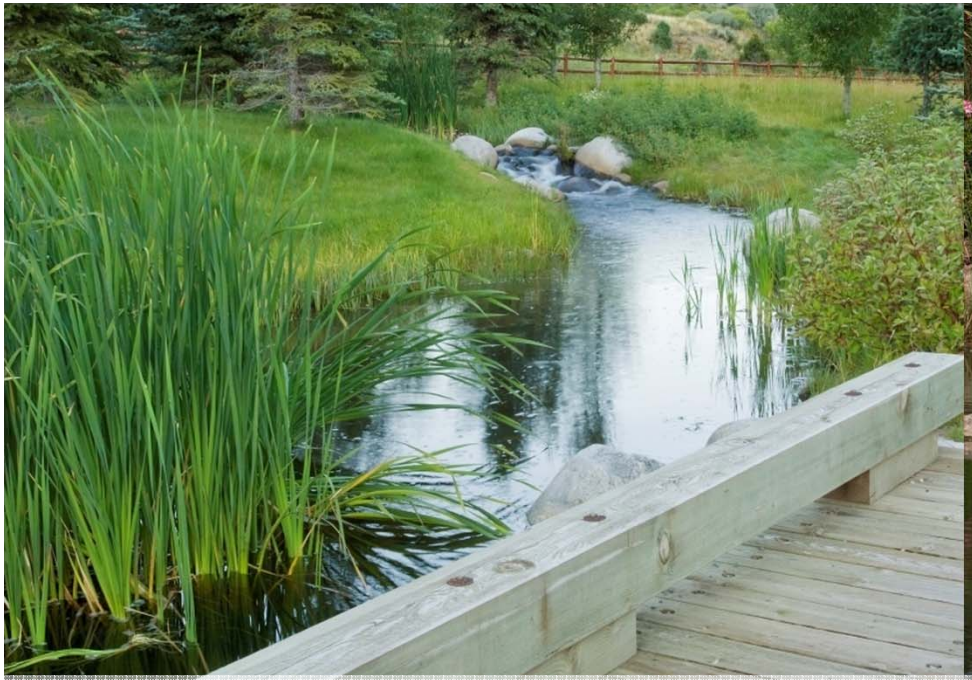


STORMWATER MANAGEMENT PHASE III: Design Workshop and LAN

Watershed Advisory Committee | July 18, 2012

AGENDA

1. Continue to present the final recommendations.
2. Review diagrams and illustratives for strategy implementation.
3. Outline proposed changes to the DCM.
4. Review Next Steps in process.

PURPOSE OF THE STORMWATER MANAGEMENT PROGRAM

1. Provide the public process needed for the MS4 permit and demand from public.
2. Build consensus around stormwater strategies
3. Introduce state-of-the art, innovative stormwater solutions
4. Integrate regionally specific stormwater management solutions to the drainage control manual

PROPOSED SCOPE

- **Phase I**: Kick off, Goals, Inventory and Analysis
- **Phase II**: Community Outreach, Engagement and Information
- **Phase III**: Conceptual Recommendations for Stormwater Management
- **Phase IV**: Improvements for Stormwater Management

PHASE III REPORT

- Conceptual recommendations for stormwater management:
  - Develop list of stormwater management strategies
  - Diagram strategies to communicate proposed improvements
  - Develop specific implementation options for each strategy
    - How to get there
    - Cost
    - Partners
    - Schedule

STORMWATER STRATEGIES

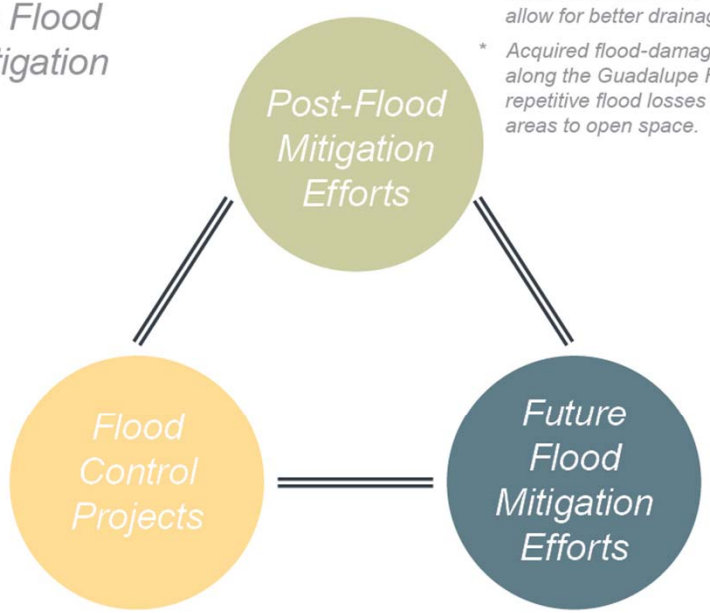
Based on an average of online rankings from Phases I and II:

1. Flood hazard mitigation
2. Open space conservation
3. Stream and river restoration
4. Floodway building prohibitions
5. Litter control
6. Retrofit stormwater facilities
7. Construction control measures
8. Building runoff capture
9. Maintenance and monitoring
10. Impervious coverage reduction
11. Detention basin
12. City tools

1. FLOOD HAZARD MITIGATION

Prepare to minimize, expedite communication during and swiftly recover after a flood hazard event.

What does Flood Hazard Mitigation Entail?



New Braunfels recently:

* *Removed trees and debris from Dry Comal Creek and the Guadalupe River to allow for better drainage.*
* *Acquired flood-damaged structures along the Guadalupe River to remediate repetitive flood losses and convert those areas to open space.*

New Braunfels recently completed the following projects:

* *North Tributary Regional Flood Control Project*
* *South Tributary Regional Flood Control Project*
* *Dry Comal Flood Control Project*
* *Gruene Crossing Drainage Project*
* *Landa Dam culvert repair*

New Braunfels recently:

* *Adopted a flood damage prevention ordinance, which seeks to minimize losses due to flood conditions.*
* *Approved Resolution No. 2011-R02, which authorizes the City Manager to support the Guadalupe-Blanco River Authority's application for flood protection planning grant assistance filed with the Texas Water Development board.*

1. FLOOD HAZARD MITIGATION

a) Flood risk reduction - 30 voted to include this strategy vs. 8 to exclude it.

Fund additional long-term, cost effective and environmentally-sound flood risk reduction structural projects, such as regional detention and channel improvements. Improve process to select and rank priorities city-wide.

Critical Path Components:

- » Cost?
  City: $$$$$
  Developer: -
  Landowner: -
- » How?
  -Utilize Watershed Master Planning to identify best projects. Prepare B/C ratios considering expected depth of flooding and compare each project to a "buy out" option.
- » Partners?
  Comal and Guadalupe Counties
  GBRA
  USACE

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

1. FLOOD HAZARD MITIGATION

b) Public information enhancement - 21 voted to include this strategy vs. 12 to exclude it.

Enhance public information to both visitors and property owners about hazards.

Critical Path Components:

» Cost?
City: $$
Developer: -
Landowner: -

» How?
-Enhance website hosted by City that provides flooding information, including up to the minute known low water crossing and their status.
-Install flood depth gauges in known flooding hazard areas.
-Creek name signage on major creek crossings.

» Partners?
TxDOT
Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

FLOOD HAZARD MITIGATION

c) Improve prevention measures - 31 voted to include this strategy vs. 5 to exclude it.

Improve prevention measures through more stringent building elevation and flood-proofing requirements.

Critical Path Components:

- » Cost?
  City: $
  Developer: $ - $$
  Landowner: $ - $$
- » How?
  -Increase freeboard requirements.
  -Tighten substantial damage/ improvement threshold.
  -Require additional flood protection for critical facilities (hospitals, fire stations, etc.)
  -Prohibit or limit building enclosure size below FFE.
  -Require CFM staffing or additional training for City staff.
- » Partners?
  Comal and Guadalupe Counties

**Assists with FEMA's Community Rating System program

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

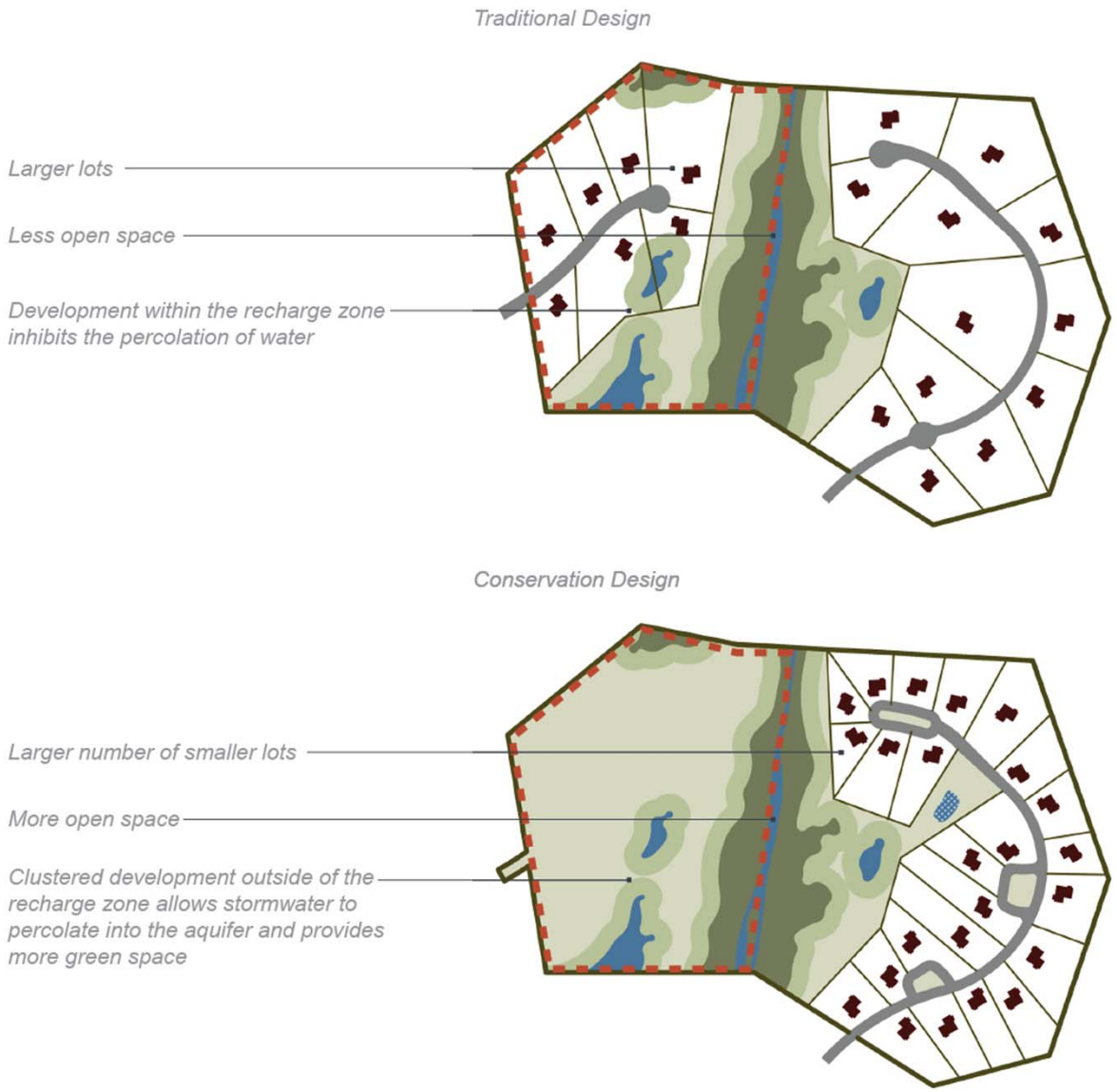
$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

2. OPEN SPACE CONSERVATION

Set aside land to preserve open space that has high infiltration rates, which contributes to a decrease in peak flow levels and increased infiltration into underground aquifers.



2. OPEN SPACE CONSERVATION

a) Conservation banking program - 22 voted to include this strategy vs. 5 to exclude it.

Create a city program (staff and funding source) for conservation banking of floodway and floodplains and upland areas that include recharge areas and other open space.

Critical Path Components:

- » Cost?
  City: $$$$$
  Developer: -
  Landowner: -
- » How?
  -Evaluation of appropriate conservation areas.
  -Incentivize cluster development (dependent upon evaluation mentioned above).
  -Provide incentives when developers exceed minimum regulations of development over the Edwards Aquifer or other sensitive areas.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

2. OPEN SPACE CONSERVATION

b) Conservation programs awareness - 33 voted to include this strategy vs. 2 to exclude it. This was voted as a “Favorite” option.

Partner with existing conservation programs to promote awareness of conservation programs and issues. Encourage responsible infiltration to the Edwards Aquifer Recharge Zone through education and incentives.

Critical Path Components:

» Cost?
City: $
Developer: -
Landowner: -

» How?
-Coordinate with EARIP.

» Partners?
Hill Country Alliance
Hill Country Conservancy
EARIP/US Fish & Wildlife Service
GBRA
Comal and Guadalupe Counties
WORD
GEAA

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

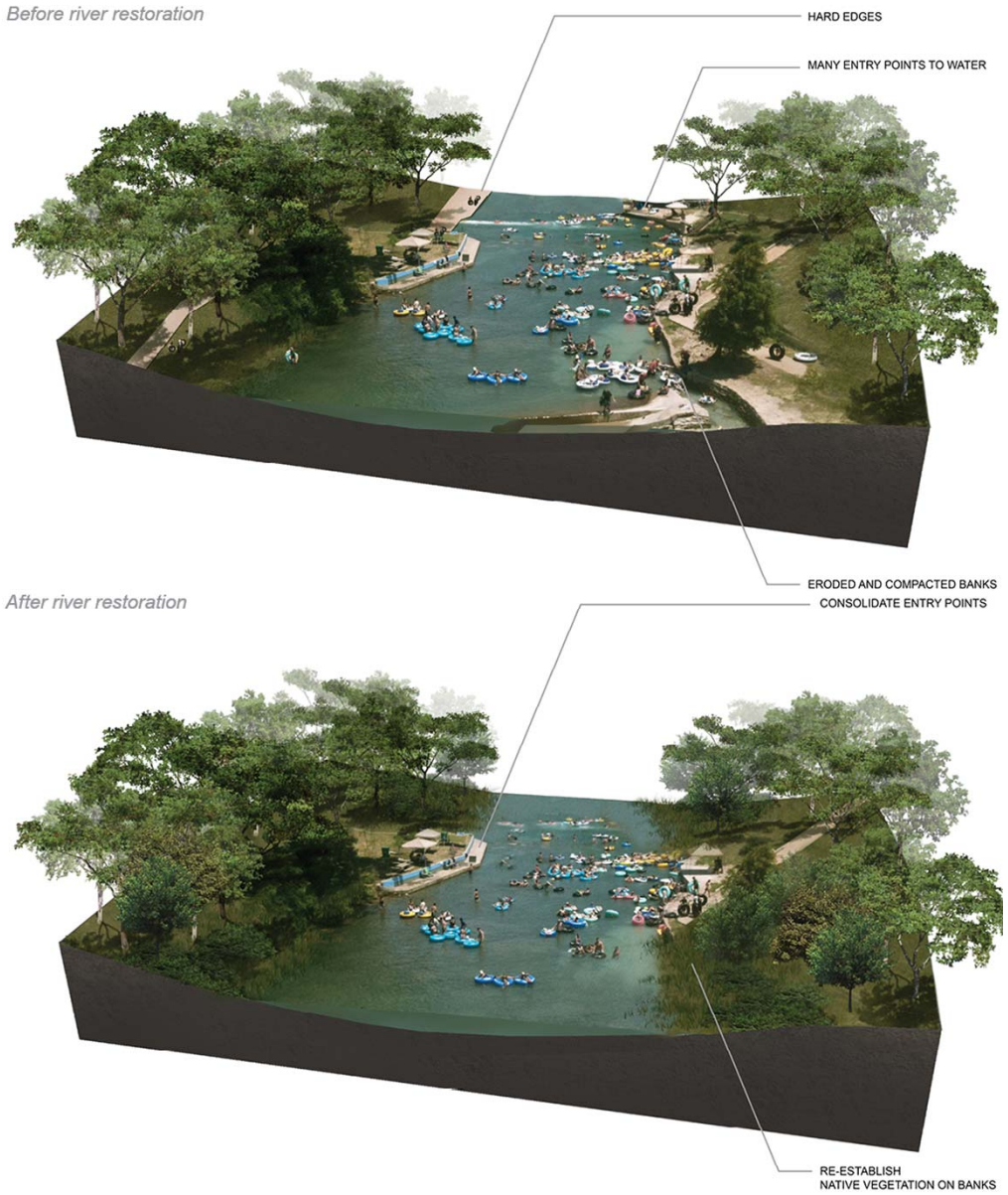
$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

3. STREAM AND RIVER RESTORATION

Restoring degraded streams and rivers will restore original hydrological functioning to waterways and can restore channel and waterway ecosystems.



3. STREAM AND RIVER RESTORATION

a) Partnering with local education institutions - 22 voted to include this strategy vs. 6 to exclude it.

Partner with local groups and universities to implement ecological and habitat restoration projects, research and studies.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
- » How?
  -Evaluate where restoration is most critical.
  -Reach out to institutions to compile a comprehensive map of drainage easements and to assist with evaluation and data collection.
- » Partners?
  Texas State University
  University of Texas
  Howard Payne University

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

3. STREAM AND RIVER RESTORATION

b) Create a stream setback - 23 voted to include this strategy vs. 7 to exclude it.

Create a stream and riparian corridor setback requirement, which can vary per watershed and creek size.

Critical Path Components:

- » Cost?
  City: $
  Developer: $ (Depends on size of property and setbacks.)
  Landowner: $ (Depends on size of property and setbacks.)
- » How?
  -Adopt a stream setback or buffer into floodplain building ordinance.
  -Add an additional buffer for impervious surfaces along intermittent streams.
  -Buffer rules could include allowance for narrower buffers with detailed engineering analyses.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

3. STREAM AND RIVER RESTORATION

c) Maintenance of drainage ways - 16 voted to include this strategy vs. 8 to exclude it.

Establish a funding source for on-going sedimentation and invasive vegetation removal.

Critical Path Components:

» Cost?
City: $$$
Developer: $$
Landowner: $

» How?
-Improve operations and maintenance of drainage easements.
-Create invasive species education program for city staff.
-Compile comprehensive mapping of drainage easement.
-Allocate a portion of the stormwater utility fee for creek clean-out.
-Update the DCM to be more specific on maintenance responsibilities.
-Per the EARIP, the City must perform flow-split management in the Old and New Channels and restore certain waterways in the City.

» Partners?
Comal and Guadalupe Counties
EARIP

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

3. STREAM AND RIVER RESTORATION

d) Establish Adopt-a-Stream programs - 25 voted to include this strategy vs. 6 to exclude it.

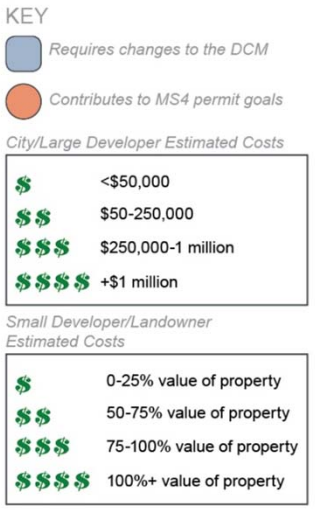
Establish an Adopt-a-Stream program via grants.

Critical Path Components:

» Cost?
City: $
Developer: -
Landowner: -

» How?
-Establish stream bank and riverside planting programs.
-Establish stream bank and riverside litter clean-up programs for waterways that may not receive regular cleanup.

» Partners?
Local businesses
Other community organizations



4. FLOODWAY BUILDING PROHIBITIONS

Further limit or restrict new construction in the 100-year floodplain and floodway beyond the existing ordinance

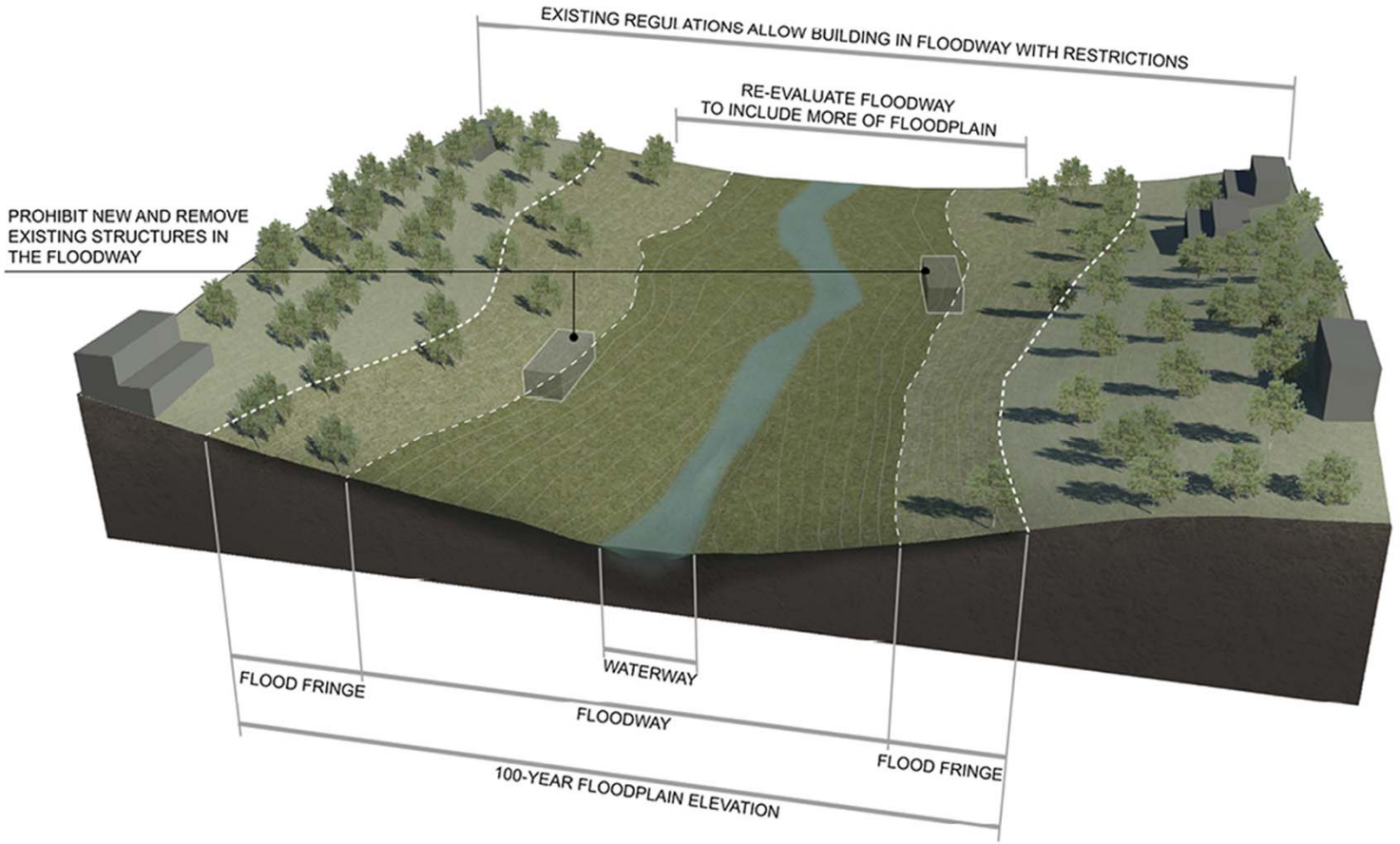


Figure 1: Floodway Building Prohibitions Diagram

4. FLOODWAY BUILDING PROHIBITIONS

a) Prohibit floodway construction - 33 voted to include this strategy vs. 5 to exclude it. This was voted as a “Favorite” option.

Prohibit (versus regulation of) new habitable structures from being constructed in the floodway.

Critical Path Components:

- » Cost?
  City: $
  Developer: $ $ (Dependent on grandfather clause)
  Landowner: $ $ (Dependent on grandfather clause)
- » How?
  -Amend City Floodplain Ordinance to prohibit structures in the floodway.
- » Partners?
  Comal and Guadalupe Counties

**Assists with FEMA’s Community Rating System program

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$ $	$50-250,000
$ $ $	$250,000-1 million
$ $ $ $	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$ $	50-75% value of property
$ $ $	75-100% value of property
$ $ $ $	100%+ value of property

4. FLOODWAY BUILDING PROHIBITIONS

b) Structure removal - 25 voted to include this strategy vs. 10 to exclude it.

Establish a funding source for removal of existing buildings from the floodway.

Critical Path Components:

- Cost?
  City: $ $ (Depends on funding)
  Developer: -
  Landowner: $
- How?
  -Investigate grants before and after disasters occur.
  -Do a cost-benefit analysis on CIP projects that considers a buyout alternative.
  -Allocate a portion of the stormwater utility fee for a city buyout program.
  -Strategize buyout properties by investigating severe, repetitive loss structures
- Partners?
  FEMA and TWDB
  -Flood Mitigation Assistance (FMA)
  -Severe Repetitive Loss (SRL) Program
  -Hazard Mitigation Grant Program (HMGP)
  -Pre-Disaster Mitigation (PDM) Program
  -Community Development Block Grants (CDBG)

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$ $	$50-250,000
$ $ $	$250,000-1 million
$ $ $ $	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$ $	50-75% value of property
$ $ $	75-100% value of property
$ $ $ $	100%+ value of property

4. FLOODWAY BUILDING PROHIBITIONS

c) Floodway boundaries re-evaluation - 29 voted to include this strategy vs. 7 to exclude it.

Re-evaluate the floodway boundaries to include more of the floodplain.

Critical Path Components:

» Cost?
City: $ $
Developer: -
Landowner: -

» How?
-Decide on a more conservative definition of the floodway.
-Determine necessity of floodway boundary re-evaluation and prioritize locations where it should occur.
-Focus on the most critical water bodies.

» Partners?
Comal and Guadalupe Counties
GBRA
FEMA

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$ $	$50-250,000
$ $ $	$250,000-1 million
$ $ $ $	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$ $	50-75% value of property
$ $ $	75-100% value of property
$ $ $ $	100%+ value of property

5. LITTER CONTROL

The cleanup or minimization of litter in rivers, storm drain facilities and along streets to reduce the amount of debris in the rivers, creeks and detention basins.

5. LITTER CONTROL

a) Illicit discharge ordinance - This was added after public voting ended based on further research.

Enact an ordinance that restricts discharges (includes litter, but broader definition) into City.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
  Businesses: $
- » How?
  -Evaluate and assess the outfalls located in creek areas.
  -Pass an ordinance that has strict penalties for those who allow illicit elements to be discharged into waterways.
  -Per the EARIP, the City will initiate a hazardous household waste program that will accept prescription drugs and Freon.
  -Actively monitor for compliance.
- » Partners?
  TCEQ
  EARIP

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

5. LITTER CONTROL

b) Limit disposable items - 14 voted to include this strategy vs. 6 to exclude it.

Enact an ordinance that limits disposable items, such as bags and cups.

Critical Path Components:

» Cost?
City: -
Developer: -
Landowner: -
Businesses: $

» How?
-Pass an ordinance to ban Styrofoam containers and cups in the city.
-Pass an ordinance to ban or charge for use of plastic bags in the city.
-Per the EARIP, river outfitters must provide litter bags to their customers and sponsor a river cleanup once a year.

» Partners?
Tourism bureaus
Chamber of Commerce
EARIP

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

5. LITTER CONTROL

c) Education - 12 voted to include this strategy vs. 8 to exclude it.

Educate the public about how litter, including pet waste, affects stormwater issues and can contribute to flooding.

Critical Path Components:

- » Cost?
  City: $$
  Developer: -
  Landowner: -
- » How?
  -TV and radio public service announcements.
  -Brochures distributed at visitor centers and hotels about littering and protecting the quality of the waterways.
  -Install pet waste stations in parks and open spaces.
- » Partners?
  Local radio and television stations
  Tourist bureaus
  Chamber of Commerce
  River outfitters

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

5. LITTER CONTROL

d) City-wide cleanup program - 23 voted to include this strategy vs. 5 to exclude it.

Fund a city-wide regular cleanup program.

Critical Path Components:

» Cost?
City: $
Developer: -
Landowner: -

» How?
-Focus on cleanup of put-in points.
-Institute a “Clean Up My Park Day”.
-Institute an “Adopt-a-Stream” program.

Partners?
Hill Country Conservancy
Hill Country Alliance
Tourism bureaus
Chamber of Commerce
EARIP

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

6. RETROFIT STORMWATER FACILITIES

Upgrade existing facilities in need of repair to current standards and low impact development techniques.

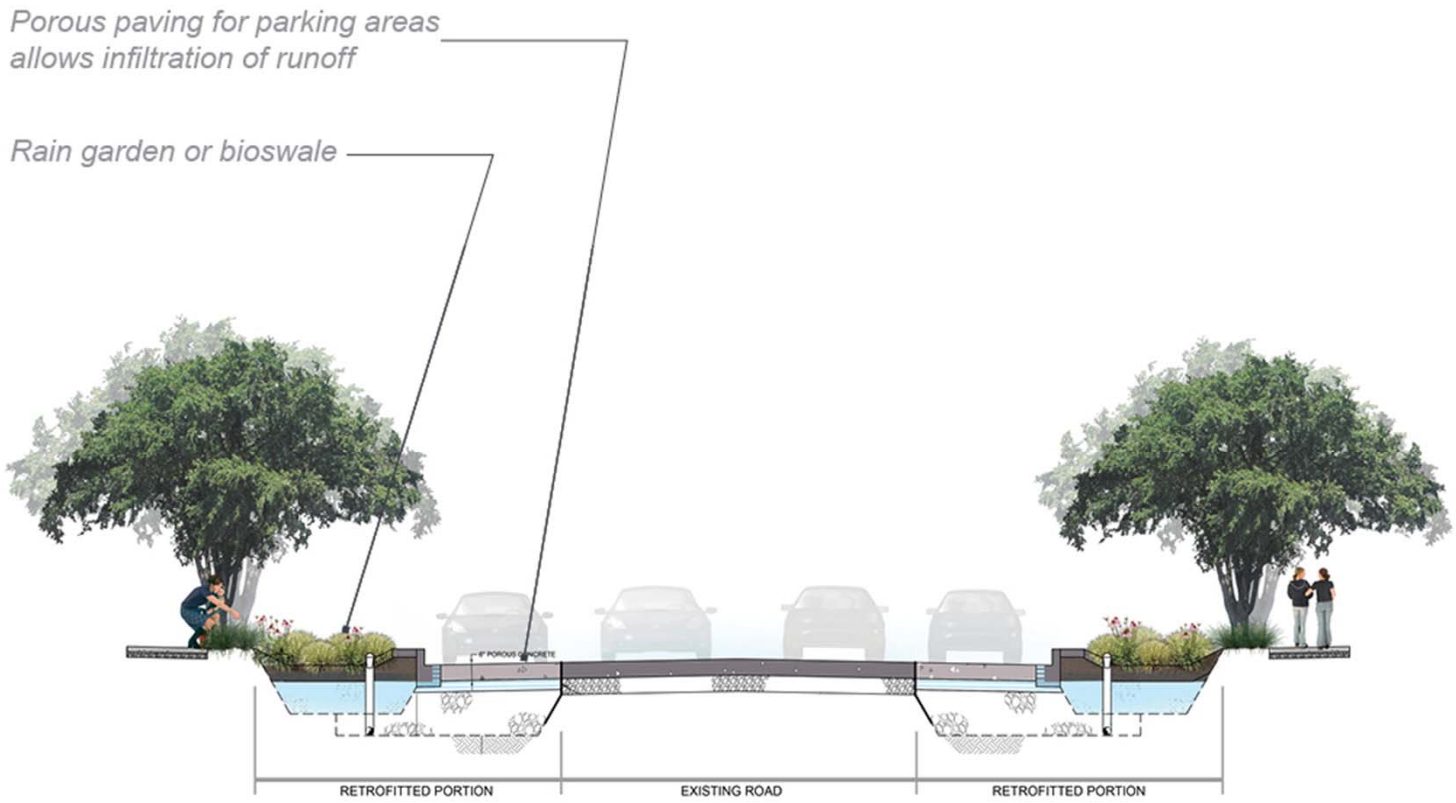


Figure #: Section through a retrofitted street.

6. RETROFIT STORMWATER FACILITIES

a) Facilities database - 22 voted to include this strategy vs. 4 to exclude it.

Fund and staff an on-going stormwater inventory and needs assessment database. Require digital submissions for all drainage reports and design/as-built plans.

Critical Path Components:

- » Cost?
  City: $$
  Developer: $
  Landowner: -
- » How?
  -New development must submit plans digitally so that they can be incorporated into an overall city-counties-ETJ GIS database.
  -Create a database that is managed by city staff.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

6. RETROFIT STORMWATER FACILITIES

b) Low Impact Design techniques - 26 voted to include this strategy vs. 3 to exclude it.

Enact an ordinance that requires the incorporation of Low Impact Design techniques in retrofitted construction projects.

Critical Path Components:

- » Cost?
  City: $
  Developer: $
  Landowner: -
- » How?
  -Education about low impact design methods is critical for maintenance staff.
  -Amend building code and DCM to require LID techniques in both new and retrofitted projects.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

6. RETROFIT STORMWATER FACILITIES

c) Privately-owned facility inspections - 15 voted to include this strategy vs. 6 to exclude it.

Fund and staff City inspections of privately-owned stormwater detention, treatment and conveyance systems. Limit future private systems and gradually acquire existing private systems.

Critical Path Components:

» Cost?
City: $$
Developer: -
Landowner: $

» How?
-Expand the definition of what is included within a drainage easement and how they are to be maintained.
-Allot a portion of the stormwater utility fee to fund the inspections and acquisition of privately-owned stormwater systems.
-Prohibit any future privately-owned stormwater detention, treatment and conveyance systems.
-Expand the current operations and maintenance plan requirements to include a detailed schedule with regular inspections.

» Partners?
Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

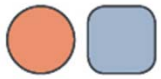
$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

7. CONSTRUCTION CONTROL MEASURES

These measures refer to enhanced seeding, mulching, sediment traps, silt fencing and enforcing a more stringent erosion control plan, all in an effort towards reducing erosion and sedimentation that flows into and blocks waterways.

7. CONSTRUCTION CONTROL MEASURES

a) Erosion control standards - 27 voted to include this strategy vs. 9 to exclude it.



All construction activity, regardless of size, must meet minimum erosion and sediment control standards.

Critical Path Components:

- » Cost?
  City: $
  Developer: $
  Landowner: $
- » How?
  -Currently, only projects of one acre or more have to meet minimum erosion and sediment control standards.
  -Amend the building code to require all construction projects to meet the minimum requirements.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

7. CONSTRUCTION CONTROL MEASURES

b) Construction site inspections - 20 voted to include this strategy vs. 7 to exclude it.

Fund and staff a greater frequency of construction site inspections through permit fees, enforcement and stormwater utility funds.

Critical Path Components:

- » Cost?
  City: $$
  Developer: $
  Landowner: -
- » How?
  -Institute a tip line for the public to call.
  -Allocate a portion of the stormwater utility fee to fund inspections.
- » Partners?
  TCEQ
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

7. CONSTRUCTION CONTROL MEASURES

c) Benefits for exceeding requirements - 27 voted to include this strategy vs. 6 to exclude it.

Provide benefits for exceeding minimum construction control requirements, such as expedited review time or reduced fee costs.

Critical Path Components:

» Cost?
City: $
Developer: $
Landowner: -

» How?
-Amend ordinance to require more stringent erosion and sediment control requirements. Write a comprehensive Grading, Erosion and Sediment (GESC) Control manual.
-Incentivize developers who exceed the minimum requirements through expedited review time and/or reduced permitting fees.

» Partners?
TCEQ
Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

8. BUILDING RUNOFF CAPTURE

Capture and store rainwater from roofs and cisterns.

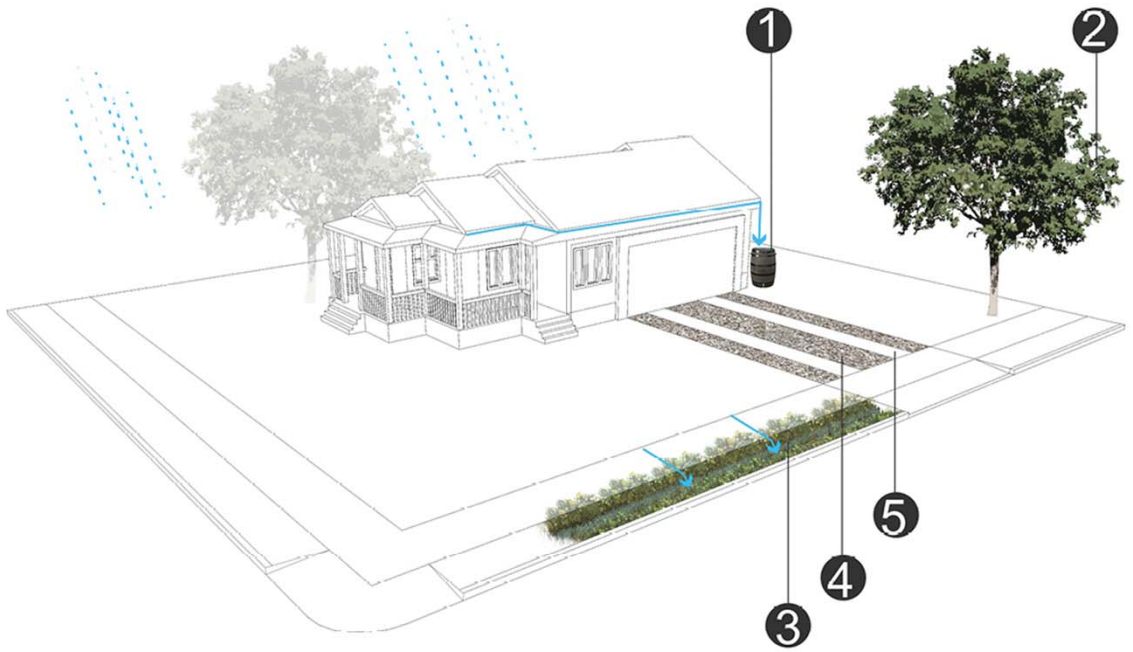


Figure #: Diagram of different building runoff capture methods.

1. **Capture and use:**
   Captures and stores runoff from impervious surfaces, reducing volume and overall water quality impairments. Typically used for irrigation.
2. **Preserve Native Vegetation:**
   Enhances the aesthetic quality of community and maintains infiltration and evapotranspiration rates.
3. **Vegetated Swale:**
   Vegetated channels that slow stormwater runoff and promote infiltration, trap sediment and help treat pollutants.
4. **Pervious Pavement:**
   Pavement that allows rain to infiltrate, thereby reducing runoff and promoting groundwater recharge.
5. **Reduced Hardscape:**
   Narrower streets, sidewalks and driveways increases pervious areas and open spaces.

8. BUILDING RUNOFF CAPTURE

a) Cisterns and rain barrels - 25 voted to include this strategy vs. 8 to exclude it.

Expand current City-sponsored cistern program through grants to provide no-cost cisterns or rain barrels.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
- » How?
  -Allocate a portion of the stormwater utility fee to fund a portion of the program.
  -Research grant programs.
- » Partners?
  NBU

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

8. BUILDING RUNOFF CAPTURE

b) Disconnect downspouts - 23 voted to include this strategy vs. 8 to exclude it. This was voted as a “Favorite” option.

Provide permitting or fee incentives for new or retrofitted construction that directs downspouts to rain gardens or pervious cover.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: $
- » How?
  -Amend building code to incentivize disconnected downspouts.
  -Educate the public via websites on the benefits of disconnecting downspouts.
- » Partners?
  USGBC

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

8. BUILDING RUNOFF CAPTURE

c) Zero impact development ordinance - 24 voted to include this strategy vs. 14 to exclude it.

Enact a voluntary zero impact development ordinance, with incentives. A zero impact development is defined as a development that maintains the natural hydrologic function of the site.

Critical Path Components:

» Cost?
City: $
Developer: -
Landowner: -

» How?
-Develop an ordinance that incentivizes zero impact development for new construction or re-development.
-Create an extra incentive for early adopters and even consider a sort of innovative design competition to recognize the early adopters that set a good example for others.

» Partners?
Hill Country Alliance
Hill Country Conservancy

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

8. BUILDING RUNOFF CAPTURE

d) Re-grade to direct stormwater

Provide permitting or fee incentives for retrofitted construction that re-grades paved areas to direct stormwater to detention, open space or bioswales.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
- » How?
  -Incentivize re-development that directs stormwater to recharge zones with reduced fees and/or expedited permitting.
- » Partners?
  USGBC

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

9. MAINTENANCE AND MONITORING

This strategy outlines the responsibilities for ensuring that drainage facilities have proper maintenance and that monitoring is not only completed and operating correctly, but also requires regular city maintenance practices to incorporate BMPs.

9. MAINTENANCE AND MONITORING

a) Citizen-based monitoring - 19 voted to include this strategy vs. 7 to exclude it.

Create a citizen-based monitoring program through grants.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
- » How?
  -Establish a tip line for the public to call to report on flooding issues such as blocked storm drains, illegal dumping, etc.
- » Partners?
  Local universities
  Texas Watch
  Texas Stream Team

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

9. MAINTENANCE AND MONITORING

b) Maintenance education program - 19 voted to include this strategy vs. 8 to exclude it.

Create a Home Owners Association/ business district/tourist industry maintenance education program through online materials and brochures.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
- » How?
  -Produce and distribute brochures, informational material and recreational guides about proper maintenance of drainage ways, detention ponds, etc.
  -Install signage at tributaries and drainage facilities.
- » Partners?
  GBRA

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

9. MAINTENANCE AND MONITORING

c) Expand city monitoring programs - 28 voted to include this strategy vs. 6 to exclude it. This was voted as a “Favorite” option.

Fund and staff expansion of city monitoring and maintenance programs.

Critical Path Components:

- » Cost?
  City: $$
  Developer: -
  Landowner: -
- » How?
  -Expand upon the existing maintenance ordinance and programs to include more detail that allows the city to be more preventative than reactionary.
  -Craft a maintenance schedule with the appropriate staff. Hire additional staff as necessary.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

9. MAINTENANCE AND MONITORING

d) School-based monitoring program - 21 voted to include this strategy vs. 10 to exclude it.

Create a school-based monitoring program and curriculum that teaches children about stormwater issues and provides scientifically-valid data to the city for water quality monitoring purposes.

Critical Path Components:

» Cost?
City: $
Developer: -
Landowner: -

» How?
-Create curricula for the Independent School District that involves science classes. Students can take photos of sites that they monitor for class.
-Create a website that is maintained by the city that allows students to upload their information/photos from monitoring projects and the public to view the work.

» Partners?
New Braunfels Independent School District
Local colleges and universities

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

10. IMPERVIOUS COVERAGE REDUCTION

Increase densities, narrow road sections and reduce parking requirements. The City can establish limits to impervious coverage within City Limits or the ETJ.

10. IMPERVIOUS COVERAGE REDUCTIONS

a) LID in building requirements - 27 voted to include this strategy vs. 2 to exclude it.

Require Low Impact Design techniques into site and building requirements for new and redevelopment.

Critical Path Components:

» Cost?
City: $
Developer: $$
Landowner: -

» How?
-Amend building code and DCM to require LID techniques in both new and retrofitted projects.
-Require water quality mitigation citywide through criteria similar to our more restrictive than TCEQ for Edwards Aquifer
-Consider using either TCEQ Edwards manual or GEAA draft LID toolbox as primary source material rather than creating a separate manual/list of methods.

» Partners?
EARIP
GEAA

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

10. IMPERVIOUS COVERAGE REDUCTIONS

b) Reduce street lane width - 10 voted to include this strategy vs. 7 to exclude it.

Reduce the street lane width requirement.

Critical Path Components:

- » Cost?
  City: -
  Developer: -
  Landowner: -
- » How?
  -Determine how much different street types would narrow, i.e. major/minor/ arterial types of streets.
  -Incentivize narrowing of roads in certain areas of the city, require narrowing in others.
  -Change the requirements for the required number of turn lanes and bike lane widths.
- » Partners?
  TxDOT

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

10. IMPERVIOUS COVERAGE REDUCTIONS

c) Limit impervious cover - 22 voted to include this strategy vs. 5 to exclude it.

Evaluate, determine and regulate areas of the city that limit the density and amount of impervious cover. Consider developer transfer rights within this zone.

Critical Path Components:

» Cost?
City: -
Developer: $
Landowner: -

» How?
-Determine amount of allowed impervious cover by zoning.
-Suggest maximums, incentivize those who build less impervious cover than the maximum.
-Allow developer transfer rights in zones of limitation.
-Suggestion of impervious coverage limitation: an average of 65% for the city as a whole, but divide the percentages up between land uses.

» Partners?
Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

10. IMPERVIOUS COVERAGE REDUCTIONS

d) Parking - 19 voted to include this strategy vs. 6 to exclude it.

Require a parking maximum in addition to a parking minimum. Require shared use parking for mixed-use developments.

Critical Path Components:

- » Cost?
  City:
  Developer: $
  Landowner: -
- » How?
  -Amend the zoning code to require a parking maximum. Recommended maximum is 1.25 times the parking minimum.
- » Partners?
  Chamber of Commerce

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

10. IMPERVIOUS COVERAGE REDUCTIONS

e) Incentivize pervious paving options - 18 voted to include this strategy vs. 5 to exclude it.

Incentivize the use of pervious paving options with expedited review processes or reduction of permitting fees.

Critical Path Components:

» Cost?
City: $
Developer: -
Landowner: -

» How?
-Allow developers to replace impervious cover with porous materials to reduce the impervious cover.
-Provide permitting or fee incentives for new or retrofitted construction that removes pavement and replaces it with porous materials.

» Partners?
TCEQ (allows Permeable Friction Course (PFC) to treat Edwards Aquifer for streets over 55 mph)

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

11.DETENTION BASIN

Method of stormwater management that temporarily detains a portion of stormwater runoff for a specific length of time and can increase water quality.

11. DETENTION BASINS

a) Prioritize detention park improvements - 26 voted to include this strategy vs. 10 to exclude it.

In conjunction with the 2010 Open Space Master Plan, prioritize park improvements based upon the possible use as a detention facility, emphasizing multi-use.

Critical Path Components:

- » Cost?
  City: -
  Developer: -
  Landowner: -
- » How?
  -Prioritize CIP projects that have a multi-use function.
- » Partners?
  Hill Country Conservancy
  Hill Country Alliance
  GBRA

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

11. DETENTION BASINS

b) Reclaimed water systems - 27 voted to include this strategy vs. 5 to exclude it. This was voted as a “Favorite” option.

Update building code to allow the use of detention basin water for irrigation and provide incentives for developers that implement reclaimed water systems.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
- » How?
  -Amend the building code to incentivize reclaimed water irrigation systems in new development and retrofitted development.
- » Partners?
  USGBC

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

11. DETENTION BASINS

c) Fee-in-lieu - 20 voted to include this strategy vs. 8 to exclude it. This was voted as a “Favorite” option.

Update ordinances to better define fee-in-lieu (rather than detention) in lower portions of the watershed for all development types, where detention may be counterproductive.

Critical Path Components:

- » Cost?
  City:
  Developer: $
  Landowner: -
- » How?
  -Amend the ordinances to require fee-in-lieu rather than detention in lower portions of the watershed.
  -Update the Drainage and Erosion Control Design Manual to require detention or fee-in-lieu for Types 1 and 2 Development.
  -Allow/encourage regional water quality controls which serve more than one lot.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

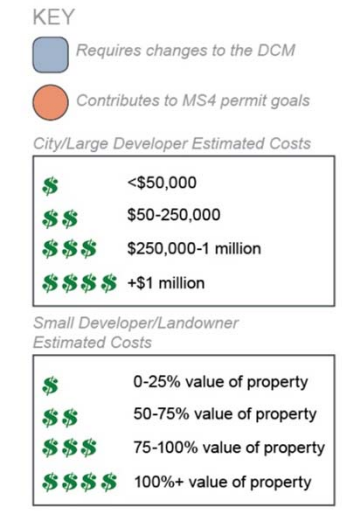
11. DETENTION BASINS

d) Incentives for detention basins - 30 voted to include this strategy vs. 5 to exclude it.

Provide incentives for specific design enhancements to detention basins to also improve their water quality functionality.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
- » How?
  -Incentivize with reduced fees detention basin designs that enhance water quality.
- » Partners?
  Comal and Guadalupe Counties



12.CITY TOOLS

This strategy refers to tools that the City can use such as implementing a stormwater utility fee to fund maintenance of stormwater facilities or incentives that provide opportunities for variance from code.

12. CITY TOOLS

a) Stormwater fee based on cover - 11 voted to include this strategy vs. 7 to exclude it.

This implementation option is already underway at the time of this report.

Base stormwater fees associated with improved land on impervious area.

Critical Path Components:

- » Cost?
  City: -
  Developer: $
  Landowner: $
- » How?
  -Consider allowing LID to reduce impervious cover in fee calculations.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

12. CITY TOOLS

b) Compliance options - 8 voted to include this strategy vs. 9 to exclude it.

Provide incentives, like a reduced stormwater utility fee rate, to incorporate Low Impact Design methods into new and redevelopment projects.

Critical Path Components:

- » Cost?
  City: $
  Developer: -
  Landowner: -
- » How?
  -Provide incentives to developers who can provide evidence that the incorporation of LID techniques will reduce the impact on stormwater infrastructure.
  -Expand or improve City development control over the ETJ to better allow implementation of these strategies.
- » Partners?
  Comal and Guadalupe Counties

KEY

Requires changes to the DCM

Contributes to MS4 permit goals

City/Large Developer Estimated Costs

$	<$50,000
$$	$50-250,000
$$$	$250,000-1 million
$$$$	+$1 million

Small Developer/Landowner Estimated Costs

$	0-25% value of property
$$	50-75% value of property
$$$	75-100% value of property
$$$$	100%+ value of property

DRAINAGE CONTROL MANUAL CHANGES

Chapter	Title	Significant Proposed Changes
1	Introduction	
2	Drainage Policy and Criteria	a. Further restrict floodplain/floodway development
		b. Development of all sizes requires flood mitigation or fee-in-lieu
		c. Development of all sizes requires water quality mitigation or fee-in-lieu
		d. Flood mitigation comparison does not stop at property line, but comparisons are required downstream
		e. Better define when to create drainage easements (minimum watershed size)
		f. Encourage fee-in-lieu for flood mitigation in lower portions of the watersheds
		g. Define maintenance responsibilities in more detail (forms, reporting requirements, city/private responsibilities, etc.)
		h. Define Erosion Hazard Setback (or Stream Buffer) in more detail
3	Comprehensive Ordinance	
4	Design Rainfall	a. Utilize revised rainfall values
5	Determination of Design Discharge	a. Better define fully developed watershed conditions to determine discharge
		b. Expand available Tc calculations
6	Street Flow	a. Simplify street flow calculations (refer to TxDOT or FHWA)
7	Inlet Design	a. Simplify inlet design calculations (refer to TxDOT or FHWA)
8	Storm Drain Design	a. Simplify storm drain calculations (refer to TxDOT or FHWA)
9	Open Channels	a. Add detail on tailwater and when normal depth can be used versus step backwater calculations
		b. Add detail on channel and energy dissipation material, post-construction erosion control
10	Bridge and Culvert Design	a. Add detail on tailwater and when normal depth can be used versus step backwater calculations
		b. Add detail on channel and energy dissipation material, post-construction erosion control
11	Detention Basin Design	a. Define criteria for multi-use ponds (water quality, recreation, etc.)
12	Lakes, Dams and Levees	a. Update dams/levees with new FEMA / TCEQ criteria
13	Site Erosion Control During Construction	a. Update with new EPA/TCEQ regulations, calculations and BMPs
New	Water Quality / LID	a. Introduce new chapter on Water Quality and Low Impact Development (LID)

FLOODPLAIN ORDINANCE CHANGES

Title	Significant Proposed Changes
Flood Damage Prevention	a. Further restrict floodplain/floodway development
	1. Freeboard requirements - BFE + 2 ft goes to BFE + 3 ft and/or ultimate floodplain, not existing floodplain
	2. Floodway more conservatively defined (takes up more/all floodplain)
	3. Prohibit buildings in Floodway
	4. Additional protection for critical facilities such as hospitals, fire stations, etc. (clear of 500-year floodplain)
	5. Substantial Damage/Substantial Improvement tightening to less than 50%
	6. Protection of Floodplain Storage Capacity - cut/fill mitigation or prohibit fill
	7. Building enclosure limits - prohibit or limit enclosure size below BFE
	8. Require CFM staffing and/or training for City staff

ORDINANCE CHANGES

Ordinance Location	Proposed Changes
Building Code - Chapter 14	a. Require LID in new and retrofitted construction
	b. Incentivize the disconnection of downspouts
	c. Limit impervious cover by zoning category
	a. Re-evaluate 300 acre minimum requirement for City drainage ROW
Solid Waste - Chapter 110	a. Ban Styrofoam containers and cups
	b. Ban or charge for use of plastic bags
	c. Create an illicit discharge ordinance
Streets - Chapter 114	a. Reduce the number of turning lanes that are required and reduce the required width for bike lanes
Traffic - Chapter 126	a. Require a parking maximum in addition to a parking minimum. Recommended maximum is 1.25 times the parking minimum.
Utilities - Chapter 130	a. Incentivize reclaimed water irrigation systems in new and retrofitted construction
Stormwater Connections - Chapter 143	a. Define water quality fee-in-lieu
Zoning - Chapter 144	a. Create a voluntary zero impact development ordinance for new construction or redevelopment
	b. Allow for fee-in-lieu rather than detention in lower portions of the watershed

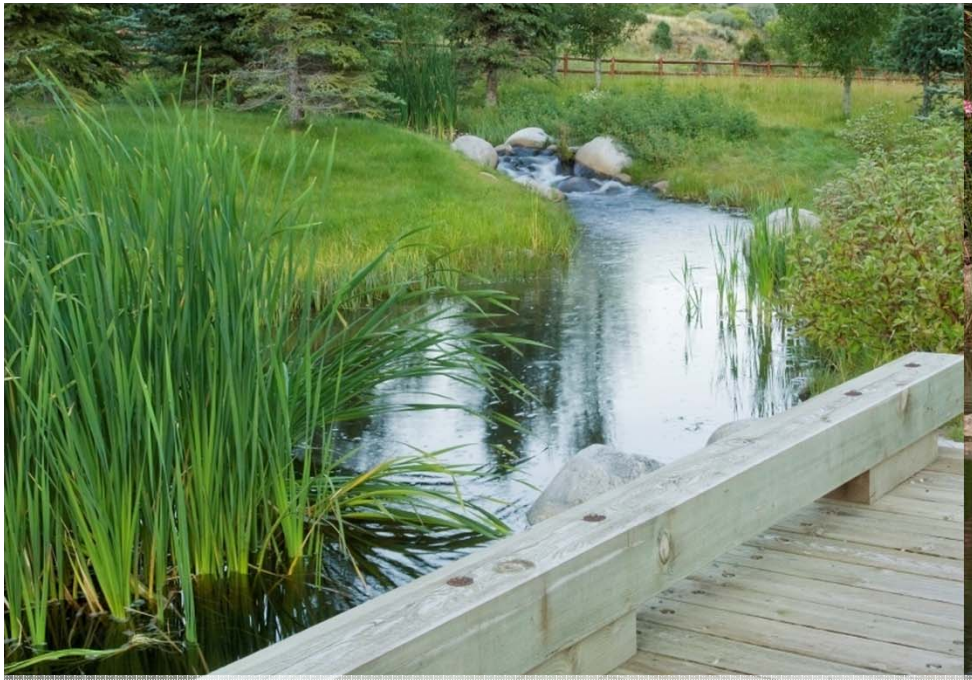
NEXT STEPS

- Phase III Report Comments
  - Update Phase IIII Report with WAC comments.
- Meetings:
  - September 6, 2012: present the Phase III draft document and review proposed MS4 goals and DCM changes. (WAC)
  - Late October: present the document and review proposed MS4 goals and DCM changes. (Stakeholders)

NEXT STEPS FOR THE WAC

- Submit any additional comments to:

  City contact: Amy Rogers | arogers@nbtexas.org



STORMWATER MANAGEMENT PHASE III : Design Workshop and LAN

Watershed Advisory Committee | July 18, 2012