EARLY STORMWATER PLANNING TOOLS FOR A SUCCESSFUL DEVELOPMENT & REDEVELOPMENT

DECEMBER 16, 2020

North Central Texas Council of Governments
Environment & Development

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INTRODUCTIONS

- NCTCOG Environment & Development
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  - Stephen Crawford, PE, CFM
  - Ashley Lowrie, PE, CFM
- TBG
  - Mikel Wilkins

integrated Stormwater Management iSWM

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ISWM BENEFITS &
THE DEVELOPMENT PROCESS

WHAT IS ISWM

- Assists cities and counties to achieve their goals of
  - water quality protection
  - streambank protection
  - flood mitigation
- Also helps meet construction and post-construction obligations under state stormwater permits
- Resources
  - Criteria Manual
  - Technical Manuals
  - Training
  - Program Guidance & Supplemental Documents

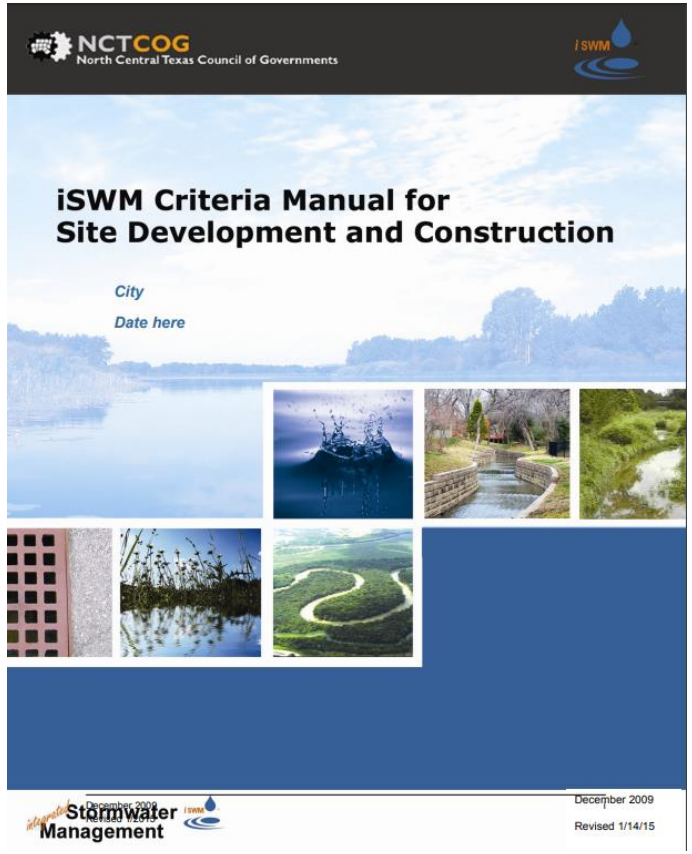

Photo By Mikel Wilkins

WHAT IS ISWM

- iSWM Overview and Resources
- Hydrologic Methods
- Water Quality protection
- Acceptable downstream conditions
- Streambank protection
- Flood mitigation
- Stormwater conveyance systems
- Easements, plat, and maintenance agreements
- Stormwater control selection / detention
- Integrated construction criteria

Each section REFERS to the iswm criteria manual located here:

http://iswm.nctcog.org/Documents/iSWM_Criteria_Manual_01142015.pdf



ISWM COMMUNITIES

2006	2007	2008	2009	2010	2011	2012	2013	2014
Fort Worth	Roanoke	Benbrook	Dallas	Glenn Heights	Duncanville	Azle	Hurst	Outcome Focused Implementation
Grand Prairie	Southlake		Lakeside		University Park			
			Mansfield	Northlake				

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WHY ISWM

- Increased runoff leads to flooding
- Streambank erosion
- Water quality concerns
- Stormwater regulations
- Loss of natural features
- Comprehensive approach needed
- Regional consistency

WHY ISWM

- 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

EARLY IN THE DEVELOPMENT PROCESS

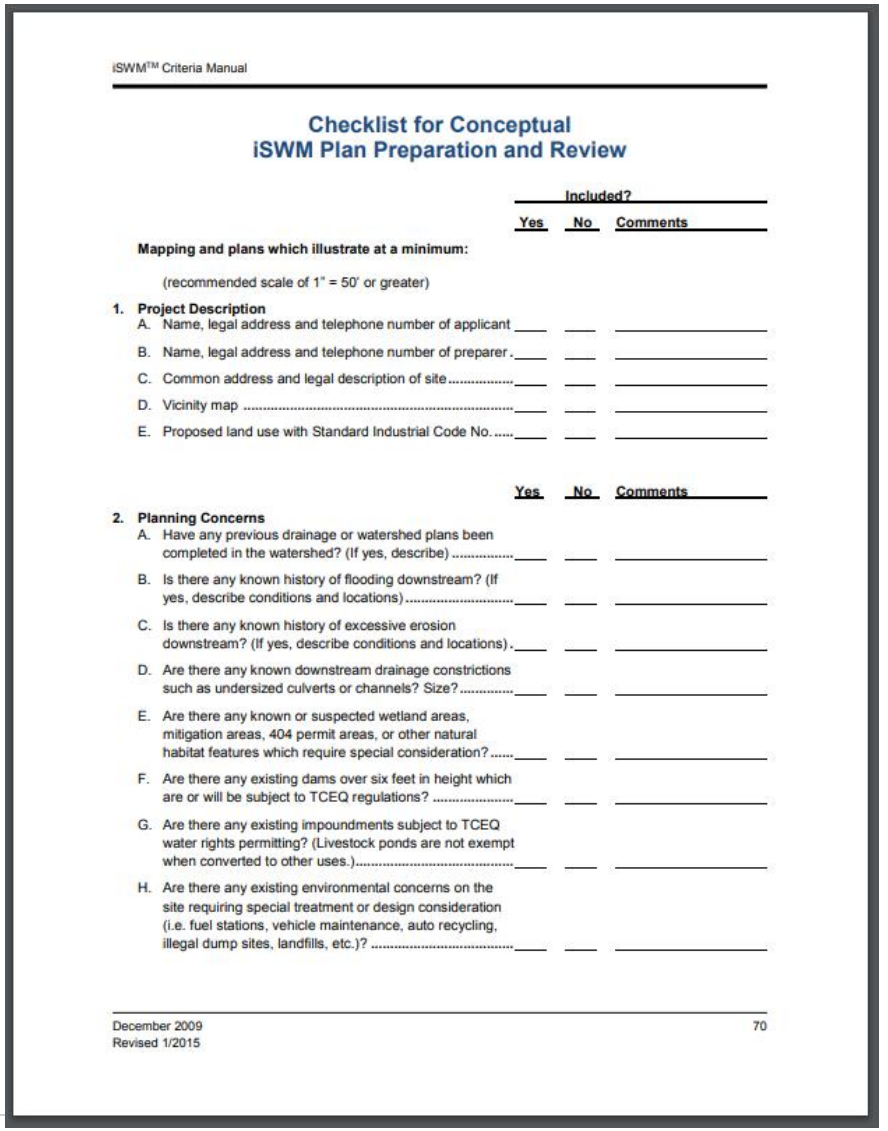
- Developer Due Diligence Process
  - Engineer provides assessment of property
- City engagement at conceptual level
  - Discussions with the City on the regulations required and constraints of the property


Photo By Mikel Wilkins


Photo By Mikel Wilkins

EARLY IN THE DEVELOPMENT PROCESS

- Checklist for Conceptual iSWM Plan Preparation & Review
  - Can help guide discussions between the developer and the engineer and City
  - Located in the Criteria Manual



iSWM™ Criteria Manual

Checklist for Conceptual iSWM Plan Preparation and Review

	Included? Yes	No	Comments
Mapping and plans which illustrate at a minimum: (recommended scale of 1" = 50' or greater)			
1. Project Description			
A. Name, legal address and telephone number of applicant	___	___	_____
B. Name, legal address and telephone number of preparer	___	___	_____
C. Common address and legal description of site	___	___	_____
D. Vicinity map	___	___	_____
E. Proposed land use with Standard Industrial Code No.	___	___	_____

	Yes	No	Comments
2. Planning Concerns			
A. Have any previous drainage or watershed plans been completed in the watershed? (If yes, describe)	___	___	_____
B. Is there any known history of flooding downstream? (If yes, describe conditions and locations)	___	___	_____
C. Is there any known history of excessive erosion downstream? (If yes, describe conditions and locations)	___	___	_____
D. Are there any known downstream drainage constrictions such as undersized culverts or channels? Size?	___	___	_____
E. Are there any known or suspected wetland areas, mitigation areas, 404 permit areas, or other natural habitat features which require special consideration?	___	___	_____
F. Are there any existing dams over six feet in height which are or will be subject to TCEQ regulations?	___	___	_____
G. Are there any existing impoundments subject to TCEQ water rights permitting? (Livestock ponds are not exempt when converted to other uses.)	___	___	_____
H. Are there any existing environmental concerns on the site requiring special treatment or design consideration (i.e. fuel stations, vehicle maintenance, auto recycling, illegal dump sites, landfills, etc.)?	___	___	_____

December 2009
Revised 1/2015

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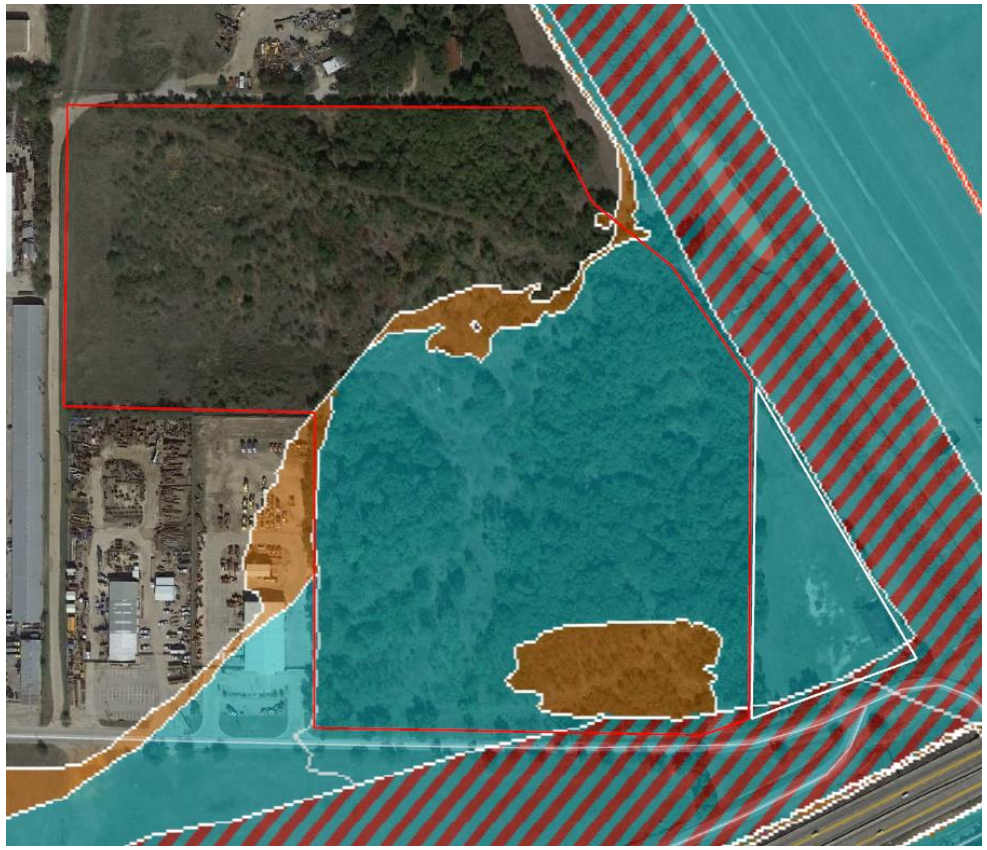
DEVELOPER DUE DILIGENCE

Example: Development in North Texas

- Floodplain Reclamation
  - Local (City), Regional (NCTCOG/USACE/CDC), and Federal (FEMA) requirements & issues
- Stormwater
  - Downstream Assessment/Stormwater quantity
  - Stormwater quality
- Environmental (Section 404 permitting and Section 408/Federal project)



The process helped developer negotiate on the land sale with the owner

CITY ENGAGEMENT AT CONCEPTUAL LEVEL

- Pre-development meeting
  - Making decisions with limited information
- Development Review Committee (DRC) process
  - Multiple department review
- Common issues:
  - Adequate outfalls
  - Obtaining necessary permits & approvals
  - Detention with recommended iSWM criteria
  - Stormwater quality improvements
  - Push back on more than minimum required
  - Follow through on maintenance

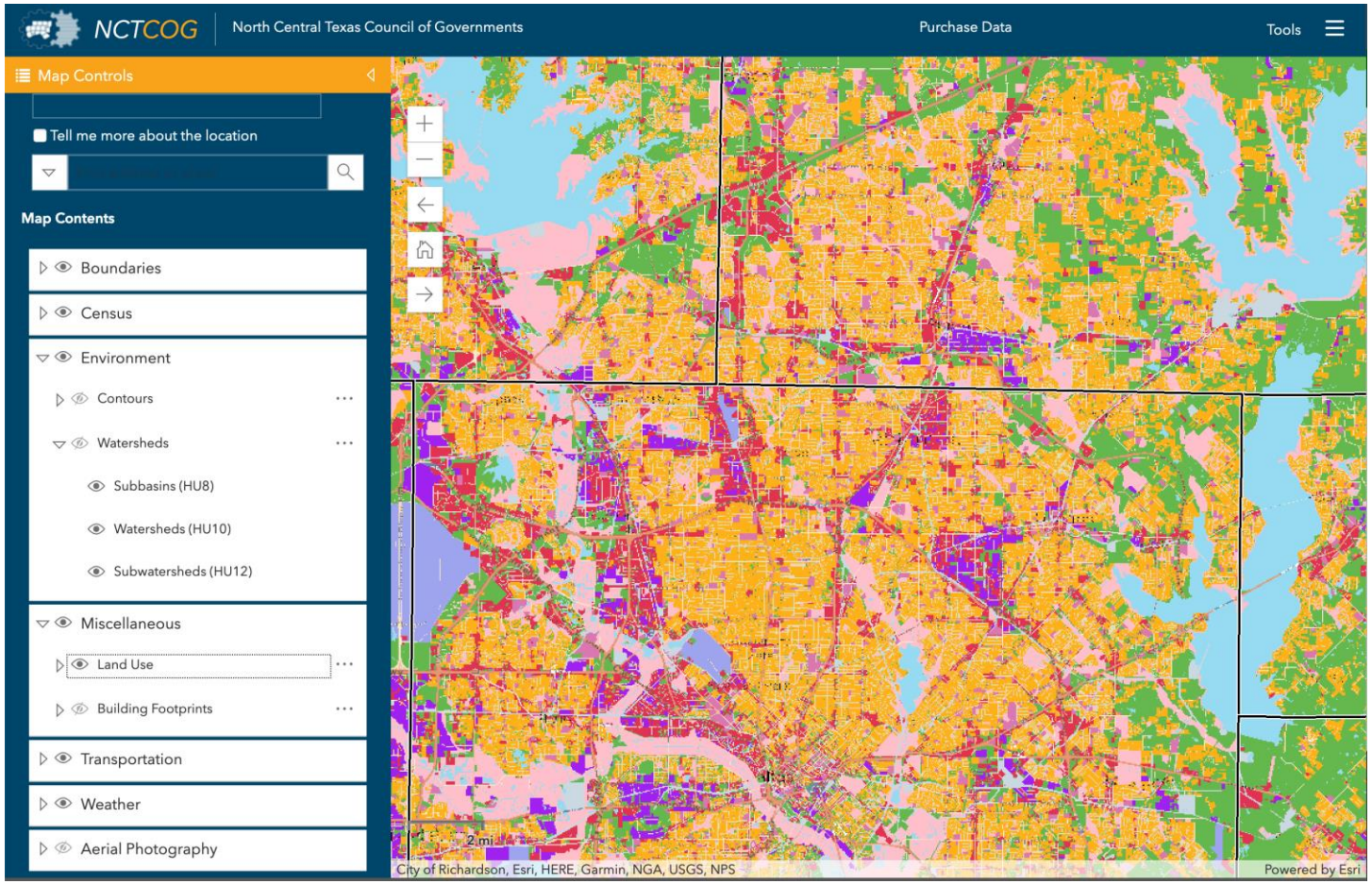
Q & A

PLANNING TOOLS CASE STUDIES

PLANNING TOOLS

DFWMAPS.COM

- Historical Aerials
- 2’ topography
- Watersheds
- building footprints
- land use



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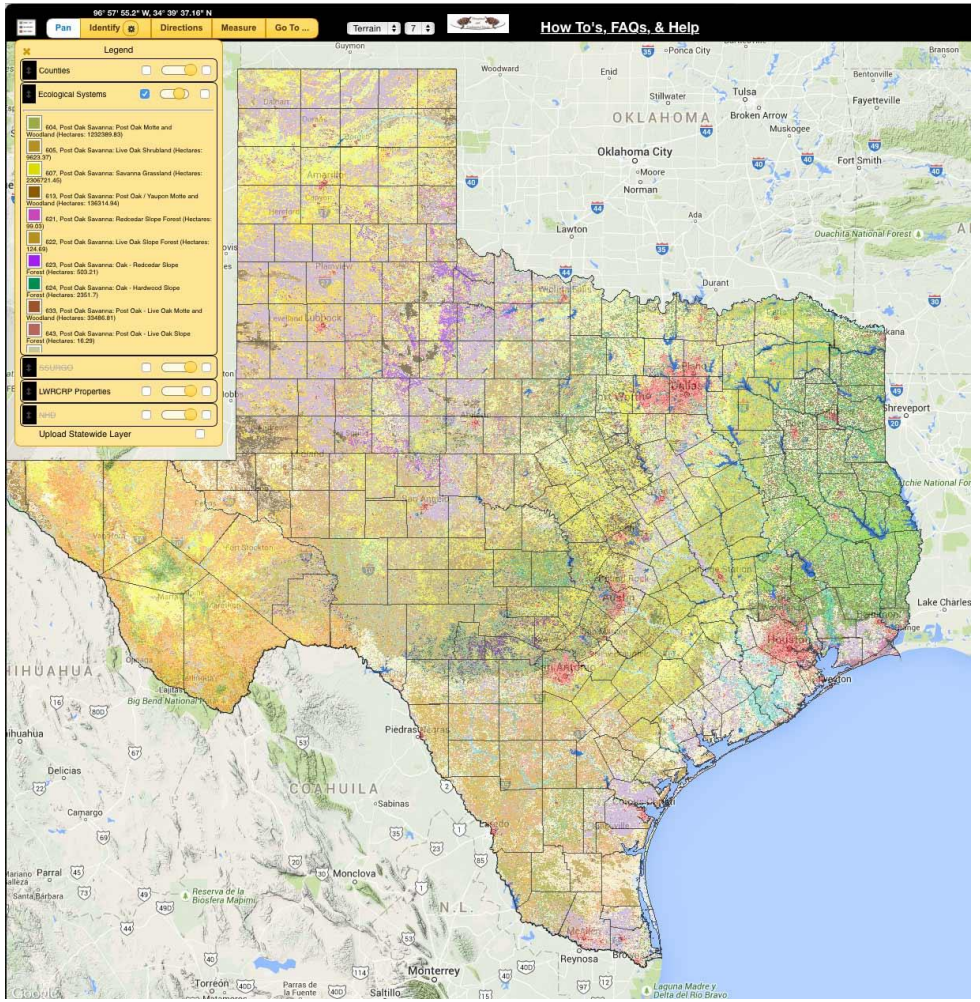
PLANNING TOOLS

TEXAS ECOSYSTEM ANALYTICAL MAPPER

- Woodlands
- Riparian Corridors
- Prairie/Grassland
- Shrubland
- Wetlands
- NHD



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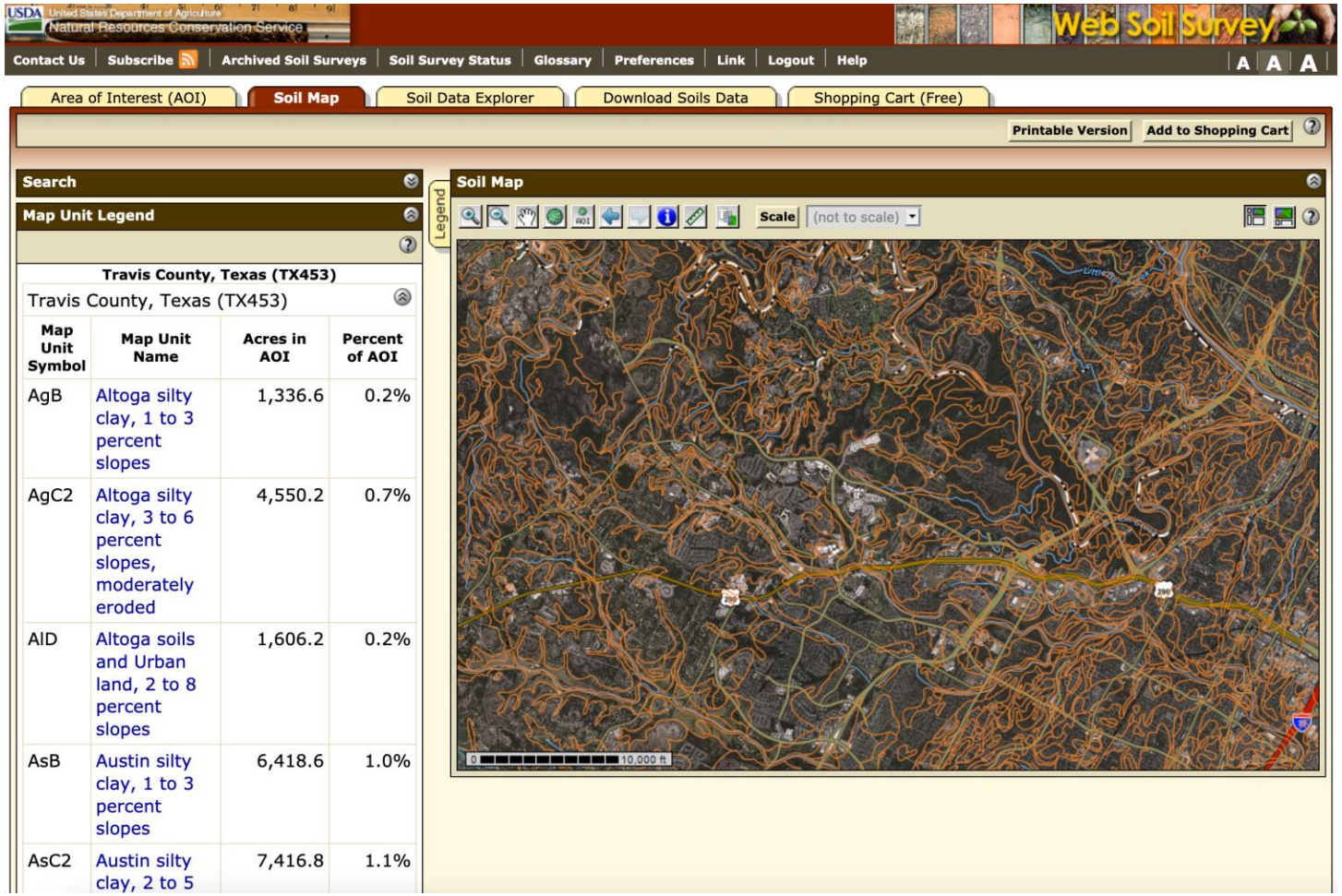
PLANNING TOOLS

WEB SOILS SURVEY

- Detailed soils data



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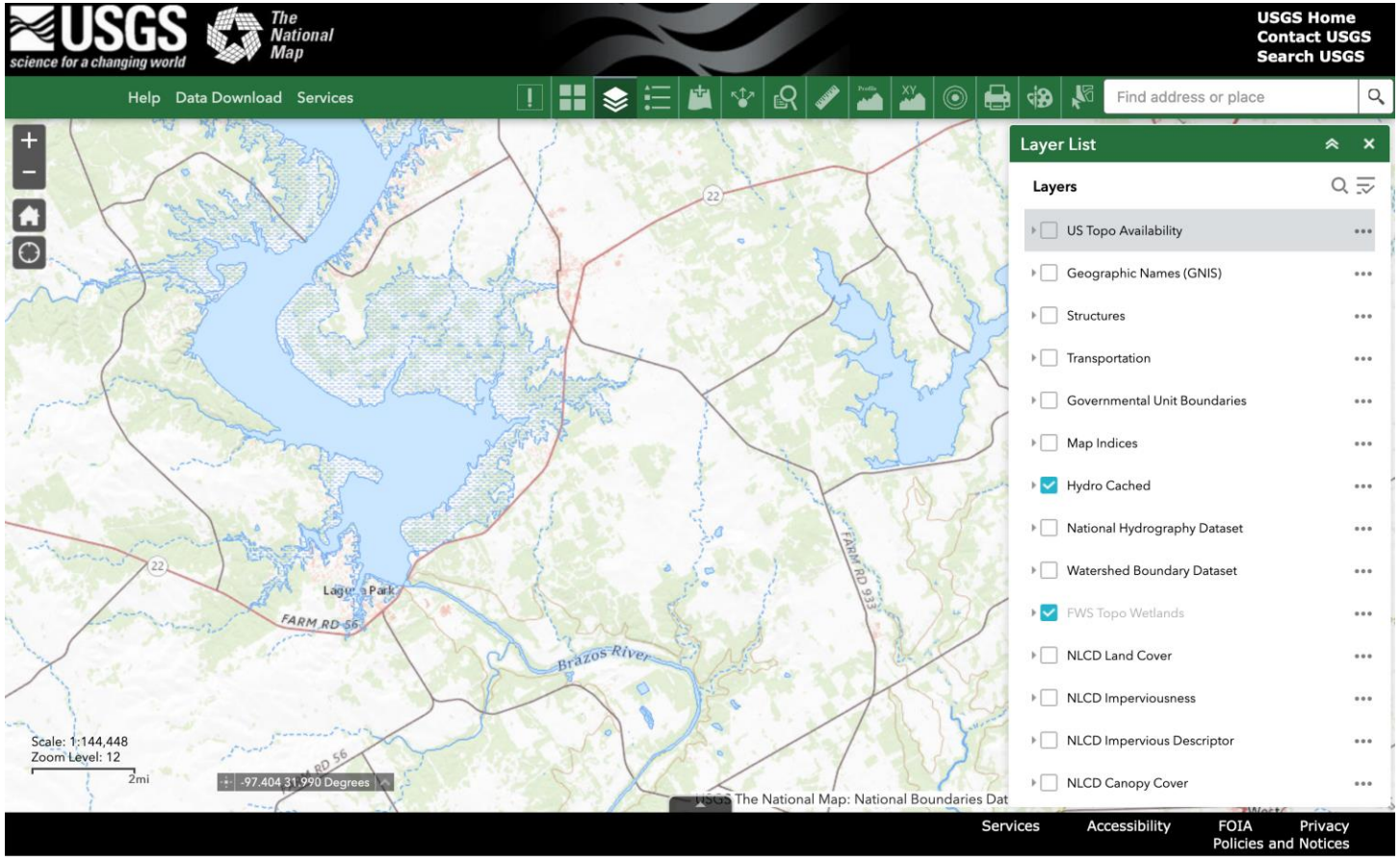
PLANNING TOOLS

NATIONAL MAP VIEWER

- Hydrologic features
- Wetlands
- USGS topography



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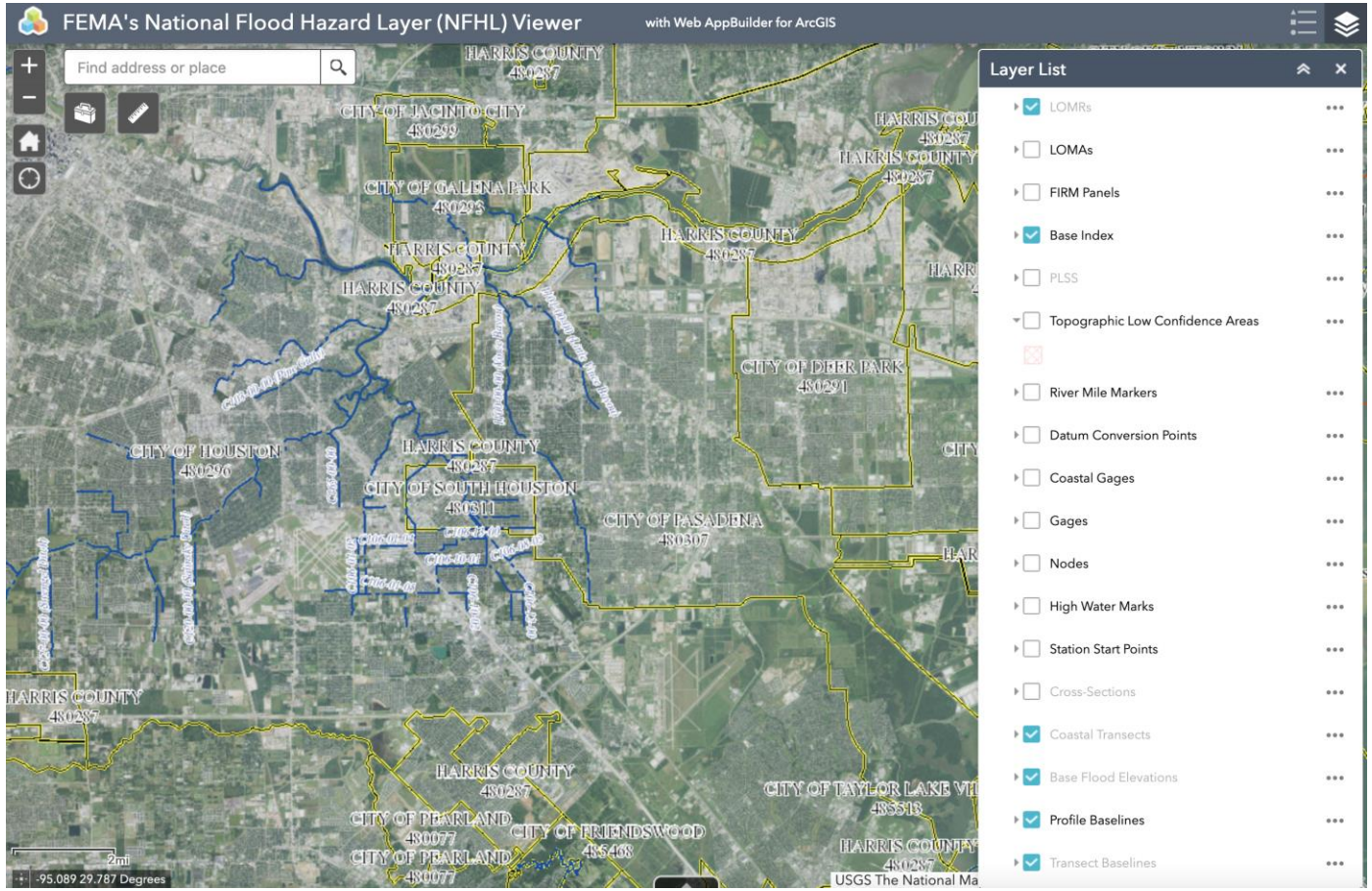
PLANNING TOOLS

NATIONAL FLOOD HAZARD MAP VIEWER

- Floodplain
- Floodway
- FIRM Panel Data



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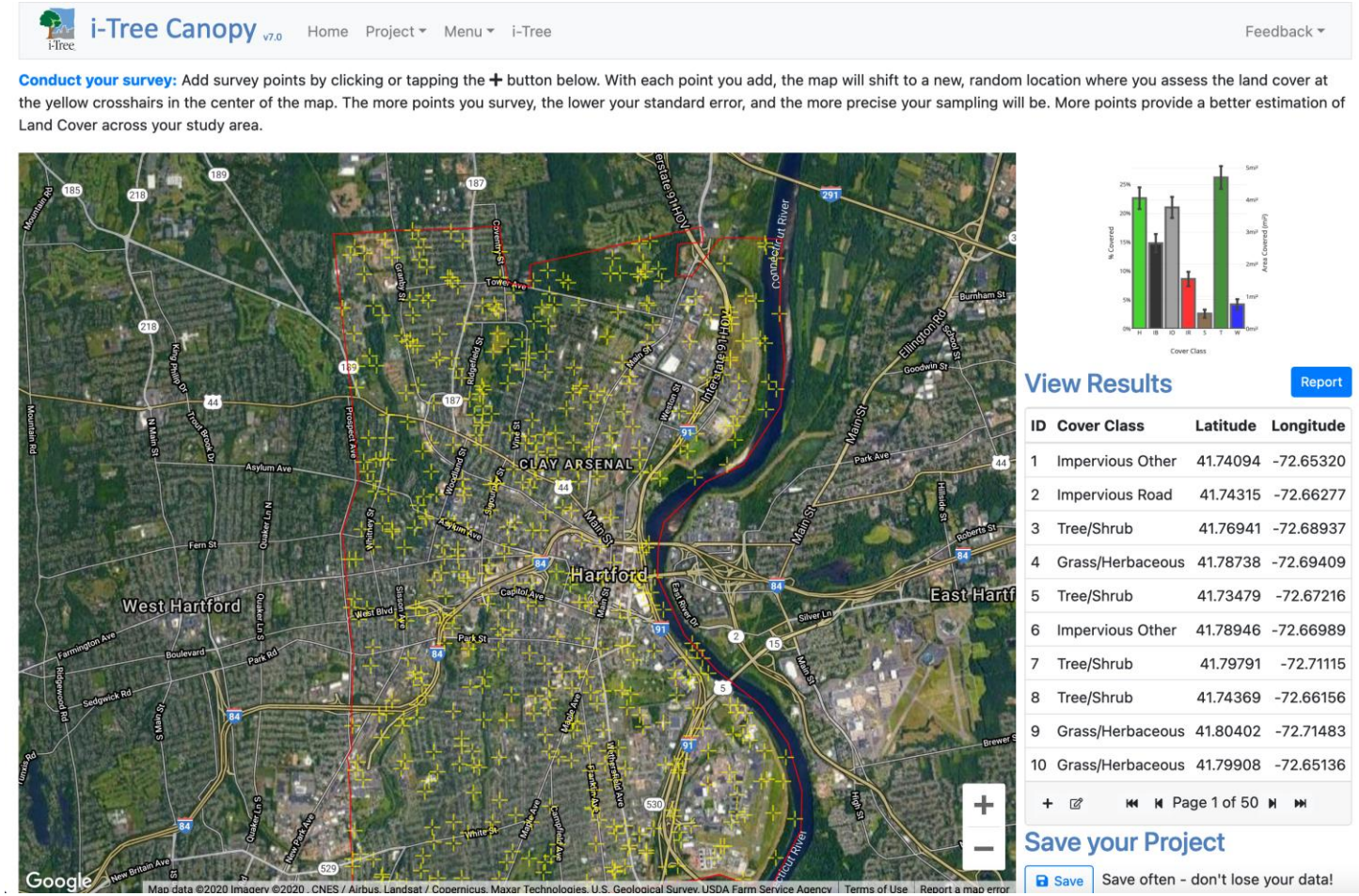
PLANNING TOOLS

i-TREE CANOPY 7.0

- Tree canopy estimates
- Environmental value



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CASE STUDY SCREEN SHARE

Q & A

HIGHLIGHTS OF
NCTCOG / ISWM RESOURCES

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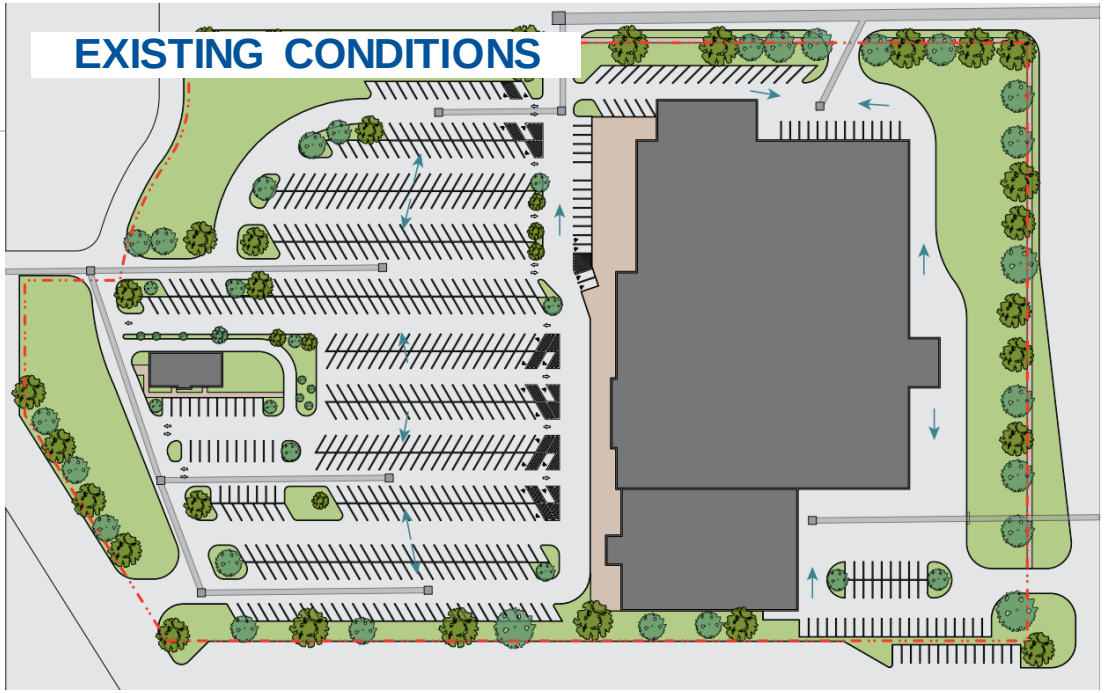
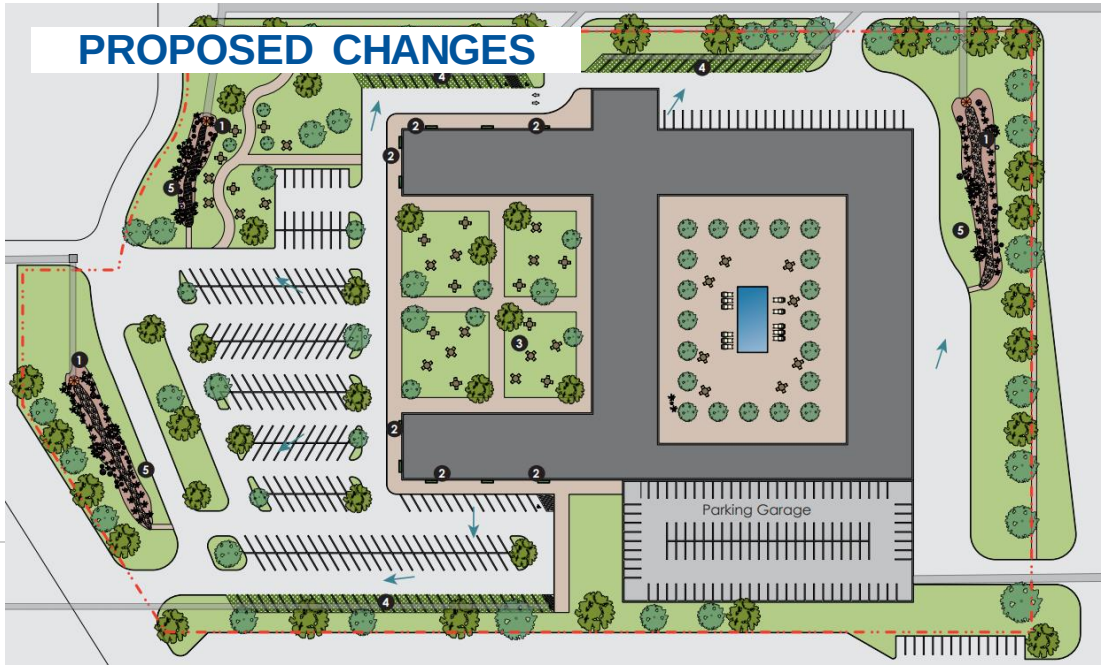
- Redevelopment Guidance
- BMP Installation video
- iSWM Criteria Inventory
- Site Development Controls Manual Updates– to be available 2021
- Hydrologic Technical Manual Atlas 14 Rainfall Update
- Proprietary Devices Guidance
- iSWM Construction Standard Details

REDEVELOPMENT GUIDANCE

- Low Impact Components of Site Redevelopment
  - Commercial to high density residential
  - For office space to mixed use
  - Small commercial





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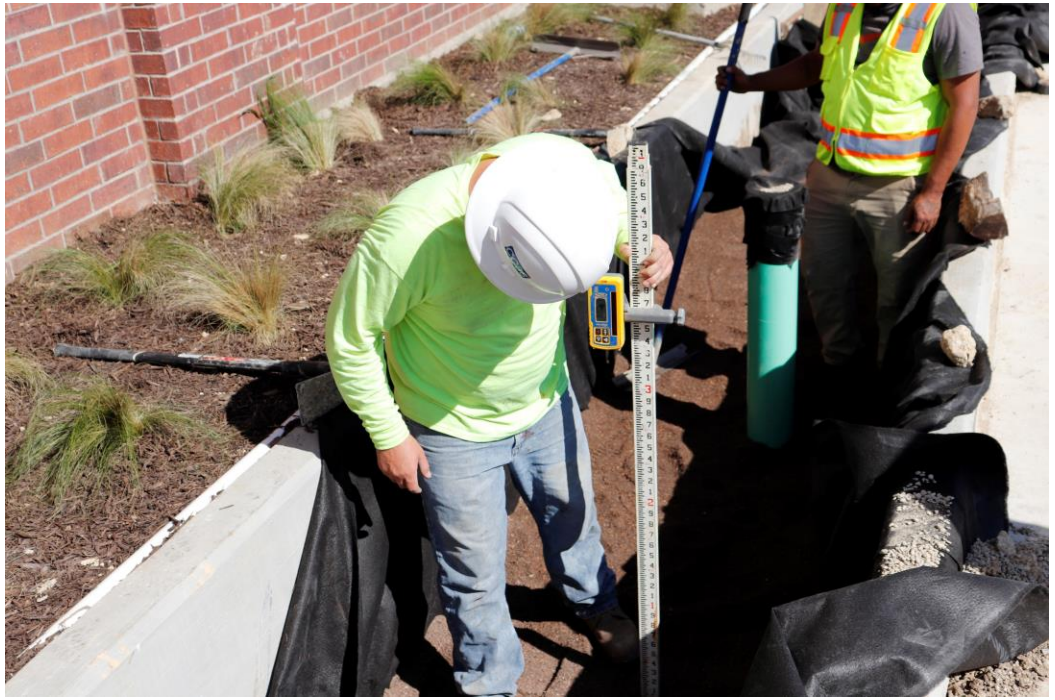
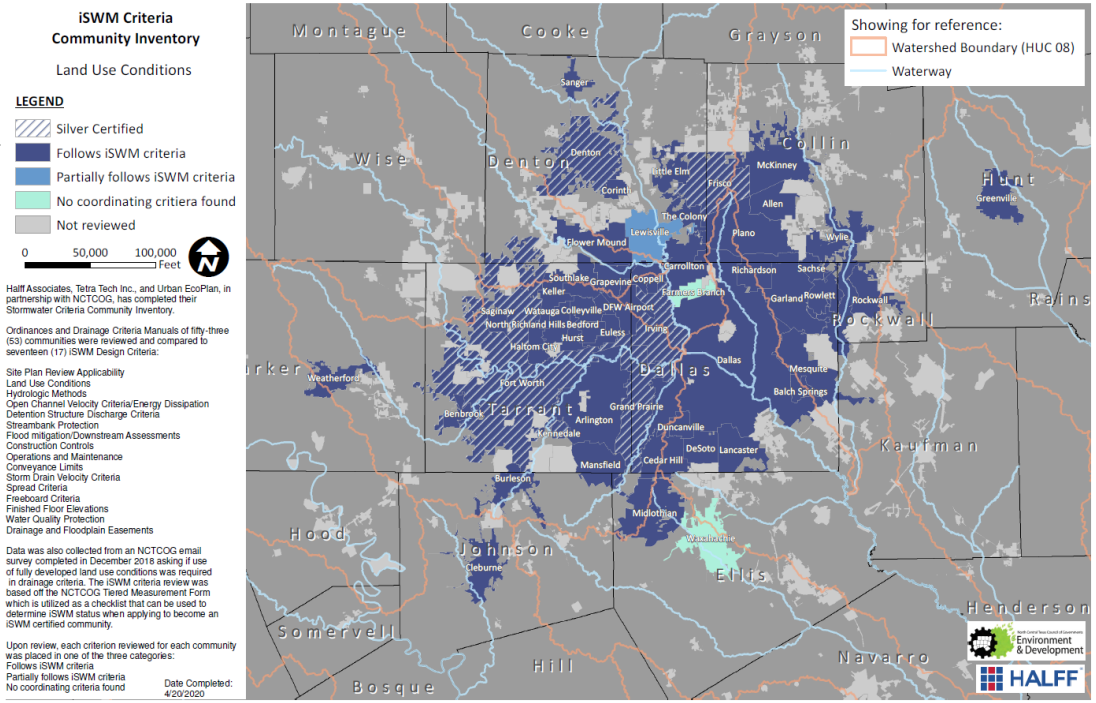
BMP INSTALLATION VIDEO

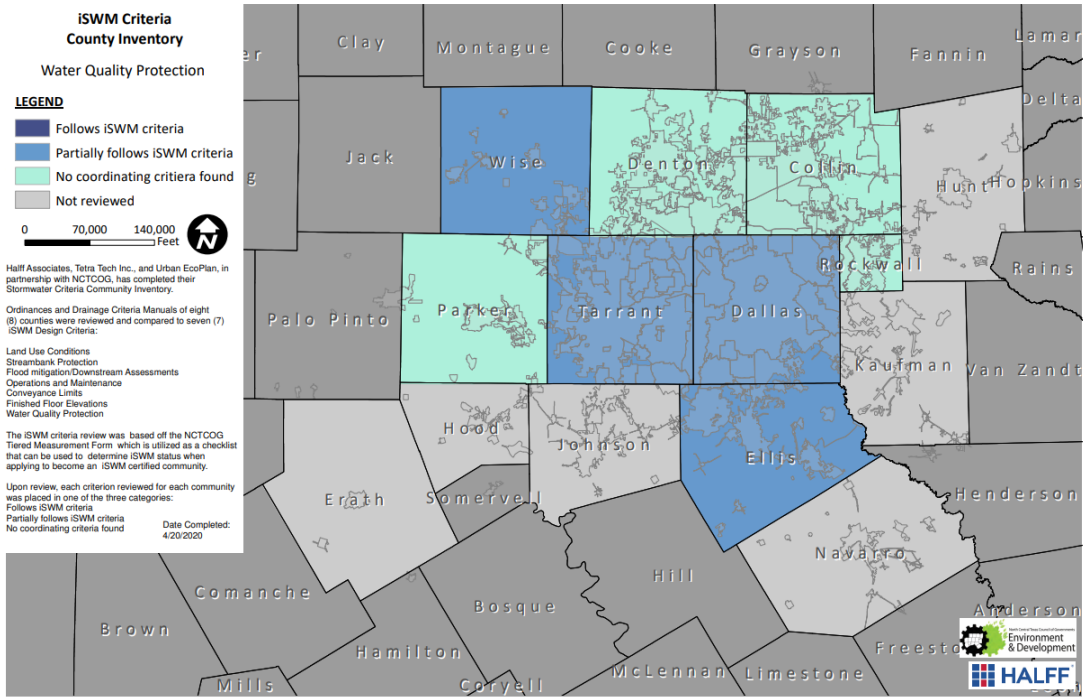
- Video of the installation of a bioretention facility in Roanoke Town Center, Roanoke, TX Discusses the Installation and Maintenance of a bioretention system
- Designed and Installed by Construction Ecoservices
- Link: http://iswm.nctcog.org/training.html#BioretentionInstallation



ISWM CRITERIA INVENTORY

- Compares city criteria to iSWM criteria for 53 communities and 8 counties
- Categorized as if the city is estimated to follow, partially follow, or not follow various iSWM criteria
- Added watershed boundaries and waterways to maps





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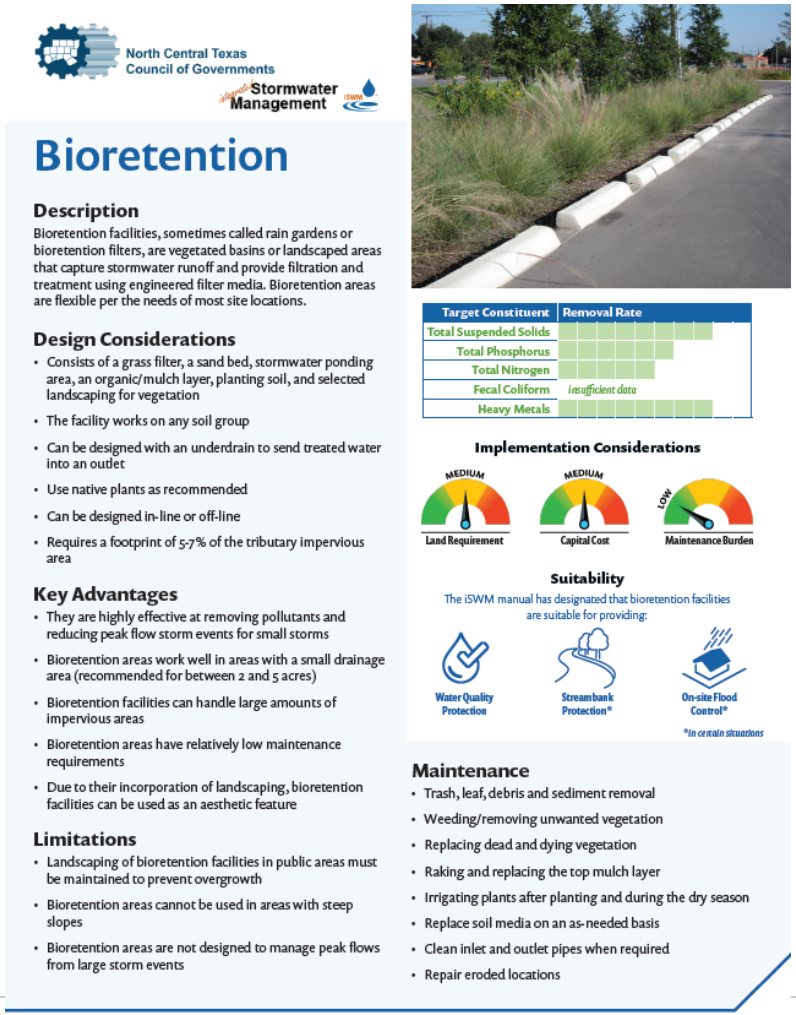
SITE DEVELOPMENT CONTROLS TECHNICAL MANUAL - COMING SOON

Summary Pages for BMPs



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Stormwater Management

Bioretention

Description

Bioretention facilities, sometimes called rain gardens or bioretention filters, are vegetated basins or landscaped areas that capture stormwater runoff and provide filtration and treatment using engineered filter media. Bioretention areas are flexible per the needs of most site locations.

Design Considerations

- Consists of a grass filter, a sand bed, stormwater ponding area, an organic/mulch layer, planting soil, and selected landscaping for vegetation
- The facility works on any soil group
- Can be designed with an underdrain to send treated water into an outlet
- Use native plants as recommended
- Can be designed in-line or off-line
- Requires a footprint of 5-7% of the tributary impervious area

Key Advantages

- They are highly effective at removing pollutants and reducing peak flow storm events for small storms
- Bioretention areas work well in areas with a small drainage area (recommended for between 2 and 5 acres)
- Bioretention facilities can handle large amounts of impervious areas
- Bioretention areas have relatively low maintenance requirements
- Due to their incorporation of landscaping, bioretention facilities can be used as an aesthetic feature

Limitations

- Landscaping of bioretention facilities in public areas must be maintained to prevent overgrowth
- Bioretention areas cannot be used in areas with steep slopes
- Bioretention areas are not designed to manage peak flows from large storm events

Target Constituent	Removal Rate
Total Suspended Solids	
Total Phosphorus	
Total Nitrogen	
Fecal Coliform	*insufficient data*
Heavy Metals	

Implementation Considerations

Land Requirement | Capital Cost | Maintenance Burden

Suitability

The iSWM manual has designated that bioretention facilities are suitable for providing:

Water Quality Protection | Streambank Protection* | On-site Flood Control*

*In certain situations

Maintenance

- Trash, leaf, debris and sediment removal
- Weeding/removing unwanted vegetation
- Replacing dead and dying vegetation
- Raking and replacing the top mulch layer
- Irrigating plants after planting and during the dry season
- Replace soil media on an as-needed basis
- Clean inlet and outlet pipes when required
- Repair eroded locations

Table 1.2

- Simplified version for reference
- No % removals

TABLE 1.2 Design Pollutant Removal Efficiencies for Stormwater Controls

Structural Control	Total Suspended Solids	Total Phosphorus	Total Nitrogen	Fecal Coliform	Metals
Bioretention Areas					
Grass Channel					
Enhanced Dry Swale					
Enhanced Wet Swale					
Alum Treatment					
Filter Strip					
Modified Extended Detention					
Organic Filter					

Low | Moderate | High

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ISWM RESOURCES

- Hydrologic Technical Manual Atlas 14 Rainfall Updat
  - USGS rainfall tables were removed and replaced with Atlas 14 rainfall intensities
- Proprietary Devices Guidance
- iSWM Construction Standard Details

Table 5.15 AMS-based precipitation frequency estimates for Tarrant County (inches)

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.405	0.439	0.572	0.673	0.807	0.909	1.012	1.117	1.261	1.371
10-min	0.649	0.704	0.919	1.081	1.297	1.462	1.627	1.791	2.008	2.171
15-min	0.807	0.875	1.137	1.336	1.601	1.801	2.004	2.212	2.493	2.711
30-min	1.117	1.210	1.570	1.842	2.203	2.475	2.752	3.041	3.436	3.746
60-min	1.449	1.572	2.047	2.408	2.888	3.248	3.619	4.011	4.553	4.983
2-hr	1.773	1.935	2.555	3.031	3.671	4.159	4.669	5.215	5.977	6.588
3-hr	1.966	2.154	2.871	3.423	4.173	4.752	5.361	6.013	6.930	7.668
6-hr	2.323	2.558	3.446	4.135	5.077	5.810	6.586	7.419	8.591	9.536
12-hr	2.733	3.016	4.089	4.919	6.051	6.928	7.852	8.840	10.224	11.336
24-hr	3.191	3.522	4.776	5.747	7.069	8.096	9.175	10.321	11.921	13.201
48-hr	3.692	4.063	5.447	6.532	8.033	9.225	10.488	11.816	13.663	15.136
3-day	4.018	4.417	5.901	7.067	8.686	9.976	11.348	12.792	14.805	16.411
4-day	4.258	4.680	6.252	7.488	9.204	10.573	12.030	13.569	15.716	17.433
7-day	4.771	5.249	7.037	8.438	10.375	11.908	13.541	15.281	17.726	19.693
10-day	5.216	5.736	7.688	9.211	11.306	12.950	14.699	16.573	19.213	21.343
20-day	6.739	7.340	9.640	11.404	13.780	15.588	17.492	19.564	22.505	24.891
30-day	8.012	8.684	11.283	13.257	15.883	17.846	19.898	22.138	25.318	27.899
45-day	9.755	10.569	13.712	16.103	19.289	21.690	24.175	26.822	30.508	33.449
60-day	11.294	12.248	15.917	18.720	22.477	25.346	28.296	31.362	35.554	38.840

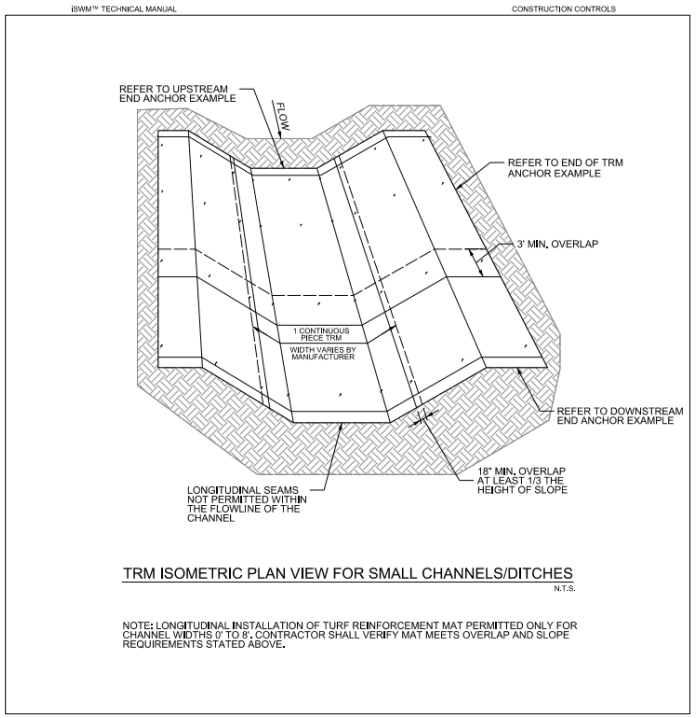

FIGURE 2.11 SCHEMATICS OF PERMANENT TURF REINFORCEMENT MATS (2 OF 3)

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THANK YOU FOR ATTENDING!

WE WILL PROVIDE LINK TO RESOURCES IN THE FOLLOWING SLIDES.

PRESENTATION WILL BE PROVIDED TO ALL ATTENDEES.

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LINKS TO RESOURCES

- **Checklist for Conceptual iSWM Plan Preparation & Review** – iSWM Criteria Manual Section 5.0
  http://iswm.nctcog.org/Documents/iSWM_Criteria_Manual_01142015.pdf
- **DFWMaps.com** – Historical Aerials (1999 – 2019), 2' topography, watersheds, building footprints, land use
  https://dfwmaps.com/
- **Texas Ecosystem Analytical Mapper** – Woodlands, Riparian Corridors, Prairie/Grassland, Shrubland, Wetlands,
  https://tpwd.texas.gov/gis/team/
- **Web Soil Survey** – detailed soils data
  https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm
- **National Map Viewer** – hydrologic features, wetlands, USGS topography
  https://viewer.nationalmap.gov/advanced-viewer/
- **National Flood Hazard Map Viewer** – Floodplain, floodway, FIRM Panel Data
  https://msc.fema.gov/nfhl
- **i-Tree Canopy 7.0** – Tree canopy estimates and environmental value
  https://canopy.itreetools.org/

LINKS TO RESOURCES

- **Redevelopment Guidance**

  http://iswm.nctcog.org/Documents/iSWM-Redevelopment-Guidance.pdf

- **BMP Installation video**

  http://iswm.nctcog.org/training.html#BioretentionInstallation

- **iSWM Criteria Inventory**

  http://iswm.nctcog.org/

  Cities – http://iswm.nctcog.org/Documents/iSWM_Criteria_Inventory_Cities_Combined.pdf

  Counties – http://iswm.nctcog.org/Documents/iSWM_Criteria_Inventory_Counties_Combined.pdf

- **Atlas 14 Rainfall Update**

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

- **Proprietary Devices memo**

  http://iswm.nctcog.org/Documents/Proprietary_Devices_Memo_2019-09-26.pdf

- **iSWM Construction Standard Details**

  http://iswm.nctcog.org/Documents/technical_manual/iSWM_Construction_Control_Standards_2020.pdf

- **Economic & Environmental Benefits of Stewardship**

  http://eebs.nctcog.org/