
EXECUTIVE SUMMARY
2000 LOCAL GOVERNMENT
WATER QUALITY PROTECTION STUDY

Local governments are involved in many activities that may impact water quality. Some policies and planning efforts are directed toward improvement of water quality. It has also been observed that other local policies and planning efforts, while directed at other relevant issues, have an indirect beneficial impact on water quality.

In late 1999, the Houston-Galveston Area Council (H-GAC) initiated a survey of local governments to determine the direct and indirect water quality protection measures being implemented in the region. The survey covered such topics as comprehensive planning, zoning, subdivision regulations, and erosion sediment control measures.

The survey was designed and procedures were created following the total design method created by Dillman (1978). One hundred-thirty-one cities, towns, and villages and all 13 counties in the H-GAC region received self-administered surveys. The survey was first mailed to all of the county judges and cities for which H-GAC had an identified city administrator or city manager. The remaining cities had surveys mailed to their mayor. Forty-four cities and three counties returned the survey, resulting in a 32 percent response rate.

Comprehensive plans present long-range goals and objectives for the development of a city or county. Typically, comprehensive plans address the problems and issues identified by the community, while also serving as a guide for future development. Twenty communities responded that they have comprehensive plans, 10 of which have been updated or adopted in the last five years.

Five of the twenty communities that have comprehensive plans include environmental issues. The three main environmental issues for these cities are floodplain management, water supply, and storm drainage/run-off. The comprehensive plans in the cities of Galveston and Missouri City address wetland preservation.

Zoning is the most common means of regulating local land use in the United States. Zoning is the division of a jurisdiction into districts within which permissible uses are prescribed and restrictions on building heights, layout, and other requirements are defined. Twenty-two communities have zoning ordinances, 10 of which have zoning for sensitive areas. Four of the communities noted that they zoned for agriculture and undeveloped parcels.

Forty-one communities responded that they have building codes. Thirty-five communities stated that their building codes specify sewer hook-ups and restrict on-site disposal.

Twenty-six communities noted that they have an ordinance that limits the percentage of the lot that can be covered by buildings, driveways, and/or other improvements. Seventeen communities have either a landscape ordinance or minimum landscaping requirements for development projects.

Subdivision regulations establish standards for the division of tracts of land into lots. They are utilized by communities to ensure that new developments have the necessary utilities, roadways, and public facilities the addition requires. Forty-two communities responded that they have subdivision regulations.

Almost all of the communities' subdivision regulations address road design and drainage design. Twenty-one of the regulations address one or a combination of parks, open space, and community facilities.

Development projects have the potential for causing localized impacts on the quality of surface water and groundwater. Erosion from construction sites during clearing and grading operations and from cut-and-fill slopes left exposed after construction can result in the sedimentation of adjacent surface waters.

Control measures to protect water quality are required under the Clean Water Act. The two most notable control measures are non-point source management programs and storm-water discharge permits. Federal storm water discharge permits for construction projects over five acres are required by municipalities, state, and federal agencies in the region. Currently Houston, Harris County, and Pasadena are required to complete NPDES storm water management permit applications under Phase I implementation of the Clean Water Act storm water provisions.

Eight communities have an ordinance or policy that specifically require the use of erosion and sediment control measures at construction sites. Twenty communities require erosion and sediment control in their roadway and other capital construction projects. The three most used measures by these communities include detention ponds, riprap, and seeding and sod grasses. Only one community is currently utilizing H-GAC's Action Guide: Erosion & Sediment Control.

The recommendations for local governments and H-GAC derived from the study area as follows:

Comprehensive Planning

- Communities should continue to create comprehensive plans. These comprehensive plans should include a discussion of water quality and other environmental issues, such as wetland protection, which can be addressed in future growth and development policies.
- The water quality issues which should be of particular interest and a focus in future plans are non-point source pollution and the use of erosion and sediment controls (best management practices) in future development.
- All planning efforts should utilize the H-GAC guides *Action Guide: Erosion & Sediment Control, and Land Use Management Techniques for Water Pollution Prevention* to strengthen the water quality element.
- Entry into the voluntary Pollution Control and Abatement Program, through the TNRCC, should be considered when completing a comprehensive plan.

Land Use Controls

- Detailed implementations of all types of land use controls may require an investment larger than some communities can afford. Therefore any type of land use control ordinance in place

should contain one or more important elements, lot coverage, drainage system design and maintenance, and/or landscaping.

- Lot coverage can be written into building codes (only for building construction requiring a permit), subdivision regulation (only for new development requiring new plats), or zoning ordinances (standards based on where or in what zone the development will occur). Lot coverage provisions should take into account area needed for storm water control and infiltration and impervious are impacts on the drainage system.
- Landscaping can be a requirement of the above mentioned land use controls as well. For beneficial use of vegetation to occur, it must be native to the area, this requires the use of less pesticides and fertilizers, and it must be able to hold soils during storms to reduce erosion.
- Maintenance of drainage systems should be considered in all subdivision regulations.

Erosion and Sediment Control

- Local ordinances should be drafted which require private developers to utilize Best Management Practices on construction projects. H-GAC has developed a voluntary guidebook that is available, *Action Guide: Erosion & Sediment Control*.
- BMPs should be used on all local capital improvement projects and other developments which are funded by local governments.
- The long-term post construction design and maintenance of BMP should be a consideration in all local projects.

General Recommendations

- Local governments should begin to document their efforts in water quality protection and the use of BMPs. This should include those programs aimed directly at improving water quality, and those in which water quality is a secondary benefit. This documentation will serve useful in future negotiations concerning non-point source issues with the TNRCC and EPA.
- Local governments should be aware of what other communities in the region are doing related to planning and BMPs. That is the intent of this report. If you would like any additional information concerning an community's program, please contact them or H-GAC.
- H-GAC should continuously update this report, add details where necessary, and serve as a clearinghouse for local governments concerning these issues. For that purpose a self-reporting update is included in this report, so that local governments may send information on any updates or revisions to H-GAC.

**2000 LOCAL GOVERNMENT
WATER QUALITY PROTECTION STUDY**

Introduction Local governments are involved in many activities that may impact water quality. Some policies and planning efforts are directed toward improvement of water quality. It has also been observed that other local policies and planning efforts, while directed at other relevant issues, have an indirect beneficial impact on water quality. In late 1999 H-GAC initiated a self-administered survey of local governments the direct and indirect water quality protection measures being implemented in the region. The survey and resulting *report 2000 Local Government Water Quality Protection Study* has two objectives:

1. To determine the extent to which local governments in the H-GAC region utilize planning and land use control measures to guide development and protect water quality.
2. To determine the extent to which erosion and sediment control measures are being implemented in the H-GAC region.

One hundred-thirty-one cities, towns, and villages and all 13 counties in the H-GAC region received self-administered surveys. Forty-four cities and three counties returned the survey, resulting in a 32 percent response rate.

Study Area The H-GAC region is the State-designated thirteen-county Gulf Coast Planning Region. The thirteen counties of the region are Austin, Brazoria, Chambers, Colorado, Fort Bend, Galveston, Harris, Liberty, Matagorda, Montgomery, Walker, Waller, and Wharton. Figure 1 is a map of the region and cities in the region. The projected population of the region is 4,634,442 persons, or 24.8% of the State of Texas population. Appendices one and two illustrate the historic population trends in the region.

Survey Methodology Data for this report was collected using a self-administered survey of the cities, towns, villages, and counties in the H-GAC region. The survey was designed and procedures were created following the total design method created by Dillman (1978). H-GAC maintains records and mailing list for one hundred and thirty-one cities and the thirteen counties of the region. The survey was first mailed to all of the county judges and cities for which H-GAC had an identified city administrator or city manager. The remaining cities had surveys mailed to their mayor.

Water Quality Study Area

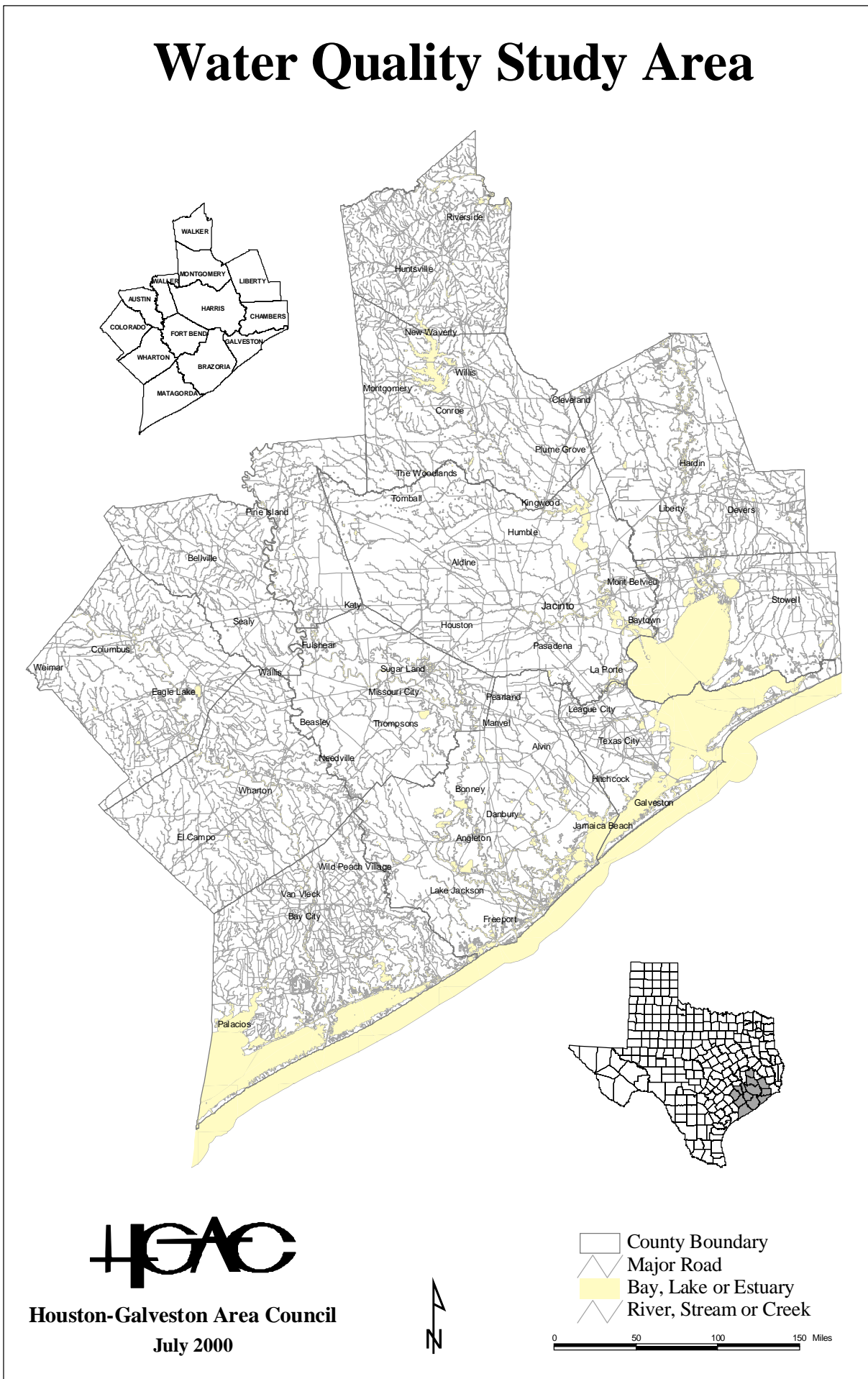


Figure 1 Water Quality Study Area

Comprehensive Planning

Comprehensive plans present long-range goals and objectives for the development of a city or county. Typically, comprehensive plans address the problems and issues identified by the community, while also serving as a guide for future development. Plans can be as simple as a statement of goals for the community or as detailed as a technical report describing and making recommendations for the financial, physical and social aspects of the area. As can be seen in Table 1, in the H-GAC region, of the cities that responded 20 communities have adopted a comprehensive plan. With the 1994 survey, the total is 38 communities.

TABLE 1: COMPREHENSIVE PLANS IN THE H-GAC REGION
(Date of adoption or last revision)

Community	Title	Date
Alvin	Master Plan for the City of Alvin	1987
Angleton	Comprehensive Master Plan	1991
Baytown	Baytown Comprehensive Plan	*1992
Bellaire	City of Bellaire Comprehensive Plan	1997
Clute	Planning/ Capacity/ Building Project for the City of Clute, Texas	1991
El Campo	City of El Campo Comprehensive	2000
Friendswood	City of Friendswood Comprehensive Plan	1998
Galveston	Galveston Island –A Comprehensive Plan Based on Coastal Zone Management Principles	*1988
Huntsville	The Comprehensive Plan of the City of Huntsville	1998
La Porte	City of La Porte Comprehensive Master Plan	*1984
Lake Jackson	Comprehensive Master Plan-Lake Jackson 2020	1996
Manvel	City of Manvel Comprehensive Plan	1998
Missouri City	Vision 20/20	1990
New Waverly	Planning/ Capacity/ Building Project for City of New Waverly	1997
Rosenberg	City of Rosenberg Comprehensive/ Master Plan	1997
Sealy	City of Sealy Comprehensive Development Plan	1976
Taylor Lake Village	Vision 2020/ Zoning Ordinance	1998
Tomball	Infrastructure Master Plan	1999
Webster	Webster Comprehensive Police Planning Document	1981
West University Place	Comprehensive Plan	1987

* Currently Updating their Comprehensive Plan

Six of the plans listed in Table 1 include a chapter or implementation strategy relating to environmental issues. The plans that included environmental issues and the types of issues covered are listed in Table 2.

TABLE 2: ENVIRONMENTAL ISSUES IN THE COMPREHENSIVE PLANS

Community	Floodplain Management	Household Hazardous Waste	Non-point Source Pollution	Illicit Connections to Storm Sewers	Sediment/ Erosion Control
Baytown		Yes	Yes		
Galveston	Yes				Yes
La Porte	Yes			Yes	
Sealy	Yes				
Tiki Island	Yes				Yes

TABLE 2: ENVIRONMENTAL ISSUES IN THE COMPREHENSIVE PLANS (Continued)

Community	Septic System	Storm Drainage/ Run-off	Storm Sewer Crossovers to Sewage Systems	Water Supply	Water Quality	Wetland Preservation
Baytown		Yes		Yes	Yes	
Galveston		Yes		Yes	Yes	Yes
La Porte		Yes	Yes	Yes	Yes	
Missouri City						Yes
Sealy	Yes		Yes	Yes		

Baytown, Galveston, and La Porte are in the process of updating their comprehensive plans. There are still many communities that have not completed comprehensive plans, but have entered into the Community Development Block Grant (CDBG) program. An element of the federally funded CDBG program is the study of infrastructure capacity needs and community priorities related to infrastructure development. In the last 10 years, the following communities in the non-entitlement areas of the region have received such funds (Harris County is an entitlement area, Fort Bend County has been entitlement since 1992):

- 1990 Kendleton
- 1991 Devers, Wallis
- 1992 Brookshire
- 1993 Cleveland, Liberty, Willis, Freeport
- 1994 Hitchcock, Columbus, Prairie View, Dickinson, Hempstead, Angleton, Ames
- 1995 Magnolia, Bay City, Holiday Lakes, Wharton, Montgomery, West Columbia, Palacios, Kemah, New Waverly, Brazoria, Alvin
- 1996 Huntsville, Brookshire, Sweeny, La Marque, Sealy
- 1997 League City
- 1998 Daisetta, Liverpool, Manvel
- 1999 Dayton, Anahuac, El Campo

Land Use Controls

In this study, land use controls encompass a broad range of local ordinances or development criteria that in some way impact land development in a community. This includes zoning ordinances, building codes, and subdivision regulations.

Zoning is the most common means of regulating local land use in the United States. Zoning is the division of a jurisdiction into districts (zones) within which permissible uses are prescribed and restrictions on building heights, layout, and other requirements are defined. As presented in Table 3, in the H-GAC region 22 communities have zoning ordinances. Ten of those ordinances include a zone for sensitive lands such as floodplains, waterways, and/or groundwater recharge zones. In these cases the sensitive areas are flood plains and the zones are based on FEMA requirements. Four of these communities have zones for agriculture and/or open space. These zones are often intended to change as growth occurs over time.

TABLE 3: ZONING ORDINANCES IN THE H-GAC REGION

Community	Zoning	Zoning for Sensitive Areas	Zoning for Open Space/ Agriculture/ Undeveloped Land
Angleton	Yes		
Baytown	Yes	Yes	
Bellaire	Yes	Yes	
Bunker Hill	Yes		
Clute	Yes		
Danbury	Yes		
El Campo	Yes	Yes	
Friendswood	Yes	Yes	
Galveston	Yes		Yes
Hilshire Village	Yes	Yes	
Huntsville	Yes		
Jersey Village	Yes	Yes	
La Porte	Yes		Yes
Lake Jackson	Yes	Yes	
Missouri City	Yes		Yes
Pearland	Yes		Yes
Santa Fe	Yes	Yes	
South Houston	Yes		
Spring Valley	Yes	Yes	
Taylor Lake	Yes	Yes	
Webster	Yes		
West U Place	Yes		

Building codes are a set of regulations that describe standards for the construction of new buildings. Building codes may affect water quality in two manners. First, they may set standards for plumbing, impacting the use of septic systems and types of hook-ups to water and sewer systems. Second, building codes can specify overall building design, such as building separation, yards, courts, parking and access to streets which will impact run-on/run-off of storm water. Forty-one respondents have building codes, of these, thirty-five specify sewer hook-ups and/or restrict the use of septic tanks or other on-site disposal methods. Appendix 3 illustrates the communities with building codes.

Subdivision regulations establish standards for the division of tracts of land into lots. Subdivision regulations are utilized by communities to ensure that new development has the necessary utilities, roadways and public facilities a new addition to community requires. Every community has a legitimate interest in ensuring that subdividers help pay the major portion of the cost for these services. Forty-two respondents have subdivision regulations, and forty in some way cover local street design or construction. As illustrated in Appendix 4, almost all have drainage system criteria. Park space dedication and open space requirements, while serving to provide areas for needed public facilities, also allow undevelopable areas to be excluded from residential or commercial buildout. Eighteen communities require park space dedication, and 12 require open space dedication. Eight require both park space and open space.

Zoning regulations, building codes, and subdivision regulations alone or in some combination can cover two areas important to water quality, lot coverage and landscaping. Appendix 5 illustrates the twenty-six communities in the H-GAC region that enforce lot coverage requirements. Some of these are simply setbacks, where front and side yard minimums are required. This allows utility easements, fire protection, drainage, and setbacks from street traffic. Other communities limit lot buildout by percentages. This may have the same desired effect as setbacks, but further protect the density of buildout.

Seventeen communities have landscaping ordinances, as illustrated in Appendix 6. Landscaping ordinances, requiring use of native vegetation, serves as both a conservation tool and protection against erosion and sedimentation in the long-term maintenance of a site.

**Erosion and
Sediment control
Measures**

Development projects have the potential for causing localized impacts on the quality of surface water and groundwater. Erosion from construction sites during clearing and grading operations and from cut-and-fill slopes left exposed after construction can result in the sedimentation of adjacent surface waters. Sediment can clog streams, infiltrate groundwater supplies, or wash downstream to lakes or estuaries polluting the water. In addition, once in place, developed areas can result in increased pollution of adjacent water resources by trash, oil grease, pesticides, fertilizers, and other toxic materials through spills and overuse of materials on the site. These pollutants can drain into adjacent water bodies and groundwater recharge zones.

Control measures to protect water quality are required under the Clean Water Act. The two most notable control measures are non-point source (NPS) management programs and storm-water discharge permits. Voluntary NPS management programs have been adopted by the TNRCC, Texas Department of Transportation (TxDOT), Texas State Soil and Water Conservation Board (TSSWCB) and H-GAC that recommend the use of Best Management Practices (BMPs) in construction projects.

Federal storm water discharge permits for construction projects over five acres are required by municipalities, state, and federal agencies in the region. Storm water, particularly from construction sites, greatly increases the potential for erosion and sedimentation. In addition construction projects may require the use of toxic or hazardous materials that may pollute storm water discharges from construction sites. The permit requires the use of BMPs in projects to protect the run-off from unwanted contamination.

Currently Houston, Harris County and Pasadena are required to complete an NPDES storm water management permit applications under Phase I implementation of the Clean Water Act storm water provisions. Phase II will be implemented in December 2002 for communities 50,000-100,000 in population size. Community facilities such as airports, landfills are required to have an NPDES discharge permit since they are considered industrial discharges of pollutants. Both types of discharge permits require the use of BMPs.

BMPs as a measure to protect water quality have been utilized for the past decade. Surprisingly little information is available about their performance, cost, and longevity. Still improved and more reliable designs are constantly evolving. The following is an overview of BMPs in use at this time:

- Native vegetation buffer zones allow temporary storage of run-off, separation for adjacent land uses, lower density development, and absorb and filter pollutants.
- Detention ponds provide temporary storage of run-off to allow sediments to settle, decrease the velocity of run-off, and absorb and filter pollutants.
- Dikes and swales are used to direct flow from an area to stabilized outlet or trapping device.
- Drains and flumes are used to convey concentrated surface runoff safely down slopes to a drainage point or pond.
- Fences made of filter fabric, straw bales, or brush is used to intercept and detain sediments and decrease the velocity of run-off.
- Infiltration trenches and basins are constructed to provide the benefits of both fences and either sediment basins or detention ponds.
- Mulching, seeding and sod grasses are used to stabilize disturbed areas, reduce erosion, and filter run-off.
- Rip Rap is permanent, erosion-resistant ground cover (such as gravel and stones) that protect erodible surfaces from high velocity run-off.
- Sediment basins intercept and collect sediments from run-off in a waterway to stop unwanted build-up of sediments and unnecessary discharges.

Local Governments may implement BMPs as a requirement for private builders in their development ordinances, as part of public works construction projects, or as part of long-term maintenance plans for public facilities. The results of the survey pertaining to BMP use in the H-GAC region are presented in Appendices 7-9. Eight communities require the use of BMPs during construction activities by private developers. Twenty require erosion and sediment control in its roadway and other capital construction projects. Thirteen communities emphasize permanent, long-term erosion/sediment control in the design of roadway and capital improvement projects, for implementation during actual operations of the facility. Many respondents list their guidelines as following “the law or EPA regulations.” This means most are just following the Federal guidance for storm water permits required when construction projects affect more than five acres. Therefore, those local governments who did not respond to this question are either not aware of the requirements, have not been involved in projects affecting more than five acres, or have not actively followed the guidelines in their projects.

Interestingly, more communities responded as using BMPs than those requiring the use of BMPs. That is probably true because many of the activities have been used for so long that they are not viewed as a BMP, and the community is not taking full credit for its use. Appendix 10 illustrates the types of BMPs in use by communities in the H-GAC region.

In 1990 H-GAC adopted erosion and sediment control guidelines as part of the region’s Water Quality Management Plan. These guidelines are intended to provide a framework that allows each jurisdiction to create an erosion control program that fits its particular needs. Only one community responded that it had used H-GAC’s *Action Guide: Erosion & Sediment Control*, however all respondents asked for copies of the guide.

Recommended Actions

Comprehensive Planning

- Communities should continue to create comprehensive plans. These comprehensive plans should include a discussion of water quality and other environmental issues, such as wetland protection, which can be addressed in future growth and development policies.
- The water quality issues which should be of particular interest and a focus in future plans are non-point source pollution and the use of erosion and sediment controls (best management practices) in future development.
- All planning efforts should utilize the H-GAC guides *Action Guide: Erosion & Sediment Control*, and *Land Use Management Techniques for Water Pollution Prevention* to strengthen the water quality element.
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- Detailed implementations of all types of land use controls may require an investment larger than some communities can afford. Therefore any type of land use control ordinance in place should contain one or more important elements, lot coverage, drainage system design and maintenance, and/or landscaping.
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General Recommendations

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- Local governments should be aware of what other communities in the region are doing related to planning and BMPs. That is the intent of this report. If you would like any additional information concerning an community's program, please contact them or H-GAC.
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APPENDIX 1
CENSUS POPULATION, 1860-1990, AND PROJECTED 2000
BY STATE, H-GAC REGION, AND COUNTY

Year	Texas	H-GAC	Austin	Brazoria	Chambers	Colorado	Fort								
							Bend	Galveston	Harris	Liberty	Matagorda	Montgomery	Walker	Waller	Wharton
1860	604,215	73,810	10,139	7,143	1,508	7,885	6,143	8,229	9,070	3,189	3,454	5,479	8,191	--	3,380
1870	818,579	99,688	15,087	7,527	1,503	8,326	7,114	15,290	17,375	4,414	3,377	6,483	9,766	--	3,426
1880	1,591,749	149,149	14,429	9,774	2,187	16,673	9,380	24,121	27,985	4,999	3,940	10,154	12,024	9,024	4,459
1890	2,235,527	181,755	17,859	11,506	2,241	19,512	10,586	31,476	37,249	4,230	3,985	11,765	12,874	10,888	7,584
1900	3,048,710	263,493	20,676	14,861	3,046	22,203	16,538	44,116	63,786	8,102	6,097	17,067	15,813	14,246	16,942
1910	3,896,542	321,750	17,699	13,299	4,234	18,897	18,168	44,479	115,693	10,986	13,594	15,679	16,061	12,138	21,123
1920	4,663,228	427,107	18,874	20,614	4,162	19,013	22,931	53,150	186,667	14,637	16,589	17,334	18,556	10,292	24,288
1930	5,824,715	630,557	18,860	23,053	5,710	19,129	29,718	64,401	359,328	19,868	17,678	14,588	18,528	10,014	29,681
1940	6,414,824	846,841	17,384	27,069	7,511	17,812	32,963	81,173	528,961	24,541	20,066	23,055	19,868	19,280	36,158
1950	7,711,194	1,178,475	14,663	46,549	7,871	17,576	31,056	113,066	806,701	26,729	21,559	24,504	20,163	11,961	36,077
1960	9,579,677	1,698,748	13,777	76,204	10,379	18,463	40,527	140,364	1,243,158	31,595	25,744	26,839	21,475	12,071	38,152
1970	11,196,730	2,305,106	13,831	108,312	12,187	17,638	52,314	169,812	1,741,912	33,014	27,913	49,479	27,680	14,285	36,729
1980	14,229,191	3,276,239	17,726	169,587	18,538	18,823	130,846	195,940	2,409,547	47,088	37,828	128,487	41,789	19,798	40,242
1990	16,986,510	3,897,147	19,832	191,707	20,088	18,383	225,421	217,399	2,818,199	52,726	36,928	182,201	50,917	23,390	39,955
2000	18,673,143	4,634,442	20,809	225,358	20,892	18,132	332,865	234,988	3,320,437	60,417	38,590	241,384	52,748	26,782	41,040

Source: Texas State Data Center, H-GAC Regional Data Book 1982, and U. S. Department of Commerce 1991

APPENDIX 2
CENSUS POPULATION 1970-1990 AND PROJECTED 2000
BY STATE, H-GAC REGION, AND COUNTY

City or CDP	1970	1980	1990	2000 (projected)*
<i>Austin County</i>				20,809
Sealy	2,685	3,878	4,541	
<i>Brazoria County</i>				225,358
Alvin	10,671	16,515	19,220	
Angleton	9,770	13,929	17,140	
Brazoria	1,681	3,025	2,717	
Clute	6,023	9,577	8,910	
Danbury	807	1,357	1,447	
Lake Jackson	13,376	19,102	22,776	
Manvel	106	3,549	3,733	
Pearland (part)*	6,444	12,461	17,234	
<i>Chambers County</i>				20,892
Anahuac	1,861	1,840	1,993	
Baytown (part)*				
<i>Fort Bend County</i>				332,865
Houston (part)*		16,270	27,027	
Missouri City (part)*	4,136	20,597	32,219	
Needville	1,024	1,417	2,199	
Rosenburg	12,098	17,995	20,183	
Thompsons		240	167	
<i>Galveston County</i>				234,988
Friendswood(part)*	5,675	10,719	14,979	
Galveston	61,809	61,902	59,070	
Santa Fe		6,172	8,429	
Tiki Island			537	
<i>Harris County</i>				3,320,437
Baytown	43,980	56,917	61,126	
Bellaire	19,009	14,950	13,842	
Bunker Hill Village	3,977	3,750	3,391	
Friendswood (part)*			7,835	
Hilshire Village	627	621	665	
Houston (part)*	1,232,802	1,578,849	1,603,524	
Jersey Village	765	4,084	4,826	
La Porte	7,149	14,062	27,910	
Missouri City (part)*		3,936	3,957	
Pearland (part)*		787	1,463	
South Houston	11,527	13,293	14,207	
Spring Valley	3,170	3,353	3,392	
Taylor Lake Village	1,004	3,669	3,394	
Tomball	2,734	3,996	6,370	
Waller (part)*		164	170	
Webster	2,231	2,405	4,678	
West University Place	13,317	12,010	12,920	
<i>Liberty County</i>				60,417
<i>Matagorda County</i>				38,590
Bay City	11,733	17,837	18,170	

City or CDP	1970	1980	1990	2000 (projected)*
<i>Montgomery County</i>				241,384
Splendora		721	745	
Woodbranch Village	378	720	1,312	
Woodloch		351	291	
<i>Walker County</i>				52,748
Huntsville	17,610	23,936	27,925	
New Waverly	496	824	936	
Riverside		425	451	
<i>Waller County</i>				26,782
Brookshire	1,683	2,175	2,922	
Hempstead	1,891	3,456	3,551	
Pattision		318	327	
Waller (part)*	1,123	1,077	1,323	
<i>Wharton County</i>				41,040
El Campo	9,332	10,462	10,511	

Sources: Texas State Data Center, H-GAC Regional Data Book 1982, and U. S. Department of Commerce 1991

**APPENDIX 3
BUILDING CODES IN THE H-GAC REGION**

Community	Building Codes	Restrict Septic Systems	Community	Building Codes	Restrict Septic Systems
Chambers County	Yes	Yes	Lake Jackson	Yes	Yes
Alvin	Yes	Yes	Liberty	Yes	Yes
Anahuac	Yes	No	Manvel	Yes	Yes
Angleton	Yes	Yes	Missouri City	Yes	Yes
Baytown	Yes	Yes	Needville	Yes	Yes
Bay City	Yes	Yes	Pearland	Yes	Yes
Bellaire	Yes	Yes	Rosenburg	Yes	No
Brazoria	Yes	Yes	Santa Fe	Yes	No
Brookshire	Yes	Yes	Sealy	Yes	Yes
Bunker Hill Village	Yes	Yes	South Houston	Yes	Yes
Clute	Yes	Yes	Splendora	Yes	Yes
Danbury	Yes	Yes	Spring Valley	Yes	Yes
El Campo	Yes	No	Taylor Lake Village	Yes	Yes
Friendswood	Yes	No	Tiki Island	Yes	Yes
Galveston	Yes	Yes	Tomball	Yes	No
Hempstead	Yes	Yes	Waller	Yes	Yes
Hilshire Village	Yes	Yes	Webster	Yes	Yes
Houston	Yes	Yes	West University Place	Yes	Yes
Huntsville	Yes	Yes	Woodbranch Village	Yes	Yes
Jersey Village	Yes	Yes	Woodloch	Yes	Yes
La Porte	Yes	Yes			

**APPENDIX 4
SURVEY RESPONDENTS SUBDIVISION REGULATIONS
IN THE H-GAC REGION**

Community	Uses Subdivision Regulations	Requires Roads	Has Road Design Standards	Road Dedication Procedures	Drainage System Design	Drainage System Maintenance	Lot Coverage Requirement	Park Dedication	Open Space Dedication	Other Community Facilities
Austin County	Yes	Yes	Yes	Yes	Yes					
Chambers County	Yes						Yes	Yes	Yes	Yes
Matagorda County	Yes	Yes	Yes	Yes	Yes					
Alvin	Yes	Yes	Yes	Yes	Yes		Yes			
Anahuac	Yes									
Angleton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Baytown	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	
Bay City	Yes	Yes	Yes	Yes	Yes		Yes	Yes		
Bellaire	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	
Brazoria	Yes	Yes	Yes	Yes	Yes	Yes				
Brookshire	Yes	Yes	Yes		Yes			Yes		
Bunker Hill Village	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Clute	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Danbury	Yes	Yes	Yes	Yes	Yes					
El Campo	Yes	Yes	Yes	Yes	Yes	Yes				
Friendswood	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes
Galveston	Yes	Yes	Yes	Yes	Yes					
Hempstead	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hilshire Village	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Houston	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Huntsville	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Jersey Village	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
La Porte	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Lake Jackson	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Liberty	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Manvel	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes
Missouri City	Yes	Yes					Yes	Yes	Yes	
Needville	Yes	Yes	Yes	Yes			Yes			
New Waverly	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Community	Uses Subdivision Regulations	Requires Roads	Has Road Design Standards	Road Dedication Procedures	Drainage System Design	Drainage System Maintenance	Lot Coverage Requirement	Park Dedication	Open Space Dedication	Other Community Facilities
Pattison	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Pearland	Yes	Yes	Yes	Yes	Yes	Yes				
Rosenburg	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Santa Fe	Yes	Yes	Yes	Yes	Yes		Yes			
Sealy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Splendor	Yes	Yes	Yes	Yes	Yes	Yes				
Spring Valley	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Taylor Lake Village	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Tomball	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Waller	Yes	Yes	Yes	Yes			Yes			
Webster	Yes	Yes	Yes	Yes	Yes	Yes	Yes			
Woodbranch Village	Yes				Yes	Yes	Yes	Yes		
Woodloch	Yes			Yes		Yes				

APPENDIX 5 LOT COVERAGE REQUIREMENTS

Community	Lot Coverage	How
Baytown	Yes	
Bellaire	Yes	55-60% Lot Coverage
Bunker Hill Village	Yes	10,000sq. ft. lots = 60% 20,000 or larger = 40%
Clute	Yes	
Danbury	Yes	Setback requirements: 25 ft. front, 5 ft. side, 7ft. back
El Campo	Yes	Varies, depends on zone and use
Friendswood	Yes	The zoning ordinance limits the total amount of lot coverage by a building. This percentage is based upon the zoning category.
Galveston	Yes	100 sq. feet of open space required for each dwelling unit.
Hilshire Village	Yes	The non-permeable constructed surface must not exceed 60% behind the front building line and 50% in front of the building line.
Jersey Village	Yes	At least 10% of the total area within the property lines shall be landscaped area.
La Porte	Yes	Varies by zoning classification
Lake Jackson	Yes	Varies by zone
Missouri City	Yes	Depends on zoning classification
Needville	Yes	Front and side setback requirements
New Waverly	Yes	Subdivision and manufactured home ordinance requires 12,000sq. feet per dwelling.
Pearland	Yes	Coverage applies to building footprints only. Maximum coverage varies by zoning designation.
Santa Fe	Yes	
Sealy	Yes	Percentage of lot coverage varies on type of development, ranges from 30% to 90%
South Houston	Yes	
Spring Valley	Yes	Lot coverage is limited to 60% of the area behind the front building line and no more than 50% of the area in front of the building line.
Taylor Lake Village	Yes	Shall not exceed 25% exclusive of swimming pool and tennis courts. Waterfront is limited to 27%
Tiki Island	Yes	Deed restrictions for sections
Tomball	Yes	Building setback line
Webster	Yes	Percentage of lot covered by building only
West University Place	Yes	Maximum 80%
Woodbranch Village	Yes	

APPENDIX 6 LANDSCAPING REQUIREMENTS

Community	Landscaping	How
Baytown	Yes	
Bellaire	Yes	Subject to Community Development Department approval
El Campo	Yes	Minimal- Grass and Trees
Friendswood	Yes	Requires a set amount of landscaping area based upon the parking lot size and a certain number of trees based upon the lot frontage and number of islands in the parking lot.
Galveston	Yes	Landscape screening required for all parking/servicing areas visible from right of way. Landscaping include shrubs.
Houston	Yes	
Huntsville	Yes	10% of lot required to be landscaped, minimum number of canopy trees required, disbursement of landscaping is regulated.
Jersey Village	Yes	Minimum number of trees for different lot sizes is determined by an ordinance.
La Porte	Yes	Varies by zoning classification
Lake Jackson	Yes	For commercial areas, varies by size of tract. 5-10% of area not covered by a structure must be left green.
Manvel	Yes	Not yet approved, governs commercial activity along major thoroughfares.
Missouri City	Yes	
Pearland	Yes	Minimum number of trees/shrubs required based on lot frontage. Also have a tree preservation ordinance.
Santa Fe	Yes	Subdivision ordinance and zoning ordinance have limited landscaping requirements.
Spring Valley	Yes	Tree ordinance requires replacement of trees removed by development and planting of additional trees.
Tomball	Yes	Apartments- 500 sq. ft./ Apartment Unit
Webster	Yes	Landscaping ordinance
West University Place	Yes	Tree Preservation Ordinance

APPENDIX 7
BMPs FOR CONSTRUCTION PROJECTS

Community	BMPs	How
Bunker Hill Village	Yes	All construction sites are required to retain all sediment on site with filter fences or hay bales.
Friendswood	Yes	City code section 66-28 prohibits the depositing of soils on streets.
Hempstead	Yes	Filter fabric fences.
Houston	Yes	The use of silt fences and construction controls on site.
Jersey Village	Yes	Stage I storm water regulations received by consulting engineer.
La Porte	Yes	Statutory
Pearland	Yes	Follows EPA regulations
Taylor Lake Village	Yes	No sediment run-off allowed from construction sites. Sediment barriers trap sediment before it enters storm sewers.

APPENDIX 8
BMPs FOR ROADWAYS AND OTHER LOCAL PROJECTS

Community	BMPs	How
Chambers County	Yes	
Angleton	Yes	
Bunker Hill Village	Yes	They are all part of all construction specifications.
Clute	Yes	
Friendswood	Yes	Silt fencing and erosion protection are specified for all storm sewer inlets and earthwork on all Capital Improvement Projects.
Hempstead	Yes	Filter fabric fences.
Houston	Yes	Use of all construction controls.
Huntsville	Yes	
Jersey Village	Yes	
La Porte	Yes	Statutory
Lake Jackson	Yes	As required by law.
Missouri City	Yes	Minimal SWPPP to protect existing infrastructure.
Needville	Yes	Grass seed and sod.
Pearland	Yes	EPA regulations
Rosenburg	Yes	
Sealy	Yes	Comply with regulations per engineer requirements for compliance.
Spring Valley	Yes	City projects comply with stormwater pollution prevention requirements of the EPA.
Taylor Lake Village	Yes	Written into contracts.
Tomball	Yes	As per Federal Law.

APPENDIX 9
BMP DESIGN FOR LONG TERM PROJECT USE

Community	BMPs Long Term	How
Chambers County	Yes	
Angleton	Yes	
Bellaire	Yes	Drainage design
Friendswood	Yes	Project design emphasizes long term erosion control by limiting velocities in storm sewers, specifying concrete rip rap and slope paving, and by specifying maximum slopes for all earthwork embankments.
Hempstead	Yes	
Houston	Yes	The use of concrete road curbs, natural open ditches, seeding and sod grass, and storm inlet drain protections.
Jersey Village	Yes	Drainage design reviewed and approved by consulting engineer.
Missouri City	Yes	
Pearland	Yes	Maximum side slopes.
Rosenburg	Yes	
Sealy	Yes	Engineering review of projects to determine best management practices, such as sodding, concrete, rip-rap, etc.
Spring Valley	Yes	All city projects require solid sodding of disturbed areas.
Taylor Lake Village	Yes	In new roadway designs we use retaining walls and grass planted swales for additional storm water drainage and filtration.

APPENDIX 10
BMP MEASURES USED IN THE H-GAC REGION

Community	Buffer Zones	Detention Ponds	Dikes & Swales	Drains & Flumes	Filter Fabric	Infiltration basins	Mulching	Rip-Rap	Seeding & Sod	Sediment Basins	Straw Bales	Drain Inlet Protection
Austin County							Yes	Yes	Yes		Yes	
Chambers County		Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes	Yes
Matagorda County								Yes	Yes			
Angleton		Yes		Yes				Yes				Yes
Baytown		Yes			Yes		Yes		Yes		Yes	Yes
Bay City								Yes				
Bellaire		Yes	Yes	Yes					Yes			
Brookshire							Yes	Yes				Yes
Bunker Hill Village			Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes
Clute									Yes			Yes
Friendswood		Yes	Yes		Yes			Yes	Yes		Yes	Yes
Hempstead	Yes	Yes			Yes		Yes	Yes	Yes		Yes	Yes
Houston									Yes			Yes
Huntsville	Yes	Yes	Yes	Yes	Yes			Yes	Yes		Yes	
Jersey Village		Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes	Yes
La Porte	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lake Jackson		Yes			Yes			Yes	Yes			
Manvel		Yes										
Missouri City					Yes			Yes	Yes			Yes
Needville				Yes				Yes	Yes			
Pearland		Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes	Yes
Rosenburg		Yes						Yes				Yes
Santa Fe		Yes										
Sealy		Yes	Yes	Yes	Yes		Yes	Yes	Yes		Yes	Yes
Spring Valley			Yes		Yes			Yes	Yes			Yes
Taylor Lake Village		Yes	Yes		Yes			Yes	Yes		Yes	Yes
Tomball		Yes					Yes	Yes	Yes			