Integrated Stormwater Management (iSWM) Implementation Subcommittee Meeting

April 30, 2025, 1:30 pm – 3:30 pm

iSWM

North Central Texas Council of Governments
Environment & Development

1. Welcome and Introductions

Meeting agenda, and presentation are located on the iSWM Implementation Subcommittee webpage: https://www.nctcog.org/envir/committees/public-works-council/iswm-implementation-subcommittee

iSWM

North Central Texas Council of Governments
Environment & Development

Action Items

iSWM

North Central Texas Council of Governments
Environment & Development

2. Approval of January 29, 2025, Meeting Summary

- The meeting summary is posted online. https://www.nctcog.org/getmedia/5f758697-7ce0-4cc8-9ecb-cfaa5e478628/iSWM-Meeting-Summary-01-29-2025.pdf?ext=.pdf

iSWM

North Central Texas Council of Governments
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Discussion Items

North Central Texas Council of Governments
Environment & Development

3. NCTCOG Training & Development Institute (TDI)

SW3P Courses

Background:

1. SW3P Curriculum: developed by third party using NCTCOG grant funding
    a. Last Update: August 2023
2. Training Sessions
    a. Quarterly (on NCTCOGs fiscal year), 2 consecutive days, 4 hours daily
        i. Nov, Feb, Jun, and Aug
        ii. Day 1: Plan Reviewers
        iii. Day 2: Field Inspectors
    b. All logistics are handled by TDI without oversite

New Instructor – potential position available:

1. The current instructor has mentioned a desire to be fully retired. (Note: I am not sure when he will decide to be firm on this statement.)
2. Desired instructor:
    a. Education & Field experience (ability to answer technical/policy questions)
    b. Effective public speaker (can insert color into the presentation, won't need to read the slides verbatim to participants)
    c. Scheduling availability
    d. Under the "Services for Resale" exemption NCTCOG is not required to utilize an RFP to find an instructor

Committee Assistance

1. Request recommendations for an instructor
    a. Based on the above criteria
2. TDI is open to changing the number of sessions annually; is there an E&D/iSWM requirement for 4?

Fiscal Year	Plan Reviewers	Field Inspectors
25	35	51
24	64	98

iSWM

North Central Texas Council of Governments
Environment & Development

Denton's Design Criteria Manual and Conditions-Based Updates

Inlet Protection and Best Practicable Technology

Jennifer Rovezzi, City of Denton Watershed Protection

- Updating the DCM – the Process
- Curb Inlet Protection
- Best Practicable Technology
- Updating the Denton Development Code

City of Denton, Texas

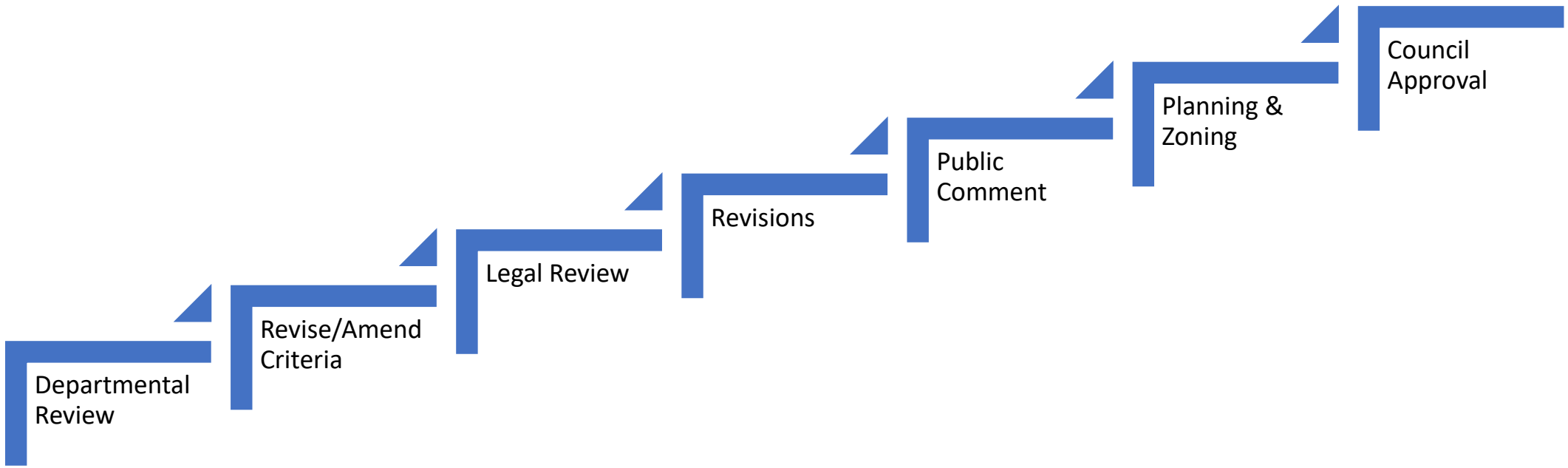
Updating the Design Criteria Manual

The Process

April 30, 2025

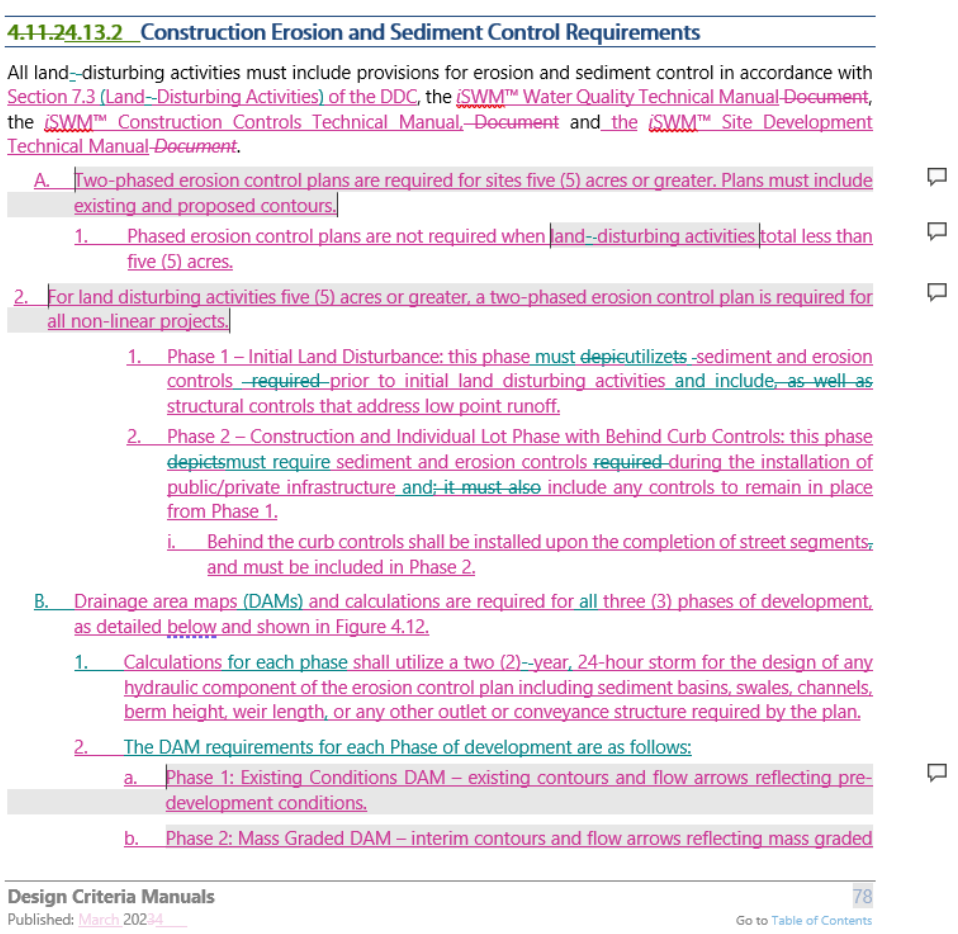
Updating the Design Criteria Manual

City of Denton, Texas



Updating the Design Criteria Manual

City of Denton, Texas



~~4.11.~~24.13.2 Construction Erosion and Sediment Control Requirements

All land-disturbing activities must include provisions for erosion and sediment control in accordance with Section 7.3 (Land-Disturbing Activities) of the DDC, the iSWM™ Water Quality Technical Manual ~~Document~~, the iSWM™ Construction Controls Technical Manual, ~~Document~~ and the iSWM™ Site Development Technical Manual ~~*Document*~~.

A. Two-phased erosion control plans are required for sites five (5) acres or greater. Plans must include existing and proposed contours.

1. Phased erosion control plans are not required when land-disturbing activities total less than five (5) acres.

2. For land disturbing activities five (5) acres or greater, a two-phased erosion control plan is required for all non-linear projects.

1. Phase 1 – Initial Land Disturbance: this phase must ~~depic~~utilize~~s~~ sediment and erosion controls ~~required~~ prior to initial land disturbing activities and include~~, as well as~~ structural controls that address low point runoff.

2. Phase 2 – Construction and Individual Lot Phase with Behind Curb Controls: this phase ~~depicts~~must require sediment and erosion controls ~~required~~ during the installation of public/private infrastructure and~~; it must also~~ include any controls to remain in place from Phase 1.

i. Behind the curb controls shall be installed upon the completion of street segments~~,~~ and must be included in Phase 2.

B. Drainage area maps (DAMs) and calculations are required for all three (3) phases of development, as detailed below and shown in Figure 4.12.

1. Calculations for each phase shall utilize a two (2)-year, 24-hour storm for the design of any hydraulic component of the erosion control plan including sediment basins, swales, channels, berm height, weir length, or any other outlet or conveyance structure required by the plan.

2. The DAM requirements for each Phase of development are as follows:

a. Phase 1: Existing Conditions DAM – existing contours and flow arrows reflecting pre-development conditions.

b. Phase 2: Mass Graded DAM – interim contours and flow arrows reflecting mass graded

Mullins, Christopher
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Mullins, Christopher
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Mullins, Christopher
The structure of this seems odd. Why are these a subset of A?

Mullins, Christopher
Formatting/numbering issues.

Reply

Mullins, Christopher
Would land disturbing activities occur outside of a site?

Reply

Mullins, Christopher
Isn't this covered generally in A?

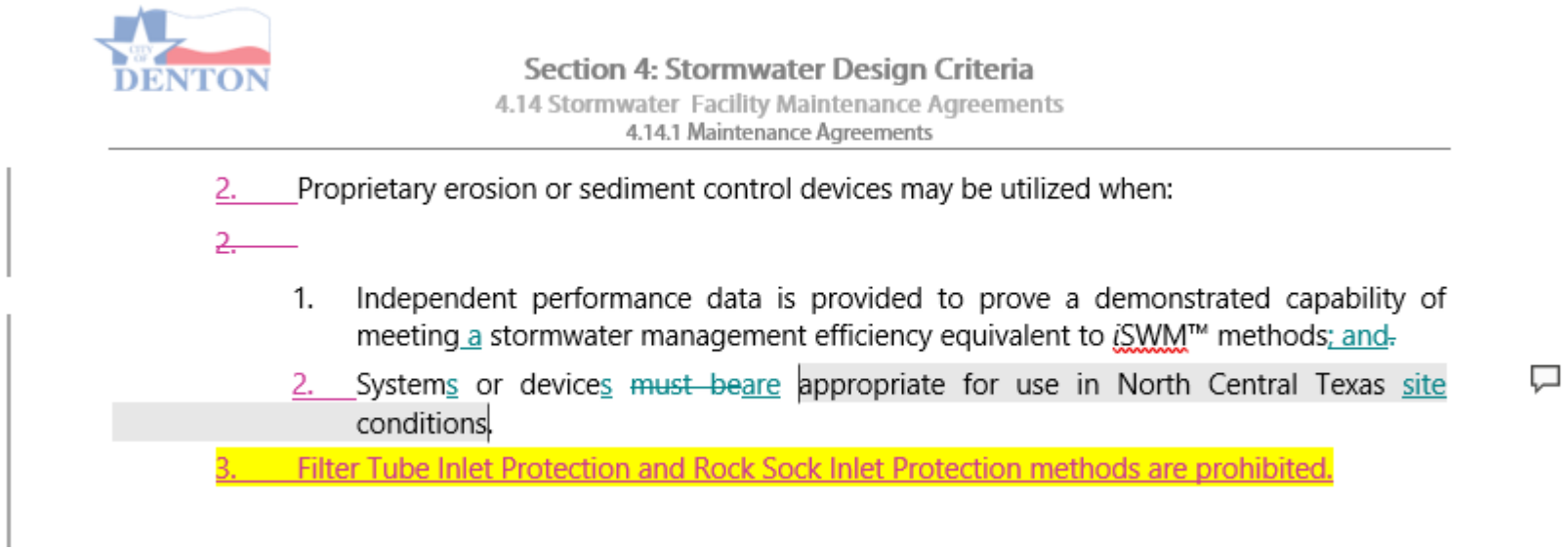
Reply

Mullins, Christopher
Are these all features of the maps or are they the maps and the calculations?

Reply

Updating the Design Criteria Manual

City of Denton, Texas



Section 4: Stormwater Design Criteria
4.14 Stormwater Facility Maintenance Agreements
4.14.1 Maintenance Agreements

2. Proprietary erosion or sediment control devices may be utilized when:

~~2.~~

1. Independent performance data is provided to prove a demonstrated capability of meeting a stormwater management efficiency equivalent to iSWM™ methods; and.
2. Systems or devices ~~must be~~are appropriate for use in North Central Texas site conditions.

3. Filter Tube Inlet Protection and Rock Sock Inlet Protection methods are prohibited.

City of Denton, Texas

Limiting Curb Inlet Protection

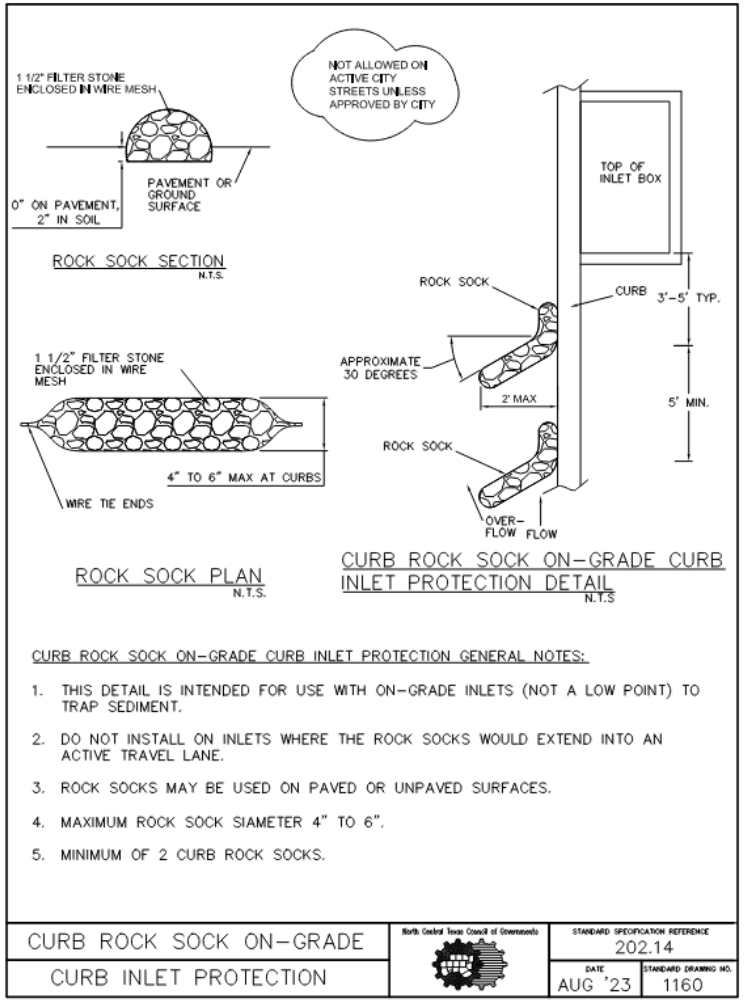
April 30, 2025

Limiting Curb Inlet Protection

City of Denton, Texas

- Curb Rock Sock On-Grade Curb Inlet Protection
- Filter Tube Curb Inlet Protection

Curb Rock Sock On-Grade Curb Inlet Protection



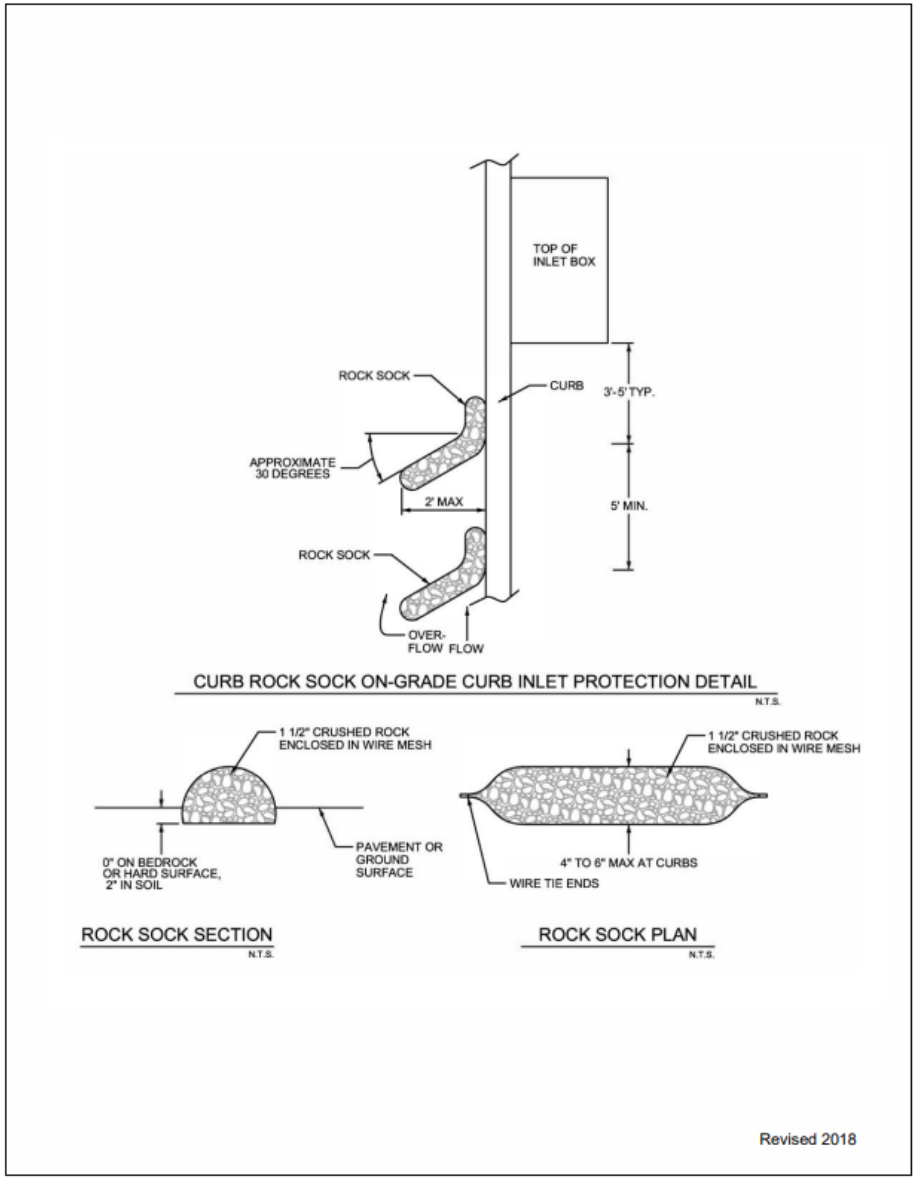


Figure 3.10 Schematic of Organic Filter Tube On-Grade Curb Inlet Protection

CURB ROCK SOCK ON-GRADE CURB INLET PROTECTION GENERAL NOTES:

1. THIS DETAIL IS INTENDED FOR USE WITH ON-GRADE INLETS (NOT A LOW POINT) TO TRAP SEDIMENT.
2. DO NOT INSTALL ON INLETS WHERE THE ROCK SOCKS WOULD EXTEND INTO AN ACTIVE TRAVEL LANE.
3. ROCK SOCKS MAY BE USED ON PAVED OR UNPAVED SURFACES.
4. MAXIMUM ROCK SOCK DIAMETER 4" TO 6".
5. MINIMUM OF 2 CURB ROCK SOCKS.

Revised 2018

Figure 3.11 Organic Filter Tube On-Grade Curb Inlet Protection General Notes

REVISED IN 2018

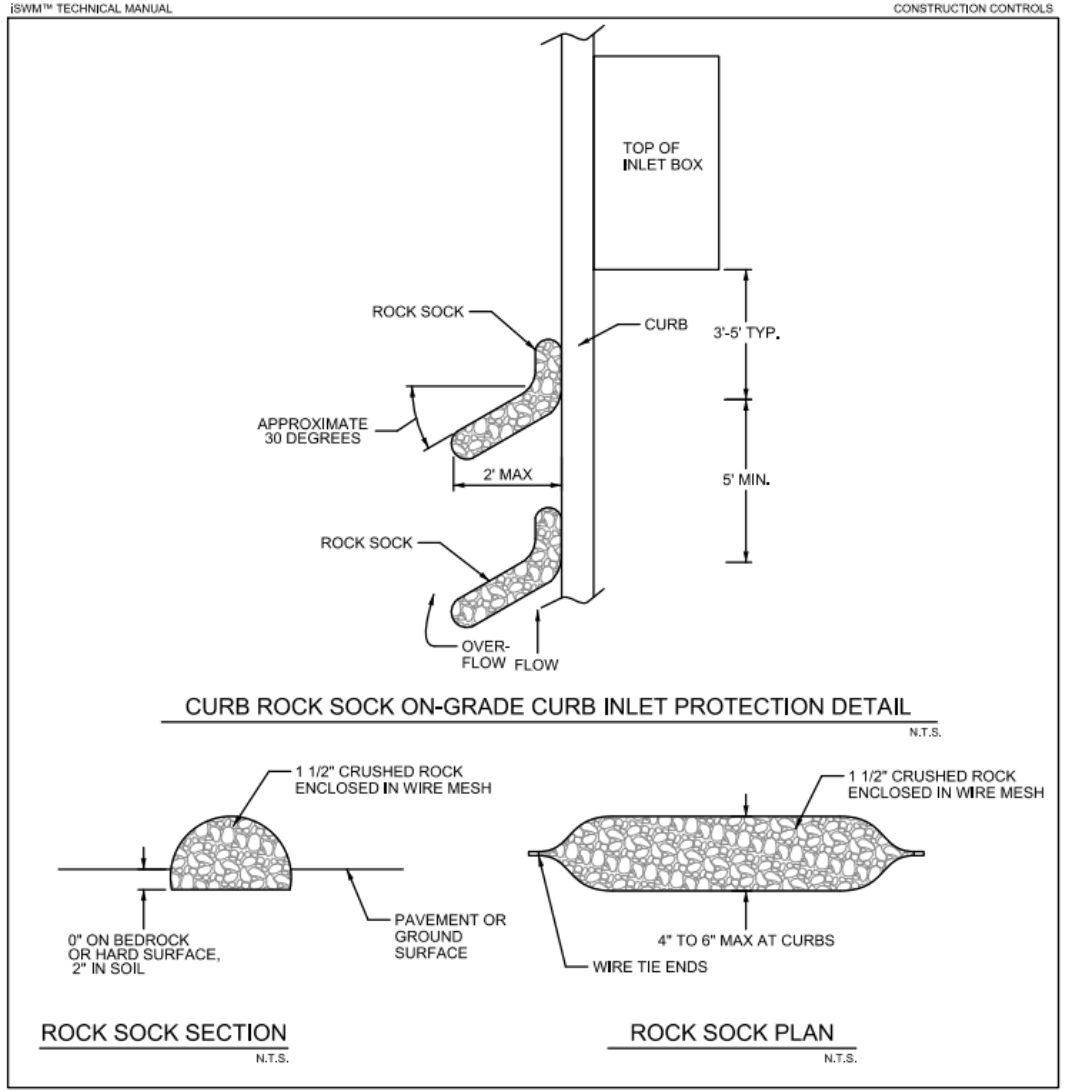


FIGURE 3.9 STANDARD CONSTRUCTION DETAIL -
CURB ROCK SOCK ON-GRADE CURB INLET PROTECTION (1 OF 2)

iSWM™ TECHNICAL MANUAL CONSTRUCTION CONTROLS

CURB ROCK SOCK ON-GRADE CURB INLET PROTECTION GENERAL NOTES:

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5. MINIMUM OF 2 CURB ROCK SOCKS.

FIGURE 3.9 STANDARD CONSTRUCTION DETAIL -
CURB ROCK SOCK ON-GRADE CURB INLET PROTECTION (2 OF 2)

Filter Tube Curb Inlet Protection

City of Denton, Texas

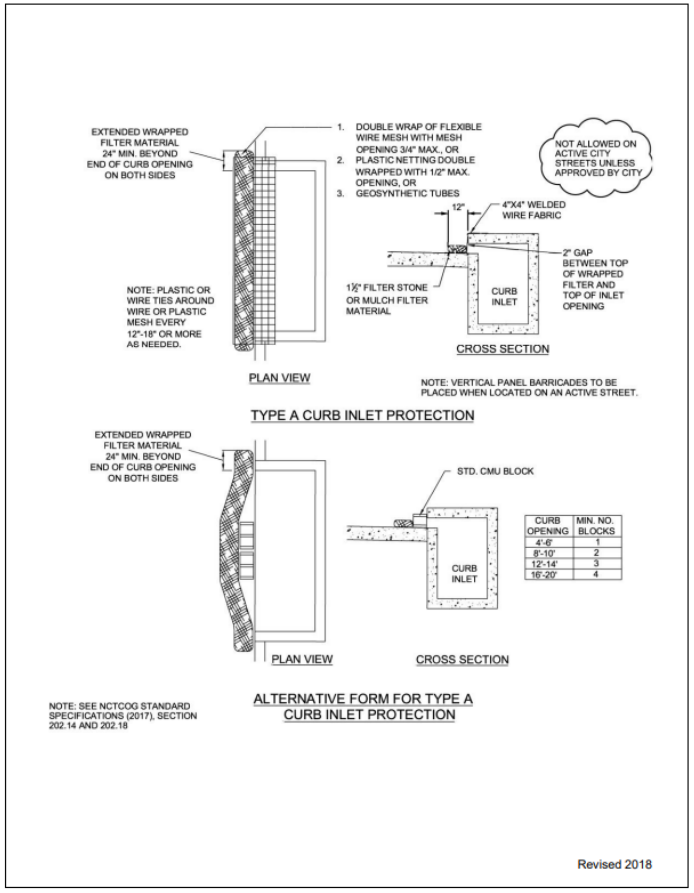

Figure 3.6 Schematics of Organic Filter Tube Curb Inlet Protection
(Source: Modified from City of Plano BMP SP-4)

Inlet Protection
April 2010, Revised 9/2014

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REVISED IN 2018

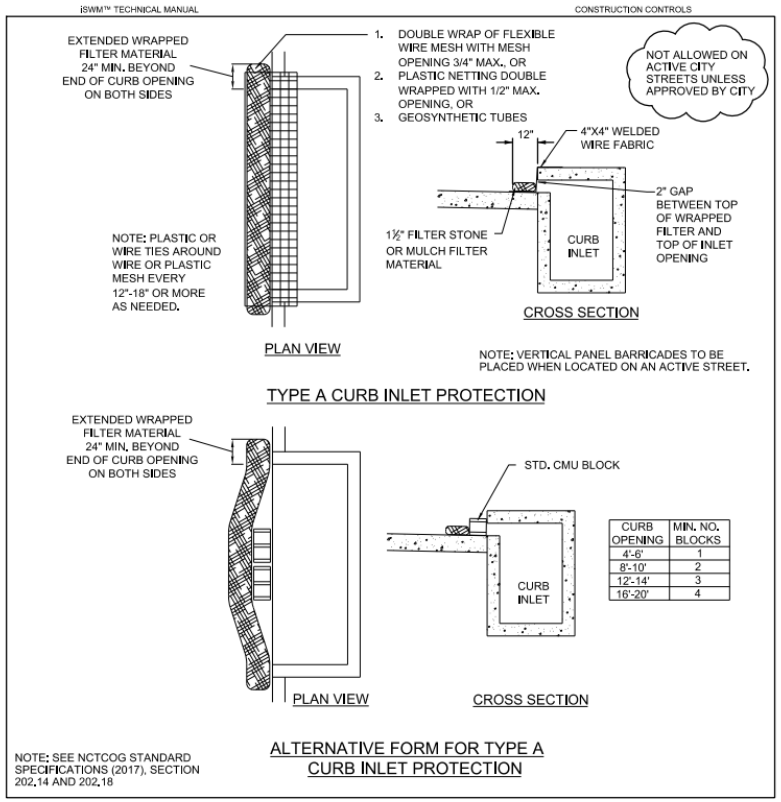
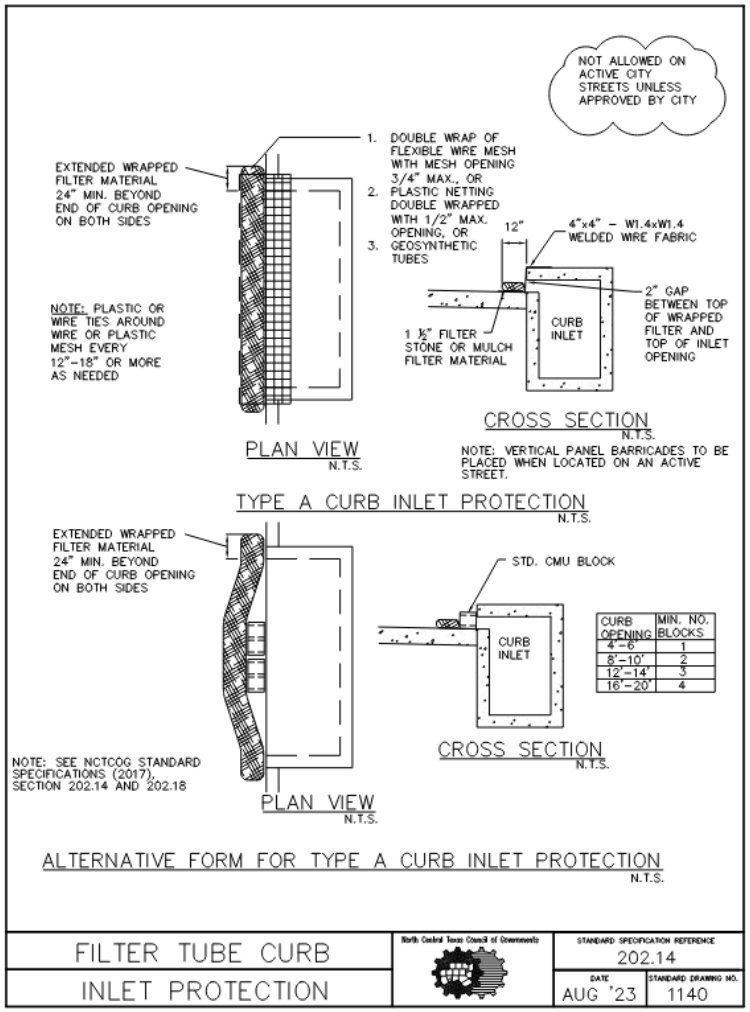


FIGURE 3.6 STANDARD CONSTRUCTION DETAIL -
FILTER TUBE CURB INLET PROTECTION

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STOP

Where Does That Leave Us?

- Hog Wire Weir Inlet Protection
- Grate Inlet Protection
- Best Practicable Technology

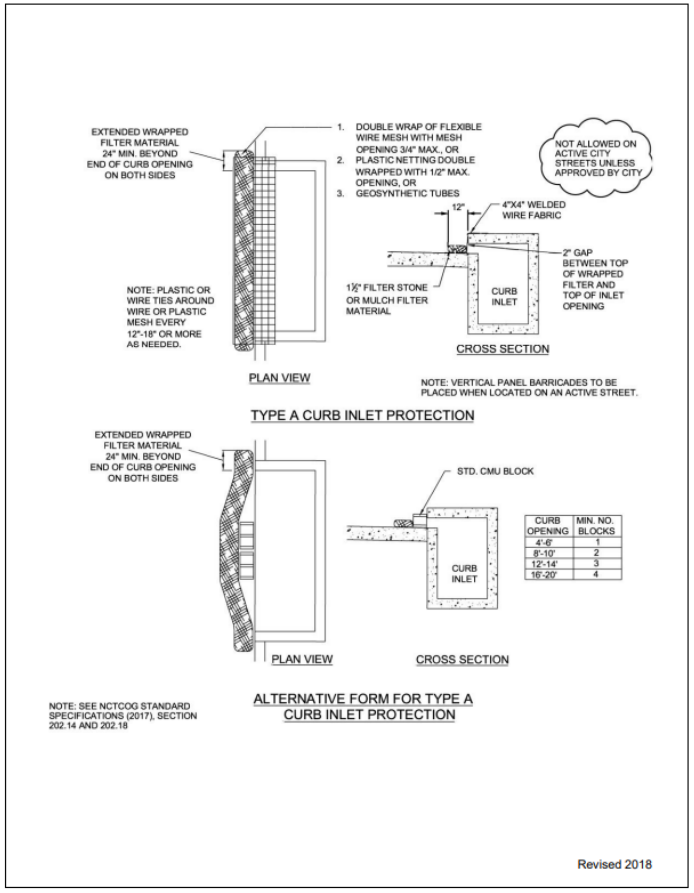
Limiting Curb Inlet Protection

City of Denton, Texas

- Curb Rock Sock On-Grade Curb Inlet Protection
- Filter Tube Curb Inlet Protection

Filter Tube Curb Inlet Protection

City of Denton, Texas



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Inlet Protection
April 2010, Revised 9/2014

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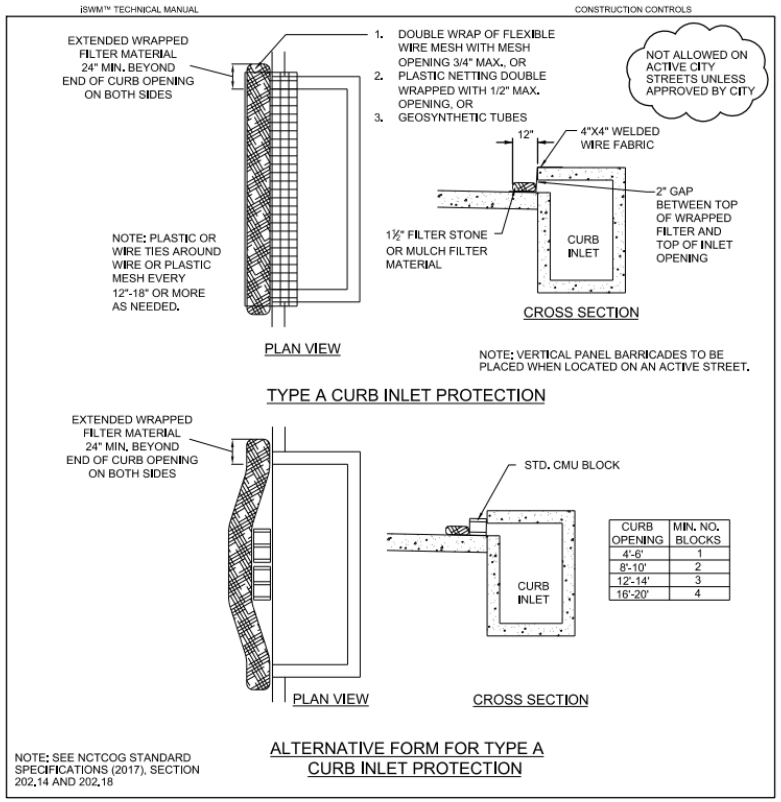
REVISED IN 2018



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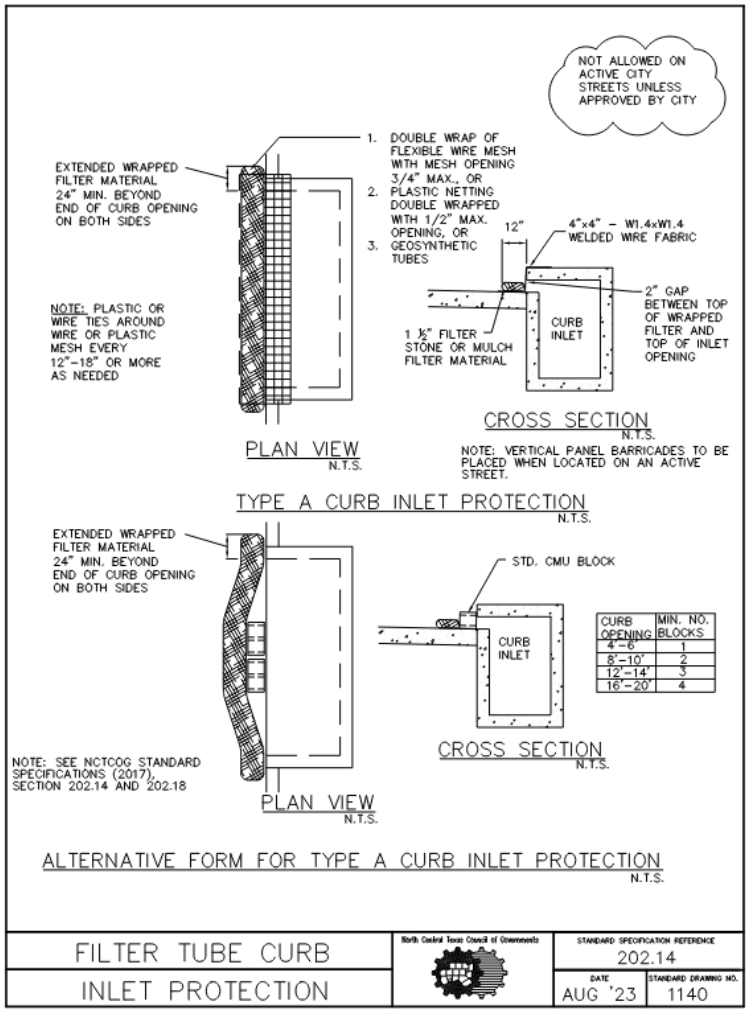
FILTER TUBE CURB INLET PROTECTION



Where Does That Leave Us?

- Remaining Curb Inlet Options
- Best Practicable Technology

Remaining Curb Inlet Options

City of Denton, Texas

- Block and Gravel?
- Hog Wire Weir Protection

Block and Gravel Filter Curb Inlet Protection

City of Denton, Texas

- Still included in the complete Construction Controls Technical Manual
- Not included in the addendum or 2023 PWCS

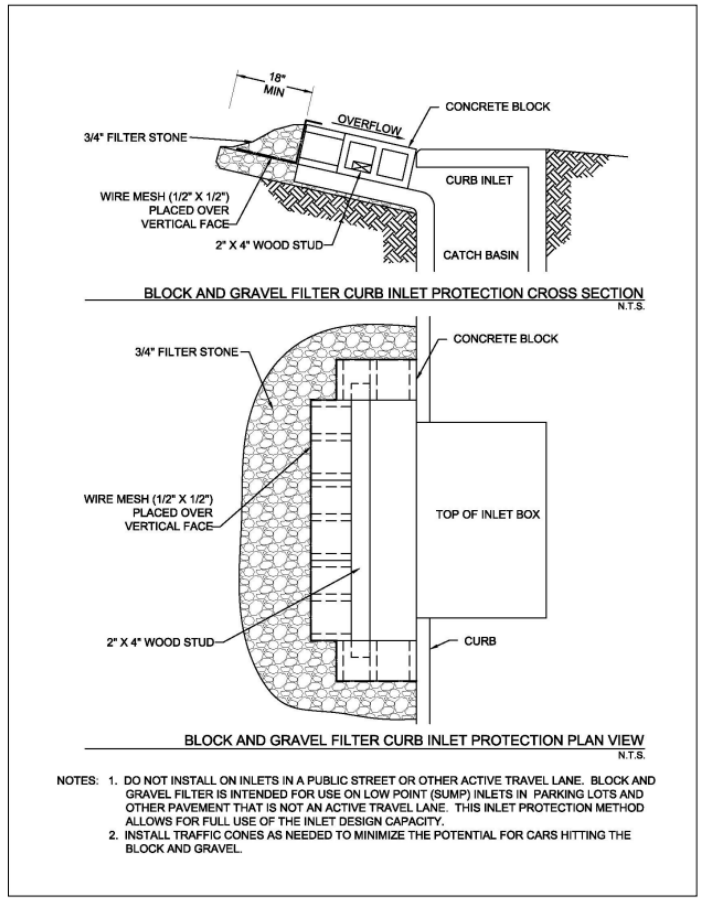


Figure 3.9 Schematics of Block and Gravel Filter Curb Inlet Protection

Inlet Protection
April 2010, Revised 9/2014

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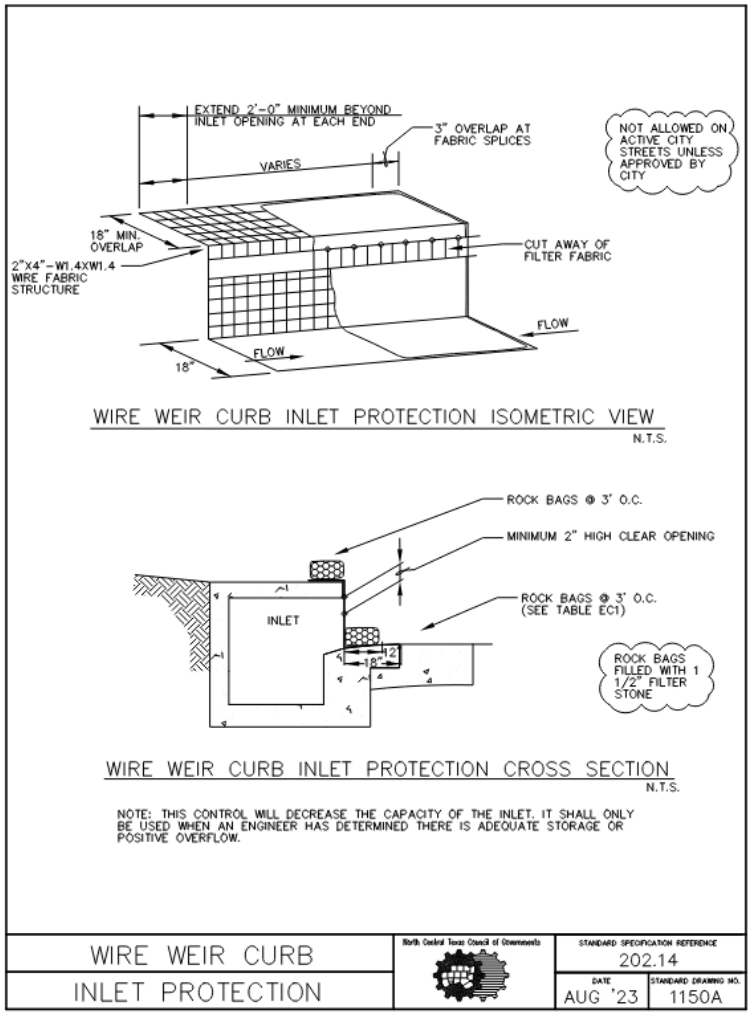
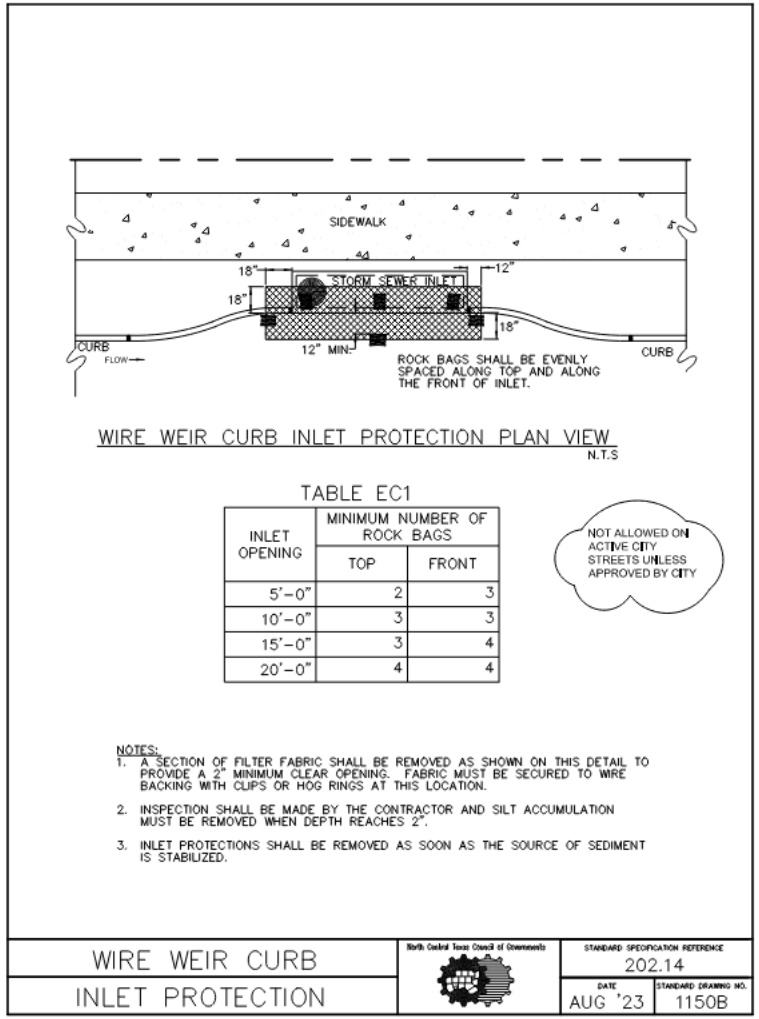
Wire Weir Curb Inlet Protection

City of Denton, Texas



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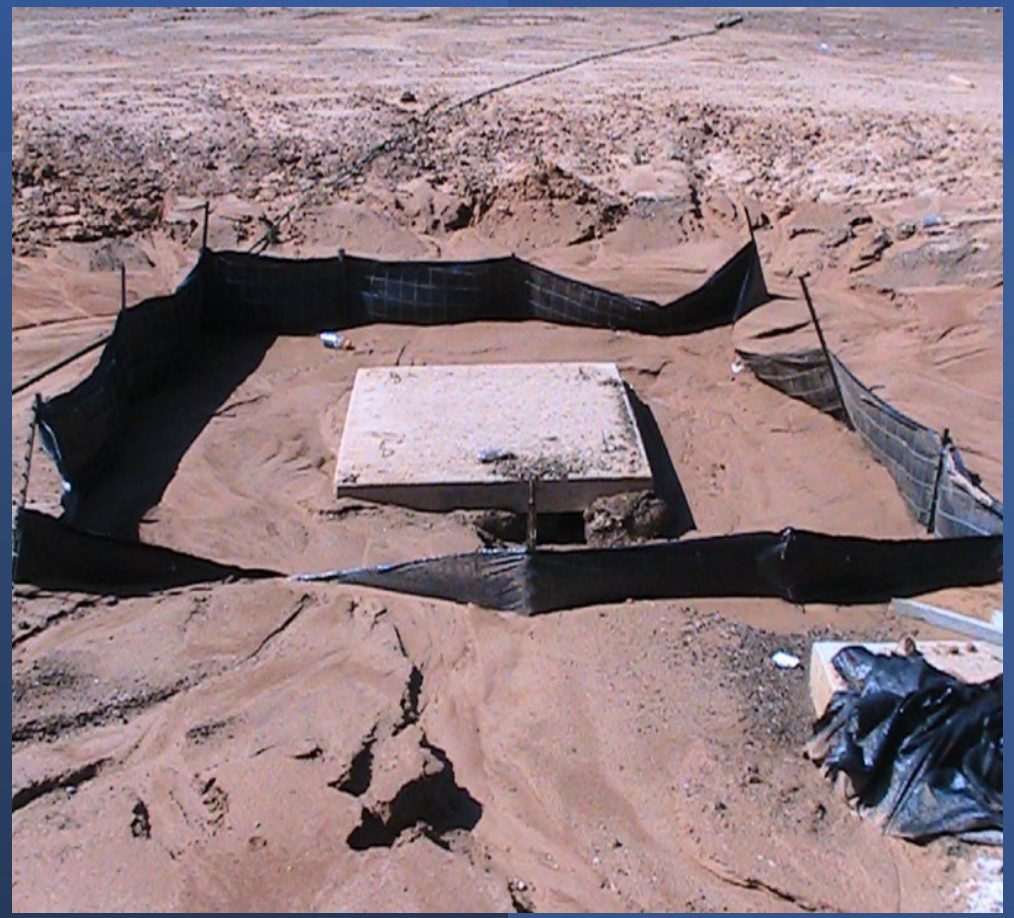
ESSENTIAL
ENVIRONMENTA
817-692-1780

Grate Inlet Protection – No Good Options

- Higher failure rate with hardscapes and flatwork
- Commonly run over



Best Practicable Technology

City of Denton, Texas

TPDES General Permit No. TXR150000, Part IV: Erosion and Sediment Control Requirements Applicable to All Sites

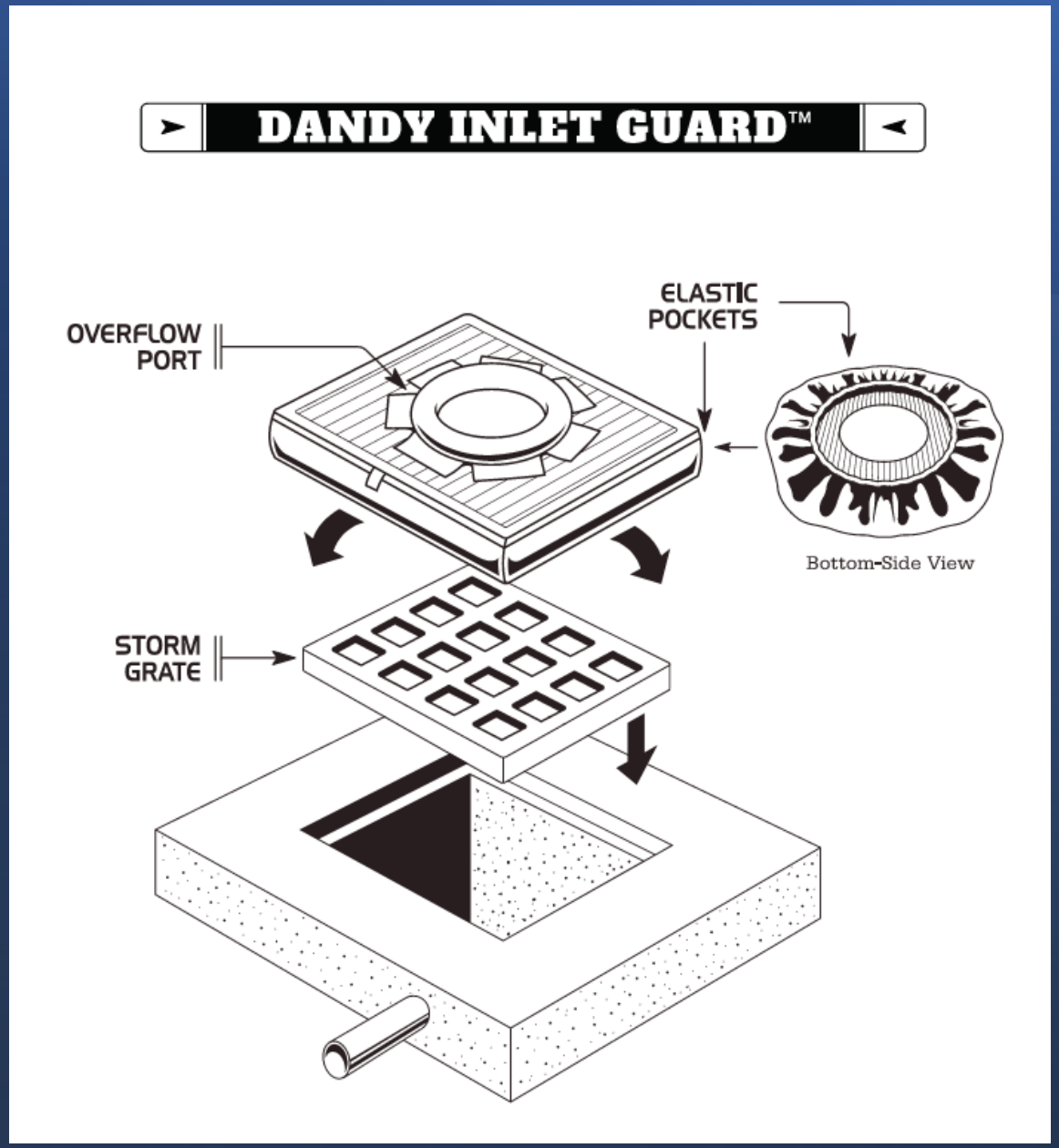
Except as provided in 40 CFR §§ 125.30-125.32, any discharge regulated under this general permit, with the exception of sites that obtained waivers based on low rainfall erosivity, must achieve, at a minimum, the following effluent limitations representing the degree of effluent reduction attainable by application of the best practicable control technology currently available (BPT). The BPT are also required by and must satisfy the Effluent Limitations Guideline (ELG) permitting requirement for application of 40 CFR § 450.24 New Source Performance Standards (NSPS), 40 CFR § 450.22 Best Available Technology Economically Achievable (BAT), and 40 CFR § 450.23 Best Conventional Pollutant Control Technology (BCT).

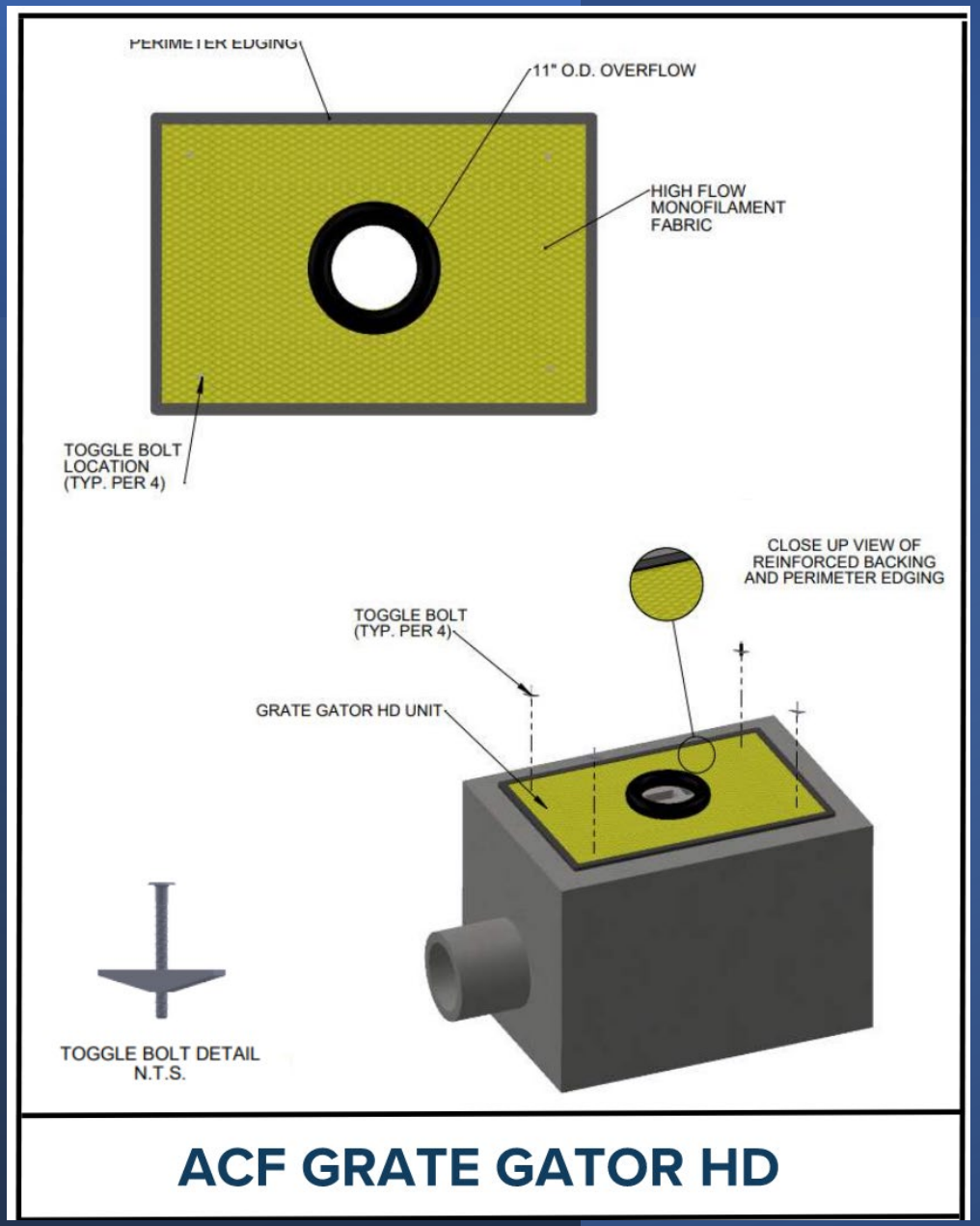
Grate Inlet Protection Alternatives: Proprietary Technology

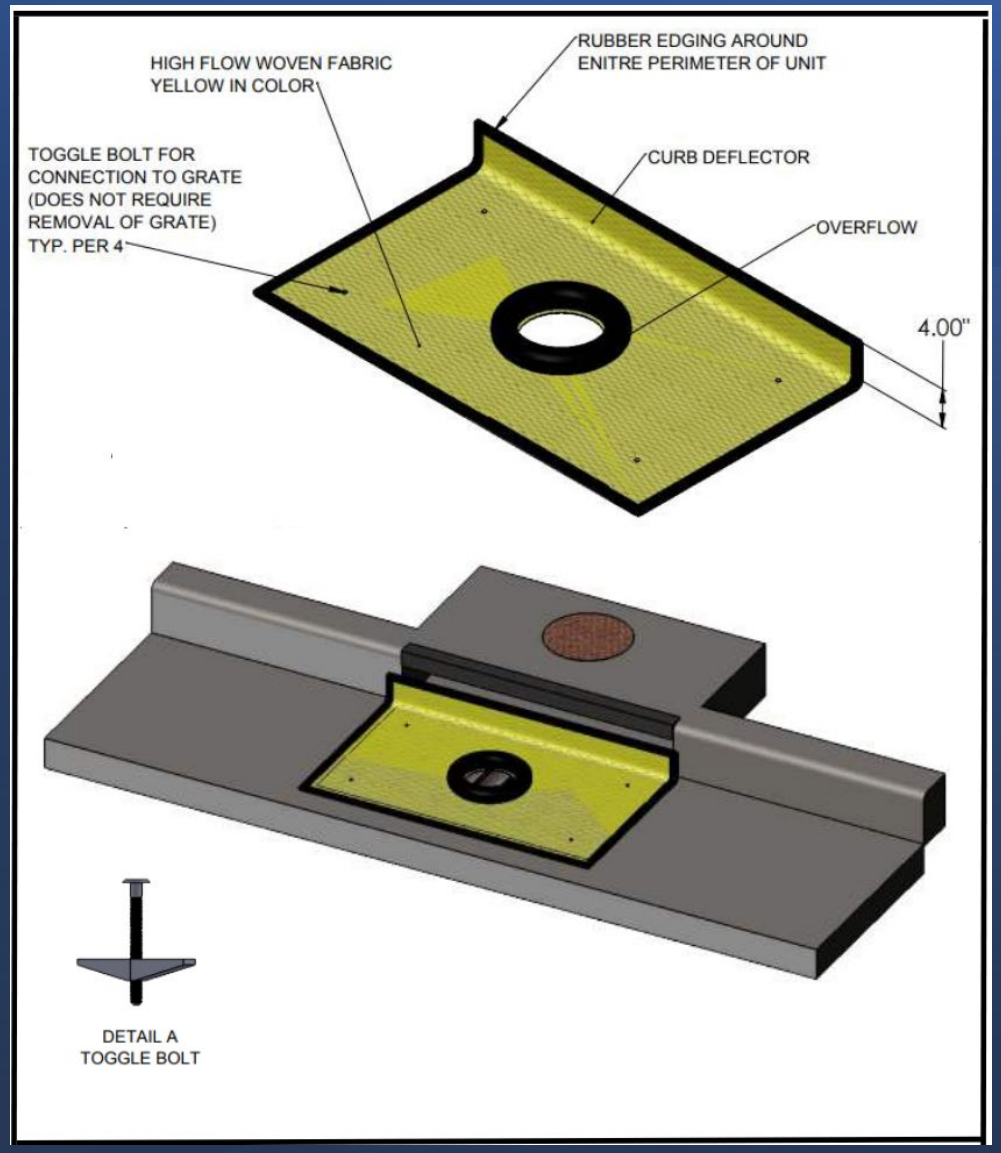
- Numerous proprietary protection devices are available from commercial vendors. The devices often have the advantage of being reusable on several projects if they are maintained in good condition.
- It is the policy of this manual not to recommend any specific commercial vendors for proprietary controls. However, this subsection is included in order to provide municipalities with a rationale for approving the use of a proprietary inlet protection device within their jurisdiction.
- The designer shall work with the supplier to provide the municipality with flow calculations or independent third-party tests that document the device's performance for conditions similar to the ones in which it is proposed to be installed. The conditions that should be considered include: type and size of inlet, inlet configuration, size of contributing drainage area, design flow rate, soil particle sizes to be removed, and other pollutants to be removed.
- The designer or vendor of the proprietary device shall provide a minimum of three references for projects where the device has been installed and maintained in operation at a construction site for at least six months. Local references are preferred; but references from other regions can be accepted if a similarity between the reference project and the proposed application can be demonstrated.
- Proprietary devices must not completely block the inlet. The device shall have a minimum of a 2 inch wide opening for the length of the inlet when it will be used in areas that water can safely pond to depths deeper than the design depths for the inlet. If ponding is not an option, then the device must have overflow capacity equal to the inlet design flow rate.
- Some proprietary devices are available with replaceable pads or filters. These pads or filters have the added benefit or removing pollutants such as metals and oils in addition to removing sediment. These types of inserts are recommended in applications where prior or current land use in or adjacent to the construction areas may result in the discharge of pollutants.
- Proprietary protection devices shall be in accordance with the General criteria at the beginning of this section and any criteria listed under Curb Inlet Protection and Area Inlet Protection that are not specific to an inlet protection method.

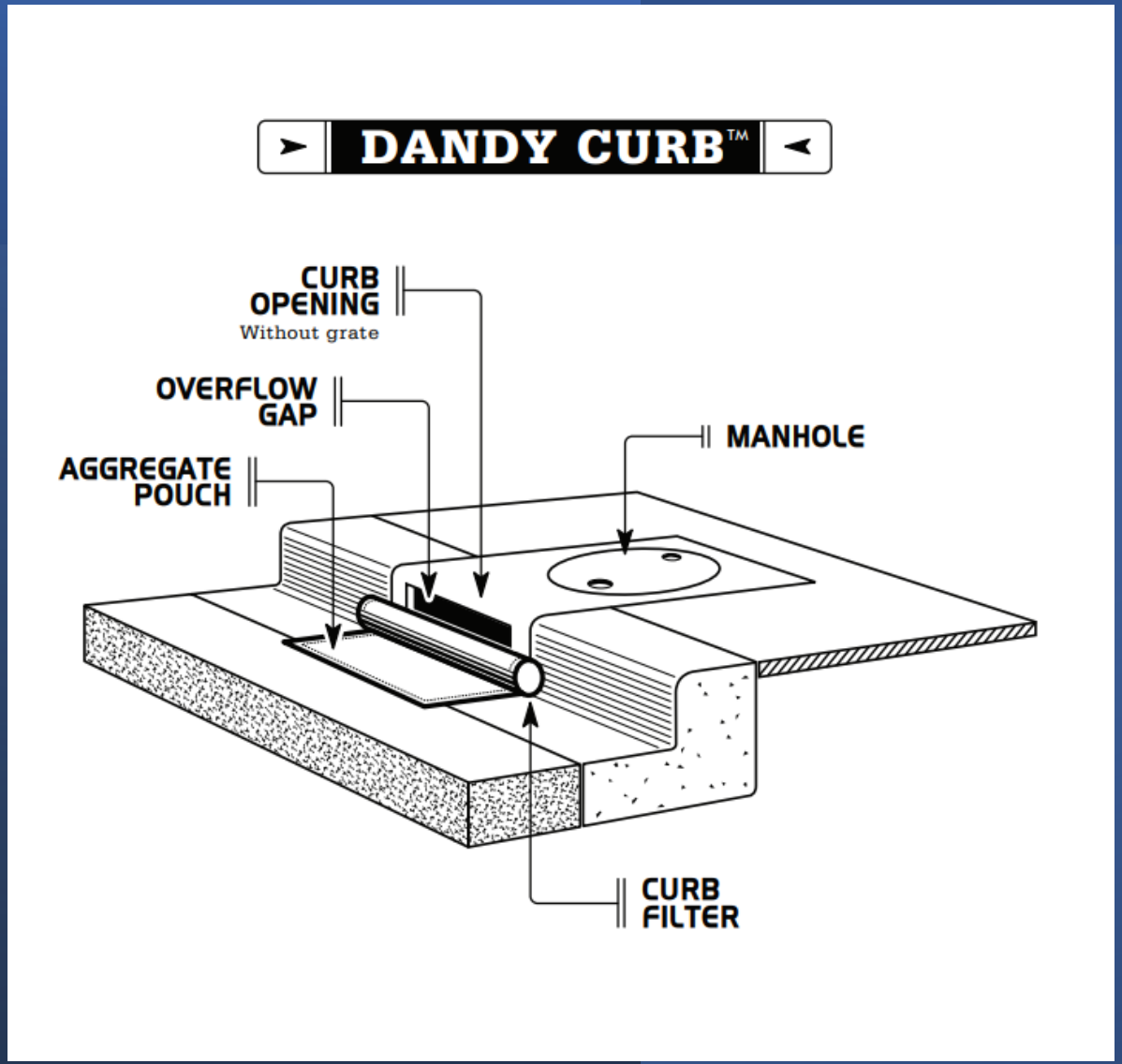
Grate Inlet Protection Alternatives: Design Criteria

- Drainage patterns shall be evaluated to ensure inlet protection will not divert flow or flood the roadway or adjacent properties and structures.
- Inlet protection measures or devices that completed block the inlet are prohibited. They must also include a bypass capability in case the protection measures are clogged.
- Inlet protection must be designed to pass the conveyance storm (25-year, 24-hour) without creating a road hazard or damaging adjacent property. This may be accomplished by any of the following measures:
  - An overflow weir on the protection measure.
  - An existing positive overflow swale on the inlet. ○ Sufficient storage volume around the inlet to hold the ponded water until it can all filter into the inlet.
  - Other engineered method.
- Positive overflow drainage is critical in the design of inlet protection. If overflow is not provided for at the inlet, temporary means shall be provided to route excess flows through established swales, streets, or other watercourses to minimize damage due to flooding.


DANDY INLET GUARD™
ELASTIC POCKETS
OVERFLOW PORT
Bottom-Side View
STORM GRATE


PERIMETER EDGING
11" O.D. OVERFLOW
HIGH FLOW MONOFILAMENT FABRIC
TOGGLE BOLT LOCATION (TYP. PER 4)
CLOSE UP VIEW OF REINFORCED BACKING AND PERIMETER EDGING
TOGGLE BOLT (TYP. PER 4)
GRATE GATOR HD UNIT
TOGGLE BOLT DETAIL N.T.S.
ACF GRATE GATOR HD

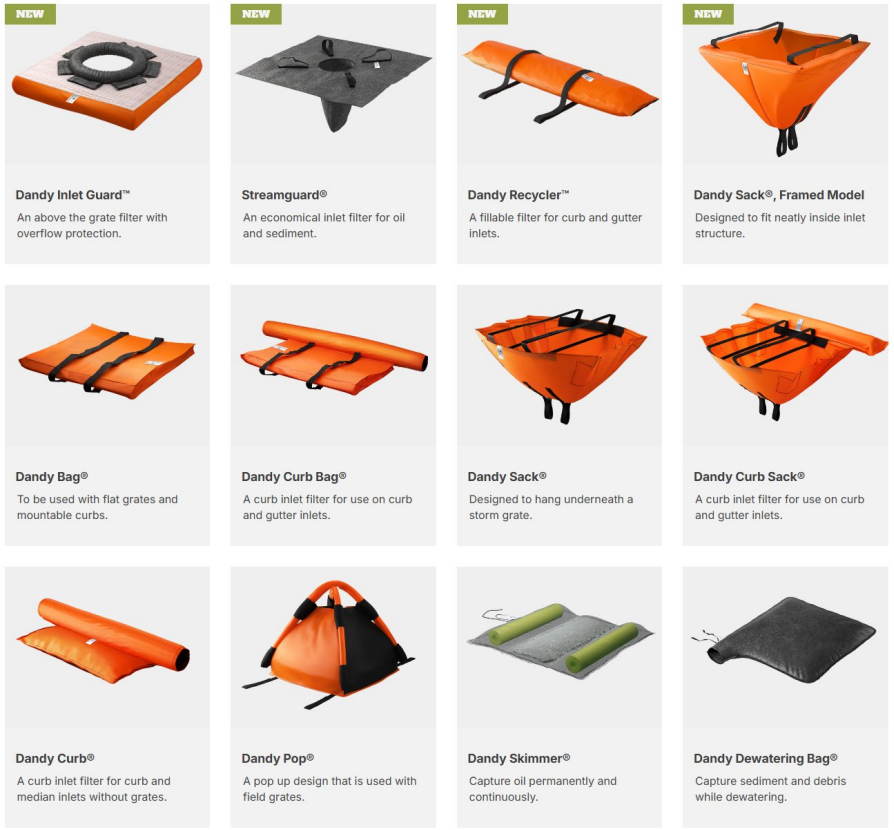

HIGH FLOW WOVEN FABRIC
YELLOW IN COLOR
RUBBER EDGING AROUND
ENITRE PERIMETER OF UNIT
TOGGLE BOLT FOR
CONNECTION TO GRATE
(DOES NOT REQUIRE
REMOVAL OF GRATE)
TYP. PER 4
CURB DEFLECTOR
OVERFLOW
4.00"
DETAIL A
TOGGLE BOLT


DANDY CURB™
CURB
OPENING
Without grate
OVERFLOW
GAP
AGGREGATE
POUCH
MANHOLE
CURB
FILTER

Inlet Protection: Best Practicable Technology

City of Denton, Texas

- BPT has outpaced iSWM
- Companies are consistent in their designs
- The proprietary standard isn't used.
- An update would be most successful.



Questions?

Additional Closing Information

5. FY25 Work Program Update

- Task Deliverables for FY25:

integrated Stormwater Management (iSWM) Subcommittee: The Subcommittee will focus on the following FY2025 tasks:

- iSWM Promotional Presentations
- iSWM Community Panel Workshop
- Compile iSWM Manual Changes; Publish Updated Manuals
- Guidance or Training on Temporary Sediment Basins
- Expanded use of Trees in Detention Ponds for Dual Purposes, Water Quality and Carbon Sequestration
- Stormwater Quality Monitoring of Existing iSWM BMPs
- Guidance on Pipe Utility Crossing
- Website Updates

NCTCOG iSWM Task Order Updates

April 30, 2025

TASK ORDER 2.2 PROGRESS

1. Project Management and Support Services
2. iSWM Implementation Guidance for Communities in Region
3. iSWM Promotional Presentations for Partnering Organizations
4. Stormwater Quality Monitoring Program Development for Existing iSWM BMPs
5. Develop Technical Case Studies
6. Website Updates
7. Guidance or Training on Temporary Sediment Basins
8. Guidance on Pipe Utility Crossings
9. Expanded Use of Trees in Detention Ponds

TASK 4 – STORMWATER QUALITY MONITORING PROGRAM DEVELOPMENT FOR BMPS

- Goal of BMP Monitoring Program?
- Site Access?
- Which BMPs to monitor?
- Which parameters to monitor?

TASK 4 – STORMWATER QUALITY MONITORING PROGRAM DEVELOPMENT FOR BMPS

- How accurate do parameters need to be?
- Statistical parameters?
- Modelling software?
- Sufficient staff and finances?

TASK 4 – STORMWATER QUALITY MONITORING PROGRAM DEVELOPMENT FOR BMPS

- Which method of BMP water quality monitoring analysis to use?
- Qualifying storm?
- Flow data?
- Automated/Manual?
- Equipment?
- Data Management?

TASK 5: DEVELOP TECHNICAL CASE STUDIES

- Preferred types
- Preferred brands
- IPDs falling into inlets?
- Most common challenges
- Other challenges

TASK 7: GUIDANCE OR TRAINING ON TEMPORARY SEDIMENT BASINS

- Detaining stormwater volumes
- Perforated riser calculations
- Hydrologic calculation consistency

TASK 7: GUIDANCE OR TRAINING ON TEMPORARY SEDIMENT BASINS

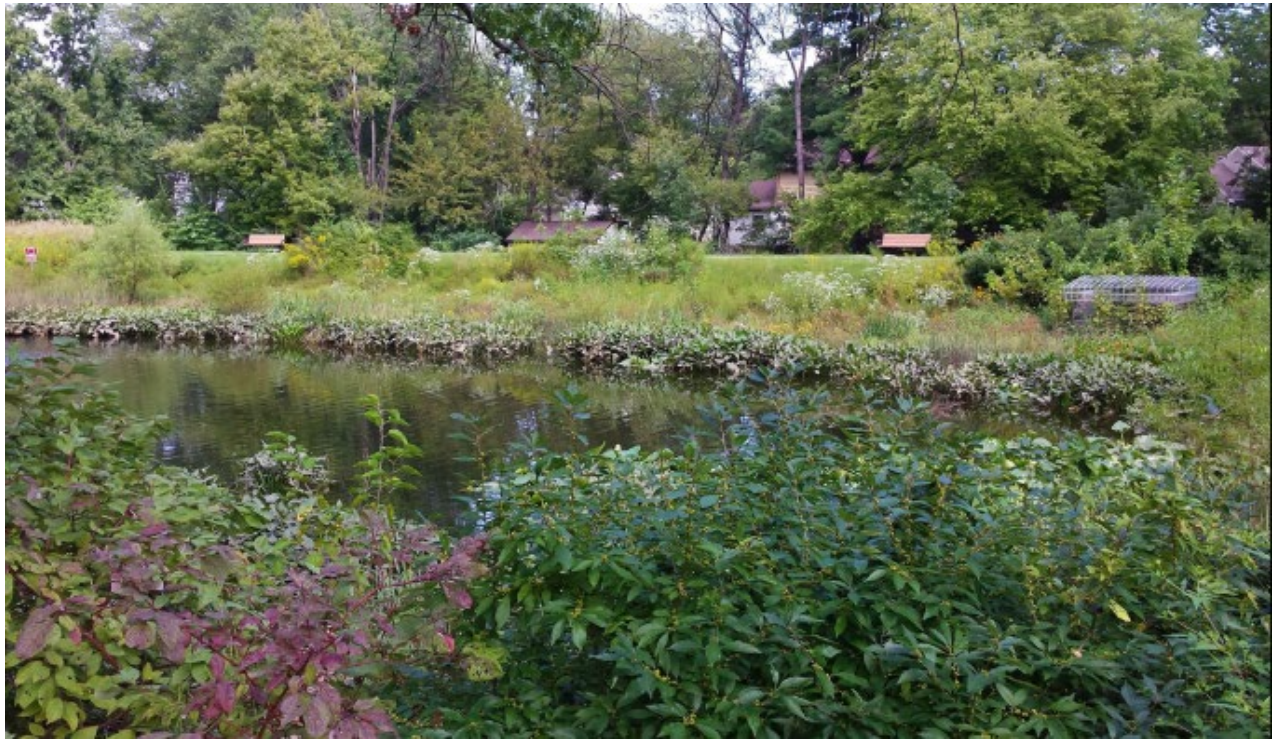
- Temporary foundations for inlets/risers
- When to install/remove?
- Construction specifications

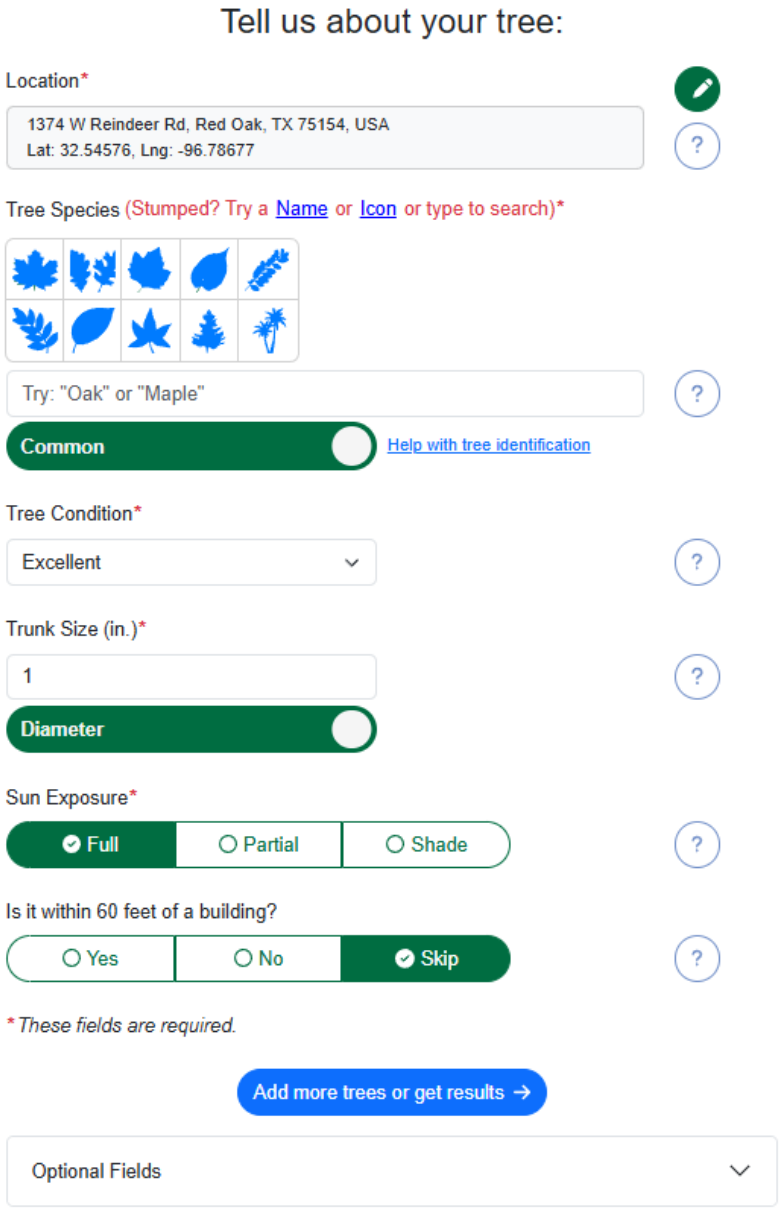
TASK 9: EXPANDED USE OF TREES IN DETENTION PONDS

- Trees in Detention Ponds
  - Benefits
  - Planting guidelines
  - Types of trees to use
  - Maintenance
- Carbon Sequestration
  - 1998 EPA Memo
  - iTree – US Forest Service

TASK 9: TREES IN DETENTION PONDS

- Trees and Water Quality
- iTree





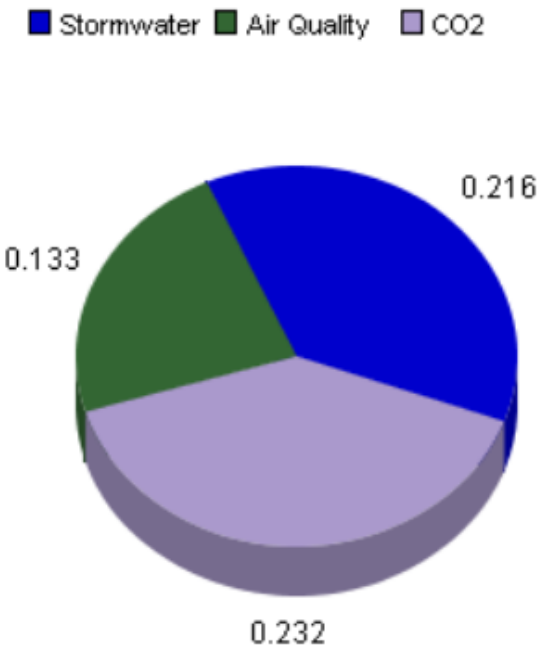
i-Tree Design v7.0

3803 Parkwood Blvd # 800, Frisco, TX 75034, USA

Display results for: All Trees

Overall Benefits | Stormwater | Energy | Air Quality | Carbon Dioxide

Current Year (2025) | Future Year (2045) | Total (2025-2045)



Numbers are in US Dollar

Breakdown of tree benefits

Click on one of the tabs above for more detail

Your selected trees will provide overall benefits of $1 in the current year.

While some functional benefits of trees are well documented, others are difficult to quantify (e.g., human social and communal health). Trees' specific geography, climate, and interactions with humans and infrastructure are highly variable and make precise calculations that much more difficult. Given these complexities, the results presented here should be considered initial approximations to better understand the environmental and economic value associated with trees and their placement.

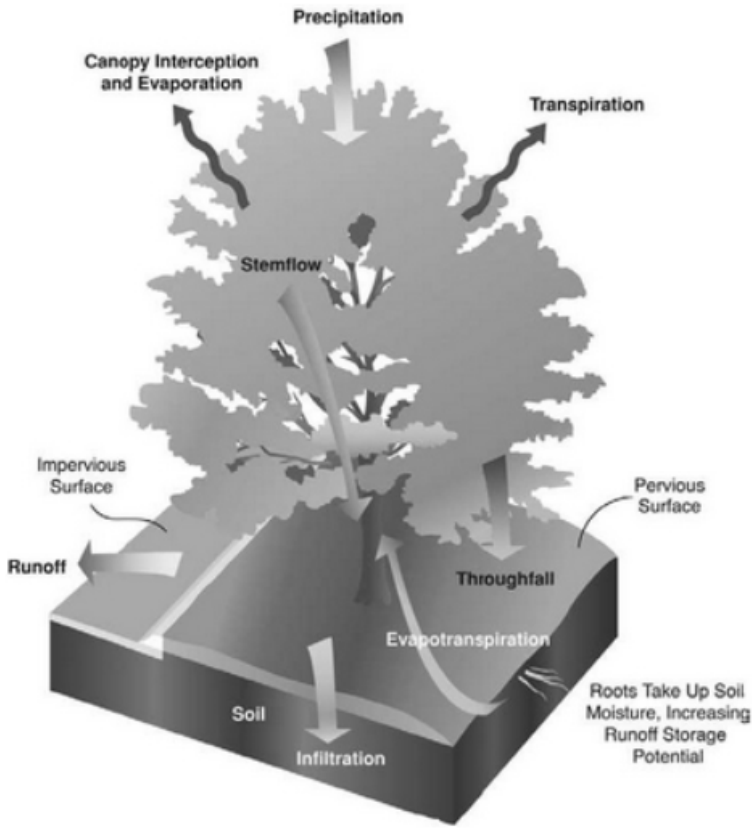
Benefits of trees do not account for the costs associated with trees' long-term care and maintenance.

If these trees are cared for and grow, they will provide $4 worth of annual benefit in 20 years. See 'Future Year (2045)' tab at left for details.

Display results for: All Trees

Overall Benefits | Stormwater | Energy | Air Quality | Carbon Dioxide

Current Year (2025) | Future Year (2045) | Total (2025-2045) | Total to Date



Your selected trees will intercept 138 gallons of rainfall and help avoid 24 gallons of stormwater runoff this year.

Urban stormwater runoff (or "non-point source pollution") washes chemicals (oil, gasoline, salts, etc.) and litter from surfaces such as roadways and parking lots into streams, wetlands, rivers, and oceans. The more impervious the surface (e.g., concrete, asphalt, rooftops), the more quickly pollutants are washed into our community waterways. Drinking water, aquatic life, and the health of our entire ecosystem can be adversely affected by this process.

Trees act as mini-reservoirs, controlling runoff at the source. Trees reduce runoff by:

- Intercepting and holding rain on leaves, branches, and bark
- Increasing infiltration and storage of rainwater through the tree's root system
- Reducing soil erosion by slowing rainfall before it strikes the soil

Please see this document for more on stormwater modeling and estimated value differences between i-Tree applications: iTree Streets/Design/Eco Rainfall Interception Model Comparison.

MyTree Benefits

Over 20 years.

Sweetgum spp, *(Liquidambar)*

Serving Size: 1.00 in. diameter
Condition: Good
Location: Frisco, Tx, United States
Expected over 20 years: $77.12

Discover benefits of all your community trees!

Carbon Dioxide Uptake	**$11.61**
Carbon Sequestered[1]	53.66 lbs
CO_2 Equivalent[2]	196.74 lbs
Storm Water Mitigation	**$3.81**
Runoff Avoided	426.84 gal
Rainfall Intercepted	2,444.34 gal
Air Pollution Removal	**$4.17**
Carbon Monoxide	0.53 oz
Ozone	28.59 oz
Nitrogen Dioxide	3.53 oz
Sulfur Dioxide	0.23 oz
$PM_{2.5}$	1.29 oz
Nitrogen Dioxide	0.75 oz
Sulfur Dioxide	10.47 oz
$PM_{2.5}$	0.96 oz

Benefit estimates are based on USDA Forest Service research and are meant for guidance only. Visit www.itreetools.org to learn more.

Footnotes

[1] For large trees sequestration is overtaken by CO_2 loss with decay/maintenance.

[2] CO_2 equivalent is estimated by calculating how much atmospheric CO_2 is taken in by trees to provide the carbon stored in the tissues of individual trees.

[3] Positive energy values indicate savings or reduced emissions. Negative values indicate increased usage or emissions. Electricity used for cooling and heating and fuels like natural gas or oil used for heating, based on typical usage for the selected location.

[4] Not an annual amount or value.

[5] This location is supported by i-Tree. Localized data have been used to estimate its tree benefits.

Abbreviations:

CO_2 = Carbon dioxide
$PM_{2.5}$ = Particulate matter 2.5 microns or less
lbs = Pounds
kg = Kilograms
gal = Gallons
L = Liters

QUESTIONS?

halff

6. iSWM FY26 New Work Program Task Discussion

Proposed tasks:

1. Project Management
2. Research “Cumulative Impacts” on Small Footprint Developments (continued from TO 2.1)
3. iSWM Promotional Presentation for Partnering Organizations (continued from TO 2.2)
4. Develop Technical Case Studies (continued from TO 2.2) …

6. iSWM FY26 New Work Program Task Discussion (cont.)

Proposed tasks, continued:

5. Stormwater Quality Monitoring Program Development for Existing iSWM BMPs (continued from Task 2.2)

6. Provide Support Services for iSWM Program Updates (Short-Term and Long-Term)

Discussion?

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7. iSWM Manual Update Discussion

Purpose of iSWM? Water quality, erosion, floodplain management, stormwater management?

Cities have their own stormwater manuals. How does iSWM interact with these?

Identify short-term, small fixes vs. long-term, larger fixes that require additional funds.

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7. iSWM Manual Update Discussion

Who uses iSWM, how is it used?

Are there sections no longer used?

Downloadable tools (H&H calcs)?

New sections that could be added?

Current information can assist with updating iSWM technical manual (Overview)

Mile High Flood District Urban Storm Drainage Criteria Manual can provide useful information

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7. iSWM Manual Update Recommendations

Sample of recommendations from Workshop

- Outdated or Missing BMP options; add modern and flexible BMP options, decide whether to have proprietary ones like Marley float.
- Revise Manual to address the experience gap and meet the needs of newer users
- Inconsistent BMP Implementation; Provide more guidance on materials that reduce maintenance issues; ensure they are built correctly and function as intended, reducing variability in implementation.

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7. iSWM Manual Update Recommendations (continued…)

- Large and unwieldy manual; reduce file sizes or improve load times to make more accessible on mobile devices, especially in the field. Look at EPA and TXDOT BMP resources for example.

- Detailed Operational maintenance and Inspection form; specific instructions for both engineers and property owners to follow

- More detailed schematics and instructions for BMP design and implementation to improve communication between design engineers and plan reviewers.

- Suggestions on other updates that need to be made?

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7. iSWM Manual Update Recommendations (continued..)

Hydrology Manual Issue:

Section 5.0 Rainfall Tables location

Thus, if a storm event with a specified duration and volume has a 1% chance of occurring in any given year, then it has an exceedance probability of 0.01 and a return period of 100 years.

Rainfall intensities for the 16 counties which participate in the NCTCOG area (see Figure 1.1) are provided in *Section 5.0* and should be used for all hydrologic analysis within the given county. The values in these tables were derived in the following way:

- New IDF values for the 1-year through 500-year storm return periods were determined for the NCTCOG area on a county by county basis.
- All values were plotted and smoothed to ensure continuity. The values were smoothed by fitting an equation of the form:

$$i = b/(t + d)^e \qquad (1.1)$$

where:

i = rainfall intensity (inches per hour)

t = rainfall duration (minutes)

b, d and e = parameters found at the top of each of the tables in Section 5.0.

- The tabular values in *Section 5.0* Rainfall Tables were determined from the new IDF curves.

5.0 Rainfall Tables

5.1 Methodology

Rainfall tables are based on the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for the counties within the jurisdiction of NCTCOG. NOAA Atlas 14 is produced by the NOAA's National Weather Service, Hydrometeorological Design Studies Center and may be considered as the national standard for precipitation frequency estimates. NOAA Atlas 14 is published in volumes for different geographic areas of the US. The final version of NOAA Atlas 14 Volume 11 for Texas was released on September 2018 and has been peer-reviewed extensively. Volume 11 provides precipitation frequency estimates, upper and lower bounds for 90% confidence intervals for durations of 5-minute through 60-day and recurrence intervals of 1, 2, 5, 10, 25, 50, 100, 200, 500 and 1,000-year for the State of Texas.

Precipitation frequency estimates are computed using regional frequency analysis based on L-moment statistics calculated from annual maxima series (AMS). NOAA Atlas 14 employs a regionalization approach wherein the L-moment statistics are calculated by grouping stations within a 60-mile radius. This results in 700 to 1,800 years of data for daily durations and 200 to 700 years for hourly durations. Several distribution functions were examined and ultimately the generalized extreme value (GEV) distribution was adopted for fall stations and durations. The upper and lower 90% confidence intervals are based on a Monte-Carlo simulation approach.

Gridded precipitation frequency estimates at a spatial resolution of 30-arc second are also available for all durations and recurrence intervals discussed above. The gridded frequency estimates are generated from grids of mean annual maxima which are derived from at-stations mean annual maxima using the PRISM interpolation methodology (http://www.prism.oregonstate.edu/). The precipitation frequency grids are the basis of the NOAA Precipitation Frequency Data Server (PFDS) for retrieval of precipitation frequency estimates by co-ordinates.

Based on the review of the NOAA Atlas 14 methodology, it is apparent that a robust and standardized technique has been adopted for the development of precipitation frequency estimates. The methods and results have also been extensively peer reviewed. In addition, Atlas 14 also uses a long period of data for the development of frequency estimates (average record length of approximately 60 years) and more recent data, as available.

Rainfall tables have been generated at the center of each county within the jurisdiction of the North Central Texas Council of Governments (NCTCOG). AMS based precipitation frequency grids for all available recurrence intervals and durations were first downloaded from the NOAA PFDS[1]. Subsequently, at the centroid of each county, the value associated with each duration and recurrence interval was extracted from the respective AMS frequency grids in ArcGIS. The compiled precipitation frequencies for each county in a tabular format are provided below. Note that the estimates for 1-yr recurrence interval are based on the frequency analysis of partial duration series (PDS).

While precipitation frequency estimates at the centroid of a county is a reasonable approach for summarizing the NOAA Atlas 14 data, these estimates may not be representative of smaller areas such as a metropolitan area or census block. For such cases, precipitation frequency estimates may be directly downloaded from the NOAA PFDS[2] by specifying the desired geographic co-ordinates.

5.2 References

https://iswm.nctcog.org/Documents/technical_manual/Hydrology_4-2020.pdf

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8. iSWM Website Analytics

- As of April 2nd, 2025 there have been over 42,000 total page views since April 1, 2023.
- Includes all pages on the site, and the technical manual page accounts for almost half of the page views.
- One-day spike of 2,400 page views on August 3, 2024; all other days are in the 0-100 range of page views per day

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8. iSWM Website Update Suggestions?

- Improve design to make resources and training materials more accessible.
- Incorporate BMP trainings (task 2) onto website.
- Remove 2014 & 2018 Construction Control Manual Drawings on the website and swap for 2023 drawings.
- Resolve issue of www.iswm.nctcog.org vs. iswm.nctcog.org, http: vs https:, SSL certificate – NCTCOG's IT team looking into this
- Suggestions on other updates that need to be made?

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9. Manual and Website Update Sticky Dot

We need your input, help us decide what our short term/ long term goals for the manual/ website updates

Information Items

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10. Regional Public Works Program Update

- Public Works Council Meeting, May 15th, 9:30am via Microsoft Teams www.nctcog.org/envir/committees/public-works-council
- Save the date for the 26th Annual Public Works Roundup, September 4, 2025, Hurst Conference Center https://www.nctcog.org/envir/public-works/annual-public-works-roundup
  - Call for Presentations will go out in May.
  - Call for sponsors went out in early April.

For more information on the Public Works program, please contact Erin Blackman at eblackman@nctcog.org or 817-608-2360

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11. NCTCOG TMDL Program Update

- TMDL Implementation Strategies under revision process
  - Education and Outreach Task Force Meeting: May 12, 2025 at 1:30 PM
  - Seeking additional feedback on all implementation strategies through May 2025
    - Revised strategies to be published for further review in Fall 2025
- Annual TMDL Coordination Committee Meeting: tentatively scheduled for June 19, 2025 at 9:30 AM

For more information on the TMDL program please contact Casey Cannon at ccannon@nctcog.org or (817) 608-2313

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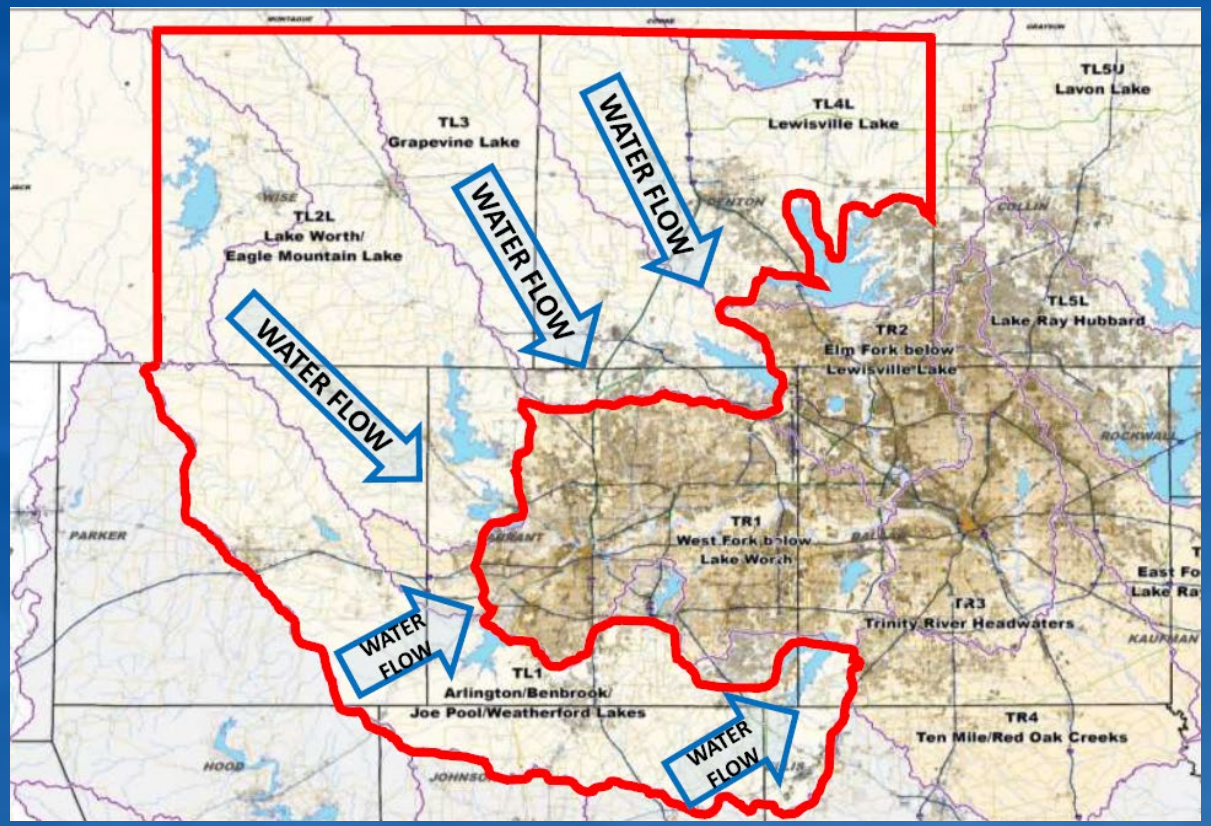
12. Integrated Transportation and Stormwater Infrastructure Study Updates



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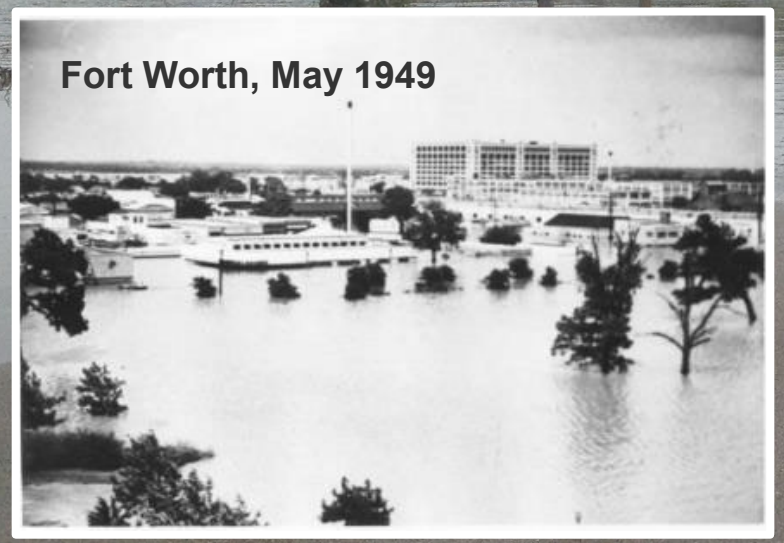
TSI – A Proactive Approach to Growth and Development

Funded by the Texas General Land Office, Community Development Block Grant, Disaster Recovery Program.

Also Funded by the Texas Water Development Board and Texas Department of Transportation.

Historic flooding led to improvements in flood control infrastructure. But a need remains.

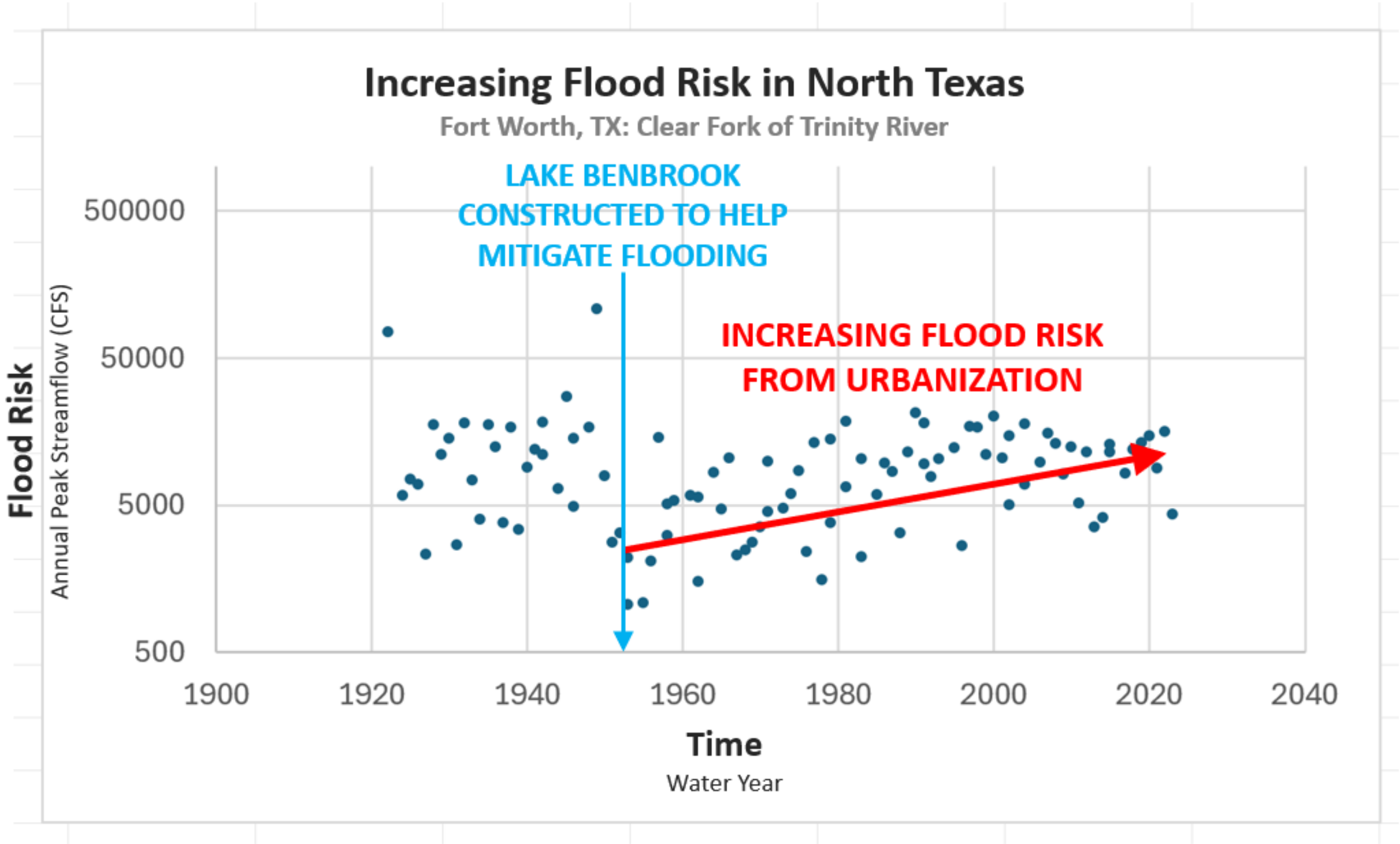


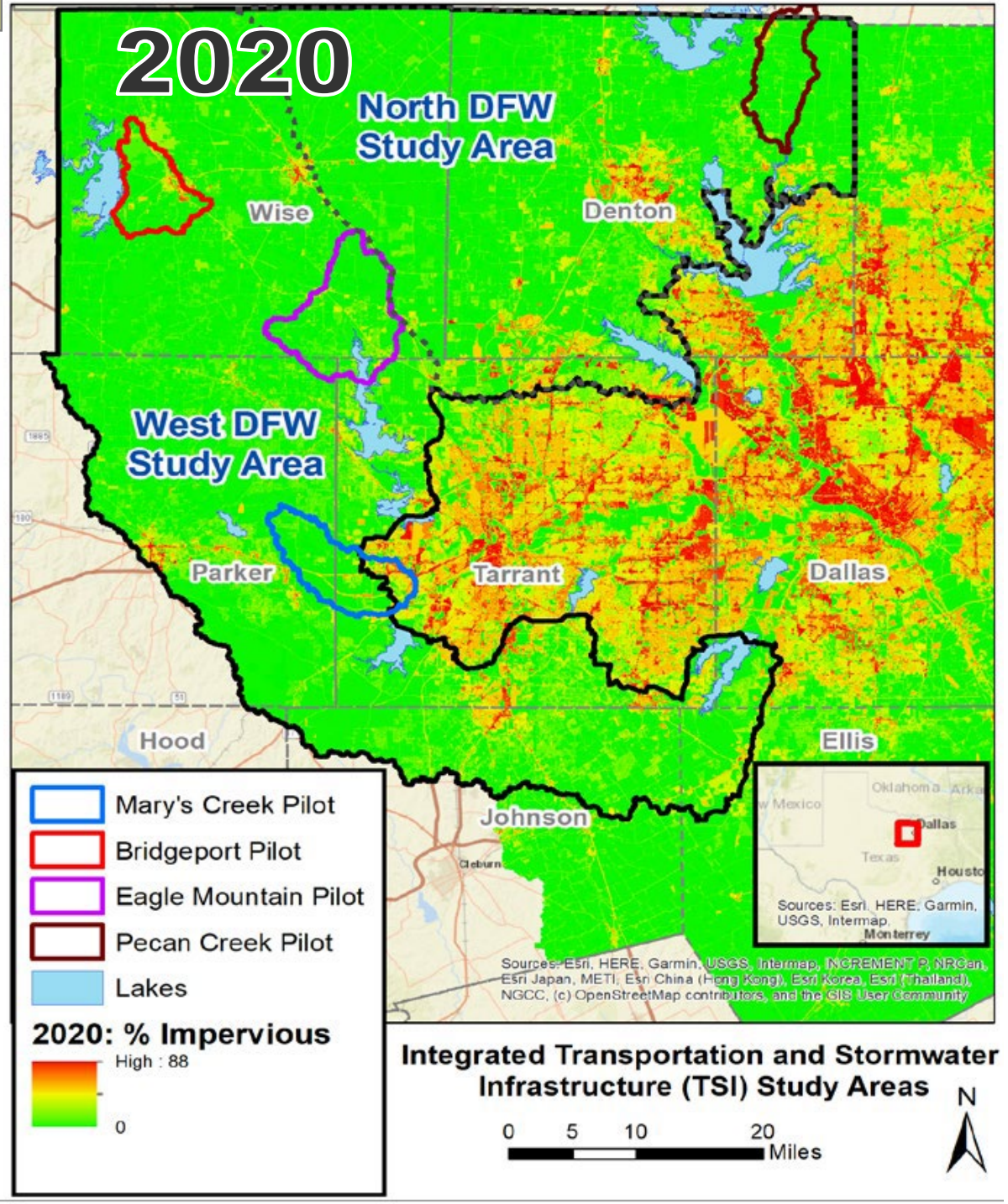
Rhome, May 2015
Courtesy Tarrant Regional Water District

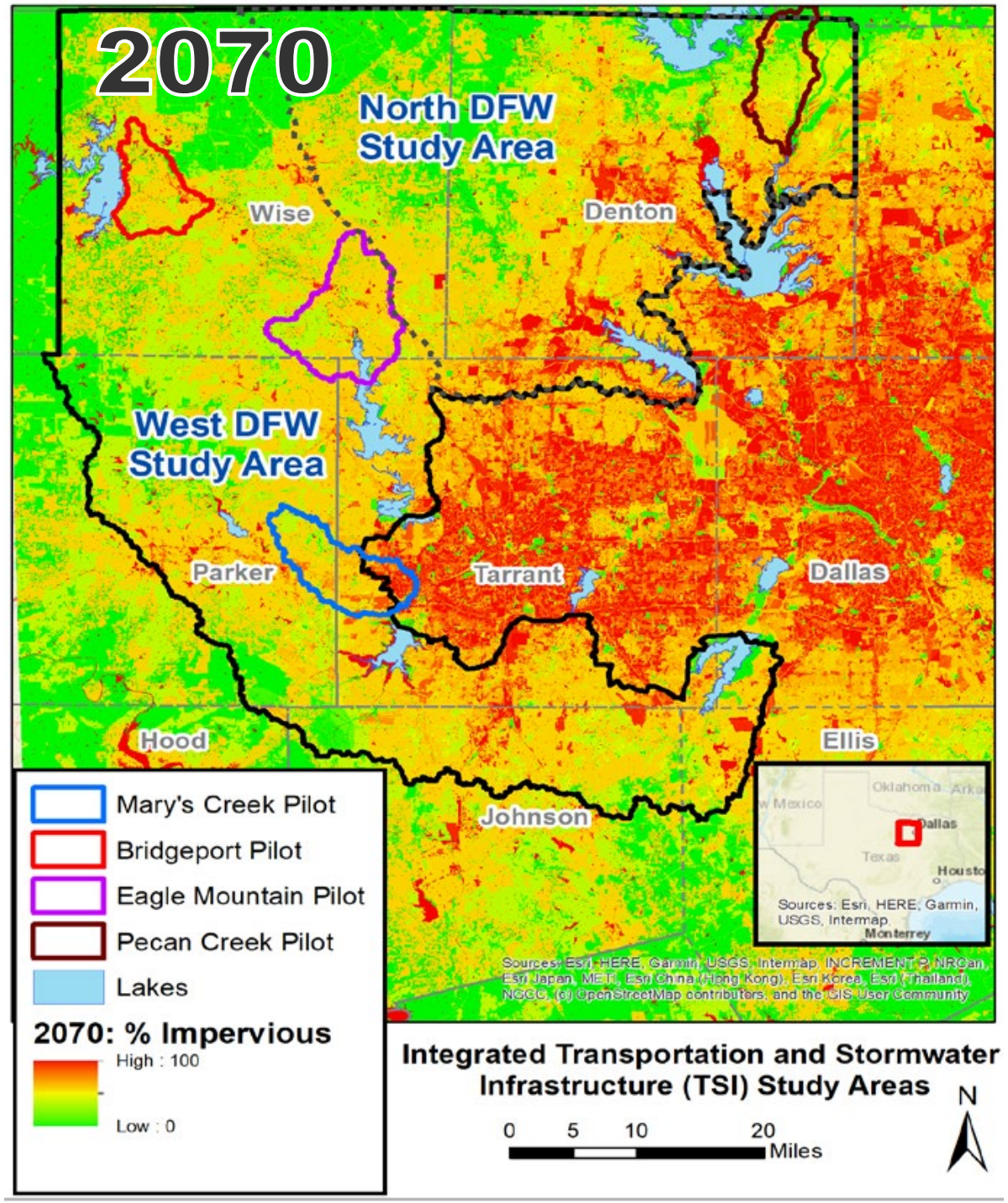
The integrated Transportation and Stormwater Infrastructure study proactively addresses the increased flood risk resulting from extraordinary population growth in the Upper Trinity River basin.

Adobe Stock

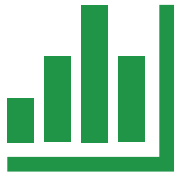
Courtesy City of Newark


Increasing Flood Risk in North Texas
Fort Worth, TX: Clear Fork of Trinity River
LAKE BENBROOK
CONSTRUCTED TO HELP
MITIGATE FLOODING
INCREASING FLOOD RISK
FROM URBANIZATION
Flood Risk
Annual Peak Streamflow (CFS)
500000
50000
5000
500
1900
1920
1940
1960
1980
2000
2020
2040
Time
Water Year


2020
North DFW Study Area
West DFW Study Area
Wise
Denton
Parker
Tarrant
Dallas
Hood
Ellis
Johnson
Mary's Creek Pilot
Bridgeport Pilot
Eagle Mountain Pilot
Pecan Creek Pilot
Lakes
2020: % Impervious
High : 88
0
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Integrated Transportation and Stormwater Infrastructure (TSI) Study Areas
0 5 10 20
Miles
N


2070
North DFW Study Area
West DFW Study Area
Wise
Denton
Parker
Tarrant
Dallas
Hood
Ellis
Johnson
Mary's Creek Pilot
Bridgeport Pilot
Eagle Mountain Pilot
Pecan Creek Pilot
Lakes
2070: % Impervious
High : 100
Low : 0
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Integrated Transportation and Stormwater Infrastructure (TSI) Study Areas
0 5 10 20
Miles
N

TSI outputs will empower engineers, local governments, and developers to reduce the threat to people, property, and infrastructure.



Collect and Analyze Data

Assess Hydrology and Hydraulics Scenarios

Identify Transportation Infrastructure Impacts

Conduct Environmental Planning

Evaluate a Real-Time Flood Warning System

Support and Empower Communities

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Estimated Study Timeline

Through Fall 2025
Continue training workshops and site visits to individual communities

Winter 2025/2026
Complete H&H modeling and identify transportation, environmental and other policy recommendations

March 2026
Conduct project update meeting to present findings and seek stakeholder feedback

June 2026
Conduct project update meeting to present final products incorporating stakeholder feedback

July 2026
Submit deliverables to funding agencies

integrating **Transportation & Stormwater Infrastructure**

The effectiveness of TSI outputs depends on engagement from local governments and other stakeholders. Help us help you.

Technical Advisory Group

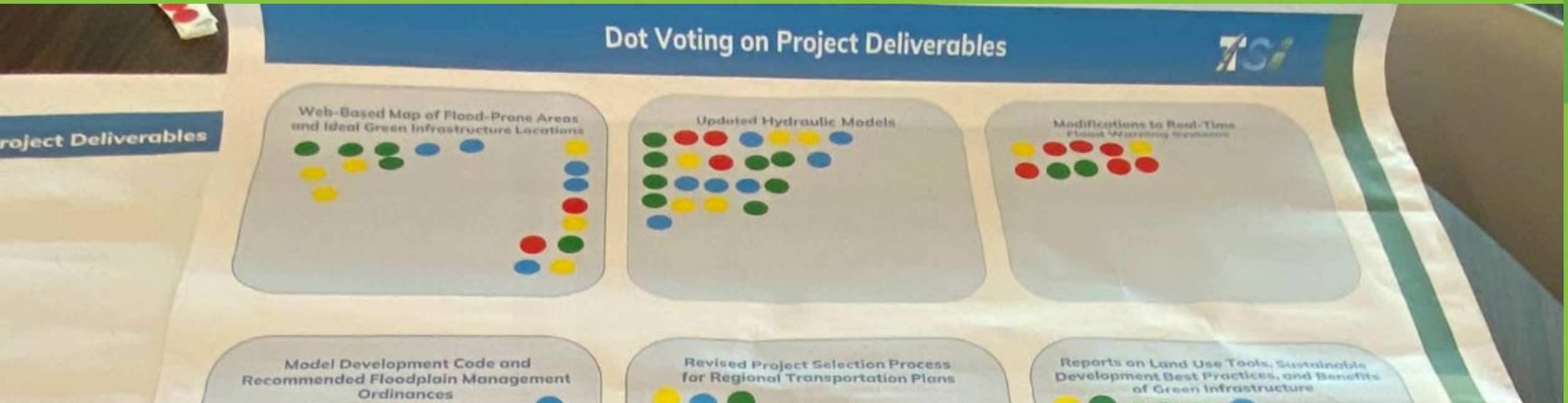
Annual Project Updates

Community Site Visits

Training Workshops

www.nctcog.org/tsi

https://geospatial.nctcog.org/portal/apps/storymaps/stories/6b73437fc69643cb9b6f239831706191



Hydrology Enhancement

Developed SOP and enhancing hydrology (including new flow locations) across TSI study area:

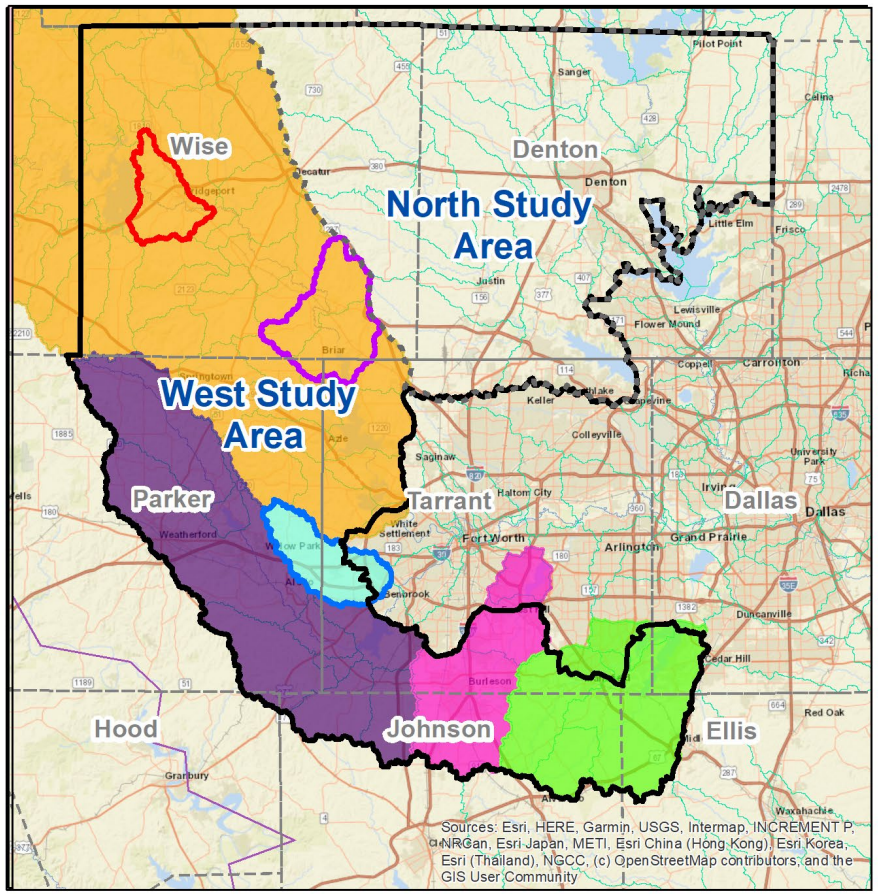
- Mary's Creek
- Village Creek
- Mountain Creek
- Clear Fork
- West Fork

TSI Project
West Study Region
HEC-HMS Model Development SOP

May 2024

1. *Overview of the HMS Model Development for TSI* ____ 2
2. *Data Sources* ____ 2
   2.1 GIS Data ____ 2
   2.2 Model Data ____ 3
3. *Subbasin Locations* ____ 3
4. *HEC-HMS Methodology* ____ 4
   4.1 Pilot Example ____ 4
   4.2 Subbasin Delineations in HEC-HMS ____ 4
   4.3 Update HEC-HMS Element Names and Descriptions ____ 6
   4.4 Initial HMS Parameters Calculations ____ 9
   4.5 Calibration to InFRM WHA Results ____ 17
   4.6 Update the HEC-HMS Basin Model for TSI 2020 Conditions ____ 20
      4.6.1 TSI Existing Conditions for 2020 ____ 20
      4.6.2 Run the 100-yr Storm for 2020 Conditions ____ 21
   4.7 Run TSI 2020 Storm Scenarios ____ 21
   4.8 Model Documentation ____ 22
   4.9 Interim Review 4 - Final Existing Conditions HEC-HMS Model ____ 22
   4.10 Update the HEC-HMS Basin Model for TSI Future Conditions ____ 22
      4.10.1 TSI 2070 Future Conditions Basin Model ____ 23
      4.10.2 Run the 100-yr Storm for 2070 Future Conditions ____ 23
      4.10.3 Run TSI Storm Scenarios for Future Conditions ____ 24
   4.11 Model Documentation ____ 25
   4.12 Final Review 5 - Final Future Conditions HEC-HMS Model ____ 25
5. *Additional Considerations for the Hydrology of the West Fork* ____ 25

1. Delineate additional subbasins in HEC-HMS
2. Update HMS element names and descriptions
3. Calculate initial HMS parameters
4. Calibrate to InFRM WHA results
5. Update the HMS basin model for TSI current and future conditions
6. Run TSI storm scenarios
7. Model documentation
8. Submit final HMS model for review and use for team members



TSI Pilot and Hydrology Focus Areas

TSI Study Areas
County Boundary
InFRM WHA Subbasins

Eagle Mountain Pilot Area
Mary's Creek Pilot Area
Bridgeport Pilot Area

0 5 10 20 Miles

N

West Hydrology Focus Areas

Clear Fork
Marys Creek
Mountain Creek
Village Creek
West Fork

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Hydraulics Enhancement

Developed SOP and enhancing hydraulic models to inform flooding considerations:

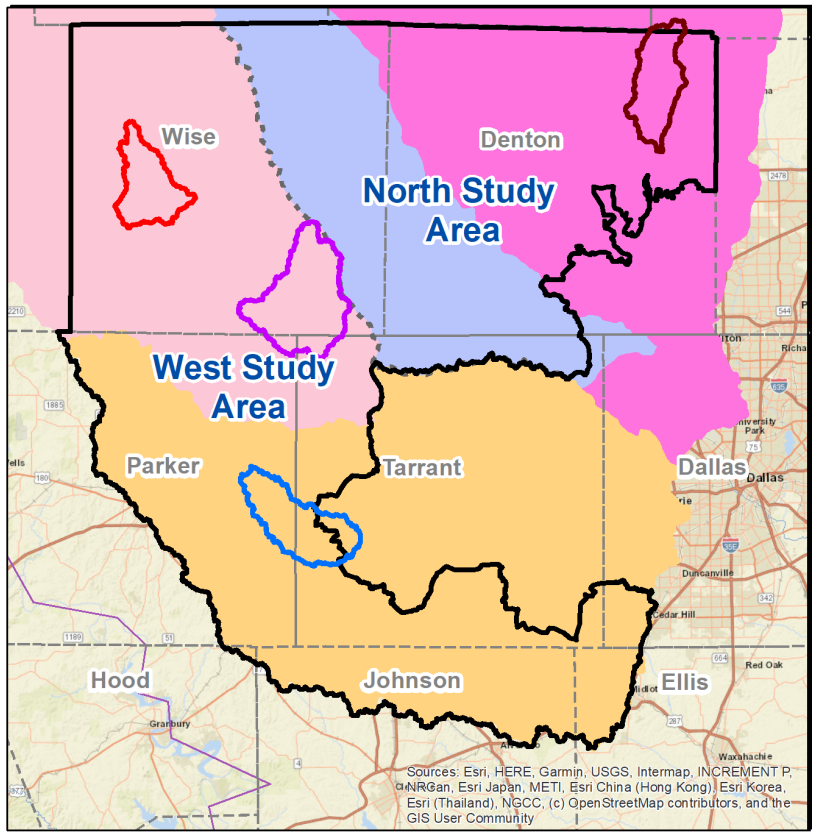
- **Defining approach for enhancing Base Level Engineering (BLE)**
  - Exploring 1D vs 2D model considerations
  - Testing approaches, adding detail, urban drainage, determining environmental constraints, establish recurrence intervals, incorporate current/future flows, optimization scripting, etc.

TSI Project
West Study Region
HEC-RAS Model Development
May 2024

1 *Overview of the Hydraulic Model Development for TSI* ____ 2
2 *Data Sources* ____ 2
2.1 GIS Data ____ 2
2.2 Model Data ____ 2
3 *HEC-RAS Methodology Development* ____ 3
3.1 Eagle Mountain Pilot ____ 3
3.2 HEC-RAS Modeling Process ____ 3
3.2.1 1D BLE Individual Models ____ 3
3.2.2 1D Combined Models ____ 11
3.2.3 2D Modeling ____ 14
4 *Model Methodology Comparison, Discussion, and Recommendation* ____ 22

Defining TSI HEC-RAS Modeling Process for:

1. 1D Individual Models
2. 1D Combined Models
3. 2D Modeling



TSI Pilot Areas with BLE (as of AUG 2024)

- Eagle Mountain Pilot Area
- Mary's Creek Pilot Area
- Bridgeport Pilot Area
- Pecan Creek Pilot Area

0 5 10 20 Miles

N

- Denton: BLE AVAILABLE ON VIEWER (1D STUDY)
- Elm Fork Trinity: BLE AVAILABLE ON VIEWER (1D STUDY)
- Lower West Fork Trinity: BLE COMPLETE & ON VIEWER SOON (2D STUDY)
- Upper West Fork Trinity: BLE AVAILABLE ON VIEWER (1D STUDY)

BLE Viewer Link: https://webapps.usgs.gov/infrm/estBFE/

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Optimization Methodology

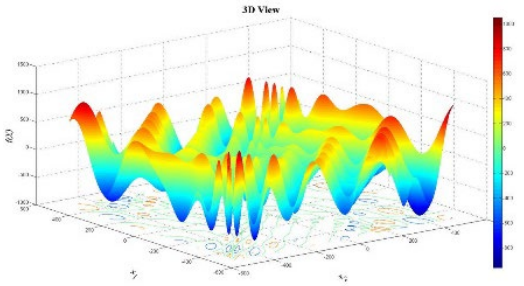
Receive updated HEC-HMS model and modify for optimization

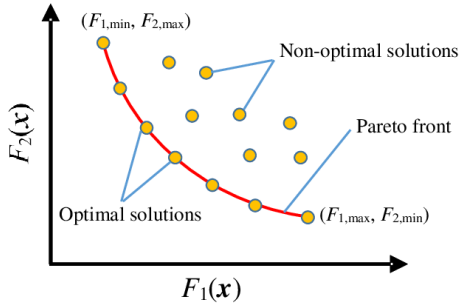
Conduct GIS-based suitability analysis for the menu of traditional and green infrastructure options

Set up variables and initial data for traditional and green stormwater infrastructure options

Determine objective function and constraints with emphasis for on-stream and environmentally-conscious solutions

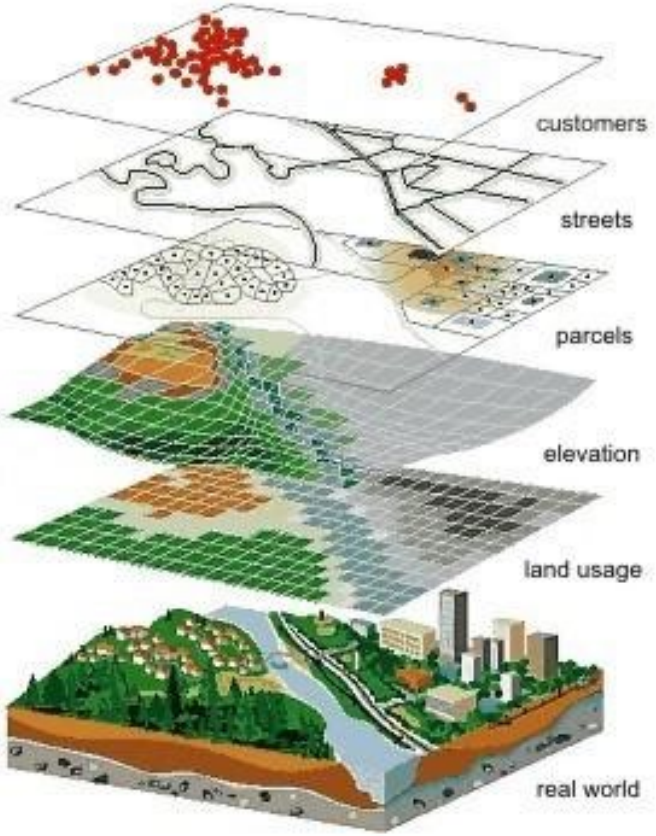
Develop and run a script using optimization techniques and algorithms to work with the HEC-HMS model





Green Stormwater Infrastructure and Nature-Based Solutions

- GIS stacking model of suitability parameters for GSI and NBS
- Menu of potential GSI and NBS mitigation strategies
- Ideal locations for GSI and NBS
- Return-on-investment analysis



integrating Transportation & Stormwater Infrastructure

13. Upcoming Events, Conferences, Opportunities

- FEMA L0278 Community Rating System (CRS) course
  - August 11-14, 2025, 8 am-5 pm. At NCTCOG offices
  - This course describes activities eligible for credit under the 2017 CRS Coordinator's Manual, how a community applies for credit, and how it modifies an application to improve its classification.
  - Registration available online: https://nctcog.org/envir/watershed-management/crs-user-group/l0278-nfip-crs-course

- TSI County Watershed Workshop
  - Date TBD, Hybrid at NCTCOG offices

- TSI Technical Advisory Group Meeting
  - May 1, 2025, 2 pm- 3:30 pm. Virtual Teams Meeting
  - https://www.addevent.com/event/cd25370874

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14. Upcoming NCTCOG Committee/ Subcommittee Meetings

- Next iSWM Meeting: July (TBD)
- Joint TMDL Stormwater & Wastewater Subcommittee Meeting: June 19, 2025 at 9:30 AM
- Regional Stormwater Management Coordinating Committee: May 21, 2025 at 9:30 AM

Environment & Development Committees Information Available at nctcog.org/envir/committees

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15. Future Agenda Items and Schedule for the Next Meeting

Thank you all for your participation today!

Our next iSWM Meeting will be held July _____

iSWM

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16. Roundtable Discussion

iSWM

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Environment & Development

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EandD@nctcog.org

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