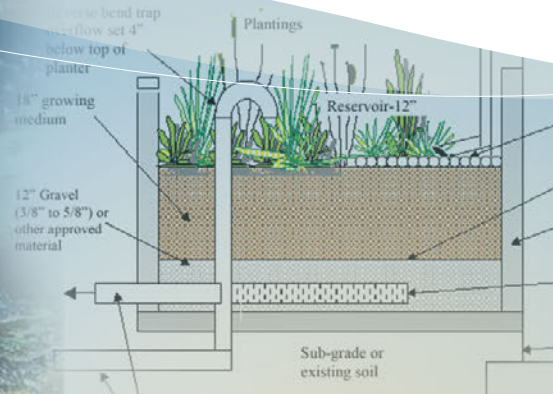




New iSWM Implementation Approach



Presenters



NCTCOG

Edith Marvin, P.E., CFM

Jack Tidwell, AICP, CFM

Jeff Rice

Freese and Nichols

Lesley Brooks, P.E., CFM

Agenda

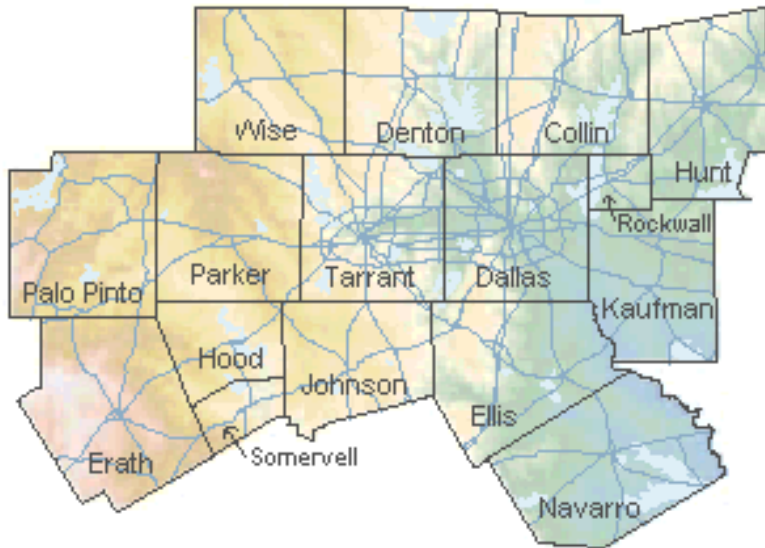


- Overview of the iSWM Program
- Previous iSWM Implementation Requirements
- Implementation Roadblocks
- New Approach to Implementing iSWM
- Benefits to Joining the iSWM Program

What is iSWM?



- A regional program to assist local governments:
 - Manage stormwater impacts
 - Meet MS4 Permit requirements



- Collaborative effort between:
 - 60+ local governments
 - iSWM Committee
 - Regional Public Works Council
 - Consultant team led by Freese and Nichols

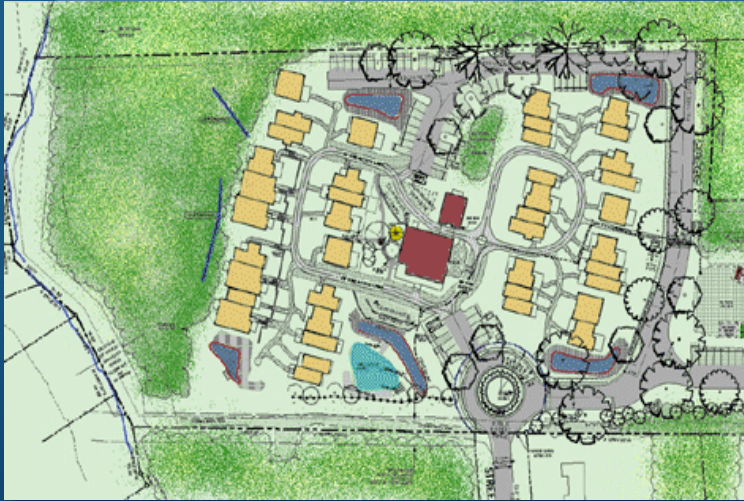
Why iSWM?



- Increased runoff → flooding and streambank erosion
- Water quality concerns/stormwater regulations
- Loss of natural features
- Interest in green infrastructure
- Comprehensive approach needed
- Regional consistency and equity
- Obtain Community Rating System (CRS) credits for reduced insurance rates through higher standards



iSWM Basics



- Address stormwater early in the development process
- Design for multiple storm events
- Use integrated Site Design Practices

- Reduce downstream impacts
 - Water quality
 - Streambank erosion
 - Flooding
- Protect water quality during construction activities



Overview of iSWM Program



<http://iswm.nctcog.org>

iSWM Criteria Manual
(For Adoption)

iSWM Technical Manual
(For Reference)

iSWM
Program

iSWM Tools
(For Reference)

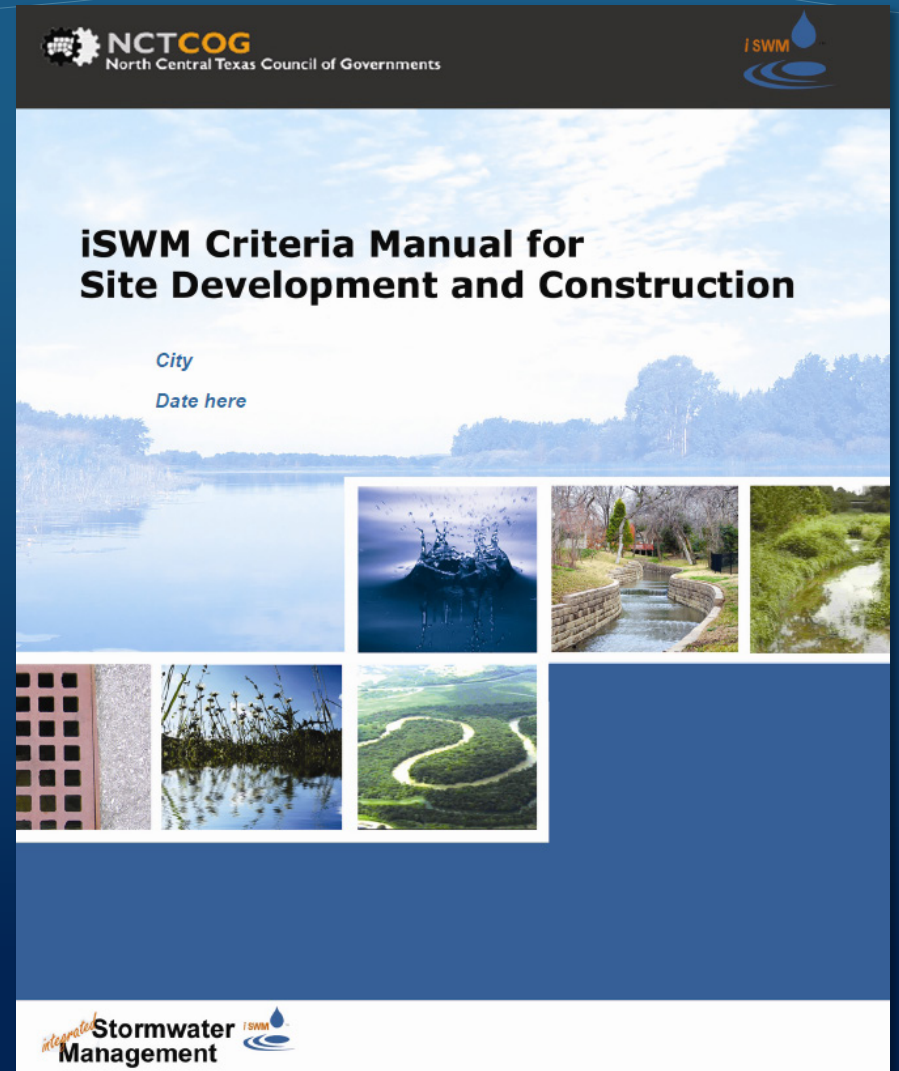
iSWM Program
Guidance
(For Reference)

Criteria Manual



What's in the Criteria Manual?

- **Ch. 1:** Overview of iSWM Criteria Manual
- **Ch. 2:** *integrated* Development Process
- **Ch. 3:** *integrated* Design Criteria
- **Ch. 4:** *integrated* Construction Criteria




iSWM Technical Manual



NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

integrated Stormwater Management iSWM

 iSWM Program Guidance read more


1 2 3 4 5 6 7 < || >

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Planning	(4Mb)
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- Technical and design information
- Online resource for use by local governments and design community
- Separate volumes for easy download and use

Fundamentals of iSWM

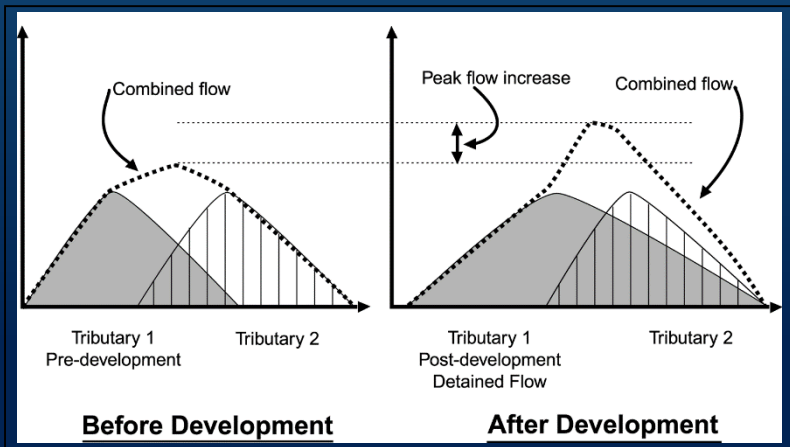
1. Development Process

- Stormwater - early and often
- Get the right people involved



2. Downstream Assessments

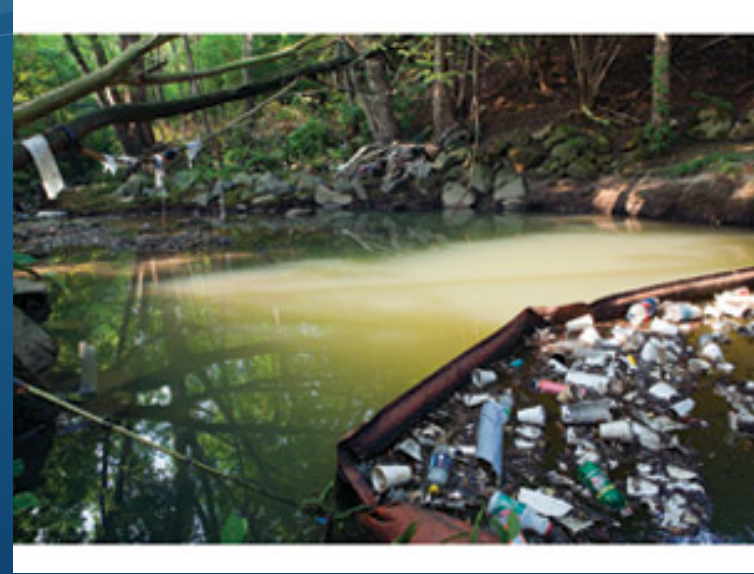
- Detention not always the answer
- See what downstream can handle first



Fundamentals of iSWM

3. Water Quality

- 3 options to meet TCEQ MS4 Requirements



4. Flooding & Erosion Protection

- 3 options to reduce problems downstream

Overview of iSWM Program

Water Quality * **Streambank Protection** * **Flood Control**

Options:

1. Use *integrated* Site Design Practices. Measured with a point system based on the percentage of natural features on a site and the percentage of practice utilized.
2. Treat the runoff resulting from rainfalls of up to 1.5 inches (85th percentile storm).
3. Assist in implementing off-site community stormwater pollution prevention programs/activities.



Option 1: Site Design



Table 3.5 Point System for *integrated* Site Design Practices

iSWM Practice No.	Practice	Percent of Eligible Area Using Practice	Maximum Points	Actual Points Earned (% practice used * max. points)
Conservation of Natural Features and Resources				
1	Preserve/Create Undisturbed Natural Areas		8	
2	Preserve or Create Riparian Buffers Where Applicable		8	
3	Avoid Existing Floodplains or Provide Dedicated Natural Drainage Easements		8	
4	Avoid Steep Slopes		3	
5	Minimize Site on Porous or Erodible Soils		3	
Lower Impact Site Design				
6	Fit Design to the Terrain		4	
7	Locate Development in Less Sensitive Areas		4	
8	Reduce Limits of Clearing and Grading		6	
9	Utilize Open Space Development		8	
10	Incorporate Creative Design (e.g. Smart Growth, LEED Design, Form Based Zoning)		8	
Reduction of Impervious Cover				
11	Reduce Roadway Lengths and Widths		4	
12	Reduce Building Footprints		4	
13	Reduce the Parking Footprint		5	
14	Reduce Setbacks and Frontages		4	
15	Use Fewer or Alternative Cul-de-Sacs		3	
16	Create Parking Lot Stormwater "Islands"		5	
Utilization of Natural Features				
17	Use Buffers and Undisturbed Areas		4	
18	Use Natural Drainageways Instead of Storm Sewers		4	
19	Use Vegetated Swale Design		3	
20	Drain Runoff to Pervious Areas		4	
Subtotal – Actual site points earned			100	
Subtract minimum points required (Table 3.4)			-	
Points available for development incentives				
Add 1 point for each 1% reduction of impervious surface			+	
Total Points for Development Incentives				

Option 1: Site Design



- Requirements Based on Existing Natural Features

Table 3.4 <i>integrated</i> Site Design Point Requirements		
Percentage of Site(by Area) with Natural Features Prior to Proposed Development	Minimum Required Points for Water Quality Protection (WQP)	Additional Points Above WQP for Development Incentives
> 50%	50	10 points each
20 - 50%	30	10 points each
< 20%	20	10 points each

Natural Features:

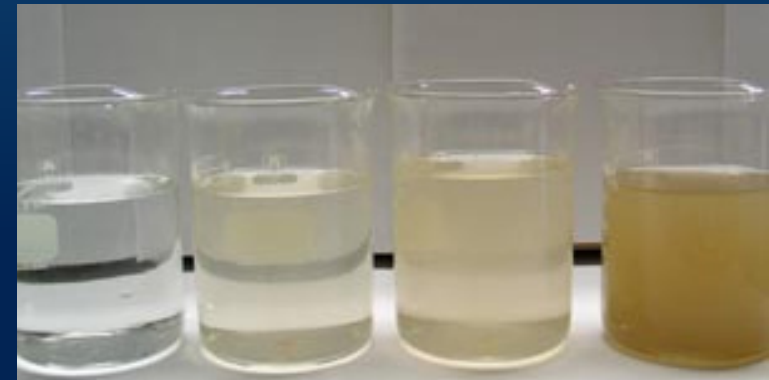
- Unfilled floodplain
- Stand of trees, forests
- Established vegetation
- Steep sloped terrain
- Creeks, gullies, and other natural stormwater features
- Wetland areas and ponds

Option 2: Treat 1.5" Rainfall



Treating the 1.5 inch (85%) Rainfall Event

- Why 85th Percentile?
 - Several entities nation wide chose the 85th percentile storm.
- How was 1.5" calculated?
 - In 2003 precipitation data for North Texas was obtained from NOAA and the 85th percentile was calculated as 1.5 inches.

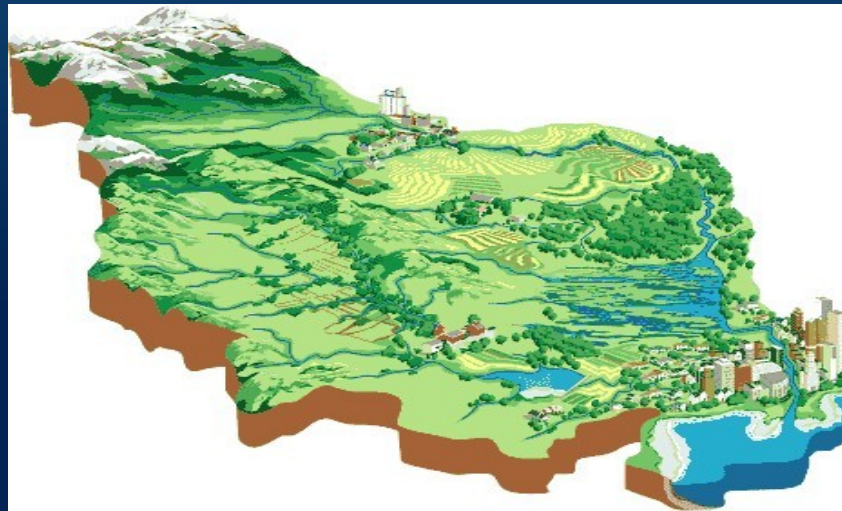


Low Turbidity —————> High Turbidity

Option 3: Regional Approach



- Participate in off-site pollution prevention programs (i.e. regional detention across multiple lots or across community boundary lines).
- Program must be described in city's Stormwater Management Program (SWMP) and/or city's approved watershed plan.



Overview of iSWM Program

Water Quality * Streambank Protection * Flood Control

Options:

1. Reinforce/stabilize downstream conditions.
2. Install stormwater controls to maintain or improve existing downstream conditions.
3. Provide on-site controlled release of the 1-year, 24-hour storm event over a period of 24 hours.



Overview of iSWM Program

Water Quality * Streambank Protection * **Flood Control**

Options:

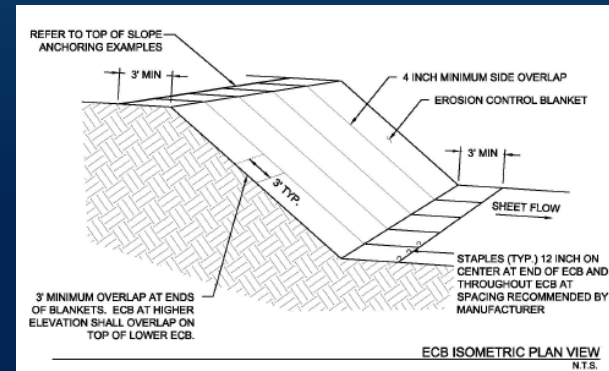
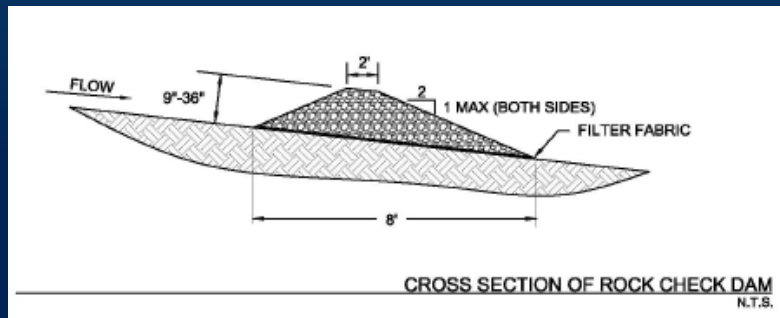
1. Provide adequate downstream conveyance systems.
2. Install stormwater controls on-site to maintain or improve existing downstream conditions.
3. Maintain existing on-site runoff conditions in lieu of a downstream assessment.



Overview of iSWM Program

Construction


- Prepare and submit iSWM Construction Plan.
- Consider topography, areas to be left undisturbed, location and types of controls.
 - Erosion Controls
 - Sediment Controls
 - Material and Waste Controls




iSWM Technical Manual



NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

integrated Stormwater Management 

 iSWM Program Guidance [read more](#)

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- Technical and design information
- Online resource for use by local governments and design community
- Separate volumes for easy download and use

iSWM Technical Manual - Planning

integrated Site Design Practices

- Conserve Natural Features and Resources
- Lower Impact Site Design Techniques
- Reduction of Impervious Cover
- Utilization of Natural Features for Stormwater Management

Fact Sheets

iSWM™ Technical Manual Planning

integrated Site Design Practice #6:
Fit Design to the Terrain Lower Impact
Site Design Techniques

Description: The layout of roadways and buildings on a site should generally conform to the landforms on a site. Natural drainageways and stream buffer areas should be preserved by designing road layouts around them. Buildings should be sited to utilize the natural grading and drainage system and avoid the unnecessary disturbance of vegetation and soils.

KEY BENEFITS	USING THIS PRACTICE
<ul style="list-style-type: none">• Helps to preserve the natural hydrology and drainageways of a site.• Reduces the need for grading and land disturbance.• Provides a framework for site design and layout.	<ul style="list-style-type: none"><input checked="" type="checkbox"/> Develop roadway patterns to fit the site terrain.<input checked="" type="checkbox"/> Locate buildings and impervious surfaces away from steep slopes, drainageways and floodplains.

Discussion
All site layouts should be designed to conform with or "fit" the natural landforms and topography of a site. This helps to preserve the natural hydrology and drainageways on the site, as well as reduces the need for grading and disturbance of vegetation and soils. Figure 2.10 illustrates the placement of roads and homes in a residential development.

Roadway patterns on a site should be chosen to provide access schemes which match the terrain. In rolling or hilly terrain, streets should be designed to follow natural contours to reduce clearing and grading. Street hierarchies with local streets branching from collectors in short loops and cul-de-sacs along ridgelines help to prevent the crossing of streams and drainageways as shown in Figure 2.11. In flatter areas, a traditional grid pattern of streets or "fluid" grids which bend and may be interrupted by natural drainageways may be more appropriate (see Figure 2.12). A grid pattern may also allow for narrower streets and less imperviousness as having more than one route for emergency vehicles makes it easier to relax minimum street width requirements. In either case, buildings and impervious surfaces should be kept off of steep slopes, away from natural drainageways, and out of floodplains and other lower lying areas. In addition, the major axis of buildings should be oriented parallel to existing contours.

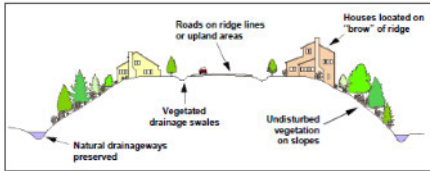


Figure 2.10 Preserving the Natural Topography of the Site
(Adapted from Sikes, 1989)

Planning
Revised 2/10 PL-21

Planning




Figure 2.11 Subdivision Design for Hilly or Steep Terrain Utilizes Branching Streets from that Preserves Natural Drainageways and Stream Corridors




Figure 2.12 A Subdivision Design for Flat Terrain Uses a Fluid Grid Layout that is Interrupted by the Stream Corridor

Planning
Revised 2/10 PL-22

iSWM Technical Manual – Site Development Controls



1.6.2	Use of Multiple Structural Controls in Series.....
1.6.3	Calculation of Pollutant Removal for Structural Controls.....
1.6.4	Routing with WQ ₂ Removed.....

2.0 Bioretention.....

2.1	General Description.....
2.2	Stormwater Management Suitability.....
2.3	Pollutant Removal Capabilities.....
2.4	Application and Site Feasibility Criteria.....
2.5	Planning and Design Criteria.....
2.5.1	Location and Siting.....
2.5.2	General Design.....
2.5.3	Physical Specifications / Geometry.....
2.5.4	Pretreatment / Inlets.....
2.5.5	Outlet Structures.....

Site Development Controls
Revised 02/10

iSWM™ Technical Manual

2.5.6	Emergency Spillway.....
2.5.7	Maintenance Access.....
2.5.8	Safety Features.....
2.5.9	Landscaping.....
2.5.10	Additional Site-Specific Design Criteria and Issues.....

2.6	Design Procedures.....
2.7	Inspection and Maintenance Requirements.....
2.8	Example Schematics.....


3.0 Enhanced Swales.....

3.1	General Description.....
3.2	Stormwater Management Suitability.....

iSWM™ Technical Manual

Site Development Controls

2.0 Bioretention



Structural Stormwater Control

Description: Shallow stormwater basin or landscaped area that utilizes engineered soils and vegetation to capture and treat runoff.

<p>KEY CONSIDERATIONS</p> <p>DESIGN CRITERIA:</p> <ul style="list-style-type: none"> Maximum contributing drainage area of 5 acres (< 2 acres recommended) Often located in "landscaping islands" Treatment area consists of grass filter, sand bed, ponding area, organic/mulch layer, planting soil, and vegetation Typically requires 5 feet of head <p>ADVANTAGES / BENEFITS:</p> <ul style="list-style-type: none"> Applicable to small drainage areas Good for highly impervious areas, flexible siting Good retrofit capability Relatively low maintenance requirements Can be planned as an aesthetic feature <p>DISADVANTAGES / LIMITATIONS:</p> <ul style="list-style-type: none"> Requires extensive landscaping if in public area Not recommended for areas with steep slopes <p>MAINTENANCE REQUIREMENTS:</p> <ul style="list-style-type: none"> Inspect and repair/replace treatment area components 	<p>STORMWATER MANAGEMENT SUITABILITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">P</td> <td>Water Quality Protection</td> </tr> <tr> <td style="text-align: center;">S</td> <td>Streambank Protection</td> </tr> <tr> <td style="text-align: center;">S</td> <td>On-Site Flood Control</td> </tr> <tr> <td style="text-align: center;">S</td> <td>Downstream Flood Control</td> </tr> <tr> <td style="text-align: center;">Accepts</td> <td>Hotspot Runoff: Yes (requires impermeable liner)</td> </tr> <tr> <td style="text-align: center;">S</td> <td>- in certain situations</td> </tr> </table> <p>IMPLEMENTATION CONSIDERATIONS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">M</td> <td>Land Requirement</td> </tr> <tr> <td style="text-align: center;">M</td> <td>Capital Cost</td> </tr> <tr> <td style="text-align: center;">L</td> <td>Maintenance Burden</td> </tr> </table> <p>Residential Subdivision Use: Yes High Density/Ultra-Urban: Yes Drainage Area: 5 acres max. (< 2 acres recommended) Soils: Planting soils must meet specified criteria; No restrictions on surrounding soils Other Considerations: Use of native plants is recommended</p> <p style="text-align: center;">L=Low M=Moderate H=High</p>	P	Water Quality Protection	S	Streambank Protection	S	On-Site Flood Control	S	Downstream Flood Control	Accepts	Hotspot Runoff: Yes (requires impermeable liner)	S	- in certain situations	M	Land Requirement	M	Capital Cost	L	Maintenance Burden
P	Water Quality Protection																		
S	Streambank Protection																		
S	On-Site Flood Control																		
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Accepts	Hotspot Runoff: Yes (requires impermeable liner)																		
S	- in certain situations																		
M	Land Requirement																		
M	Capital Cost																		
L	Maintenance Burden																		

POLLUTANT REMOVAL

80%	Total Suspended Solids
40/50%	Nutrients - Total Phosphorus / Total Nitrogen removal
M	Metals - Cadmium, Copper, Lead, and Zinc removal
No Data	Pathogens - Coliform, Streptococci, E. Coli removal

Bioretention
Revised 02/10

SD-28

iSWM™ Technical Manual

Site Development Controls

2.1 General Description

Bioretention areas (also referred to as *bioretention filters* or *rain gardens*) are structural stormwater controls that capture and temporarily store the water quality protection volume (WQ₂) using soils and vegetation in shallow basins or landscaped areas to remove pollutants from stormwater runoff.

Bioretention areas are engineered facilities in which runoff is conveyed as sheet flow to the "treatment area" which consists of a grass buffer strip, ponding area, organic or mulch layer, planting soil, and vegetation. An optional sand bed can also be included in the design to provide aeration and drainage of a planting soil. The filtered runoff is typically collected and returned to the conveyance system, though can also infiltrate into the surrounding soil in areas with porous soils.

There are numerous design applications, both on- and off-line, for bioretention areas. These include use in single-family residential lots (rain gardens), as off-line facilities adjacent to parking lots, along highway or road drainage swales, within larger landscaped pervious areas, and as landscaped islands in pervious or high-density environments. Figures 2.1 and 2.2 illustrate a number of examples of bioretention facilities in both photographs and drawings.



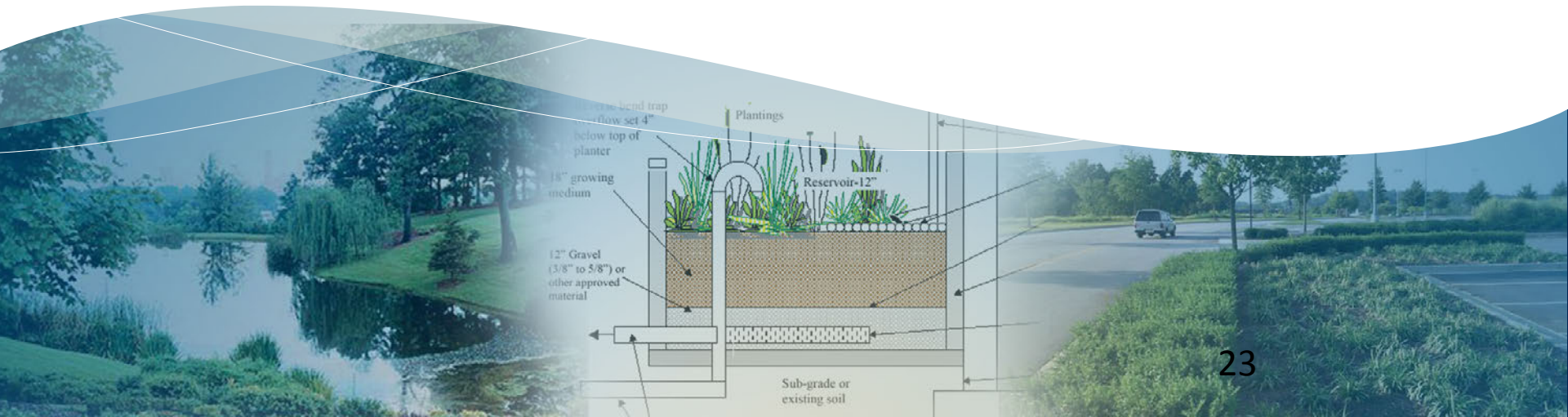
Figure 2.1 Bioretention Area Examples

Bioretention
Revised 02/10

SD-29



Previous iSWM Implementation Requirements



Implementing iSWM : 2006-2011



- Adopt the 2006 iSWM Design Manual for Site Development with added Local Criteria
- Execute License Agreement with NCTCOG
- Establish requirements:
 - Submittal of Conceptual, Preliminary, and Final iSWM Site Plans
 - Consideration of *integrated* Site Design Practices
 - Conduct downstream assessment for three storm events

Implementing iSWM: 2006-2011



- Must have participated in the Regional Public Works Program for two years (or contribute the equivalent amount) at time of adoption
 - Participation cost based on population
 - Cities are encouraged (but not required) to continue participation to support manual maintenance, updates, training, etc.

Implementing iSWM : 2006-2011

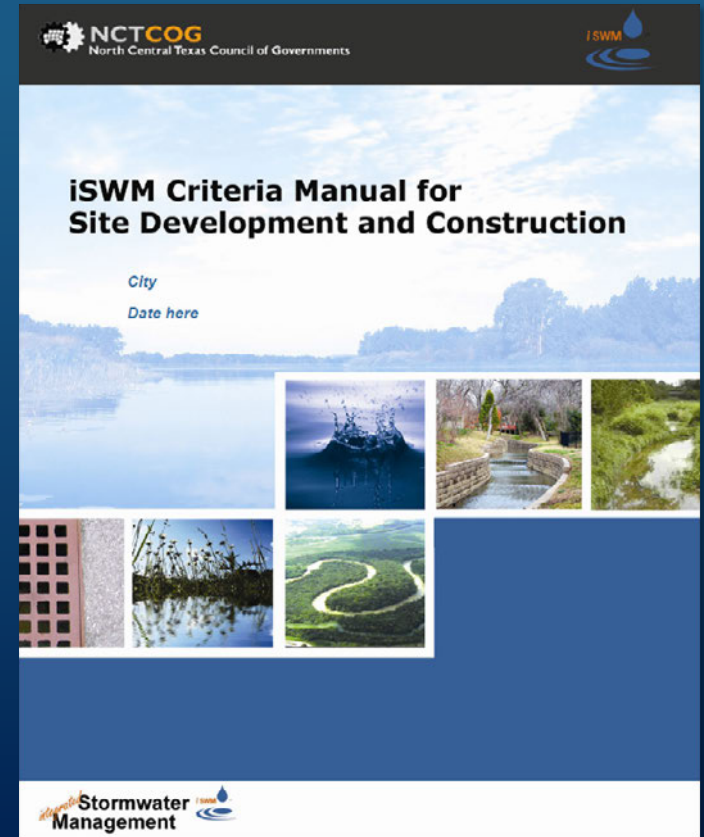


- In 2009, the iSWM Design Manual for Site Development was reorganized and replaced by:
 - iSWM Criteria Manual for Site Development and Construction
 - iSWM Technical Manual
- Licensing requirements remained unchanged until 2011
 - In 2011, changes were then made to offer additional flexibility to local governments

Implementing iSWM : 2011-2014



- Adopt the 2009 iSWM Criteria Manual
- Execute License Agreement with NCTCOG
- Meet minimum 70 points for implementation of “iSWM Elements”
- Current participant in Regional Public Works Program



Implementing iSWM : 2011-2014



iSWM Element	Points for Element	City Points
Three-Step Review Process (Concept, Preliminary, Final)	15	
Water Quality Option 1: integrated Site Design Practices	10	
Water Quality Option 2: Treat the Water Quality Protection Volume	10	
Water Quality Option 3: Off-Site Pollution Programs/Controls	10	
Downstream Assessment for Three-Storm Events (Streambank Protection, Conveyance, Flood Mitigation)	15	
Streambank Protection* (Require Options 1, 2 and/or 3)	15	
Flood Mitigation** (Require Options 1, 2 and/or 3)	15	
<i>integrated</i> Construction Criteria	10	
Points Available	100	100
Minimum Points Required	70	70
City Score		

- Community must adopt the iSWM Criteria Manual for Site Development and Construction (Manual) with Local Provisions as desired – **OR** – the Community must incorporate or reference portions of the Manual into codes, ordinances, drainage manual, etc.
- Community's adoption or incorporation of elements of the iSWM Criteria Manual for Site Development and Construction must meet a minimum of 70 points in accordance with the table.
- Note that no License Agreement is required for use of the iSWM Technical Manual.**

Adoption of iSWM

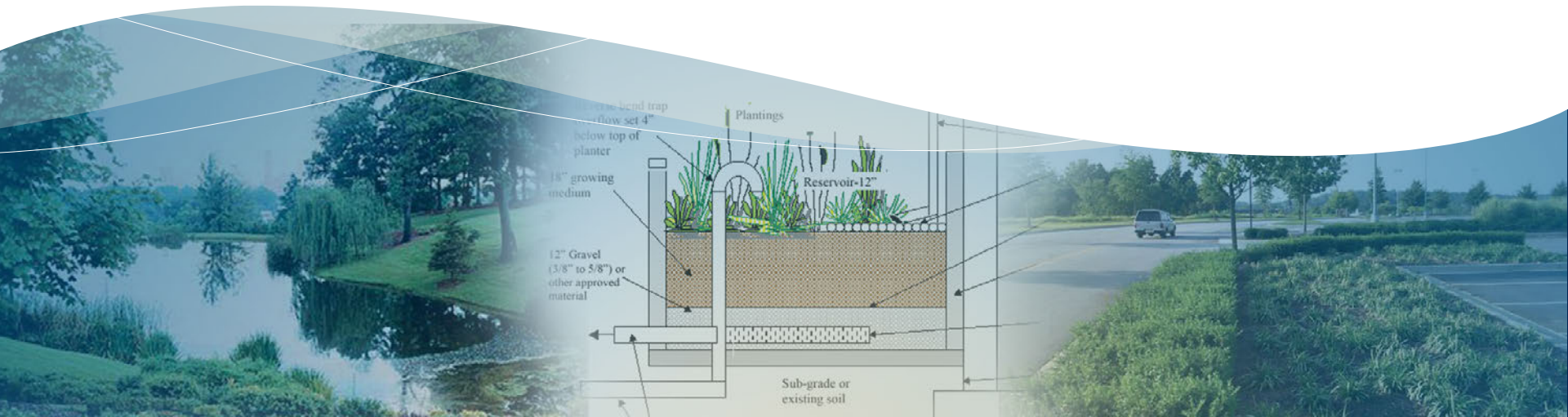


- 2006 – Fort Worth, Grand Prairie
- 2007 – Roanoke, Southlake
- 2008 – Benbrook
- 2009 – Dallas*, Lakeside, Mansfield
- 2010 – Glenn Heights, Northlake
- 2011 – Duncanville, University Park
- 2012 – Azle
- 2013 – Hurst

**Dallas has not yet formally adopted iSWM through a License Agreement, but allows the use of iSWM as an alternative to standard requirements*



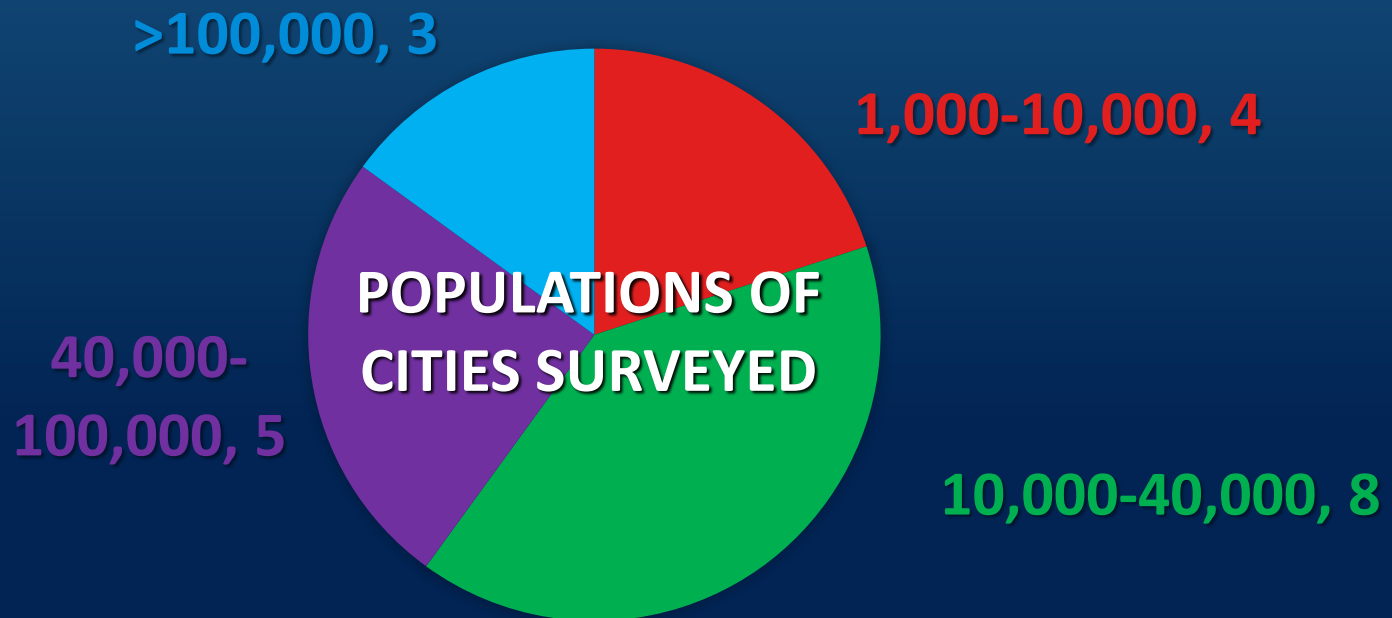
Implementation Roadblocks



Implementation Roadblocks



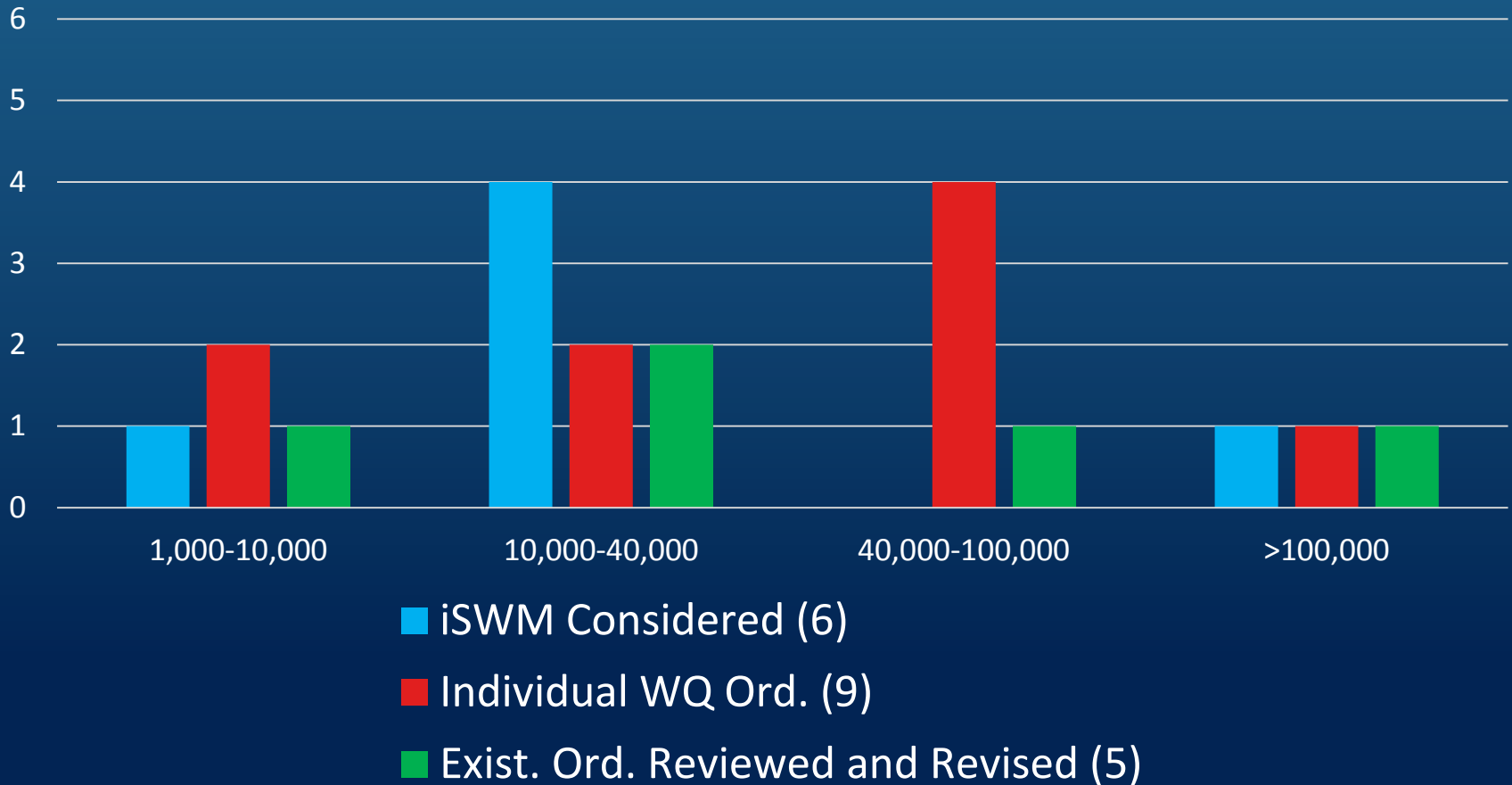
- In 2013, surveyed 20 cities in the Metroplex
- What were they doing to meet MS4 requirements, specifically post-construction controls?
 - Did they consider using iSWM? If not, why?



Implementation Roadblocks



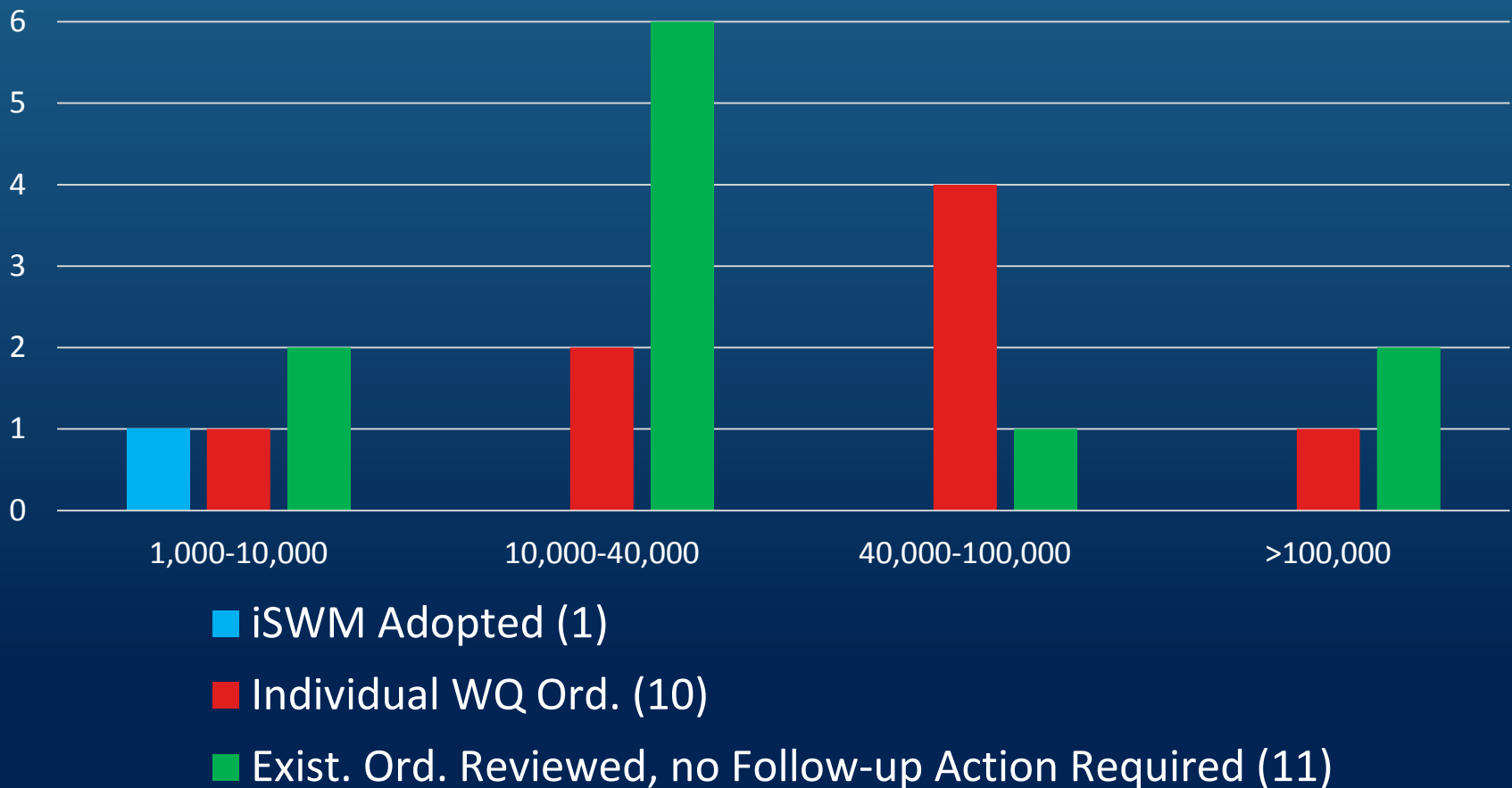
SWMP Approaches to Address Post-Construction Requirements



Implementation Roadblocks



Actions to Address Post-Construction Requirements



Implementation Roadblocks



1 of the six communities that indicated they would consider adopting iSWM did adopt

6 of the nine communities that adopted a post-construction ordinance referenced iSWM

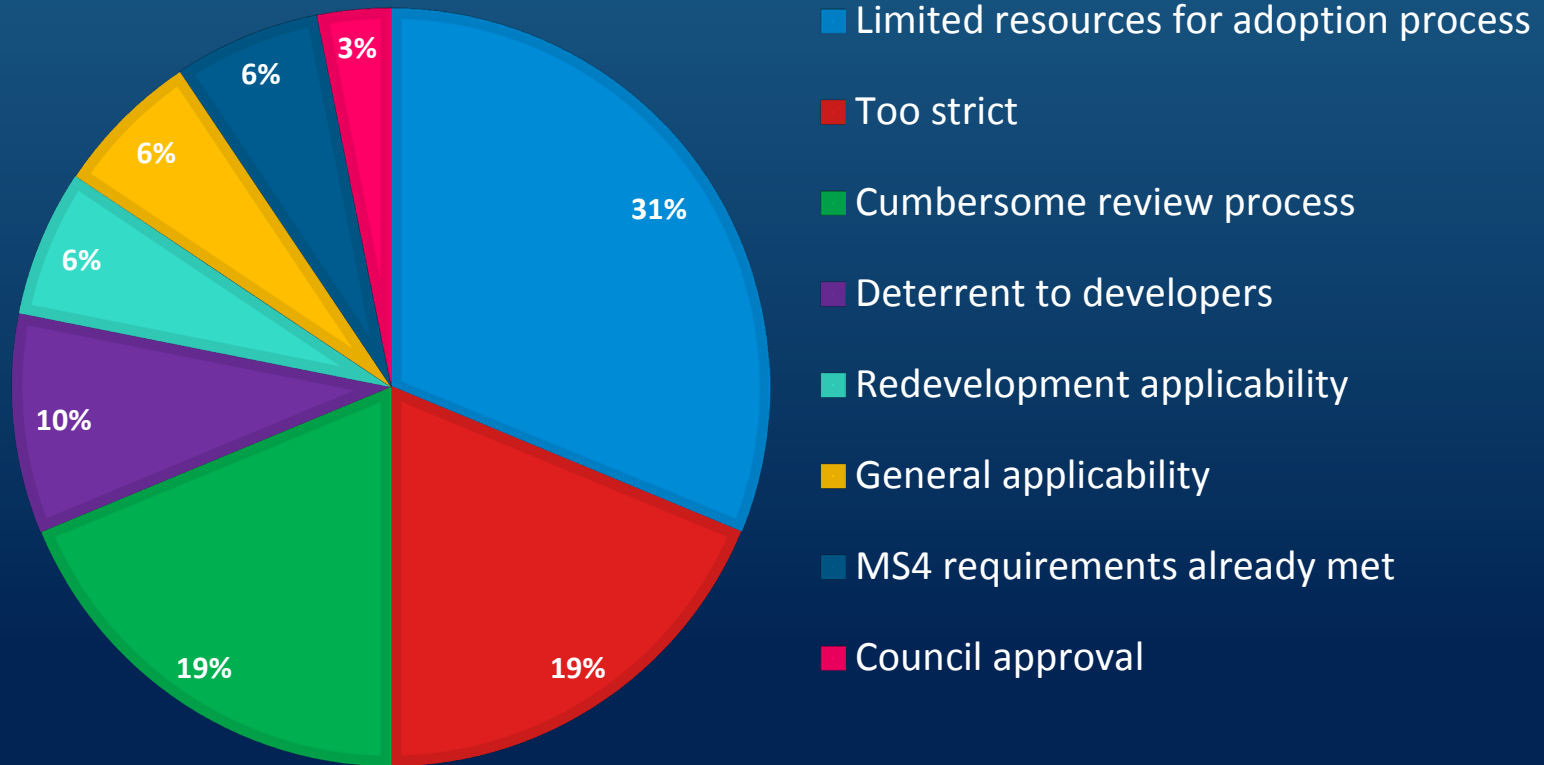
7 of the communities said they are still considering iSWM adoption in the future

5 of the communities used construction control measures to meet post-construction control measures

Implementation Roadblocks



WHY NOT iSWM?



Implementation Roadblocks

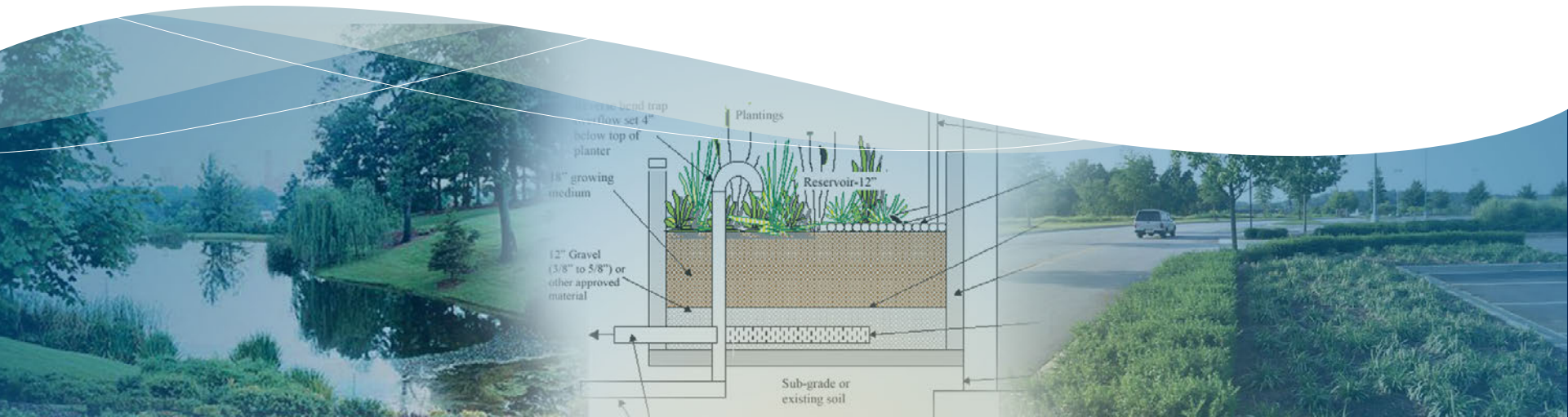


Recommended Changes:

- (4) Provide a separate “scaled” version of iSWM for smaller cities
- (4) Provide a separate version of iSWM that only covers water quality
- (2) Provide more guidance for redevelopment
- (2) Provide a “refresher” course to remind people of the 2009 iSWM Manual changes
- (1) More involvement of other departments (Planning, Maintenance, etc.)



Implementing iSWM: 2014 and beyond



A New Direction



- Communities may **adopt the iSWM Criteria Manual** OR implement iSWM **through their own criteria and ordinances**
- A License Agreement with NCTCOG that must be taken to a community's council is no longer required. Rather, a recording of satisfying the criteria through a document by the Local Stormwater Authority that is reviewed by the iSWM Review Board.

A New Direction



- Changes were not made to the content or criteria as part of this process.
- Three levels of adoption were added in order to reflect the intensity of usage and benefit of the program by the community.

A New Direction



- Moving to an outcome-focused implementation format
 - What “outcomes” are we trying to achieve?
 - What are the fundamental components of iSWM?
 - Criteria in iSWM that has an impact on development practices

A New Direction



■ Step 1: List of Outcomes

- Criteria significant to iSWM

■ Step 2: Tiered Measurement of Implementation

- Provide levels of implementation and set the requirements of each level

■ Step 3: Jurisdictional Implementation

- Reviewing implementation applications and increasing program participation

Step 1: List of Outcomes

Sorting the Outcomes

- *Mandatory*: Outcomes critical to iSWM and are required to join the program
- *Recommended*: Outcomes that strongly embody iSWM but are not all required to join the program
- *Optional*: Outcomes that are not required to join the program, but are encouraged due to the long-term benefits that will be experienced by the community

Step 1: List of Outcomes

Mandatory Outcomes

1. Site Plan Review Applicability
2. Land Use Conditions
3. Hydrologic Methods
4. Open Channel Velocity Criteria
5. Detention Structure Discharge Criteria
6. Streambank Protection
7. Flood Mitigation
8. Construction Controls
9. Operations and Maintenance
10. Downstream Assessments

Step 1: List of Outcomes

Recommended Outcomes

1. Conveyance Limits
2. Storm Drain Velocity Criteria
3. Spread Criteria
4. Freeboard Criteria
5. Finished Floor Elevations
6. Water Quality Protection
7. Drainage and Floodplain Easements

Step 1: List of Outcomes

Optional Outcomes

1. Open Channel Stability Criteria
2. Detention Downstream Timing Analysis
3. Conservation and Utilization of Natural Features and Resources
4. Lower Impact Site Design Techniques
5. TriSWM

Step 1: List of Outcomes

Applying Outcomes

- *Full Application:* Community currently has criteria that meets or exceeds iSWM criteria
- *Partial Application:* Community currently has criteria that addresses the intent of the outcome, but the criteria does not meet iSWM criteria

Step 1: Outcome Documentation

North Central Texas Council of Governments ISWM PROGRAM IMPLEMENTATION TIERED MEASUREMENT

SUBMITTING COMMUNITY: _____

Requirements for Implementation Levels

Outcome Category	Gold	Silver	Bronze
Mandatory	10 full application	10 full or partial application	10 full or partial application
Recommended	7 full application	7 full or partial application	4 full or partial application
Optional	3 full or partial application		

Note: The following outcomes apply to land disturbing activities of 1 acre or more for water quality and streambank protection, and apply to all land disturbing activities for flood mitigation and conveyance.

#	Outcome	CHECK COMMUNITY'S LEVEL OF APPLICATION N/A Partial Full	Full Application	ISWM Criteria Manual Ref.	Equivalent Local Criteria/Ordinance Reference
MANDATORY OUTCOMES					
1	Site Plan Review Applicability		Stormwater requirements discussed at a pre-development/pre-application meeting or equivalent (Concept ISWM)	Section 2.2, Step 3	
2	Land Use Conditions		Design stormwater infrastructure to fully-developed (built-out) land use conditions	Section 3.6.1	
3	Hydrologic Methods		Limit Rational Method applicability to drainage areas of 100 acres or less and utilize frequency factors (per TM HO Table 1.4); Limit Modified Rational Method applicability to drainage areas of 200 acres or less; For larger areas, require Unit Hydrograph methodology	Section 3.1 Table 3.2; TM* HO** Section 1.2	
4	Open Channel Velocity Criteria/Energy Dissipation		Require maximum permissible channel velocity criteria be met and/or use erosion control measures for 1-, 25-, and 100-yr or similar storm events to protect receiving drainage element from erosion	Section 3.6.3, Table 3.10 and 3.11	
5	Detention Structure Discharge Criteria		When a detention structure is utilized, design facility for fully-developed 1-, 25-, and 100-yr or similar storm events matching pre-development peak flows and velocities; Provide emergency spillway with 6 inches of freeboard to convey fully-developed 100-yr storm event assuming outlet blockage	Section 3.6.3, Detention Structures	
6	Streambank Protection		Require downstream stabilization to prevent erosive velocities; maintain existing downstream velocity conditions with on-site controls; and/or control fully-developed 1-yr, 24-hr storm event release over 24 hours to prevent erosive velocities	Section 1.3, Table 1.3; Section 3.4	
7	Flood Mitigation		Require adequate downstream conveyance for peak discharges; maintain existing downstream peak discharge conditions with on-site controls; and/or provide detention to pre-development peak discharge conditions	Section 1.3, Table 1.3; Section 3.5.2	
8	Construction Controls		Limit erosion and the discharge of sediment and other pollutants from construction sites by adhering to the integrated Construction Criteria or Construction General Permit	Section 4.0	
9	Operations and Maintenance		Define responsible party and requirements for operation, maintenance, frequency of inspection, and enforcement of temporary and permanent stormwater controls and drainage facilities	Section 2.2, Step 5	
10	Downstream Assessments		Confirm no negative impact or mitigate negative impacts of peak discharges and velocities for 1-, 25-, and 100-yr or similar storm events	Section 3.3; TM* HO** Section 2.4	
TOTALS					

North Central Texas Council of Governments ISWM PROGRAM IMPLEMENTATION TIERED MEASUREMENT

RECOMMENDED OUTCOMES

11	Conveyance Limits		25-yr fully-developed design storm or higher for: streets, roadway gutters, storm drain pipe systems, inlets on-grade and parking lots; 100-yr fully-developed design storm event for: drainage in the right-of-way, drainage easements, and road low points	Section 3.6.2
12	Storm Drain Velocity Criteria		Limit velocity in pipes with minimum and maximum values to prevent clogging and erosion	Section 3.6.1, Table 3.8
13	Spread Criteria		Flow spread limits for various street classifications for 25-yr storm event or higher	Section 3.6.2, Table 3.7
14	Freeboard Criteria		Minimum of 1 foot of freeboard provided for the fully-developed 100-yr storm event for culverts and detention structures; Minimum of 2 feet of freeboard for bridges for fully-developed 100-yr storm event	Section 3.6.3
15	Finished Floor Elevations		Minimum of 1-foot above fully-developed 100-yr storm event water surface elevation or 2-feet above effective FEMA base flood elevation	Section 3.7
16	Water Quality Protection		Require integrated site design practices; treat the water quality volume; and/or enact regional water quality programs	Section 1.3, Table 1.3; Section 3.2
17	Drainage and Floodplain Easements		Required for all drainage systems that convey stormwater runoff across property boundaries and must include sufficient area for operation and maintenance of the public drainage system	Section 3.7
TOTALS				

OPTIONAL OUTCOMES

18	Open Channel Stability Criteria		Design includes low-flow channel	Section 3.6.3
19	Detention Downstream Timing Analysis		Confirm detention does not exacerbate peak flows in downstream reaches	Section 3.3.2, Option 3
20	Conservation and Utilization of Natural Features and Resources		Ordinances encourage preservation of natural resources such as riparian buffers and/or natural open space areas and utilization of natural design features for stormwater conveyance	Section 3.2.2; TM PL 2.2.1**
21	Lower Impact Site Design Techniques		Ordinances encourage reducing limits of clearing and grading and limiting impervious cover per integrated site design practices	Section 3.2.2; TM PL 2.2.1**
22	TriSWM		Incorporate practices for improving water quality of runoff from public rights-of-way	TriSWM Appendix
TOTALS				

*TM HO = ISWM Technical Manual, Hydrology Section

**TM PL = ISWM Technical Manual, Planning Section

Tier Level Applied For: ☐ GOLD ☐ SILVER ☐ BRONZE

Print Name and Title of Local Stormwater Authority _____

Contact Phone Number and Email _____

Signature of Local Stormwater Authority _____

Date _____

For IIS Review Board Use Only:

Date of Submittal: _____

Date of Request for Additional Information: _____

Date of Approval: _____

Date Additional Information Received: _____

Approved Tier Level: _____

Date Informational Letter Sent: _____

Step 1: Outcome Documentation

- Determining Partial Application
 - Guidance documentation on the intent of the outcome will be provided
 - As more applications are reviewed, a database of approved and non-approved partial applications will become available
 - Final approval given to the iSWM Implementation Subcommittee (IIS) review board

Step 2: Tiered Measurement of Implementation

Outcome Category	Gold	Silver	Bronze
Mandatory	10 full application	10 full or partial application	10 full or partial application
Recommended	7 full application	7 full or partial application	4 full or partial application
Optional	3 full or partial application		

- Original iSWM communities to be recognized with founding member designation

Step 3: Jurisdictional Implementation

1. Voluntary meeting with NCTCOG staff
2. Submit documentation
 - A filled out tiered measurement form
 - Copies or scanned sections of the ordinance or criteria manual that are relevant OR links to the ordinance or criteria manual with the relevant sections noted on the tiered measurement form

Step 3: Jurisdictional Implementation

3. Documentation reviewed by iSWM Implementation Subcommittee (IIS) review board

- 3 member voluntary review board comprised of IIS members and/or representatives of iSWM cities



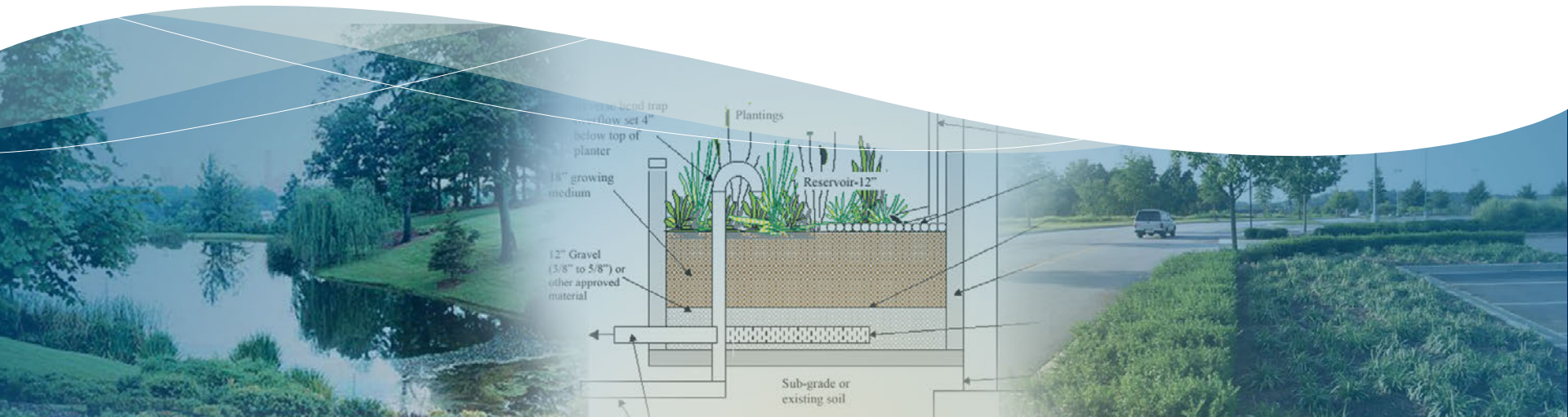
Step 3: Proposed Application Review

4. Voluntary meeting with NCTCOG to review results

If needed, an appeal process with review by the iSWM Implementation Subcommittee is available.



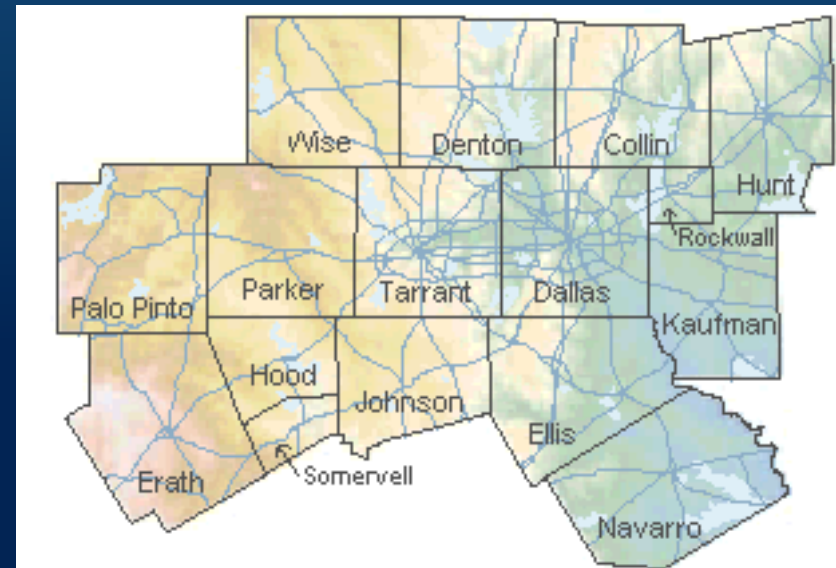
Benefits to Joining the iSWM Program



Regulatory Benefits



- **Helps Comply with State and Federal Regulations**
 - iSWM compatible with state & federal regulations.
 - It will be updated as new regulations come out.
- **A Regional Program with Regional Recognition**



iSWM offers you:



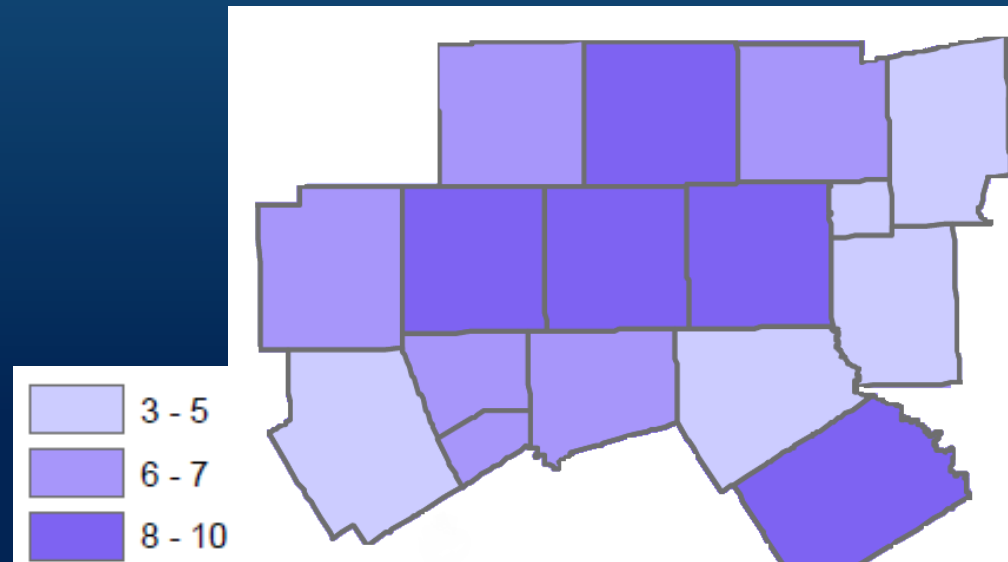
- An effective way to deal with five critical issues
 1. Public Safety
 2. Erosion
 3. Water Quality
 4. Use of Resources
 5. Better Design
- Benefits to your community
- A standard process & methodology



Issue 1: Public Safety



- Flooding is the most destructive natural disaster in terms of economic loss to Texas.
- Texas has the most flood related deaths in the nation in the past 36 years.
- By reducing flooding, iSWM design saves lives & property and reduces demands on public safety personnel & budgets.



Presidential Disaster Declarations 1964-2007

Issue 2: Erosion



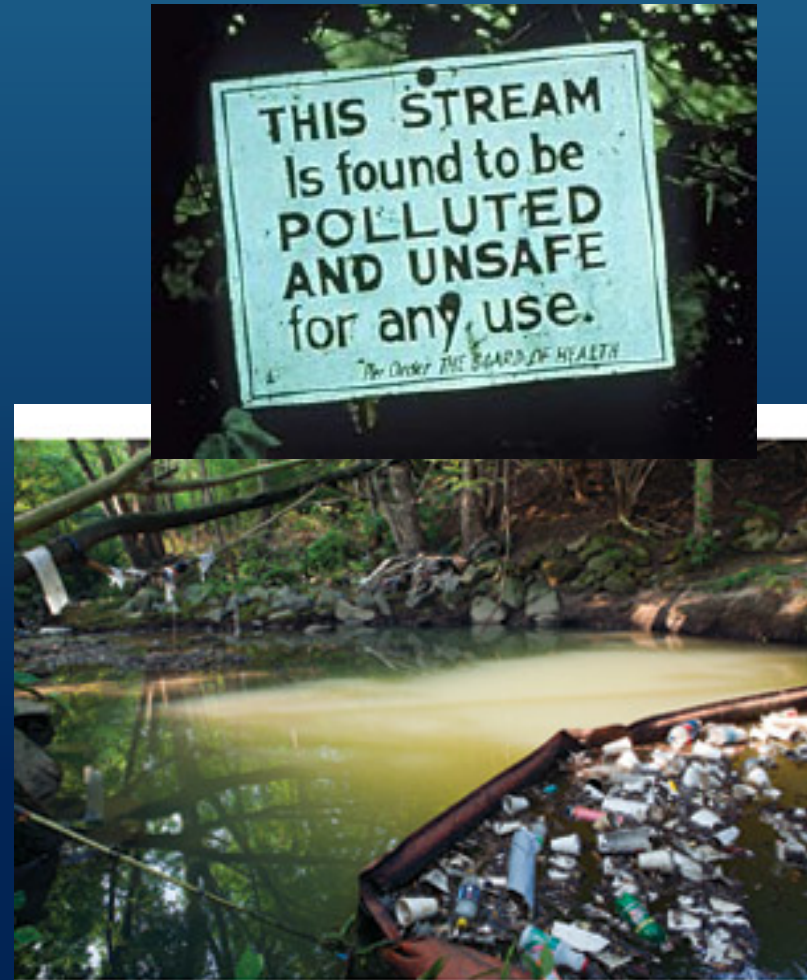
- Erosion creates safety concerns for residents and communities.
- Damage to property reduces private property value and increases public costs and liability concerns.
- iSWM designs reduce erosion, protecting property values and reducing demands on local governments.



Issue 3: Water Quality



- Segments of major rivers in North Texas don't meet water quality standards.
- Lower water quality in reservoirs means higher costs for water treatment.
- Recreational opportunities and quality of life are reduced.
- iSWM means cleaner water coming into reservoirs.



Issue 4: Use of Resources



- Key resources are limited:
 - Developable land
 - Water for community uses
 - Funding for capital & operations
- It makes sense to use these resources as efficiently & effectively as possible.
- The challenge is to meet today's needs while planning sensibly to meet the needs of the future.
- iSWM designs can reduce costs for major capital project construction, operations & maintenance.
- It's a better return on investment.



Issue 5: Better Design



- Using a site's natural features creates neighborhoods with distinctive character.
- Places with green spaces appeal to a growing market of residents & businesses.
- Designing with nature means higher property values and long-term desirability.
- iSWM design offers quality of life people want.



Additional Benefits

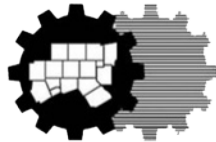


- **The municipality benefits from iSWM because:**
 - Credits towards a lower FEMA Community Rating System (CRS) rating.
 - A greener community is likely to be more desirable over time.
 - Consistent approaches within a watershed will be more effective.
- **The development community benefits from iSWM because:**
 - Developers can work with the same technical standards and methodology – don't need to learn a different approach for each community.
- **Local government staff benefit from iSWM because:**
 - iSWM provides a consistent framework that is customizable for each individual jurisdiction.
 - NCTCOG provides training for staff and developers.
 - NCTCOG manages & updates necessary support data.

Increasing Participation

- Potential incentives to add value to participation
 - Free training to iSWM communities and their consultants
 - Classes at communities' offices, also aimed at broader audience (i.e. planners)
 - City entrance signage
 - Plaques
 - Annual banquet or separate industry event (i.e. TFMA North Texas Luncheon) to present program highlights, awards, and discussions
 - Provide flyers for utility mailers that may also assist in MS4 requirements

Questions?



North Central Texas
Council of Governments

Jeff Rice

jrice@nctcog.org

817-695-9212

Jack Tidwell, AICP, CFM

jt看dwell@nctcog.org

817-695-9220



Lesley Brooks, P.E., CFM

lmb@freese.com

214-217-2248

Jill Trevino, P.E., CFM

jill.trevino@freese.com

817-735-7227

iswm.nctcog.org

