riverside Drive. The sewer sub-basins are E-1, E-2, & E-4.

These three sub-basins drain toward the downtown area and during a rain event, activate combination sewer overflows that drain to the Ohio River along Riverside Drive.

The purpose of the participation program is to directly reduce the volume of combination sewer overflow released in the Dress Plaza area. Reduction of storm water through the combination sewer overflows can happen three ways: redirection, capture and reuse, or capture and timely release back into the combination sewer.

The calculation of the participation can best be summarized as follows:

1. Select the desired GI storm water device.
2. Calculate the direct drainage area of the GI device (square feet).
3. Determine the Rational Formula Runoff Coefficient (C) of the drainage area.
4. Calculate the rain event size that can be captured by the GI device prior to any discharge to the combined sewer system (inches).
5. Determine the % of rainfall capture by storm rainfall depth by the following Table:

Rain Event Size Captured with Zero Discharge	Percent Annual Rainfall Captured
½"	55%
1"	79%
1 ½"	89%
2"	94%

6. Calculate the Utility participation amount using the following formula:

Utility Participation = 0.0565 x C x % Annual Rainfall Captured x Direct Drainage Area

The following requirements must be satisfied by any GI proposed feature:

1. All redirection proposals must include a penetrometer test at the actual feature site and depth.
2. All reuse proposals must include a consistently available reuse need through all seasons.
3. All store and release proposals must have valving and emergency overflow that allows precise control by the Utility.
4. All proposals must provide for cleaning and maintenance of the GI feature.
5. All proposals shall be able to provide an empty condition within 48 hours of the rain event.

Example GI Participation Proposal No. 1

A parking garage with a drainage area of 20,000 sft will be drained through top level inlets and routed vertically to a 15,000 gallon holding tank located in the lowest level of the garage. The tank will be operated with a valve which can be closed prior to a rain event to catch the full 15,000 gallons before an emergency overflow would allow excess storm water runoff to drain to the combination sewer trunk line. After the combination sewer overflow has ceased activation after the rainfall event, the valve can be opened allowing the tank to drain to the combination sewer trunk line and directed to the wastewater treatment plant for treatment.

The Utility will participate in this GI feature in the following amount:

Direct Drainage Area	20,000 sft
C Value	0.9
Rain event size to be captured	12 in/ft * (15,000 gal / 7.48 gal/cft) / 20,000 sft = 1.2"
% Annual Rainfall Captured	83% (straight line between 1" and 1 ½")

Participation = 0.0565 x 0.9 x 83 x 20,000 = $84,400

Example GI Participation Proposal No. 2

A building redevelopment proposes to install three 12-foot diameter dry wells in an open café area to redirect storm water to the ground water table. The entire 18,000 sft site will be directed to the drywells. A penetrometer test shows that the infiltration rate at 8 feet deep is 0.9 in/hr. The overflow for the dry wells are directed to the combination sewer trunk line.

The Utility will participate in the GI feature in the following amount:

Direct Drainage Area	18,000 sft
C Value	0.85 (Composite C-value of entire site)
Rain event size to be captured	0.9 in/hr x 48 hours = 43.2 inches useful dry well height
	3 x (π x D^2 / 4) x (43.2/12) = 1221 cft / 18,000 sft = 0.8 in.
% Annual Rainfall Captured	69% (straight line between ½" and 1")

Participation = 0.0565 x 0.85 x 69 x 18,000 = $59,647

Example GI Participation Proposal No. 3

A redevelopment proposes to over excavate under a recessed curbed island area of a parking lot. The over excavation will be 6-feet deep and will have a plan area of 944 square feet. The parking lot area draining to the island area is 13,800 sft. A penemtrometer test shows that the infiltration rate at 6 feet deep in this area is 1.7 in/hr. The void ratio of the stone backfill is 40%. An overflow inlet in the recessed curbed island will be set to provide overflow runoff capacity to the combination sewer trunk.

The Utility will participate in the GI feature in the following amount:

Direct Drainage Area	13,800 sft
C Value	0.9
Rain event size to be captured	1.7 in/hr x 48 hours = 81.6 inches – can use full depth

0.4 x 6 x 944 = 2265 cft / 13,800 cft = 2.0 in.

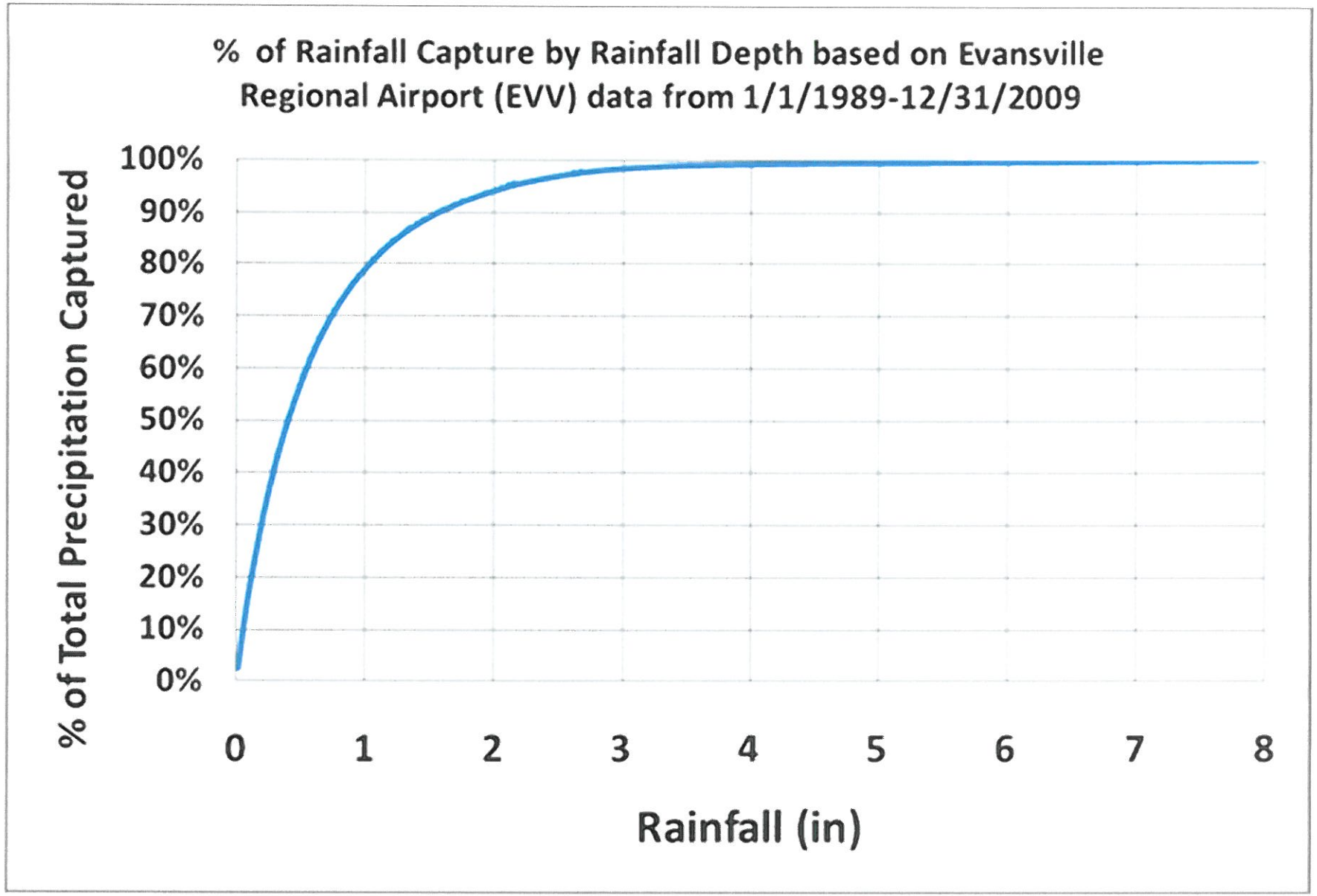
% Annual Rainfall Captured 94%

Participation = 0.0565 x 0.9 x 94 x 13,800 = $65,963

The above guidelines are subject to change as the program develops. Anyone wishing to consider the implementation of a GI feature into their development are encouraged to check the most current participation conditions prior to engineering.

This draft was produced January 16, 2014.

The Green Infrastructure Policy was Board approved September 2, 2014.


% of Rainfall Capture by Rainfall Depth based on Evansville Regional Airport (EVV) data from 1/1/1989-12/31/2009
% of Total Precipitation Captured
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
1
2
3
4
5
6
7
8
Rainfall (in)