Appendix J to the Houston-Galveston Area Council Clean Rivers Program FY 2014/2015

Site Characterizations

Prepared by the Houston-Galveston Area Council (H-GAC) in cooperation with the Texas Commission on Environmental Quality (TCEQ)

Effective: Immediately upon approval by all parties

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SS-A1 Approval Page

Texas Commission on Environmental Quality

Water Quality Planning Division

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Clean Rivers Program

Allison Fischer — Date 6/8/15
CRP Project Quality Assurance Specialist

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Project Manager, CRP

Monitoring Division

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Houston-Galveston Area Council (H-GAC)

Todd Running — Date: 6/8/15
H-GAC Project Manager

Jean Wright — Date: 6/8/15
H-GAC Quality Assurance Officer

SS-A2 Table of Contents

List of Acronyms

As described in Section A2 of the H-GAC's basin-wide QAPP dated September 19, 2013.

SS-A3 Distribution List

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The Houston-Galveston Area Council (H-GAC) will provide copies of this project plan and any amendments or appendices of this plan to each person on this list and to each sub-tier project participant, e.g., subcontractors, other units of government. H-GAC will document distribution of the plan and any amendments and appendices, maintain this documentation as part of the project's quality assurance records, and will ensure the documentation is available for review.

SS-A4 PROJECT/TASK ORGANIZATION

Description of Responsibilities

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

Project Organization Chart

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

SS-A5 Problem Definition/Background

Elevated levels of bacteria and/or low dissolved oxygen concentrations are recurring conditions in waterways throughout the greater Houston area. It has been suggested these same waterways, many of which are unclassified small ditches and/or concrete channels, should not be assessed using the state of Texas default water quality standard of a presumed 'High Aquatic Life Use.' Rather, site specific standards should be developed and applied to these waterways. Hence, H-GAC initiated a special study to examine and map the types of environmental factors which may influence water quality.

In FY2008, the City of Houston Health & Human Services Department (HHS) began conducting investigations into the causes of some of the most problematic areas of the city. These investigations had a two-fold purpose. Initially, the city was looking to identify illicit discharges and eliminate sources of pollution which could be directly related to water quality issues. Secondly, information was needed by the TCEQ assessor to help apply the correct standards to the various urban stream/waterways in the region. Information regarding physical characteristics of the waterway, bank habitat characteristics, and land cover of the watershed upstream from each monitoring site, and potential sources of pollution upstream of each targeted site were needed. The site characterization information was then made available to the TCEQ to help assessors determine whether the appropriate water quality standard was being applied during the biannual assessment.

In 2007, TCEQ provided H-GAC with a list of assessment units and monitoring stations that would potentially benefit from a site characterization study. Between 2008 and 2011, HHS completed 60 site characterizations from the list. Then, H-GAC completed an additional 12 site characterizations in 2013 working from the same list and using the same methodologies and forms as employed by HHS. All 72 final reports were submitted to TCEQ and made available for use by the regional assessor during development of the biennial Texas Integrated Report.

During FY2015, H-GAC will conduct 5 or 6 additional site characterizations depending on time and accessibility to the specific waterway. The list of monitoring sites being characterized under this special study mapping project can be found in Table SS-B1. A map showing where the sites are located can be found in Figure SS-B1.

SS-A6 Project/Task Description

These targeted site characterizations will be completed using a two tiered approach.

Tier I addresses the immediate sampling site and the visible upstream area at every sampling location chosen to be characterized. H-GAC's standard Habitat Survey Form and photographs are used to document observations regarding the general physical and vegetative characteristics of the stream as well as any anthropogenic influences visible upstream of the immediate sampling location. The survey form can be found in Appendix A.

Tier II involves a more detailed evaluation of the waterbodies within that defined watershed and the watershed upstream of each characterized monitoring station. The characterized area includes the watershed between the identified monitoring stations and the next upstream monitoring station.

Particular effort will be made to identify potential sources of pollution. Methods may include review of aerial photos, windshield surveys, walking the stream bank, or canoeing the waterway. All potential sources of pollution, such as, permitted and illicit wastewater and stormwater outfalls will be documented and their position captured using Global Positioning System (GPS) technology or H-GAC's Geographical Information Management System (GIMS). The survey forms for these activities can also be found in Appendix A.

All potential pollution sources identified during Tier I and Tier II surveys will be submitted to the appropriate city or agency for further investigation or resolution. Identifying the sources of pollution will allow the city or agency to prioritize their resources to fix the problems and will, hopefully, result in improved water quality conditions at these sites.

A short report of approximately 1-5 pages in length along with photographs and maps will be submitted to TCEQ following completion of each site characterization. All reports will be submitted to TCEQ before the end of July 2015.

No surface water quality data will be collected during these characterization surveys and, therefore, no data will be submitted to SWQMIS.

Amendments to the QAPP

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and

Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

SS-A7 Quality Objectives and Criteria

The objective of this project will be to characterize the physical attributes of the waterway upstream of selected monitoring stations listed in the coordinated monitoring schedule, identify potential sources and causes of nonpoint source pollution in the upstream watersheds, and share the maps, photographs, and final reports with the TCEQ assessor and the appropriate city or municipal utility district to resolve any issue(s) or initiate further investigation(s).

There are no measurement performance specifications for this project and therefore no need for Table SS-A7.1.

Ambient Water Reporting Limits (AWRLs)

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project.

Precision

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project.

Bias

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project.

Representativeness

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project.

Comparability

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project.

Completeness

Completeness as described in Section A7 of the basin-wide QAPP is not applicable to this project. Rather, for this project, completeness is related to the thoroughness of the investigations in the field, surveying aerial photography back in the office, and documentation provided with final reports.

SS-A8 Special Training/Certification

As described in Section A4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015. No additional specialized training is required to complete this project.

SS-A9 Documents and Records

The documents and records that describe, specify, report, or certify activities are listed. The list below is limited to documents and records that may be requested for review during a monitoring systems audit.

Table SS-A9.1a – Project Documents and Records – H-GAC

Document/Record	Location	Retention (yrs)	Format
QAPPs, amendments and appendices	H-GAC	7	Paper & electronic
Field SOPs	H-GAC	7	Paper & electronic
QAPP distribution documentation	H-GAC	7	Paper
Field staff training records	H-GAC	7	Paper
Field notebooks or data sheets	H-GAC	7	Paper
Corrective Action Documentation	H-GAC	7	Paper & electronic
Final Reports	H-GAC	7	Paper & electronic

SS-B1 Sampling Process Design

The data collection design is summarized in Table SS-B1 (Sampling Sites and Monitoring Frequencies) and Figure SS-B1 (Sample Site Maps).

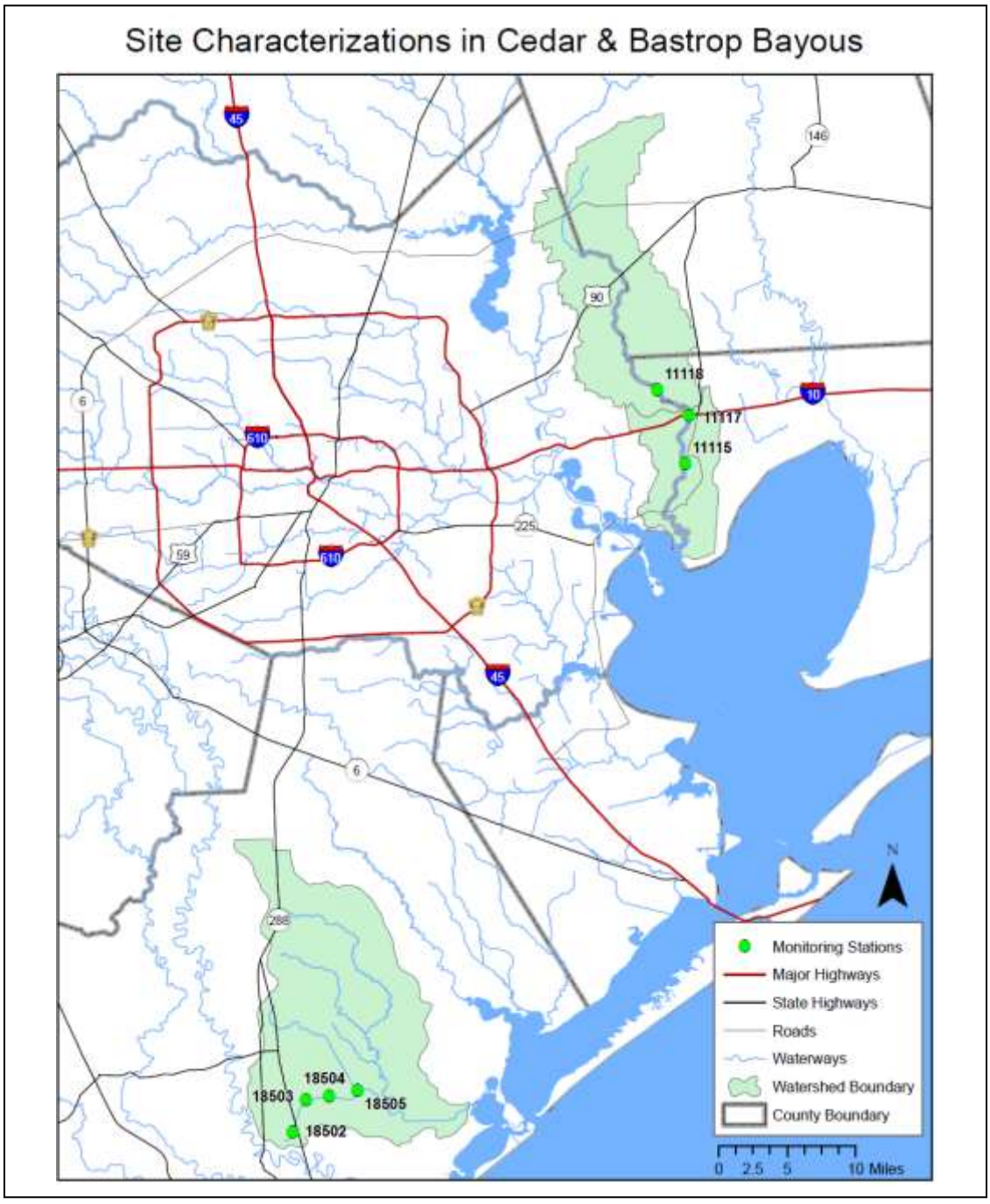
Table SS-B1.1 Sample Design and Schedule, FY 2015

Site Description	Station ID	Waterbody ID	Basin	Region	Frequency
CEDAR BAYOU TIDAL MID CHANNEL 45 M DOWNSTREAM OF SH 146 NORTHEAST OF BAYTOWN	11115	0901	9	12	1
CEDAR BAYOU TIDAL AT IH 10 EASTBOUND BRIDGE SOUTH OF MONT BELVIEU EAST SIDE OF BAYOU	11117	0901	9	12	1
BASTROP BAYOU OFF BAYOU WOOD DR DUE EAST OF BRAZORIA CR 201 AT BASTROP BAYOU DR APPROX 1.1 KM UPSTREAM OF SH 288B IN RICHWOOD VILLAGE	18502*	1105	11	12	1
BASTROP BAYOU TIDAL APPROXIMATELY 15 M OFF NORTH BANK AND 1.55 KM UPSTREAM OF FM 2004 IN RICHWOOD VILLAGE	18503	1105	11	12	1
BASTROP BAYOU TIDAL MID CHANNEL AT NORTH END OF BASTROP BEACH ROAD 350 M DOWNSTREAM OF FM 523 SE OF ANGLETON	18504	1105	11	12	1
BASTROP BAYOU TIDAL 38 M NORTH OF N END OF COMPASS DR/BRAZORIA CR 504 APPROXIMATELY 4.4 KM DOWNSTREAM OF FM 523 SE OF ANGLETON	18505	1105	11	12	1

*Accessibility to this stream section may prevent completion of a site characterization at this time.

Figure SS-B1. Sampling Site Map

A map of stations to be characterized by the H-GAC are provided below. The map was generated by H-GAC. This product is for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. For more information concerning this map, contact Jean Wright at 713-499-6660. Station 11118, pictured below is not included in this study.



Sample Design Rationale and Site Selection Criteria

Numerous factors were evaluated before selecting the six monitoring stations listed in Table SS-B1.1 above. H-GAC completed a basic statistical analysis of bacteria, nitrate-N, total phosphorus, and total suspended solids data from all monitoring stations in this region from the past seven years. Those sites that showed the most significant impairments percentage wise were compared to the list of segments, assessment units, and site numbers previously provided by TCEQ as being potential sites for characterizations. If a characterization had already been completed in the last six years, the site was removed from the current list of potential sites. Next, sites were culled from the overall list if a TMDL had been completed and an I-plan was underway. Lastly, H-GAC looked at other water resource projects that could benefit from the information gathered during the characterizations and how quickly could the investigations be completed. The six sites were chosen because of their proximity to each other which would facilitate completing the field work.

SS-B2 Sampling Methods

Field Sampling Procedures

As described in Section B2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Sample volume, container types, minimum sampling volume, preservation requirements, and holding time requirements

As described in Section B2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Sample Containers

As described in Section B2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Processes to Prevent Contamination

As described in Section B2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Documentation of Field Sampling Activities

Field investigation activities are documented on field data sheets as presented in Appendix A. The following will be recorded for all Tier I site visits and repeated for all Tier II investigations:

Station ID and Description
Survey Date
Surveyor's name
Location / Perspective at site
Width of stream
Width of channel
Bank angle
A hand drawn illustration of stream cross section
Physical Characteristics
Vegetative Characteristics
Aquatic Life Activity
Anthropogenic influences
Other Influences on Stream Character

The following will be recorded for all Tier II surveys:

Outfall Descriptions
- Type of outfall (pipe/ditch/tributary/other)
- Side of channel (right bank/left bank)
- Size/material of outfall
- Presence or absence of flow
- Days since last rainfall

Recording Data

As described in Section B2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

Sampling Method Requirements or Sampling Process Design Deficiencies, and Corrective Action

As described in Section B2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

SS-B3 Sample Handling and Custody

As described in Section B3 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Chain-of–Custody

As described in Section B3 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Sample Labeling

As described in Section B3 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Sample Handling

As described in Section B3 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Sample Tracking Procedure Deficiencies and Corrective Action

As described in Section B3 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

SS-B4 Analytical Methods

As described in Section B4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Standards Traceability

As described in Section B4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Analytical Method Deficiencies and Corrective Actions

As described in Section B4 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

SS-B5 Quality Control

Sampling Quality Control Requirements and Acceptability Criteria

As described in Section B5 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Laboratory Measurement Quality Control Requirements and Acceptability Criteria

As described in Section B5 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

Quality Control or Acceptability Requirements Deficiencies and Corrective Actions

As described in Section B5 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

SS-B6 Instrument/Equipment Testing, Inspection, and Maintenance

As described in Section B6 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project. However, a hand held GPS unit may be used to collect global positioning coordinates identifying potential sources of pollution or points of discharge during field surveys. Operation and maintenance manual and SOP for the unit is included in Appendix B.

SS-B7 Instrument Calibration and Frequency

As described in Section B7 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project. However, a hand held GPS unit may be used to collect global positioning coordinates identifying potential sources of pollution or points of discharge during field surveys. Operation and maintenance manual and SOP for the unit is included in Appendix B.

SS-B8 Inspection/Acceptance of Supplies and Consumables

As described in Section B8 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project.

SS-B9 Acquired Data

As described in Section B9 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no acquired data will be entered into SWQMIS. Potential sources of pollution and/or discharges identified during field and windshield surveys will be verified against aerial photos and GIS maps maintained by H-GAC (See SS-B10).

SS-B10 Data Management

As described in Section B10 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no samples are collected. H-GAC's Data Management Plan (The Plan) found in Appendix C outlines the standard policies and procedures for data management within the Community and Environmental Planning Department. The Plan covers the management of both tabular (non-geographic) and spatial (geographic) datasets. Its primary purpose is to ensure efficient access to and maintenance of these datasets within the C&E Geospatial/Geographic Information Systems (GIS) environment.

Data Dictionary

As described in Section B10 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, are not applicable to this project because no field samples will be collected during this project and no data will be submitted to SWQMIS.

SS-C1 Assessments and Response Actions

As described in Section C1 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

Corrective Action

As described in Section C1 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015, however a nonconformance can only be related to documentation of findings in the field.

SS-C2 Reports to Management

Reports to H-GAC Project Management

As described in Section C2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

Reports to TCEQ Project Management

As described in Section C2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

Reports by TCEQ Project Management

As described in Section C2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

SS-D1 Data Review, Verification, and Validation

As described in Section D1 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

SS-D2 Verification and Validation Methods

As described in Section D2 of H-GAC's basin-wide QAPP approved September 13, 2013 and Amendment #2 to H-GAC's basin-wide QAPP approved April 10, 2015.

SS-D3 Reconciliation with User Requirements

Data produced in this project will be reconciled for consistency and completeness across all investigations. All reports will be provided to the appropriate city or entity for resolution of further investigation. Reports will also be made available to TCEQ's for support when completing the next Texas Integrated Report (TIR).

SS-APPENDIX A – Tier I and Tier II Field Data Sheets

Tier I & II - Watershed Assessment Summary & Checklist

Please check All at the completion of the survey

_____ Provide watershed map

_____ Estimate Sq. miles of Watershed Assessed

_____ Analyze Landcover (%)

_____ Identify Suspect Properties

_____ Conduct Windshield Survey

_____ Show route driven on map

_____ Identify Potential Pollution Sources

_____ List referrals for further action

Include:

_____ 3-Page Station Characterization and Habitat Survey Form

_____ 2-Page Waterway Characterization Form

_____ Outfall Description Form

Tier I - Station Characterization and Habitat Survey Field Form

Site Description _____ Photo Format Digital Print No Photo

Site ID _____ Date of Survey _____

Monitoring Agency _____ Survey Conductor _____

Location/Perspective _____ Angle of banks _____

Width of stream _____ Width of channel _____

THE TEXAS CLEAN RIVERS PROGRAM

Cross section illustration

Please fill-in all that apply
Include any additional comments in the "Notes:" section or at the end of the datasheet

Physical Characteristics

Main Channel (natural or channelized)

natural- contains bends and point bars	channel widened (no concrete)	channel straightened (no concrete)	concrete present

Notes:

Tributaries

Number	distance from sampling point	natural or altered	additional comments

Notes:

If stream banks have different characteristics, please note and label each bank separately. Right and left banks are determined by facing downstream. Per SWQM Procedures Vol. 2 Manual (June 2007)

Bank characteristics = 100%

natural vegetation	mowed grasses	bare soil	pervious concrete/mats	rip rap	concrete
%	%	%	%	%	%

Notes:

Bank stability

stable- little evidence (<10%) of erosion or bank failure	moderately stable-10-30% eroded or bank failure; small areas of erosion	moderately unstable-30-50% eroded or bank failure; high potential for erosion	unstable- >50% eroded or bank failure; steep banks	concrete

Notes:

Substrate

stable- >50% gravel or larger substrate	moderately stable-30-50% gravel with some finer sediments	moderately unstable-10-30% gravel; dominant type is mix with sand	unstable- <10% gravel or larger; uniform sand, silt, or clay bedrock	concrete

Notes:

Aquatic Habitat Present

logs/branches	wetland vegetation	pools	tires	other
Abundance:	Abundance:	Abundance:	Abundance:	Abundance:

Notes:

Water color

brown	light brown	green	clear	other

Check One:

Water clarity

heavy turbidity	moderate turbidity	slight turbidity	clear

Check One:

Overall aesthetics

wilderness- outstanding natural beauty; wooded or pastured area	natural area- trees and/or native vegetation with some development	common setting- not offensive; area is developed, but uncluttered such as an urban park	offensive- stream does not enhance the area; highly developed;

Check One:

Vegetative Characteristics

If banks have different characteristics, please note and label each bank separately

Position of riparian vegetation

overhanging	immediately adjacent to stream bank	mowed buffer with vegetation outside buffer	no riparian habitat

Check One:

Density of riparian vegetation

dense - difficult to walk through	moderate - somewhat difficult to walk through	sparse- easy to walk through	no riparian habitat

Check One:

Width of buffer zone

extensive- width of natural buffer is > 20m	wide- width of natural buffer is 10-20m	moderate- width of natural buffer is 5-10m	narrow- width of natural buffer is <5m	no riparian habitat

Check One:

Terrestrial/Riparian vegetation present = 100%

mowed	tall grass	shrubs	young trees	fully developed trees	no riparian habitat
%	%	%	%	%	

Aquatic vegetation present

submerged	emergent	algae common	no aquatic vegetation
Abundance:	Abundance:	Abundance:	

Notes:

Aquatic Life Activity

Aquatic activity

abundant - a lot of observed activity	some - occasional activity observed	none visible
		Reason:

Notes:

Fish populations

diverse	1-2 species	none visible
		Reason:

Notes:

Reason Codes:

Distance from waterbody **(DT)**

Depth of waterbody **(DP)**

Turbidity **(T)**

Site ID_____ Date of Survey_____ page ___ of ___

Benthic populations
Notes:

diverse	1-2 species	none visible
		Reason:

Obstructions **(O)**

Visible But None Present **(NP)**

Other wildlife present
Notes:

diverse	1-2 species	none visible
		Reason:

Anthropogenic Influences

**** If item is present, please complete the rest of the boxes for that section***

Stormdrains upstream and size
Notes:

present/not present	distance from sampling point	size

Treatment Plant Outfalls or Other outfalls present upstream and size
Notes:

present/not present	distance from sampling point	size

Trash present
Notes:

present/not present	type	location

Shoreline protection (bays, estuaries, lakes)
Check One:

rip rap	concrete	bulkheads	none

Type of land use or land cover in the immediate vicinity = 100%
Notes:

natural area or park	residential	commercial	light industry	industry	agriculture
%	%	%	%	%	%

Other Influences on Stream Character:

Please note any other features in the immediate vicinity as well as upstream that may affect the quality of the environment at this sampling location

Tier II - Waterway Characterization and Habitat Survey Field Form

Segment no. _____ Photo Format Digital Print No Photo

Reference Station _____ Date of Survey(s) _____
Site ID from station characterization form

Location of Reference Station _____ _____

Estimated area surveyed _____ Watershed Length _____

Assess stream upstream from sampling station. Assess main channel and all tributaries on separate sheets. Provide a aerial view map showing main channel with tributaries numbered.

Channel Characteristics

Main Channel_____ **Tributary**_____

There are _____ Tributary forms

natural- contains bends and point bars	channel widened (no concrete)	channel straightened (no concrete)	concrete present

Left or Right Bank	distance from reference site to confluence	natural or altered	additional comments

If stream banks have different characteristics, please note and label each bank separately. Right and left banks are determined by facing downstream. This is per SWQM Procedures Vol. 2 Manual (June 2007)

Physical Characteristics

Bank characteristics =	natural vegetation	mowed grasses	bare soil	pervious concrete/mats	rip rap	concrete
	%	%	%	%	%	%
Bank stability	stable- little evidence (<10%) of erosion or bank failure	moderately stable- 10-30% eroded or bank failure; small areas of erosion	moderately unstable-30-50% eroded or bank failure; high erosion potential	unstable- >50% eroded or bank failure; steep banks	concrete	
Check One:						
Substrate	stable- >50% gravel or larger substrate	moderately stable- 30-50% gravel with some finer sediments	moderately unstable-10-30% gravel; dominant type is mix with sand	unstable- <10% gravel or larger; uniform sand, silt, or clay bedrock	concrete	
Check One:						
Water color	brown	light brown	green	clear	other	
Check One:						
Turbidity	heavy turbidity	moderate turbidity	slight turbidity	clear		
Check One:						

Overall aesthetics	wilderness- outstanding natural beauty; wooded or pastured area	natural area- trees and/or native vegetation with some development	common setting- not offensive; area is developed, but uncluttered such as an urban park	offensive- stream does not enhance the area; highly developed
Check One:				

Vegetative Characteristics

If banks have different characteristics, please note and label each bank separately

Position of riparian vegetation	overhanging	immediately adjacent to stream bank	mowed buffer with vegetation outside buffer	no riparian habitat
Check One				

Density of riparian vegetation	dense - difficult to walk through	moderate - somewhat difficult to walk through	sparse- easy to walk through	no riparian habitat
Check One				

Width of buffer zone	extensive- width of natural buffer is > 20m	wide- width of natural buffer is 10-20m	moderate- width of natural buffer is 5-10m	narrow- width of natural buffer is <5m	no riparian habitat
Check One					

Terrestrial/Riparian vegetation present = 100%	mowed	tall grass	shrubs	young trees	fully developed trees	no riparian habitat
	%	%	%	%	%	

Aquatic Life Activity

Aquatic activity	abundant - a lot of observed activity	some - occasional activity observed	none visible
Check One			

Anthropogenic Influences

For storm drains and WWTP outfalls please note number, size, and distance from sampling point

Stormdrains upstream and size	number	Notes:

Treatment Plant Outfalls or Other outfalls	number	Notes:

Trash present	none	light	med	heavy	location
Check One:					

Type of land use or land cover = 100%	natural area or park	residential	commercial	light industry	industry	agriculture
	%	%	%	%	%	%

Note: Attach Outfall Description Field Form

Reference Station_____ Date of Survey_____ page ___ of ___

Tier II - Outfall Descriptions Field Form

Segment no. _____ Photo Digital Print No Photo

Reference Station _____ Date of Survey(s) _____

Site ID from station characterization form _____ _____

Location of Reference Station _____

GIMS ID#	Type (pipe/ditch/trib/other)	Side of Channel	size/material	Flow (present/absent)	Days Since Last Rainfall	other observations

Reference Station _____ Date of Survey _____ page ___ of ___

SS-APPENDIX B – GARMIN *eTrex* Vista H

Garmin *eTrex* Vista H GPS Unit

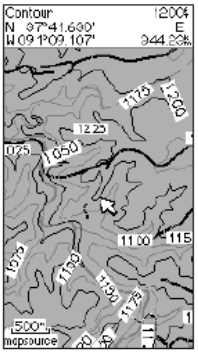
- High-sensitivity
- 24 MB internal storage
- USB connection for electronic storage

GPS: Initial Setup

Garmin eTrex Vista H

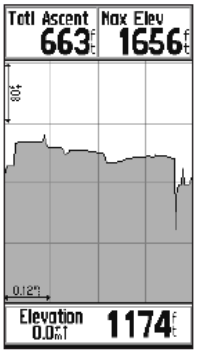
- When you power on, it will acquire satellites
- You MUST be outside

GPS: Main Screens



Map Page

Compass Page



Altimeter Page

Main Menu

GPS: Compass Calibration

From Main Menu,
Click:
-'Setup'
-Scroll down and click 'Calibration'

*Before first use, calibrate the compass

Click:
-'Compass'

Click:
-'Start'

GPS: Coordinate Units

Must change units to **DECIMAL DEGREES**

Main Menu

Click:
'Units'

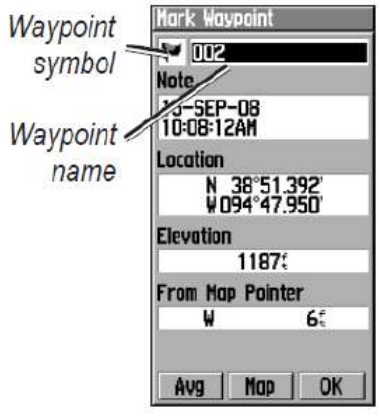
Defaults to:
Degree Minutes Seconds
Click:
'Position Format'

Scroll:
Up one
Click:
'hddd.ddddd'

GPS: Saving a Waypoint

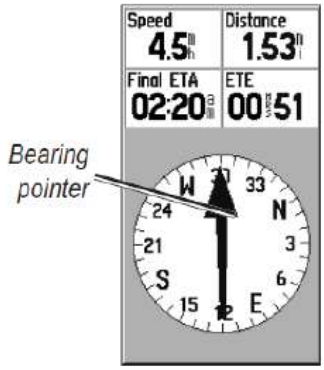
-From any of the main screens, **HOLD** the 'Rocker' button to create a Waypoint
-The 'Mark Waypoint' page will appear
-Change the name of the waypoint immediately by clicking the rocker when the 3-digit name is highlighted
-Type in the desired Waypoint name
-Then click OK twice

It's that easy!

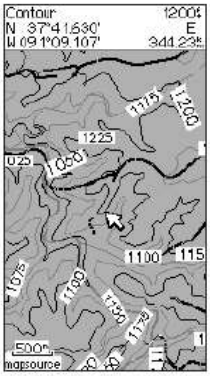


GPS: Locating the Waypoint

If you need to find a waypoint...



OR



What's Next?

Using the coordinates gathered

-Mapsource Software

-http://www8.garmin.com/support/download_details.jsp?id=209

-Google Earth / Maps

What is the best method of providing the data to H-GAC?

-Database
-Spreadsheet
-Paper Records

For the latest free software updates (excluding map data) throughout the life of your Garmin products, visit the Garmin Web site at www.garmin.com.

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Part Number 190-00780-00 Rev. B

GARMIN®

eTrex Legend® H and eTrex Vista® H

owner's manual

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December 2008 Part Number 190-00780-00 Rev. B Printed in Taiwan

Introduction

Thank you for choosing the Garmin® eTrex Legend® H or eTrex Vista® H. These units use the proven performance of Garmin high-sensitivity GPS and full-featured mapping to create an unsurpassed portable GPS receiver. The eTrex models operate identically except that the Vista H has an electronic compass and a barometric altimeter and the Legend H does not. Take a moment to compare the contents of this package with the packing list on the box. If any pieces are missing, contact your Garmin dealer immediately.

Tips and Shortcuts

- To return to the Main Menu from any page, press the **MENU** key twice.
- To extend battery life, turn off the GPS when not using the eTrex for navigation. Decrease the level of the display's backlight by quickly pressing and releasing the **POWER** key.

Product Registration

Help us better support you by completing our online registration today. Go to http://my.garmin.com. Keep the original sales receipt, or a photocopy, in a safe place.

The serial number is located inside the battery compartment.

Contact Garmin

Contact Garmin Product Support if you have any questions while using your eTrex Legend H or Vista H. In the USA, go to www.garmin.com/support, or contact Garmin USA by phone at (913) 397.8200 or (800) 800.1020.

In the UK, contact Garmin (Europe) Ltd. by phone at 0808 2380000.

In Europe, go to www.garmin.com/support and click **Contact Support** for in-country support information, or contact Garmin (Europe) Ltd. by phone at +44 (0) 870.8501241.

Optional Accessories

For a complete list of available accessories and maps for use with the eTrex, refer to http://buy.garmin.com.

See the *Important Safety and Product Information* guide in the product box for product warnings and other important information.

Table of Contents

Getting Started

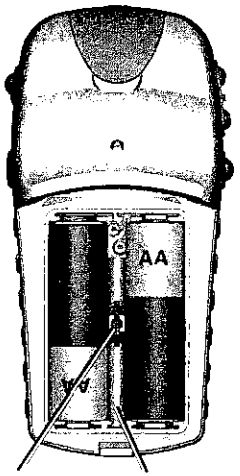
Installing Batteries and the Lanyard

The eTrex operates on two AA batteries (not included). Use Alkaline, NiMH, or Lithium batteries. See page 48 for setting the battery type.

To install the batteries:

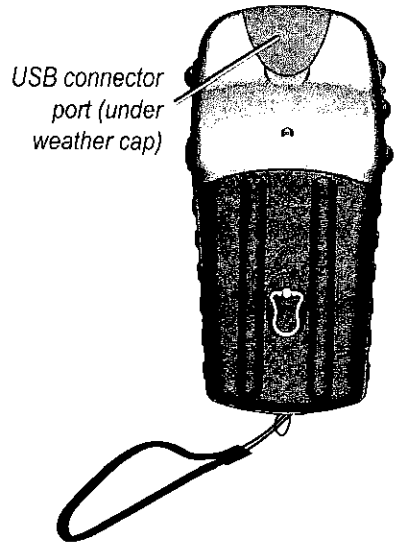
1. Remove the battery cover by turning the locking ring 1/4 turn counter-clockwise and pulling the cover loose.
2. Insert the batteries, observing the proper polarity.

Remove the batteries when you do not plan to use the unit for several months. Stored data is not lost when batteries are removed.



To install the lanyard:

1. Place the loop of the lanyard through the slot at the base of the unit.
2. Route the strap through the loop, and pull tight.



Understanding Terms

Select—move the highlighted area on the screen up, down, left, or right with the **ROCKER** to select individual fields.

Key—when you are directed to press a key, press and quickly release the key.

Field—the location on a page where data or an option can be shown or entered.

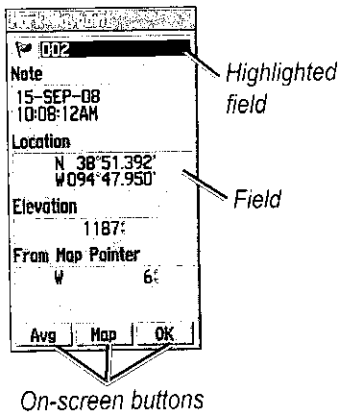
On-screen button—use the **ROCKER** key to select a button, and press it in to enter.

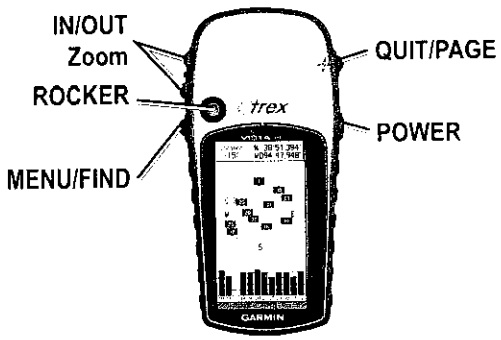
Scroll bar—when viewing a list of items too long to appear on the screen, a scroll bar appears next to the list. To scroll through a list, press up or down on the **ROCKER**, or press the **In** and **Out Zoom** keys to scroll rapidly.

Default—the factory setting saved in the unit's memory. You can change the settings, and revert to the factory settings when you select **Restore Defaults**.

Manual Conventions

In this manual, when you are instructed to select an item, small arrows (>) appear in the text. They indicate that you should highlight a series of items on the screen using the **ROCKER**, and press in to enter after each item. For example, if you see "select **Service** > **Show Info**," you should highlight **Service**, and press the **ROCKER**. Then highlight **Show Info**, and press the **ROCKER** again.





Key Functions

IN/OUT Zoom keys

From the Map page, press to zoom the map in or out.

From any other page, press to scroll up or down a list or move a highlighted slider.

MENU/FIND key

Press and release to view the Options Menu for the current page.

Press and hold to display the Find Menu.

ROCKER key

Rock up, down, right, or left to:

- move through lists
- highlight fields, on-screen buttons, or icons
- move the map panning arrow.

Press in and release to enter highlighted options and data or confirm on-screen messages.

Press in and hold at any time to mark your current location as a waypoint.

QUIT/PAGE key

Press to cycle through the main pages.

Press and hold to turn the electronic compass on or off (Vista H only).

POWER key

Press and hold to turn on or off.

Press and release for contrast, backlighting, or to view time, date, and battery capacity.

Turning on the eTrex

To turn the eTrex on and off:

Press and hold **POWER**.

Adjusting the Backlight

To adjust the backlight level:

1. Press and quickly release the **POWER** key.
2. Press up on the **ROCKER** to increase the brightness and down to decrease.
3. Press the **ROCKER** or **QUIT** to close.

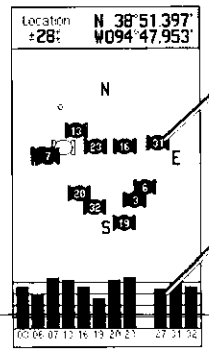
Initializing the GPS Receiver

The first time you turn on your eTrex, the GPS receiver must collect satellite data and establish its current location. To receive satellite signals, you must be outdoors and have a clear view of the sky.

To initialize your eTrex:

Hold the unit in front of you facing the sky.

While the GPS receiver is searching for the satellite signals, "Acquiring Satellites" is displayed until enough signals are acquired to fix its location.



The number of each overhead satellite is shown.

The strength of each satellite signal is shown.

If the unit cannot establish a satellite fix, a list of options appears. Highlight the appropriate option, and press the **ROCKER**.

The Status Bar and Date and Time

The Status Bar and Date/Time Window appear below the backlight adjustment slider when you press and release **POWER**.

Power to the unit is provided by batteries or from an auxiliary source. Power status is shown on the Main Menu and the Status Bar. The battery power icon shows the remaining power as the battery is depleted. The external power icon is shown when the unit is powered externally.

Satellite signal status is shown when searching for or acquiring satellites, a 2D fix is attained and a 3D fix is attained.

The Electronic Compass (Vista H only) appears when activated.

Using the Mapping Databases

Many of the eTrex features require detailed mapping data to be fully operational, so you need to transfer maps before using the unit. With optional detailed MapSource® mapping data, you can view listings of nearby restaurants, lodging, shopping centers, attractions and entertainment, and addresses. The amount of data transferable is 24 MB.

Use the USB interface cable, provided with the unit, to transfer optional MapSource data from a computer to the eTrex. See the Garmin Web site www.garmin .com for compatible MapSource products.

Basic Operation

This section explains some of the more common operations you can perform with your eTrex, including creating and using waypoints, using the Find Menu, and how to create and use tracks and routes.

Creating and Using Waypoints

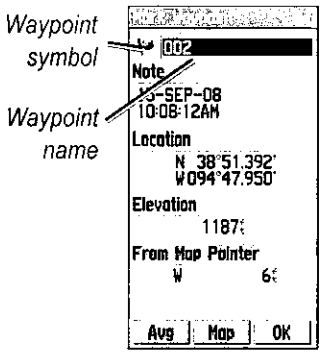
Waypoints are locations or landmarks you record and store in your GPS. You can add waypoints to routes and even create a Go To directly to the selected waypoint.

You can create waypoints using three methods. Press the

ROCKER while at a location, create a waypoint on the Map page, or enter coordinates for a waypoint manually.

Marking Your Current Location

Press in and hold the ROCKER to mark your current location creating a new waypoint. You must have a valid position (2D or 3D) fix to mark your current location.



Mark Waypoint Page

To mark your current location:

1. Press and hold the **ROCKER** until the Mark Waypoint page appears. A default three-digit name and symbol are assigned to the new waypoint.
2. To accept the waypoint with the default information, select **OK**.
   OR
   To change any information, select the appropriate field, and press the **ROCKER** to open the on-screen keypad. After entering and confirming your changes, select **OK**.

Creating Waypoints Using the Map

To create a waypoint using the Map page:

1. On the Map page, use the **ROCKER** to move the pointer to the map item you want to mark.
2. Press release the **ROCKER** to capture the pointer location and open the information page for the map item.
3. Select **Save**. If there is no information for that point, a "No map information at this point. Do you want to create a user waypoint here?" prompt appears. Select **Yes**.

Editing Waypoints

You can edit waypoints to change the symbol, name, note, location, and elevation.

To edit a waypoint:

1. Press and hold **FIND**.
2. Select **Waypoints**.
3. Select the waypoint you want to edit, and press the **ROCKER**.
4. Make changes by highlighting each field. Use the waypoint symbol chart and alphanumeric keypad to enter new data.

To delete a waypoint:

From the Waypoints page, select the waypoint you want to delete > **Delete**.

NOTE: When you delete a waypoint, you cannot recover it from the unit.

To move a waypoint on the Map Page:

1. Press **FIND** > **Waypoints**.
2. Select the waypoint you want to move, and press the **ROCKER**.
3. Select **Map** to show the waypoint on the map.

4. Press the **ROCKER** to place a move marker next to the waypoint.
5. Use the **ROCKER** to move the waypoint to a new location, and press the **ROCKER**.

To calculate a location by averaging:

1. Go to the location that you want to calculate an average for. Press and hold the **ROCKER** > **Avg** to begin averaging.
2. Press **Save**.

Projecting a Waypoint

Create a new waypoint by projecting the distance and a bearing from one location to a new location.

To project a waypoint:

1. Press **FIND** > **Waypoints**.
2. Select the waypoint you want to project. The Waypoint Information page opens.
3. Press **MENU** > **Project Waypoint** to open the Project Waypoint page.
4. Enter the distance and bearing to the projected waypoint in the appropriate fields, and press **QUIT** when finished.

Using the Find Menu

Use the Find Menu to search for waypoints, geocaches, cities, and exits in the eTrex basemap. Additional icons appear depending on the optional MapSource data loaded to the unit. Press and hold the **FIND** key to open the Find Menu.

When you access a Find group list, it contains items near your current location or the map pointer.

The options menu for each category contains search options. Select a category.

Find By Name

Use Find By Name if you know the name of the location you want to find.

To find a location using Find By Name:

1. Press and hold **FIND** to open the Find Menu.

2. Select the icon for the type of item you want to search for, or search the entire database by selecting **All Points of Interest** (with optional MapSource detailed maps).
3. Press **MENU** > **Find By Name**.
4. Use the **ROCKER** to operate the on-screen keypad and enter the name of the location you want to find. When the Find list contains a match, highlight **OK**.
5. Select the location item from the Find list and press the **ROCKER**. The item's information page opens, allowing you to save the item as a waypoint, show the item on the map, or create a route to the item (Go To).

Recent Finds

The Recent Finds page shows a list of the last 50 items you have searched for or gone to recently.

To go to a recently found item:

1. Press and hold **FIND**.
2. Select **Recent Find**.
3. Use the **ROCKER** to select the item you want to go to, and press the **ROCKER**.
4. Select **Go To**.

Using the Find Item Information Page

When you select an item from the Find item list and press the **ROCKER**, detailed information about the item is shown. Each information page contains three on-screen buttons. Different buttons appear depending on whether you are selecting a Find item to navigate to, or adding a Find item to a route list as a waypoint.

Find Information Page Options Menu

To use the Options Menu:

1. With an information page open for a Find item, press **MENU** to open the Options Menu.
2. Use the **ROCKER** to select an option:

- **Average Location**—takes several readings at the same location and uses the average value to provide more accuracy. See page 16.
- **Project Waypoint**—create a waypoint by entering bearing and distance from a referenced location. See page 16.
- **Find Near Here**—return to the Find Menu to search for map items near the item.
- **Change Reference**—point to a new location on the Map page using the pointer.
- **Add To Route**—include this item on a new route or add it to an existing route. See page 27.
- **View Sun And Moon**—view Sun and Moon tables for this item's location. See page 57.
- **View Hunt And Fish**—view Hunt and Fish tables for this item's location. See page 57.
- **Reposition Here**—reposition the location of the waypoint to your current location.

To find an item near another item:

1. Press and hold **FIND**.
2. Select a category.
3. Select an item from the Find list.
4. Press **MENU** > **Find Nearest**. The Find Menu opens with each category containing items near the item selected.
5. Select a category icon, and press the **ROCKER** to open a list of items near the item.

To find an item from another location on the map:

1. Press and hold **FIND**.
2. Select an icon on the Find Menu.
3. Press **MENU**, select **Change Reference**. The Map page appears.
4. Use the **ROCKER** to pan the arrow (pointer) to the map location you want. The Find list shows a list of items near the new map location.

Finding a Waypoint

The Waypoints page contains a list of all saved waypoints. Waypoints are stored in alphanumeric order and are identified by an assigned symbol.

To find a waypoint:

1. Press and hold **FIND**.
2. Select **Waypoints** and choose a waypoint.

Finding a Geocache

Select **Geocache** to view the list of geocache locations created by you or downloaded from your computer. A geocache location is a waypoint with a geocache symbol to separate it from others. For more information about geocaching, visit www.geocaching.com.

To find a geocache:

1. Press and hold **FIND**.
2. Highlight **Geocache**. You can view found geocaches or those that have not been found.
3. Use the **ROCKER** to highlight a geocache on the list.
4. Select **Go To** to navigate to the geocache location. When navigating to a geocache, the Compass page changes to Geocache Navigation mode and any additional information about the downloaded cache location is shown in the comment field.

When a geocache is found, the unit marks the cache as found, logs an entry into the calendar, and provides an option that shows the nearest cache.

Finding a City

Select **Cities** from the Find Menu to find any city listed in the mapping data.

To find a city:

1. Press and hold **FIND**.
2. Select **Cities**. The Cities page shows a list of cities near your current location.
3. Select a city from the list, and press the **ROCKER**.
   OR
   If the city you want is not listed, press **MENU** > select a search method.

Finding an Interstate Exit

Use the exits icon on the Find Menu to find an interstate exit.

To find an interstate exit:

1. Press and hold **FIND**.
2. Select **Exits**. A list of interstate exits near your location is shown.

3. Use the **ROCKER** to select an exit, and press the **ROCKER**. This page contains the exit description, a list of available services near the exit, and the distance and bearing from the exit to the highlighted service.
4. Select a service from the list, and press the **ROCKER**.

Finding an Address

If you downloaded detailed mapping data, use the addresses icon on the Find Menu to find an address. When you enter the street number, street name, and city, the find feature matches that data with addresses in the map database.

To find an address:

1. Press and hold **FIND**.
2. Select **Addresses**.

NOTE: If your unit has a GPS fix, the **<Enter Region>** field is populated with your current region. You do not have to specify a city in the **<Enter City>**, because the database has information for the entire region.

3. Select the **<Enter Number>** field and type the street number using the on-screen keypad. Select **OK**.
4. Select the **<Enter Street Name>** field. The street list opens.
5. Use the on-screen keypad to enter the street name. Select **OK**. A list of matches appears.
6. Select the address.

Finding an Intersection

This feature also requires detailed mapping data. Follow the basic steps for finding an address when searching for an intersection.

Searching for a Point of Interest

If you downloaded MapSource detailed mapping, you can use the All Points of Interest category on the Find Menu to locate a nearby restaurant, lodging, or landmark, or to select a category.

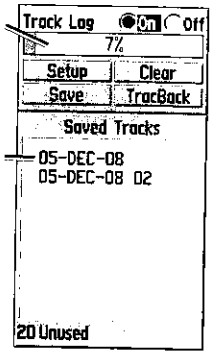
To find a point of interest:

1. Press and hold **FIND**.
2. Select **All Points of Interest** to show a list of all points near your current location.
3. Press **MENU**.
4. Select an item from the list, and press the **ROCKER**.

Using Tracks

The Tracks feature creates an electronic bread crumb trail, or "track log," on the Map page as you travel. The track log contains information about points along its path.

The track log starts recording as soon as the unit gets a location fix. The percentage of memory used by the current track log appears at the top of the Tracks page.



To clear the track log:

1. Press **MENU** twice to open the Main Menu.
2. Select **Tracks**.
3. Select **Clear** > **Yes**.

To set up a track log:

1. Press **MENU** twice > **Tracks**.
2. Select **Setup**.

- **Wrap When Full**—the track log records over the oldest data with new data.
- **Record Method**—select a track recording method. Touch Distance, Time, or Auto. If your record method is time or distance, enter the specific time or distance interval. Touch Auto to record the tracks at a variable rate to create an optimum representation of your tracks.
- **Interval**—select a track log recording rate. Recording points more frequently creates a more-detailed track, but fills the track log faster.
- **Style**—selects the type of line that represents the track currently being recorded.

To save the entire track log:

1. Press **MENU** twice > **Tracks**.
2. Select **Save**. A message appears asking you if you want to save the entire track.
3. Select **Yes** to save the track.

To save a portion of the track log:

1. Press **MENU** twice > **Tracks**.
2. Select **Save**.
3. Select **No** to save only a portion of the track log.
4. Use the **ROCKER** to move the pointer to the point on the track line that you want to be the beginning point, and press the **ROCKER**.
5. Repeat to select an ending point. Select **OK**.

To view a track on the map:

On the Saved Track page, select **Map**. A map showing the entire track appears. Begin and end markers are added to the track.

To calculate the area of a track:

1. With the Track Log page open and the Track Log on, press **MENU**.
2. Select **Area Calculation**, and press the **ROCKER**.
3. Press the **ROCKER** to start the area calculation. As you move and define the area's boundaries, a **Stop** button appears on the page.
4. When finished defining the area, press the **ROCKER** and select **Save**.

Track Profiles

A Track Elevation Profile is created from elevation readings when using the eTrex Vista H. Both the Vista H and Legend H show profiles, if using Digital Elevation Model (DEM) maps. Refer to the Garmin Web site for information about these maps.

To view a track profile:

1. Open the Saved Track page, and press **MENU**.
2. Select **Profile**. The beginning of the track is marked by a flag. Use the **ROCKER** to scroll across the track profile. At any point along the profile, press the **ROCKER** to show it on the map.
3. Press **MENU** to use Zoom Ranges and Hide Symbols options.

Navigating a Saved Track

To use the TracBack® feature:

1. With the Saved Tracks page for the track or the Track Log open, select **TracBack**, to show the track. Select the point to TracBack.
2. Use the **ROCKER** to move the pointer to the point on the map to start navigating the TracBack.
3. Move in the direction of the first turn. At the first turn, directions to each turn are shown.
4. Select **MENU** > **Stop Navigation** to exit.

To create a waypoint on a saved track:

1. With a saved track on the map, use the **ROCKER** to move the pointer on the track point that you want to mark as a user waypoint.
2. Press and hold the **ROCKER**.

Creating a Route

Routing creates a sequence of waypoints that lead you to your destination. The eTrex stores 50 routes with up to 250 points each. Create or modify a route using the Routes page, and add waypoints to a route. Create complex routes using optional MapSource mapping.

To create a route:

1. Press **MENU** twice > **Routes**.
2. Select **New** > **<Select Next Point>**.
3. Use the Find Menu to select a route waypoint from one of the Find groups.
4. Select **Use** to add it to the route.
5. Repeat steps 2 through 4 to add additional waypoints to the route.
6. Select **Navigate**.

Methods for routing you to a destination

- If you select **Go To** on the Waypoint page, or for other Find items, a straight path is created.
- If you select **Navigate** when on a Route page, the eTrex uses a route made of waypoints or Find Menu items. It navigates directly from point to point.

Navigating a Route

To navigate a saved route:

1. Press **MENU** twice > **Routes**.
2. Select a saved route > **Navigate**.
3. To stop navigating, press **MENU** > **Stop Navigation**.

To preview the turns for an active route:

1. From the Routes page, select a saved route.
2. Select **Navigate** to begin navigation.
3. Press **QUIT** to view the list of turns on the route. To view an individual turn, select it.
4. Use the **ROCKER** to scroll through all turns.

Editing a Route

Use the Route page to edit, change the route name, and review route points.

To change the name of the route:

1. Press **MENU** twice > **Routes**.
2. Select a saved route > select the route name field at the top of the Route page.

To review individual route points:

1. Press **MENU** twice > **Routes**.
2. Select a saved route > select a point on the Route page > press the **ROCKER** > **Review**.
3. Select **Save**, **Map**, or **Go To**.

To delete a route:

From the page for that route press **MENU** > **Delete Route**.

To select the off-road transition for a route:

1. Press **MENU** twice > **Routes** > **MENU**.
2. Select **Off Road Transition** > **Route Leg Transition**.
3. Select **Manual** (or **Distance**) when advancing to the next point.

Select **Distance** to enter a radius, so that when within the entered distance, you are lead to the next point.

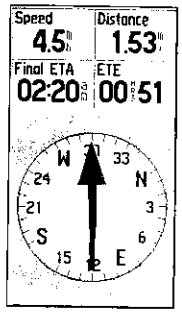
Select **Manual** to transition to the next point anytime while navigating a route.

Main Pages

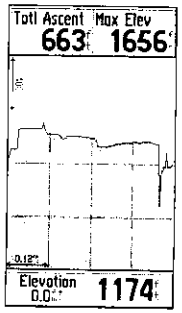
The eTrex Vista H has four main pages: Map page, Compass page, Altimeter page, and the Main Menu. The eTrex Legend H does not have the Altimeter page. Cycle through these pages by pressing QUIT. The Active Route page appears in the sequence when you are actively navigating a route. The Satellite page appears only at start up.

Each page has an options menu. To view the options menu for a page, press **MENU**.

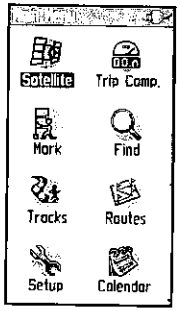
Map Page



Compass Page



Altimeter Page



Main Menu

Satellite Page

This page appears when you turn the unit on and is accessed from the Main Menu thereafter.

Satellite Page Options

- **Use With GPS Off/On**—enables you to turn the GPS receiver on or off.
- **Track Up/North Up**—indicates whether satellites are shown with the rings oriented with North toward the top of the display or your current track toward the top of the screen.
- **New Location**—use if you have moved the unit more than 600 miles (1,000 km).
- **GPS Elevation**—shows your current elevation.

Map Page

A built-in basemap that includes cities, interstates, state and county highways, exit information, and lake and river outlines is shown on this page. Increased road detail, points of interest and mapping data is added when using optional MapSource detailed mapping data.

Two map operating modes, position mode and pan mode, determine what is shown on the map display.

Position mode pans the map to keep your present location in the

display area. The position marker ▲ shows your travel on the Map page.

When you press the **ROCKER**, the eTrex enters pan mode, which moves the map to keep the white arrow ↖ (map pointer) within the display area. Add and configure up to four optional data fields at the top of the page to provide a variety of travel and navigational information.

To show data fields on the Map Page:

1. Press **MENU** > **Data Fields**. The Show sub-menu appears.
2. Select the number of data fields you want to show on the Map page, and press the **ROCKER**.

To change a data field display:

1. Press **MENU** > **Change Data Fields**. The first data field is highlighted.
2. Press the **ROCKER**.
3. Select an option.
4. Move to the next field, and repeat.

Using Additional Map Data

View listings of nearby restaurants, lodging, shopping centers, attractions and entertainment, and retrieve addresses and phone numbers for any listed location when using optional MapSource data disks.

To review map information:

1. From the Map page, press **MENU** > **Setup Map**.
2. Select the **Map Setup-information** page. The list of maps stored appears. A check mark means the map is shown on the Map page.

Changing the Zoom Range

Press the **In** key to decrease the zoom range and show an area with greater detail; press the **Out** key to increase the range to see a larger area with less detail.

The current zoom range setting is shown in the lower-left corner of the Map page. If no further map information is available, "overzoom" appears under the zoom range. When using MapSource maps, "mapsource" appears below the scale.

Map Orientation

There are two map orientations in the Setup Map option. North Up orients the map like a paper map. Track Up orients the map in the direction of travel.

Map Page Options

- **Stop (Resume) Navigation**—stops/resumes navigation.
- **Data Fields**—opens the Show sub-menu so you can select the number of data fields to show: **Map Only, 1 Wide Data Field, 2 Data Fields, 2 Wide Data Fields, 3 Data Fields**, or **4 Data Fields**.

- **Change Data Fields**—allows you to select the type of data in the data fields. This option is available if data fields are selected.
- **Guidance Text**—shows messages on the screen advising you of your next navigation move.
- **Setup Map**—accesses six pages of display options.
- **Measure Distance (Stop Measuring)**—measures the distance from your current location to the map pointer.
- **Turn Declutter On (Off)**—eliminates the display of items that can block road details.
- **Restore Defaults**—returns to factory defaults.

Guidance Text

When navigating, guidance text appears above the map. Guidance Text gives directions to a destination.

South to US 169

To show guidance text:

1. Press **MENU** > **Guidance Text**.
2. Select **Always Show**, **Never Show**, or **Show When Navigating**.

If you select **Show When Navigating**, a guidance message appears until you select **Stop Navigation**.

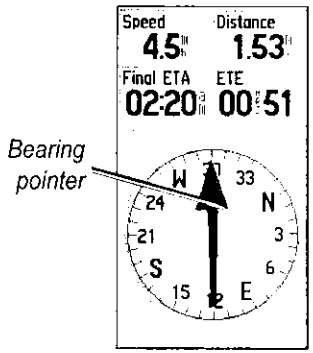
Measuring Distance

To measure distance between two points:

1. Press **MENU** > **Measure Distance**. An on-screen arrow appears at your location with "REF" below it.
2. Move the arrow to the reference point (the starting point you want to measure from), and press the **ROCKER**. A push pin icon marks the starting point.
3. Move the arrow to the point you want to measure. The distance between the two points is shown in the upper-right corner.

Compass Page

The Compass page guides you to your destination with a graphic compass display and a bearing or course pointer.



Compass Page

The rotating compass ring indicates the direction you are heading. The bearing and course pointers indicate the direction

(bearing to or course of travel) to your destination, relative to your current heading direction. Choose a bearing pointer or course pointer for guidance.

Using the Electronic Compass

Both the Legend H and the Vista H use a GPS data driven compass but only the Vista H has an additional electronic compass.

When you press and hold **QUIT** on the Vista H unit, the electronic compass turns off and stays off until you press and hold **QUIT** again.

The electronic compass functions like a magnetic compass when you are stationary. When you are moving and reach a pre-set speed, it uses data from the GPS receiver to maintain your heading. When you stop (after a pre-set time), it again operates like a magnetic compass.

To turn the electronic compass on or off:

1. Press and hold **QUIT** to turn the electronic compass on or off. The compass icon appears in the status bar when the electronic compass is on. When you are not using the electronic compass, turn it off to conserve batteries. When it is turned off, the unit uses the GPS receiver for navigation.

2. Hold the Vista H level to get an accurate electronic compass reading.

To set the speed and time for Compass Auto On and Off:

1. Press **MENU** twice > **Setup**.
2. Select **Heading**.
3. Select **Switch to compass heading when below**.
4. Use the numeric keypad to enter a speed.
5. Select **for more than** to set the time delay from the time options list.

Calibrating the Electronic Compass

Calibrate the electronic compass outdoors when you first use the Vista H. To ensure continued accuracy, calibrate after installing new batteries, after moving more than 100 miles (160 km), or experiencing a temperature change greater than 68° F (20° C) from the last calibration. The accuracy of the electronic compass is also adversely affected if the unit is not held level or you are near objects that affect magnetic fields, such as cars or buildings.

To calibrate the electronic compass (Vista H only):

1. While outdoors, hold the Vista H level and do not stand near objects that influence magnetic fields, such as cars, buildings, or overhead power lines.
2. Press **MENU** > **Calibration**.

3. Select **Start** and follow on-screen directions for holding and turning the unit.
   - A "Just Right," "Too Fast," or "Too Slow" message appears notifying you to adjust your turning speed. Hold the unit level while turning.
   - If "Calibration Failed" appears, repeat the process.
   - "Calibration Successful" appears when finished.
4. Press the **ROCKER** to return to the Compass page.

Compass Page Options

- **Sight 'N Go**—navigate to an object within your sight (Vista H only).
- **Stop/Resume Navigation**—turns active navigation for a route or Go To on and off.
- **Course or Bearing Pointer**—toggles between the course pointer and the bearing pointer.
- **Data Fields**—selects the number of data fields that appear on the Compass page.
- **Change Data Fields**—selects the type of data you want to show in the data fields.
- **Calibrate Compass**—accesses the compass Calibration page (Vista H only).
- **Restore Defaults**—returns to factory settings.

Sight 'N Go Navigation

Sight 'N Go navigation is available only on the Vista H with electronic compass.

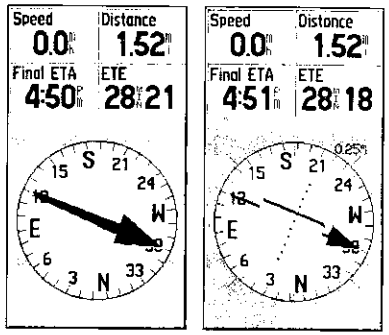
To use Sight 'N Go to navigate:

1. Press **MENU** > **Sight 'N Go** to start the feature. The compass ring with pointer is in-line with the two white sighting marks, one at the base of the screen and one at the top of the screen.
2. Hold the unit at eye level and line up the two sighting marks with the distant object. Press the **ROCKER** to lock the direction.
3. Select **Set Course**.
4. Begin traveling to your destination on a course line using the course pointer as a guide.
   OR
   Select **Project Waypoint**.
5. Enter an estimated distance from your current location to establish a projected waypoint location.
6. Select **Go To** to open the Map page and begin navigation to the projected waypoint. The Compass page shows a bearing pointer for guidance.

Using the Course or Bearing Pointer

The bearing pointer and course pointer are independent of each other. The bearing pointer indicates the direction

to your destination, and the course pointer indicates your relationship to a course line leading to the destination.



Bearing Pointer **Course Pointer**

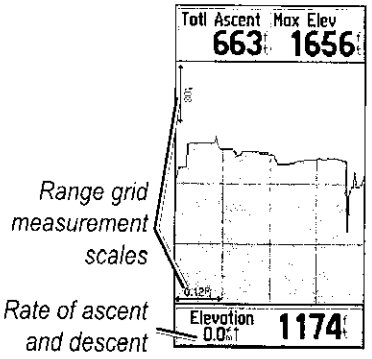
If the bearing pointer arrow is pointing straight up, for example, you are going directly to your destination. If it points any direction other than up, turn toward that direction until the arrow is pointing up and then continue in that direction. The bearing pointer points to the destination.

If you are using the course pointer option, and you drift away from the line of travel from your original location to your destination, the course deviation indicator (an arrow with horizontal dotted line) provides graphic indication of drift (right or left) according to the scale shown on the compass ring and indicated by the dotted line. Move to the right or left to get back on course.

Altimeter Page

The Altimeter page is provided with the Vista H only.

The Altimeter page shows you a profile of elevation changes over distance or time, or a profile of pressure changes over time.



Altimeter Page

Configure the profile field in the center of the page to show either elevation or ambient pressure plots.

Data fields at the top of the page are user selectable.

Altimeter Page Options

- **View Elevation Plot**—Over Time or Over Distance—view over a set period of time or over a set distance.
- **View Pressure Plot**—Barometer or Ambient Pressure—view a plot of elevation changes that occur over a set distance or view changes in barometric pressure for a set period of time.

- **Zoom Ranges**—set the Zoom Ranges for elevation, distance, or time when you show the View Elevation Plot. Customize the View option displays using the Zoom Ranges option.
- **Change Data Fields**—select the type of data you want to show in the data fields.
- **Reset**—reset the elevation data and the maximum elevation data.
- **Calibrate Altimeter**—if you know the correct elevation for your location, increase accuracy by using the Calibrate Altimeter option.
- **Restore Defaults**—clears recorded data from the page and begin recording new data.

Plot Over Time or Distance

These two measurement options (changes over a set period of time or changes over a set distance) apply only to the View Elevation Plot option. View Pressure Plot is measured by time.

View Pressure or Elevation Plots

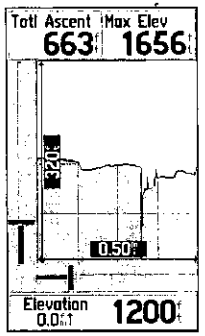
Select the **View Elevation Plot** to plot elevation. Select **View Pressure Plot** to barometric pressure.

To view elevation or pressure plots:

1. Select the option you want from the Altimeter options menu to show the plot.
2. Adjust the time and distance measurement using the elevation plot Zoom Ranges option.
3. To clear the plot, clear the Track Log.

Adjusting the Zoom Ranges

Set the zoom ranges for elevation, distance, or time when you use the View Elevation Plot.



Zoom Range Selection

To adjust zoom ranges:

1. Select the type of plot you want to show and use the **ROCKER** to select Zoom Ranges.
2. Move the **ROCKER** up or down to adjust the vertical distance, and left or right to adjust the time or distance. Press the **ROCKER** to return.

View Points

Scroll through a recorded elevation or pressure profile to view the elevation or pressure, time of day, and date the point was created.

To use the View Points option:

1. Press **MENU** > **View Pressure Plot** or **View Elevation Plot** to open the Plot page.
2. Use the **ROCKER** to scroll the cross hairs across the profile. As the cross hairs move across the profile, the status window at the bottom of the page changes to show the date, time, and altitude or pressure for the point.

View Points on Map

View the location of points on the Map page.

To view altitude points on the Map Page:

1. With the Altimeter page open, use the **ROCKER** to move the crosshairs to the point.
2. Press the **ROCKER** to show the point on the map.

Resetting Data

To reset the elevation data and max elevation fields:

1. Press **MENU** > **Reset**.
2. Select the reset options, and press the **ROCKER** to place a check by an option.
3. Highlight **Apply**, and press the **ROCKER** to reset the data fields. A confirmation message appears.

Calibrating the Altimeter

Because the altimeter relies on the barometric pressure to determine the elevation and the pressure at any given elevation can fluctuate, calibrate the altimeter to increase its accuracy.

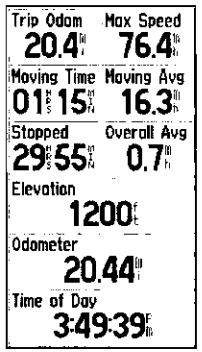
To manually calibrate the altimeter:

1. Press **MENU** > **Calibrate Altimeter**.

2. At the message "Do You Know The Correct Elevation?" select **Yes**. If you do not know the elevation, select **No** to use the pressure option. If you do not know the pressure, select **No** to use the default GPS elevation.
3. Use the **ROCKER** > **OK** to enter the new elevation or pressure.

Trip Computer Page

The Trip Computer page shows up to nine types of navigation data. Choosing Big Numbers arranges the page in four large data fields.



Trip Computer Page

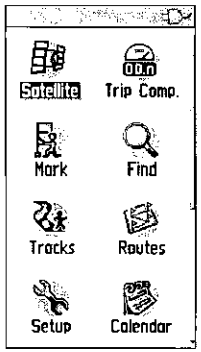
Each data field is selectable and can contain one of many data information options. When the data field title is selected, press the **ROCKER** to make a new choice.

Trip Computer Page Options

The option menu allows you to reset the Trip Computer data when you are ready to start a new trip, choose between Big or Small Numbers, and Restore Defaults.

Main Menu

The Main Menu contains settings and features not found on the main pages and sub-menus. The time and date are shown at the bottom of this page. The Main Menu is accessible from any page by pressing **MENU** twice. To select an item on the Main Menu, highlight the menu item, and press the **ROCKER**.



Main Menu

NOTE: If a page is added to the Main Page sequence, the icon for that page does not appear on the Main Menu.

Tracks

For more information, see page 23.

Routes Page

For more information, see page 27.

Setup Menu

To access the Setup Menu:

From the Main Menu, select **Setup**.

System Setup Page

To access the System Setup page:

From the Setup Menu, select **System**.

- **GPS**—choose one of the GPS options other than Normal to save battery power.
- **WAAS/EGNOS**—set Enable or Disable WAAS /EGNOS.

- **Battery Type**—set the Battery Type for more accurate battery capacity status.
- **Text Language**—select the text language on the eTrex. Changing the text language does not change the language of user-entered data or map data, such as street names.
- **External Power Lost**—set the unit to turn off if external power is lost.

Use the option menu to restore defaults, or view the version of unit software and the Unit I.D. number.

Display Setup Page

You can adjust the amount of time that the backlight stays on and set the level of brightness.

To access the Display Setup page:

From the Setup Menu, select **Display**.

- **Backlight Timeout**—choose from Stays On or delays of 15 seconds, 30 seconds, one minute, or two minutes.
- **Backlight Level**—use the slider to adjust the brightness.
- **Contrast**—adjust the difference between the lightest and darkest areas of the screen.

Page Sequence Setup

Use to add, remove, or reorder any of the Main pages.

To move, insert or remove a Main Page:

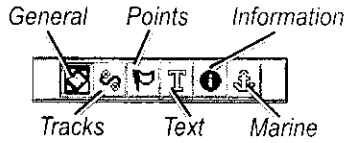
1. From the Setup Menu select **Page Seq**.
2. To rearrange a page in the page sequence, select the page. Select **Move**.
3. To insert a new page, select the page you want it inserted before, press the **ROCKER** > **Insert**.

Map Setup Page

Use the Map Setup page to adjust how items are shown on the Map page.

To customize the Map Page display:

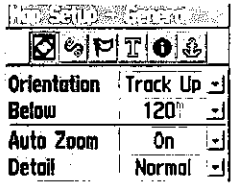
1. Press **MENU** > **Setup Map**. The top of the page contains icons for each setup page.
2. Use the **ROCKER** to select a page and to move up and down the feature fields on each page.



3. With a Map Setup feature highlighted, press the **ROCKER** to list the options for that feature. Each page has a sub-menu of general options. To access this menu, press **MENU** with the preferred setup page displayed.

Map Setup – General Page

The Map Setup – General page contains the settings for Orientation, Below, Auto Zoom, and Detail.

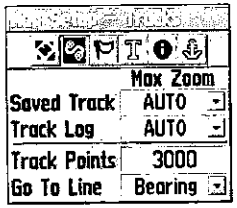


Map Setup - General Page

- **Orientation**—selects how the map is shown. North Up always shows north at the top of the page. Track Up shows your current track toward the top of the page.
- **Below** –sets the map scale at which the Track Up feature displays. All scales above that revert to the North Up map orientation.
- **Auto Zoom**—zooms the map scale to include the beginning and ending points of a route.
- **Detail**—selects the degree of map detail shown.

Map Setup – Tracks Page

Use the Map Setup –Tracks page settings for Saved Tracks, Track Log, Track Points, and Go To Line.



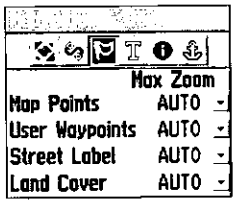
Map Setup - Tracks Page

- **Saved Track**—sets the maximum zoom range at which saved tracks are shown on the map.
- **Track Log**—sets the maximum zoom range at which active track logs are shown.
- **Track Points**—sets the maximum number of track points used to record a track.

- **Go To Line**—selects either a bearing or course line for navigating a track.

Map Setup – Points Page

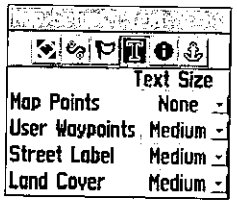
Use the Map Setup – Points page to set the map scale at which Map Points, User Waypoints, Street Label, and Land Cover appear on the Map page. Select Auto, Off, or from 20 ft to 500 mi (5 m to 800 km).



Map Setup - Points Page

Map Setup – Text Page

Use the Map Setup – Text page to select the text size for descriptions of map items on the Map page. You can select from Small, Medium, or Large.

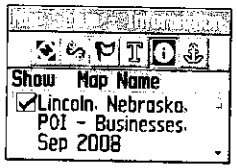


Map Setup - Text Page

Map Setup – Information Page

Use the Map Setup – Information page to view a list of downloaded detailed maps such as topographic and marine charts.

Highlight a map to show it on the map or turn it off.

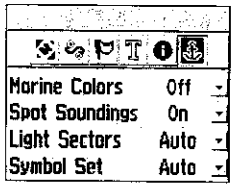


Map Setup - Information Page

Press MENU to view options for displaying maps.

Map Setup – Marine Page

Use the Map Setup – Marine page to customize settings for marine colors, spot soundings, light sectors, and symbol sets.



Map Setup – Marine Page

- **Marine Colors**—toggles colors on or off.
- **Spot Soundings**—toggles spot soundings on or off.
- **Light Sectors**—select from On, Off, and Auto.
- **Symbol Set**—select the symbol set to use (Auto, GARMIN, NOAA, International).

Geocache Setup

For more information about geocaching, visit www.geocaching.com.

To setup the Geocache feature:

1. Access the Setup Menu, select **Geocache**.
2. Select the symbol fields if you want to assign other symbols.
3. Select **Yes** or **No** for a calendar entry when a geocache is found.

Time Setup

To access the Time Setup page:

From the Setup Menu, select **Time**.

- **Time Format**—choose from 12-hour or 24-hour time format.
- **Time Zone**—set to one of the eight US Time Zones or 24 International Time Zones.
- **UTC Offset**—When the Time Zone is set to Other, specifies the offset from UTC (Universal Time Coordinated).
- **Daylight Saving Time**—On, Off or Auto.

Units Setup

To access the Units Setup page:

From the Setup Menu, select **Units**.

- **Position Format**—sets the coordinate system in which a location is shown.
- **Map Datum**—sets the description for geographic location, for mapping and navigation, and is not an actual map in the unit.
- **Distance/Speed**—sets the unit of measurement to show your speed and distance.
- **Elevation (Vert. Speed)**—sets the unit of measurement (Feet (ft/min), Meters (m/min), or Meters (m/sec)).
- **Depth**—select the unit of measurement (Feet, Fathoms, or Meters).
- **Pressure**—sets the unit of measurement (Inches, Millibars, or Hectopascals) to show pressure.

Heading Setup Page

You can select the type of heading mode.

To access the Heading Setup page:

From the Setup Menu, select **Heading**.

- **Display**—choose from Cardinal Letters, Degrees or Mils.

- **North Reference**—choose from True, Magnetic, Grid or User options.

The following two features apply to the Vista H only:

- **Switch to compass heading when below**—enter the selected speed for the unit to switch from using GPS to using the electronic compass for guidance.
- **for more than...**—enter a time limit to switch to the compass.

Calibration Setup Page

For the Vista H only. Refer to page 37.

Altimeter Setup

To setup the Altimeter:

1. From Setup Menu, select **Altimeter**.
2. Select the **Auto Calibration** field to select on or off. When on, elevation is corrected by GPS.
3. Select the **Barometer Mode** field to specify "Variable Elevation" (used when you are moving) or "Fixed Elevation" (used when stationary).

Welcome Page Setup

Insert a message when you turn the unit on.

To setup the Welcome Page:

1. From the Setup Menu, select **Welcome Message**.
2. Use the on-screen keyboard to begin entering your message in the **Welcome Message** field.

Jumpmaster Setup

Jumpmaster is designed for experienced skydivers and is available for the Vista H only. Refer to the Garmin Web site at www.garmin.com/products/etrexVistaH. Click **Manuals** and then select the *Using Jumpmaster* manual.

Calendar

To access the Calendar:

From the Main Menu, select **Calendar**.

Calculator

To access the Calculator:

From the Main Menu, select **Calculator**.

Stopwatch

To access the Stopwatch:

From the Main Menu, select **Stopwatch**.

Sun and Moon

To access the Sun and Moon Page:

From the Main Menu, select **Sun & Moon** to view the Sunrise/Sunset and Moon phases.

Hunt & Fish

To show hunting and fishing predictions for a specified date and location:

1. From the Main Menu, select **Hunt & Fish** to view the predictions for a different date. Select **Date** to open the on-screen keypad.
2. To view the predictions for a location, select the **Location** field.

Games Menu

To open the Games Menu:

From the Main Menu, select **Games**.

Appendix

Specifications

Physical

Size: W × H × D: 2.0 × 4.4 × 1.2 in. (5.1 × 11.2 × 3.0 cm)

Weight: 5.3 ounces (150 g) with batteries installed.

Display: W × H: 1.1 × 2.1 in. (2.8 × 5.4 cm), 4-level, gray scale (160 × 288 pixels) backlit LCD.

Case: Rugged, fully gasketed, water resistant, IEC-529, IPX7

Temp: from 5°F to 158°F (from -15°C to 70°C)*

*The temperature rating of the eTrex may exceed the usable range of some batteries. Some batteries can rupture at high temperatures.

Performance

Receiver: WAAS/EGNOS enabled, high-sensitivity

Acquisition Times: (approximately)
Hot start - 3 seconds
Warm start - 33 seconds
Cold start - 39 seconds

Update Rate: 1/second, continuous
Antenna: Built-in patch

Compass: (Vista H only)
Accuracy: ± 5 degrees
Resolution: ± 1 degree, user calibrated

Altimeter: (Vista H only)
Accuracy: ± 10 ft. (3.3 m)
Resolution: 1 ft. (0.3 m), user calibrated

Power

Source: Two 1.5 volt AA batteries, 12 Vdc Adapter, or USB Cable

Battery Life: Up to 18 hours

Accuracy

GPS: <33 ft. (10 m) 95% typical*

*Subject to accuracy degradation to 100m 2DRMS under the U.S. DoD imposed Selective Availability (SA) Program when activated.

DGPS: 10 ft. (3.3 m) 95% typical*

*Wide Area Augmentation System (WAAS) accuracy in North America.

Velocity: 0.1 meter/sec steady state

Interfaces: Garmin Proprietary (USB)

Data Storage Life: Indefinite; no memory battery required

Map Storage: 24 MB

Appendix

Connecting Your eTrex to a Computer

You can connect the eTrex to your computer using the supplied USB cable.

Before transferring data to the eTrex, install USB drivers from www.garmin.com. Click on **Support** > **Updates and Downloads** > **Additional Software** > **USB Drivers**.

To connect your eTrex to your computer:

1. Lift the weather cap on the top of the eTrex.
2. Insert the smaller connector on the USB cable into the USB connector port.
3. Connect the other end of the cable to a USB port on your computer.

Transferring Tracks, Routes, or Waypoints

Tracks, routes, and waypoints (including geocache sites) can be transferred between your eTrex and optional MapSource maps.

To transfer tracks, routes, or waypoints to and from MapSource:

1. Connect the eTrex to the computer with the USB cable.
2. Turn the eTrex on.
3. Open MapSource on your computer.
4. Click **Receive From Device** or **Send To Device** on the MapSource Transfer menu.

Caring for the eTrex

Cleaning the Case

Clean the outer casing (except for the screen) using a cloth dampened with a mild detergent solution, and then wipe it dry. Avoid cleaners that may damage the plastic components.

Cleaning the Screen

Clean the eTrex screen using a soft, clean, lint-free cloth. Use water, isopropyl alcohol, or eyeglass lens cleaner. Apply the liquid to the cloth, and then gently wipe the screen with the moistened cloth.

Software License Agreement

BY USING THE eTrex Vista H or eTrex Legend H, YOU AGREE TO BE BOUND BY THE TERMS AND CONDITIONS OF THE FOLLOWING SOFTWARE LICENSE AGREEMENT. PLEASE READ THIS AGREEMENT CAREFULLY.

Garmin grants you a limited license to use the software embedded in this device (the "Software") in binary executable form in the normal operation of the product. Title, ownership rights, and intellectual property rights in and to the Software remain in Garmin.

You acknowledge that the Software is the property of Garmin and is protected under the United States of America copyright laws and international copyright treaties. You further acknowledge that the structure, organization, and code of the Software are valuable trade secrets of Garmin and that the Software in source code form remains a valuable trade secret of Garmin. You agree not to decompile, disassemble, modify, reverse assemble, reverse engineer, or reduce to human readable form the Software or any part thereof or create any derivative works based on the Software. You agree not to export or re-export the Software to any country in violation of the export control laws of the United States of America.

Declaration of Conformity

Hereby, Garmin declares that this eTrex Vista H or eTrex Legend H are in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

To view the full Declaration of Conformity, see the Garmin Web site for your Garmin product: www.garmin.com/products/etrexVistaH and www.garmin.com/products/etrexLegendH. Click **Manuals**, and then select the **Declaration of Conformity**.

CE

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SS-APPENDIX C – Data Management Plan

Data Management Plan

August 2014

HOUSTON-GALVESTON AREA COUNCIL

Community & Environmental Planning Department

Prepared in cooperation with the

Texas Commission on Environmental Quality

under the authorization of the Texas Clean Rivers Act

Table of Contents

Introduction

The Data Management Plan (The Plan) outlines the standard policies and procedures for data management within the Community and Environmental Planning (C&E) Department. The Plan covers the management of both tabular (non-geographic) and spatial (geographic) datasets. Its primary purpose is to ensure the efficient access and maintenance of these datasets within the C&E Geospatial/Geographic Information Systems (GIS) environment.

GIS technology provides a systematic means to capture, manipulate, analyze, store and display spatially referenced data. GIS supports a wide variety of applications ranging from site assessments, environmental planning, urban planning, and spatial analysis to support organizational strategies. In general, GIS supports the overall departmental goals of guiding regional planning, enhancing the quality of the region's natural environment, and public education through outreach programs. The C&E GIS team supports various programs within the C&E department through data development, spatial analysis, geospatial applications development, cartography in support of departmental goals.

The Plan is considered a dynamic working document which responds to changing technology, funding, staffing, and project requirements. Consequently, the Plan is reviewed on an annual basis and amended as necessary.

Geospatial Services

The following section explains the geospatial services provided by the H-GAC C&E GIS team as it relates to the sharing of data, development of geospatial applications, cartography, and underlying GIS resources. The C&E GIS team is responsible for the development of data and sharing of many publicly viable datasets, developing geospatial applications, cartography, and coordination of maintenance of underlying geospatial hardware and software for C&E.

The C&E GIS team maintains a centralized geospatial warehouse (C&E SDE), an online mapping platform for web-based geospatial applications (Mapping Server), and an FTP download site (Data Clearinghouse). The C&E SDE utilizes ESRI's ArcSDE software running on a Microsoft SQLServer RDBMS. The mapping server uses ESRI's ArcGIS Server platform running on .NET. The Data Clearinghouse is an FTP server that provides C&E with storage space where it can post publicly available datasets for downloading. The C&E SDE, Mapping Server, and Data Clearinghouse platforms are installed by the H-GAC Data Services department (Data Services), with Data Services maintaining only the lower-level technology components such as the physical hardware, software installation, and low-level server and RDBMS functions. All upgrades and maintenance is coordinated by the C&E GIS Manager. All geospatial content stored in the C&E SDE, the Data Clearinghouse, and Mapping Server, are the responsibility of the C&E GIS staff, which resides within the C&E Socio-Economic Modeling program. A detailed schematic of the geospatial technical architecture and how the various systems are interconnected can be found in the *System Architecture* section below.

Data Sharing

The C&E SDE serves as the primary internal repository for geospatial data, metadata, and other information relevant to the activities and goals of the C&E department. All GIS users within C&E and some users from other H-GAC departments are provided *Editor* or *Viewer* access to data in the C&E SDE. The majority of users outside the core C&E GIS team have only viewer access to data in the C&E SDE. Other specific users that maintain data in the C&E SDE have editor access to the datasets. All user access privileges are assigned by the C&E GIS Manager based upon business needs, GIS skills, and role within the organization. No users outside of the C&E department have editor level access to any GIS data in the C&E SDE, and in some instances there are datasets that are viewable by only C&E GIS users. Instructions for connecting to the C&E SDE are provided to authorized users.

Datasets determined to be viable for publication to the public are exported to the Data Clearinghouse website, thereby allowing the general public widespread access to this information via the internet. Members of the public may view metadata and download any of the datasets that are posted to the Data Clearinghouse. In some instances these datasets are used in web-based mapping applications and can be accessed online via the Mapping Server's services directory, or accessible via the Data Clearinghouse for downloading. All public C&E GIS data, applications, cartographic products, and the C&E map services directory can be accessed via our C&E GIS page at http://www.h-gac.com/go/cegis, and a screen shot of the website can be found in Appendix 7.

Geospatial Applications

The C&E department has made a strategic decision to incorporate internet-based mapping applications into its deliverables for many programs and projects. Before, the results of most projects consisted of a large-format map printed on a plotter up to 48"x36" in diameter. This form of cartography although still useful in many settings, did not allow programs to communicate results to the public or external organizations that had an interest in our analysis results. By taking results from C&E projects and coupling this with base map data and imagery, C& has been able to share the results of projects to a far greater audience, and has create opportunities whereby map layers published on the C&E mapping server can be utilized in other organizations mapping applications.

Currently there are three platforms upon which C&E provides internet-based mapping solutions. The first platform is based on the Adobe Flex programming environment, and all mapping applications developed using this platform run inside standard internet browsers that support the Flash technology, such as Internet Explorer. This platform is intended to provide users with a graphics rich user interface whereby the map can be navigated, layers turned on/off, and information obtained on each feature. In some instances, features have links to additional resources such as photos of monitoring stations, external websites, and detailed reports. This mapping application environment allows the users to make full use of their computers internet browser window, and serves as a simple online GIS.

The second platform utilizes the capabilities of the ArcServer platform to allow users to directly access map layers published on the mapping server. This method of delivery is called 'streaming' and allows end users read-only access to individual map layers ad geoprocessing tools published on the server. Typical users of this method of deliver are other GIS users using desktop GIS, whereby they can connect directly to our ArcServer platform for read-only access and view our map layers. Other instances whereby users may utilize this method is where they are including our map layers in their own mapping applications.

The third and final platform involves developing applications for mobile devices or tablets. The C&E department has developed both native (installed) applications for the Apple iOS platform, as well as server-side scripted applications which utilize the free ESRI ArcGIS for Mobile Devices viewer app, which runs on iOS, Android, or Windows phone devices. In both instances, map layers used in these applications are delivered from the C&E ArcServer platform.

As previously mentioned, access to all the above forms of applications and data sharing methods can be accessed via our C&E GIS page at http://www.h-gac.com/go/cegis.

Mapping and Cartographic Products

The C&E department produces a variety of static cartographic maps for the region as a result of project activities and for general usage. To facilitate the sharing of these maps in an electronic format, C&E has implemented a Map Book as part of their C&E GIS page. Maps can be downloaded in multiple formats. The C&E Map Book can be accessed via our C&E GIS page at http://www.h-gac.com/go/cegis.

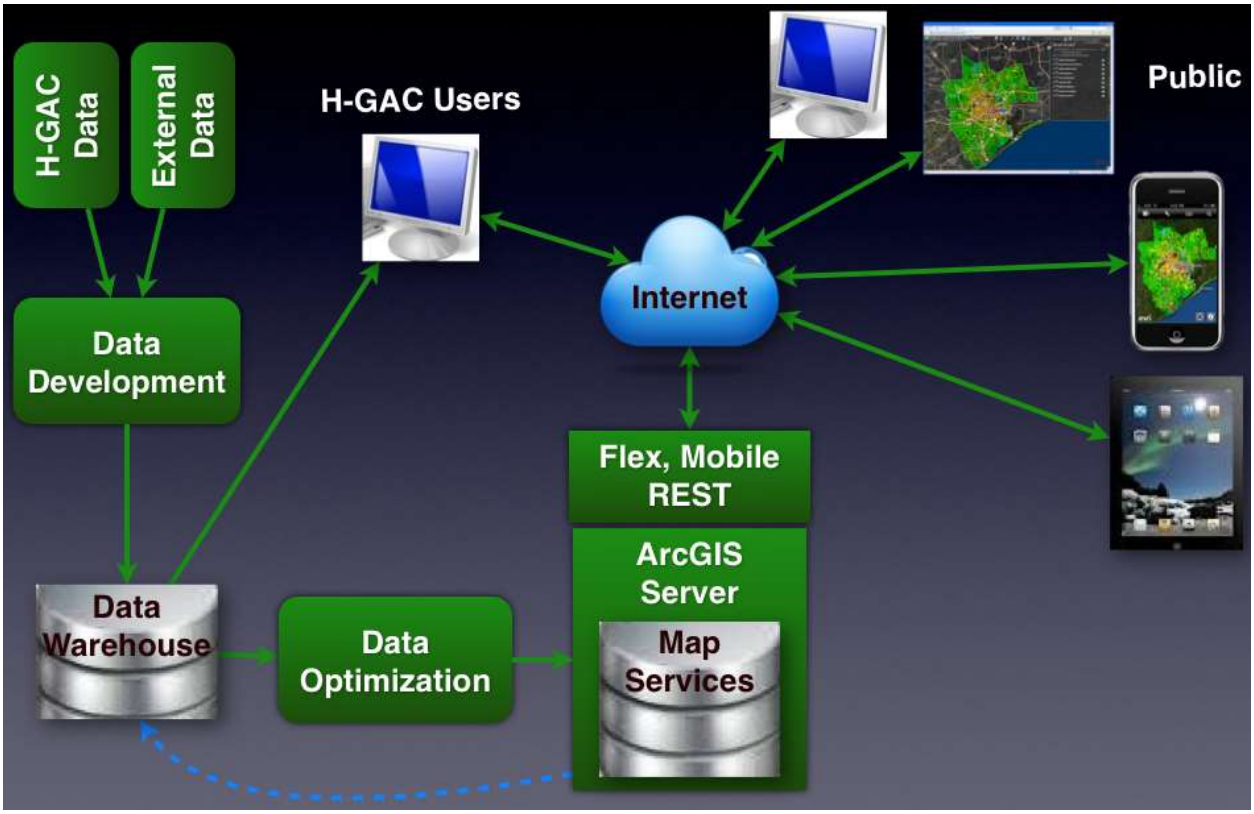
System Resources

System Architecture

The C&E department uses an integrated architecture to support the development, analysis, and dissemination of spatial information. The diagram below illustrates this system architecture at a high level. The goal of the overall system is to allow for a streamlined workflow to develop/maintain data, optimize the data for use in online applications, and the consumption of applications via multiple platforms.

Currently the C&E GIS platform supports sharing of geospatial data via the ArcServer mapping server platform. This allows end users internally or externally to consume map layers and geoprocessing tools via GIS desktop, mobile, tablet, or 3rd part applications.

In some instances, applications are configured with public feedback and volunteer GIS workflows that allow the C&E GIS team to obtain information for the public on various geographic features in the region. This public feedback loop allows C&E to investigate feedback and verify its validity prior to incorporating the information into the data warehouse.



Hardware

The configuration of the hardware used by staff that performs GIS and data Management work is a distributed network" This network consists of several PC's which are connected to central file servers. The department also uses a central web mapping server for online mapping applications.

A complete listing of departmental hardware is found in Appendix 3.

Software

The C&E department relies upon the H-GAC Data Services department (Data Services) for all of its end user workstation configuration, installation, and maintenance. Each workstation for users comes with the Microsoft Office software package which includes Outlook (e-mail), Word (word processing), Excel (spreadsheets), PowerPoint (presentations), and in some instances Access (desktop database) should the user require desktop database capabilities. Each workstation is pre-configured and setup to operate within the H-GAC internal network, and has access to central servers for file storage. In some instances, certain personnel have addition non-standard software installed by Data Services as it is required for their responsibilities.

The C&E GIS staff utilizes ESRI's ArcGIS 10 platform for all geospatial analysis and mapping needs. In addition, as needed, the staff also utilizes the SAS software platform for further analysis and data development as deemed necessary. The ESRI ArcGIS 10 platform includes integrated Python programming capabilities, which allows for the creation of programming

scripts or batch programs to improve efficiency and documentation of processes. The Python programming language is an Open Source platform, and is freely distributable.

The centralized SDE is also provided by ESRI, and provided for a centralized geospatial database where GIS staff can store geospatial data for either read-only or editable access by GIS users in the C&E department. The C&E GIS staff maintains access privileges to the SDE datasets, and assigns individual users to various SDE access groups to grant approved accessed to data in the SDE. The SDE is considered the central warehouse whereby GIS users can go to for geospatial data to use in their analysis or mapping projects.

The software products currently used to accomplish the department's data management objectives are listed in Appendix 4.

Programming Languages

Programming services will be provided on an as needed and resource available basis. All programming efforts will follow a standard procedure from needs assessment, program planning, development and testing, to refinement and documentation. The principal programming languages to be used in task automation and project customization will depend on the nature of the need and the current state of the technology. At this time, all web-based GIS applications are developed using the ESRI ArcGIS Server platform, and user interface components to that platform are developed using the Adobe Flex API. Automated data development and analysis workflows utilize the Python programming language and the SAS programming platform as needed.

Data

Department staff members will be consulted annually to determine priority needs for data management. Based on this consultation, specific data sets will be acquired or further developed for the various program areas represented in the department. The current list of department-specific data sets is shown in Appendix 5.

A separate database lists all datasets regularly obtained from external sources, contact information, as well as the frequency of the datasets availability, and its cost. This database is developed using Microsoft Access, and is available to the C&E GIS team for tracking when updates to dataset may be available.

Personnel

The Data Management staff will be responsible for the maintenance and development of the C&E SDE, mapping server, geospatial applications, C&E GIS page, and Data Clearinghouse. These data management responsibilities cover a wide range from original data creation, acquisition and integration, data archiving and distribution. Additional responsibilities include enhancing the geographic extent, feature attributes, and metadata of the datasets.

The C&E GIS team is comprised of 3 full-time GIS professionals, one of which is the GIS Manager, and 2 full-time GIS Interns. The C&E GIS team supports all programs within the C&E department, which include Clean Rivers/Water Quality, Sustainability, Economic Development, Solid Waste, Ped/Bike, Socio-Economic Modeling, and special project. The C&E GIS team is part of the Socio-Economic Modeling program within C&E.

H-GAC's Data Services Department plays an indirect role in the implementation and maintenance of The Plan. The Data Services Department is responsible for managing the underlying hardware and network upon which C&E stores GIS data and implements GIS-based applications.

Training

Training for all users of the system is a critical part of The Plan. C&E staff directly responsible for data management will attend conferences, seminars, and software/hardware training courses as needed. H-GAC users of the system will be trained and/or receive technical support by the C&E GIS Manger and other C&E subject matter experts.

Budget

Budgetary requirements to sustain data management efforts will be reviewed annually.

Data Maintenance, Manipulation, and Use

Quality Assurance/Quality Control

QA/QC is designed to standardize screening, documentation, entry, output, analysis, correction, and updating of data in the system. QA/QC will document those responsible for data and system maintenance.

Data Limitations

Prior to the integration of data within the C&E SDE and posting to the Data Clearinghouse, a review of the data set will be completed to determine predefined data limitations such as missing values, different sampling frequencies, multiple measurements, analytical uncertainty, censored or unavailable data, and duplicated data with existing data sets. After review of the data set, a report will be generated which records any errors detected and any corrections that may be necessary.

Data Development Protocol

The C&E GIS staff works to update existing dataset, acquire new data, and perform geospatial analysis in support of various C&E programs. All new data generated from the result of an analysis is a candidate to be stored not only in the SDE as a new dataset, but also as a layer with a mapping application should the need arise. All data development and analysis is done internally to C&E, and at times leverages outside resources such as consultants, other non-profits whom H-GAC is partnering with, as well as with other H-GAC departments to obtain necessary data. Two datasets that the C&E department uses regularly outside the C&E SDE are the Data Services StarMap road centerline dataset, and the Data Services aerial imagery database.

The C&E GIS staff uses a hybrid approach to conducting geospatial analysis. Much of the analysis being performed may need to be re-processed at a later date as new versions of datasets become available, or as inputs to the analysis models are updated themselves. Thus to minimize the time spend re-running analysis models, the C&E GIS staff utilizes the ESRI ArcGIS platform in conjunction with SAS and Python to develop repeatable and documented workflows. This approach saves more time than interactive methods whereby a user must remember the process to follow, and then execute each step in the analysis independently.

Documentation related to data management efforts such as system evolution, structure, and procedures for use will be compiled and made available for the end user. Documentation will be made available online and in hard copy format.

Data Input

Standard conventions for data input will be determined on a per project and or individual data set basis. To ensure Year 2000 Compliance, all data sets with date/time fields will include a four-digit year (YYYY). Either of the following formats will be used: International Standard Date notation where the date field is represented as MM/DD/YYYY (Month/Day/Year), or an ordinal format where the date field is represented as YYYYDDD.

Data Dictionary and Metadata

A list of all C&E data available in either the C&E SDE or other tabular formats can be found in Appendix 5. Metadata for each dataset in the C&E SDE is stored with the datasets, and can be viewed by GIS users via their GIS desktop software. Any data provided for public download via the Data Clearinghouse also has a metadata html page that can be viewed via internet browsers.

Data Conversion

Data to be imported into the C&E SDE from hard copy, digital or by manual data entry, will follow a uniform conversion protocol to comply with the structure of current data sets. The type of data being converted will determine the protocol. All data is stored in ESRI geodatabase format within the C&E SDE, and when posted to the Data Clearinghouse the data is stored in the ESRI File Geodatabase file format, unless there is a specific requirement to provide the data in another format such as Shapefile or GIS Coverage.

Coordinate Systems

The Texas Stateplane Coordinate System, North American Datum 1983 (NAD83) will be the standard for geographic data at H-GAC. This coordinate system is based on the Cartesian coordinate system, or rectangular coordinates. When receiving geographic data from other sources the data will be transformed into the Stateplane Coordinate System to ensure compatibility with current data sets.

When publishing mapping services for use in web-based GIS mapping applications, the Web Mercator Auxiliary Sphere projection is used for all Data Frame projections. However, the underlying GIS data within these mapping services still use the Texas Stateplane Coordinate System, North American Datum 1983 (NAD83) projection.

Data Validation

Data Quality Control

When data are received from any source, documentation will be created to include the source name, date received, format of data and a brief description of the contents. Data will be loaded onto the system from the media received and a review of the data will be made along with any corrections being made to the source documentation. An analysis will be made in order to determine the means of data entry into the system whether it is only a stand-alone database, a number of linked tables, or a geographic database. The data will be converted to the appropriate format for integration with the current system whether it is a conversion into MS Access, Excel, SAS, or ESRI ArcGIS. The data will be visually examined to determine its validity and accuracy. If the data is invalid it will be corrected (if possible) otherwise the data will be incorporated into the C&E SDE, and then if applicable, posted to the Data Clearinghouse and used in conjunction with existing data. A QA/QC report of all procedures and a detailed description of how the data was incorporated into the current system (from the date received to the date of integration) will be generated.

Equipment Quality Control

All printers, workstations, and server hardware and operating systems are maintained by the Data Services department, unless otherwise noted in Appendix 3.

Genealogy

Upon receipt of data from outside sources, all data will be screened for integrity and completeness. After the preliminary evaluation of the data, a log of the data source, type and completeness is created and maintained with the associated data. A description of the data and the responsible personnel are documented.

Migration/Transfer

A copy of every C&E generated GIS dataset will be housed in the C&E SDE which C&E GIS staff manage the contents and structure of datasets. The underlying hardware and network connections for the C&E SDE are maintained by the Data Services Department. Datasets that are of public interest will be placed in the Data Clearinghouse for public access. Transfer from the C&E SDE to the Data Clearinghouse will occur on an as needed basis following department QA/QC measures and is handled by the C&E GIS team.

Data Security & Access

Data placed on the Data Clearinghouse will be available to those with Internet browsing and/or FTP capability. Data requests for non-public data from other agencies and the general public will be evaluated on an individual basis. When the data requests are received, a preliminary evaluation of the deliverable will be determined and a timeline and cost if applicable will be provided to the requesting agency or individual.

GIS and tabular data will be secure through directory permissions. H-GAC will employ Firewall or Proxy Server Technology to filter and severely restrict access to internal networks and database systems. Virus protection will be implemented to ensure system and data integrity.

Archives/Backup

Each week the C&E GIS team runs a schedule backup program to store a copy of all C&E SDE datasets on a portable hard drive with resides in a secure location within the H-GAC office. In addition, Data Services backs up and archives C&E SDE data and server configuration at regular intervals.. A backup will be performed daily and the tapes will be maintained for 8 weeks before they will be recycled. Every six month, a complete system backup will be performed and the tapes will be archived and kept for five years off-site for security.

Disaster Recovery

In the event of a disaster, the C&E department will have access to all C&E SDE data which is stored on the portable hard drive. The C&E GIS team will restore or provide needed data to GIS users from this portable hard drive until such as time that Data Services can restore the C&E SDE onto either a new server or a temporary server.

Appendices

Appendix 1 Data Source Information Sheet

Data Title:

Source Agency:
Contact:
Title:
Address
Phone:

Data Description:
Data source:
Date created:
Accuracy:
Media:
Data items:

Description of data:

Format (specify what software)
Map:
Tabular:
Image:
Text:

Retrieval Procedure:

Command(s):

Appendix 2 Data Log Sheet

Date received: _____

Report Prepared by: _____

Source Name and Phone: _____

Format: _____

Media: _____

Check the following steps to determine the validity of the data:

1. What is the extent of the geographic area? _____
_____

2. Structure (Circle One) Vector Raster

3. Scale? _____

4. Projection and Datum? _____

1. Do any of the key fields have missing values? If so which parameters have missing values? Yes ___ No ___
_____
_____
_____

2. Any known duplicate records? Yes ___ No ___

Appendix 3 Hardware

FTP Server
Windows 2000 Server

Mapping Application Servers

Production Server (NTCEIS01)

Model:	HP Proliant BL460c G6 Blade
CPU:	Quad-Core Intel Xeon X5560 (2.80 GHz, 8M Cache)
Memory:	8GB
Hard Drive:	300GB
OS:	Windows 2008
Internet Address:	204.65.99.189
Domain URL:	http://arcgis02.h-gac.com
Serial #:	USE936RV4S
Purchased:	January 2010

Development/Backup Server (NTIS04)

Model:	HP Proliant DL 380 G3
CPU:	Single Intel Xeon 2800
Memory:	1GB
Hard Drive:	C = 16 GB, D=66 GB
OS:	Windows 2000 SP 4
Internet Address:	204.65.99.240
Domain URL:	http://arcgis.h-gac.com
Serial #:	D313LDN1L122
Purchased:	April 2003

Printers & Plotters
HP1055CM Plotter - Used by C&E staff for large format printing of maps and schematics.

HP2500CM and LaserJet 4M Printers. C&E maintains both printers.

Global Positioning System (GPS) Units
The C&E Department possesses two GPS units.

Scanning Equipment
HP Scanjet 7400c. The CEP Department owns one network-accessible HP scanner.

Fax Equipment
Brother Intellifax 4750e. The C&E Department owns one fax machine.

Portable Storage Devices
Lacie 300GB external hard drive (USB, Firewire)

Appendix 4 Software

Office Productivity Software

Microsoft Office Pro (2007) - Word, Excel, Access, PowerPoint, publisher, InfoPath and Outlook.
Internet Explorer (ver 7) – Primary Development Tool

Graphics and Desktop Publishing

Macromedia Fireworks 4
Adobe Illustrator (ver 8.01) – Graphics
Adobe Photoshop (ver 5.0) – Graphics
Corel Draw (ver 7.0) - Graphics
Quark Express (ver 5.0) - Desktop Publishing.
Paintshop Pro (ver 4.12)
Camtasia Studio (ver 7.0) – Screen capture and video tutorial production

Programming

Visual Basic (ver 6.0) – Web Mapping Development Tool.
MS Active Server Pages (ver 2.0) – Web Database Development Tool.
Adobe Flex Builder (ver 4.0) – Web-based GIS application development tool
SAS (ver 9.3) – Data development and analytics.

Geographic Information Systems (GIS)

ESRI ArcGIS (ver 10, SP3) – Computer mapping and database manipulation capable of using ArcView, ArcInfo, and ArcEditor licenses as needed.
ESRI ArcGIS Server (ver 10, SP3) – Internet Mapping Application Server.
ESRI ArcSDE (ver 10, SP3) – Spatial data warehouse.

Data Management

Access (2007, 2010) - Relational Database.
SQL Server(2000) - Relational Database.

Operating Systems

Windows XP - PC working environment/Operating System
Windows 7 - PC working environment/Operating System
Windows 2003 & 2008 - Server Operating Systems

Appendix 5 Data List

C&E Spatial Data Warehouse (SDE) Datasets

Dataset Name	Type
AustCAD_Parcels_Coverage_2005	Polygon
AustCAD_Parcels_Coverage_2005_pts	Point
AustCAD_Parcels_Coverage_2006	Polygon
AustCAD_Parcels_Coverage_2006_pts	Point
AustCAD_Parcels_Coverage_2007	Polygon
AustCAD_Parcels_Coverage_2007_pts	Point
AustCAD_Parcels_Coverage_2008	Polygon
AustCAD_Parcels_Coverage_2008_Pts	Point
Austin_County	Polygon
AUSTIN_COUNTY_PARCEL_INFO_2005	Table
AUSTIN_COUNTY_PARCEL_INFO_2006	Table
AUSTIN_COUNTY_PARCEL_INFO_2007	Table
Austin_County_Parcel_Info_2008	Table
Austin_County_Parcel_Values_2006	Table
Austin_County_Parcel_Values_2007	Table
Austin_County_Parcel_Values_2008	Table
BrazCAD_Parcels_Coverage_2005	Polygon
BrazCAD_Parcels_Coverage_2005_pts	Point
BrazCAD_Parcels_Coverage_2006	Polygon
BrazCAD_Parcels_Coverage_2006_pts	Point
BrazCAD_Parcels_Coverage_2007	Polygon
BrazCAD_Parcels_Coverage_2007_pts	Point
BrazCAD_Parcels_Coverage_2008	Polygon
BrazCAD_Parcels_Coverage_2008_Pts	Point
Brazoria_County	Polygon
BRAZORIA_COUNTY_PARCEL_INFO_2005	Table
BRAZORIA_COUNTY_PARCEL_INFO_2006	Table
BRAZORIA_COUNTY_PARCEL_INFO_2007	Table
Brazoria_County_Parcel_Info_2008	Table
Brazoria_County_Parcel_Values_2005	Table
Brazoria_County_Parcel_Values_2006	Table
Brazoria_County_Parcel_Values_2007	Table
Brazoria_County_Parcel_Values_2008	Table
Brazoria_County_Political	Polygon
Brownfield_Site_Inventory	Point
Brownfield_Site_Inventory__ATTACH	Table
Chambers_County	Polygon
Chambers_County_Political	Polygon
Clean_Rivers_Public_Feedback	Point
Clean_Rivers_Public_Feedback__ATTACH	Table
Colorado_County	Polygon

Dataset Name	Type
CRP_Project_Areas	Polygon
FBendCAD_Parcels_Coverage_2005	Polygon
FBendCAD_Parcels_Coverage_2005_pts	Point
FBendCAD_Parcels_Coverage_2006	Polygon
FBendCAD_Parcels_Coverage_2006_pts	Point
FBendCAD_Parcels_Coverage_2007	Polygon
FBendCAD_Parcels_Coverage_2007_pts	Point
FBendCAD_Parcels_Coverage_2008	Polygon
FBendCAD_Parcels_Coverage_2008_Pts	Point
Fort_Bend_County	Polygon
Fort_Bend_County_Parcel_Info_2006	Table
Fort_Bend_County_Parcel_Info_2007	Table
Fort_Bend_County_Parcel_Info_2008	Table
Fort_Bend_County_Parcel_Values_2006	Table
Fort_Bend_County_Parcel_Values_2007	Table
Fort_Bend_County_Parcel_Values_2008	Table
GalvCAD_Parcels_Coverage_2005	Polygon
GalvCAD_Parcels_Coverage_2005_pts	Point
GalvCAD_Parcels_Coverage_2006	Polygon
GalvCAD_Parcels_Coverage_2006_pts	Point
GalvCAD_Parcels_Coverage_2007	Polygon
GalvCAD_Parcels_Coverage_2007_Pts	Point
GalvCAD_Parcels_Coverage_2008	Polygon
GalvCAD_Parcels_Coverage_2008_Pts	Point
Galveston_Bay_Estuary_Program_Watersheds	Polygon
Galveston_County	Polygon
GALVESTON_COUNTY_PARCEL_INFO_2005	Table
GALVESTON_COUNTY_PARCEL_INFO_2007	Table
Galveston_County_Parcel_Info_2008	Table
Galveston_County_Parcel_Values_2005	Table
Galveston_County_Parcel_Values_2007	Table
Galveston_County_Parcel_Values_2008	Table
Galveston_County_Political	Polygon
Grimes_County	Polygon
Gulf_Of_Mexico	Polygon
Harris_County	Polygon
Harris_County_FCD_Sub_Watersheds	Polygon
Harris_County_FCD_Watersheds	Polygon
HARRIS_COUNTY_PARCEL_INFO_2005	Table
HARRIS_COUNTY_PARCEL_INFO_2006	Table
HARRIS_COUNTY_PARCEL_INFO_2007	Table
Harris_County_Parcel_Info_2008	Table
Harris_County_Parcel_Values_2005	Table
Harris_County_Parcel_Values_2006	Table

Dataset Name	Type
Harris_County_Parcel_Values_2007	Table
Harris_County_Parcel_Values_2008	Table
Harris_County_Zones_58	Polygon
HCAD_Parcels_Coverage_2000	Polygon
HCAD_Parcels_Coverage_2000_pts	Point
HCAD_Parcels_Coverage_2003	Polygon
HCAD_Parcels_Coverage_2003_pts	Point
HCAD_Parcels_Coverage_2005	Polygon
HCAD_Parcels_Coverage_2005_pts	Point
HCAD_Parcels_Coverage_2006	Polygon
HCAD_Parcels_Coverage_2006_pts	Point
HCAD_Parcels_Coverage_2007	Polygon
HCAD_Parcels_Coverage_2007_Pts	Point
HCAD_Parcels_Coverage_2008	Polygon
HCAD_Parcels_Coverage_2008_Pts	Point
HGAC_13_County_Airports	Point
HGAC_13_County_Airports_ParcelIDs	Table
HGAC_13_County_BlockGroups_1990	Polygon
HGAC_13_County_BlockGroups_2000	Polygon
HGAC_13_County_BlockGroups_2010	Polygon
HGAC_13_County_Blocks_2000	Polygon
HGAC_13_County_Blocks_2010	Polygon
HGAC_13_County_Brownfield_Sites	Point
HGAC_13_County_Bus_Routes	Polyline
HGAC_13_County_Bus_Stops	Point
HGAC_13_County_Transit_Centers_Parks_and_Rides	Point
HGAC_13_County_Census_PL_Data_2010_Block_Groups	Table
HGAC_13_County_Census_PL_Data_2010_Blocks	Table
HGAC_13_County_Census_PL_Data_2010_Counties	Table
HGAC_13_County_Census_PL_Data_2010_Places	Table
HGAC_13_County_Census_PL_Data_2010_School_Districts	Table
HGAC_13_County_Census_PL_Data_2010_Tracts	Table
HGAC_13_County_Census_Places_2000	Polygon
HGAC_13_County_Census_Places_2000_Clipped	Polygon
HGAC_13_County_Census_Places_2000_Pts	Point
HGAC_13_County_Census_Places_2010	Polygon
HGAC_13_County_Census_Places_2010_Clipped	Polygon
HGAC_13_County_Census_Places_2010_Pts	Point
HGAC_13_County_Census_Urban_Areas_1990	Polygon
HGAC_13_County_Census_Urban_Areas_2000	Polygon
HGAC_13_County_Census_Urban_Areas_2009	Polygon
HGAC_13_County_Census_Urban_Areas_2010	Polygon
HGAC_13_County_Census_Zip_Codes_2010	Polygon
HGAC_13_County_Citizen_Collection_Stations	Point

Dataset Name	Type
HGAC_13_County_City_Boundaries	Polygon
HGAC_13_County_City_Boundaries_Clipped	Polygon
HGAC_13_County_City_Ordinance_Areas	Polygon
HGAC_13_County_Closed_Landfill_Inventory	Point
HGAC_13_COUNTY_COASTAL_VIGNETTE	Raster
HGAC_13_County_Coastline	Polygon
HGAC_13_County_Coastline_Boundary	Polygon
HGAC_13_County_CRP_Monitoring_Stations_2008	Point
HGAC_13_County_CRP_Monitoring_Stations_2010	Point
HGAC_13_County_CRP_Monitoring_Stations_2011	Point
HGAC_13_County_CRP_Monitoring_Stations_2012	Point
HGAC_13_County_CRP_Monitoring_Stations_2013	Point
HGAC_13_County_CRP_Monitoring_Stations_2015	Point
HGAC_13_County_CRP_Monitoring_Stations_Historical	Point
HGAC_13_County_Dams	Point
HGAC_13_County_Districts	Polygon
HGAC_13_County_Election_Precincts_2010	Polygon
HGAC_13_County_Farmland	Polygon
HGAC_13_County_Federal_Aid_Roads	Polyline
HGAC_13_County_G1M	Polygon
HGAC_13_County_G3M	Polygon
HGAC_13_County_G5M	Polygon
HGAC_13_County_Grocery_Stores	Point
HGAC_13_County_Household_Hazardous_Waste_Facilities	Point
HGAC_13_COUNTY_LAND_COVER_10_CLASS_2008	Raster
HGAC_13_COUNTY_LAND_COVER_10_CLASS_ROADS_2008	Raster
HGAC_13_COUNTY_LAND_COVER_3X3_MODE_FILTERED_2008	Raster
HGAC_13_COUNTY_LAND_COVER_MERGED_6_CLASS_2008	Raster
HGAC_13_County_Landfills	Point
HGAC_13_County_Libraries	Point
HGAC_13_County_Libraries_Parcel_Xref	Table
HGAC_13_County_Major_Rivers	Polyline
HGAC_13_County_Major_Roads	Polyline
HGAC_13_County_Metropolitan_Statistical_Area	Polygon
HGAC_13_County_OSSF_Permits	Point
HGAC_13_County_Parks	Point
HGAC_13_County_Parks_Features	Table
HGAC_13_County_Parks_Parcels	Table
HGAC_13_County_Parks_Natural_Areas_Awards	Point
HGAC_13_County_Pipelines	Polyline
HGAC_13_County_Plats	Polygon
HGAC_13_County_Political	Polygon
HGAC_13_County_Political_Boundary	Polygon
HGAC_13_County_Railroads	Polyline

HGAC_13_County_Raster_Extent	Polygon
Dataset Name	**Type**
HGAC_13_County_Recycle_Centers	Point
HGAC_13_County_School_Districts_Census_2010	Polygon
HGAC_13_County_School_Districts_TEA_2010	Polygon
HGAC_13_County_Service_Area_Boundaries	Polygon
HGAC_13_County_Soils	Polygon
HGAC_13_County_Solid_Waste_Facilities_2002	Point
HGAC_13_County_Solid_Waste_Facilities_2004	Point
HGAC_13_County_Solid_Waste_Facilities_2008	Point
HGAC_13_County_Solid_Waste_Facilities_2009	Point
HGAC_13_County_State_Parks	Polygon
HGAC_13_County_Superfund_NPL_Sites	Polygon
HGAC_13_County_Superfund_NPL_Sites_Pts	Point
HGAC_13_County_TIRZs	Polygon
HGAC_13_County_Tracts_1990	Polygon
HGAC_13_County_Tracts_2000	Polygon
HGAC_13_County_Tracts_2010	Polygon
HGAC_13_County_Water	Polygon
HGAC_13_County_Water_Detailed	Polygon
HGAC_13_County_Watershed_Project_Monitoring_Sites	Point
HGAC_13_County_Zip_Codes_2000	Polygon
HGAC_13_County_Zip_Codes_2002	Polygon
HGAC_13_County_Zip_Codes_2005	Polygon
HGAC_15_County_Aquifer_Recharge_Zones	Polygon
HGAC_15_County_Basins	Polygon
HGAC_15_County_Bio_Monitoring_Sites	Point
HGAC_15_County_Census_Zip_Codes_2010	Polygon
HGAC_15_County_City_Boundaries	Polygon
HGAC_15_County_City_Boundaries_Clipped	Polygon
HGAC_15_County_Coastline	Polygon
HGAC_15_County_Coastline_Boundary	Polygon
HGAC_15_COUNTY_CRP_Impairments	Table
HGAC_15_County_CRP_Lakes	Polygon
HGAC_15_County_CRP_Stream_End_Points	Point
HGAC_15_County_CRP_Streams	Polyline
HGAC_15_County_DEM_10m	Raster
HGAC_15_County_Major_Rivers	Polyline
HGAC_15_County_Major_Roads	Polyline
HGAC_15_County_Political	Polygon
HGAC_15_County_Political_Boundary	Polygon
HGAC_15_County_School_Districts_TEA_2010	Polygon
HGAC_15_County_Soils	Polygon
HGAC_15_County_Wastewater_Outfalls	Point
HGAC_15_County_Wastewater_Outfalls_Historical	Point

HGAC_15_County_Wastewater_Outfalls_Info	Table
Dataset Name	**Type**
HGAC_15_County_Water	Polygon
HGAC_15_County_Watershed_Insets	Polygon
HGAC_15_County_Watershed_Signs	Point
HGAC_15_County_Watersheds	Polygon
HGAC_15_County_Zip_Codes_2000	Polygon
HGAC_15_County_Zip_Codes_2002	Polygon
HGAC_8_County_Bikeway_Needs	Polyline
HGAC_8_County_Bikeway_Network	Polyline
HGAC_8_County_Bikeways	Polyline
HGAC_8_County_BlockGroups_2000	Polygon
HGAC_8_County_BlockGroups_2010	Polygon
HGAC_8_County_Blocks_2000	Polygon
HGAC_8_County_Blocks_2010	Polygon
HGAC_8_County_Census_Places_2000	Polygon
HGAC_8_County_Census_Places_2000_Clipped	Polygon
HGAC_8_County_Census_Places_2000_Pts	Polygon
HGAC_8_County_Census_Places_2010	Polygon
HGAC_8_County_Census_Places_2010_Clipped	Polygon
HGAC_8_County_Census_Places_2010_Pts	Polygon
HGAC_8_County_Census_Urban_Areas_2000	Polygon
HGAC_8_County_Census_Urban_Areas_2009	Polygon
HGAC_8_County_Census_Urban_Areas_2010	Polygon
HGAC_8_County_Census_Zip_Codes_2010	Polygon
HGAC_8_County_City_Boundaries	Polygon
HGAC_8_County_City_Boundaries_Clipped	Polygon
HGAC_8_County_City_Ordinance_Areas	Polygon
HGAC_8_COUNTY_COASTAL_VIGNETTE	Raster
HGAC_8_County_Coastal_Vignette_50_25	Polygon
HGAC_8_County_Coastline	Polygon
HGAC_8_County_Coastline_Boundary	Polygon
HGAC_8_County_Comprehensive_Plan_2010_pts	Point
HGAC_8_County_Eco_Types	Polygon
HGAC_8_County_Forecast_Cities_h	Table
HGAC_8_County_Forecast_Cities_v	Table
HGAC_8_County_Forecast_Counties_h	Table
HGAC_8_County_Forecast_Counties_v	Table
HGAC_8_County_Forecast_G025M_h	Table
HGAC_8_County_Forecast_G1_h	Table
HGAC_8_County_Forecast_G10K_h	Table
HGAC_8_County_Forecast_G10K_v	Table
HGAC_8_County_Forecast_G1M_h	Table
HGAC_8_County_Forecast_G1M_v	Table
HGAC_8_COUNTY_FORECAST_LU_G1_H	Table

HGAC_8_County_Forecast_RAZ_h	Table
Dataset Name	**Type**
HGAC_8_County_Forecast_RAZ_v	Table
HGAC_8_County_Forecast_Region_v	Table
HGAC_8_County_Forecast_TAZ_h	Table
HGAC_8_County_Forecast_TAZ_v	Table
HGAC_8_County_Forecast_Tracts_h	Table
HGAC_8_County_Forecast_Tracts_v	Table
HGAC_8_County_Forecast_Zip_Codes_h	Table
HGAC_8_County_Forecast_Zip_Codes_v	Table
HGAC_8_County_G025M	Polygon
HGAC_8_County_G1	Polygon
HGAC_8_County_G10	Polygon
HGAC_8_County_G1M	Polygon
HGAC_8_COUNTY_LAND_COVER_10_CLASS_2008	Raster
HGAC_8_COUNTY_LAND_COVER_10_CLASS_ROADS_2008	Raster
HGAC_8_COUNTY_LAND_COVER_3X3_MODE_FILTERED_2008	Raster
HGAC_8_COUNTY_LAND_COVER_MERGED_6_CLASS_2008	Raster
HGAC_8_County_Livable_Centers	Point
HGAC_8_County_Major_Rivers	Polyline
HGAC_8_County_Major_Roads	Polyline
HGAC_8_County_PedBike_Improvement_Areas	Polyline
HGAC_8_County_PedBike_Improvement_Locations	Polyline
HGAC_8_County_Pedestrian_Pathways	Polyline
HGAC_8_County_Political	Polygon
HGAC_8_County_Political_Boundary	Polygon
HGAC_8_County_Railroads	Polyline
HGAC_8_County_Raster_Extent	Polygon
HGAC_8_County_RAZ	Polygon
HGAC_8_County_School_Districts_TEA_2010	Polygon
HGAC_8_County_Soils	Polygon
HGAC_8_County_TAZ	Polygon
HGAC_8_County_Tracts_1970	Polygon
HGAC_8_County_Tracts_1980	Polygon
HGAC_8_County_Tracts_2000	Polygon
HGAC_8_County_Tracts_2010	Polygon
HGAC_8_County_Water	Polygon
HGAC_8_County_Water_Detailed	Polygon
HGAC_8_County_Zip_Codes_2000	Polygon
HGAC_8_County_Zip_Codes_2002	Polygon
HGAC_8_County_Zip_Codes_2005	Polygon
HGAC_8_County_Zoning_2010_pts	Point
HGAC_Bastrop_Bayou_Sub_Watersheds	Polygon
HGAC_CRP_Watersheds	Polygon
HGAC_LAND_COVER_10_CLASS_2008	Raster

HGAC_LAND_COVER_10_CLASS_ROADS_2008	Raster
Dataset Name	**Type**
HGAC_LAND_COVER_3X3_MODE_FILTERED_2008	Raster
HGAC_LAND_COVER_MERGED_6_CLASS_2008	Raster
HGAC_Sea_Level_Rise_10Ft	Polygon
HGAC_Sea_Level_Rise_15Ft	Polygon
HGAC_Sea_Level_Rise_1Ft	Polygon
HGAC_Sea_Level_Rise_20Ft	Polygon
HGAC_Sea_Level_Rise_25Ft	Polygon
HGAC_Sea_Level_Rise_30Ft	Polygon
HGAC_Sea_Level_Rise_35Ft	Polygon
HGAC_Sea_Level_Rise_3Ft	Polygon
HGAC_Sea_Level_Rise_5Ft	Polygon
HGAC_Sea_Level_Rise_All_Levels	Polygon
HGAC_Sea_Level_Rise_Current_Sea_Level	Polygon
Hurricane_Dolly_Observations	Point
Hurricane_Dolly_Track	Polyline
Hurricane_Ike_High_Water_Measurements	Point
Hurricane_Ike_Observations	Point
HURRICANE_IKE_SALT_BURN_GULF_COAST	Raster
Hurricane_Ike_Storm_Surge_Model_i48_gl2	Polygon
HURRICANE_IKE_STORM_SURGE_MODEL_I48_GL2_RASTER	Raster
Hurricane_Ike_Track	Polyline
LibCAD_Parcels_Coverage_2007	Polygon
LibCAD_Parcels_Coverage_2007_pts	Point
LibCAD_Parcels_Coverage_2008	Polygon
LibCAD_Parcels_Coverage_2008_Pts	Point
Liberty_County	Polygon
LIBERTY_COUNTY_PARCEL_INFO_2007	Table
Liberty_County_Parcel_Info_2008	Table
Liberty_County_Parcel_Values_2007	Table
Liberty_County_Parcel_Values_2008	Table
Matagorda_County	Polygon
Matagorda_County_Political	Polygon
METRO_LRT_Lines	Polyline
METRO_LRT_Stations	Point
Model_Buildings	Point
Model_Buildings_Rural	Point
Model_Parcels	Polygon
Model_Parcels_Rural	Polygon
Model_Parcels_Acct_Nums	Table
Model_Parcels_Acct_Nums_Rural	Table
Model_Parcels_Addresses	Table
Model_Parcels_Addresses_Rural	Table
Model_Parcels_Forecast	Table

MontCAD_Parcels_Coverage_2005	Polygon
Dataset Name	**Type**
MontCAD_Parcels_Coverage_2005_pts	Point
MontCAD_Parcels_Coverage_2006	Polygon
MontCAD_Parcels_Coverage_2006_pts	Point
MontCAD_Parcels_Coverage_2007	Polygon
MontCAD_Parcels_Coverage_2007_pts	Point
MontCAD_Parcels_Coverage_2008	Polygon
MontCAD_Parcels_Coverage_2008_Pts	Point
Montgomery_County	Polygon
MONTGOMERY_COUNTY_PARCEL_INFO_2006	Table
MONTGOMERY_COUNTY_PARCEL_INFO_2007	Table
Montgomery_County_Parcel_Info_2008	Table
Montgomery_County_Parcel_Values_2006	Table
Montgomery_County_Parcel_Values_2007	Table
Montgomery_County_Parcel_Values_2008	Table
Montgomery_County_Zones_4	Polygon
NLCD_IMPERVIOUSNESS_2001	Raster
NLCD_IMPERVIOUSNESS_2006	Raster
NLCD_IMPERVIOUSNESS_CHANGE_2006	Raster
NLCD_LAND_COVER_2001	Raster
NLCD_LAND_COVER_2001_HGAC_13_COUNTY	Raster
NLCD_LAND_COVER_2001_HGAC_13_COUNTY_EXTENT	Raster
NLCD_LAND_COVER_2001_HGAC_13_COUNTY_RECLASSIFY	Raster
NLCD_LAND_COVER_2001_SAN_BERNARD_WATERSHED	Raster
NLCD_LAND_COVER_2006	Raster
NLCD_LAND_COVER_2006_RECLASSIFIED_10_CLASS	Raster
NLCD_LAND_COVER_CHANGE_2006	Raster
NLCD_TREE_CANOPY_2001	Raster
NOAA_Surge_MOM_Galveston_Bay	Polygon
NOAA_Surge_MOM_Matagorda_Bay	Polygon
San_Jacinto_County	Polygon
SEM_User_Input_Point	Point
SEM_User_Input_Polygon	Polygon
SEM_User_Input_Polyline	Polyline
Texas_113th_Congressional_Districts	Polygon
Texas_State_House_Districts_2012	Polygon
Texas_State_Senate_Districts_2012	Polygon
Texas_Census_BlockGroups_1990	Polygon
Texas_Census_BlockGroups_2000	Polygon
Texas_Census_BlockGroups_2010	Polygon
Texas_Census_Blocks_2000	Polygon
Texas_Census_Blocks_2010	Polygon
Texas_Census_School_Districts_2010	Polygon
Texas_Census_Tracts_1990	Polygon

Texas_Census_Tracts_2000	Polygon
Dataset Name	**Type**
Texas_Census_Tracts_2010	Polygon
Texas_Census_Urban_Areas_2009	Polygon
Texas_Coastal_Bathymetry	Point
Texas_Coastal_Vignette_50_25	Polygon
Texas_Coastline	Polygon
Texas_COG_Boundaries	Polygon
Texas_Counties_Coastline	Polygon
Texas_Counties_Political	Polygon
Texas_Highways	Polyline
Texas_Impairment_Streams_2008	Polyline
Texas_Impairment_Waterbodies_2008	Polygon
Texas_Major_Rivers	Polyline
Texas_Map_Extent	Polygon
Texas_Stream_Team_Monitoring_Sites	Point
Texas_Zip_Codes_2005	Polygon
The_Woodlands_Pathways	Polyline
TMDL_Project_Areas	Polygon
TMDL_Project_Areas_Mask	Polygon
TMDL_Watersheds	Polygon
US_State_Boundaries	Polygon
USFWS_Wetlands_2009	Polygon
USFWS_Wetlands_2010	Polygon
USFWS_Wetlands_2011	Polygon
USFWS_Wetlands_2012	Polygon
USGS_HUC_10_Watersheds	Polygon
USGS_HUC_12_Sub_Watersheds	Polygon
USGS_HUC_6_Basins	Polygon
USGS_HUC_8_Sub_Basins	Polygon
USGS_River_Basins	Polygon
USGS_Stream_Gauges_2009	Point
USGS_Stream_Gauges_2010	Point
USGS_Stream_Gauges_2012	Point
USGS_Sub_Watershed_Study_Areas	Polygon
WalkCAD_Parcels_Coverage_2005	Polygon
WalkCAD_Parcels_Coverage_2005_pts	Point
WalkCAD_Parcels_Coverage_2006	Polygon
WalkCAD_Parcels_Coverage_2006_pts	Point
WalkCAD_Parcels_Coverage_2007	Polygon
WalkCAD_Parcels_Coverage_2007_pts	Point
WalkCAD_Parcels_Coverage_2008	Polygon
WalkCAD_Parcels_Coverage_2008_Pts	Point
Walker_County	Polygon
WALKER_COUNTY_PARCEL_INFO_2005	Table

WALKER_COUNTY_PARCEL_INFO_2006	Table
Dataset Name	**Type**
WALKER_COUNTY_PARCEL_INFO_2007	Table
Walker_County_Parcel_Info_2008	Table
Walker_County_Parcel_Values_2005	Table
Walker_County_Parcel_Values_2006	Table
Walker_County_Parcel_Values_2007	Table
Walker_County_Parcel_Values_2008	Table
WallCAD_Parcels_Coverage_2007	Polygon
WallCAD_Parcels_Coverage_2007_Pts	Point
WallCAD_Parcels_Coverage_2008	Polygon
WallCAD_Parcels_Coverage_2008_Pts	Point
Waller_County	Polygon
WALLER_COUNTY_PARCEL_INFO_2007	Table
Waller_County_Parcel_Info_2008	Table
Waller_County_Parcel_Values_2007	Table
Waller_County_Parcel_Values_2008	Table
Wharton_County	Polygon
World_Country_Boundaries	Polygon

C&E Non-Spatial Data

Ambient Surface Water Quality Monitoring
Wastewater Self-reporting Data
Parcel-Based Land Use, Attributes, and Valuation (9 counties)
Census Data

Appendix 6 Data Dictionary

Data Dictionary Houston-Galveston Area Council Community and Environmental Planning Department

General Information		
Thematic Layer Name		
Feature Class		
Topology		
Table Name		
Data Source		
Report Prepared by		
Phone	Fax	E-Mail

Attribute Table				
Variable	Begin Column	Item Name	Alternate Name	Item Definition

Data History
Source Agency
Originating Date
Originating Scale

Status Information
Percentage Complete
Planned Completion Date
Geographic Extent
Planned Enhancements
Known problems or limitations

Maintenance Information
Maintaining Office/Division/Section
Contact Name
Contact Telephone Number
Type of updates performed
Frequency of Updates

Data Format Information
Data Format
Software/Version
Number of features/records
Total File Size

Projection
Geographic Projection:
Spheroid:
Zone:
Datum:
Units:
Fips Zone:
Quadrant:
X Shift:
Y Shift:
1st Standard Parallel:
2nd Standard Parallel:
Central Meridian:
Lat. of Projection Origin:
False Easting:
False Northing:

Additional Documentation
Quality Assurance Quality Control
Attribute Reports Available
Additional Documentation Available

Appendix 6 H-GAC C&E GIS Website & Data Clearinghouse

Houston-Galveston Area Council

Search A-Z Site Index

TRANSPORTATION & AIR QUALITY | COMMUNITY & ENVIRONMENTAL | PUBLIC SAFETY & SECURITY | HUMAN SERVICES | COOPERATIVE PURCHASING | REGIONAL DATA & GIS SERVICES

You are here: Home > H-GAC Home > Section Contents > GIS Web Mapping Services

SECTION CONTENTS

GIS Web Mapping Services

Map Book

GIS WEB MAPPING SERVICES

Click here to add the GIS page to your favorites!

These products are for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. They do not represent an on-the-ground survey and represents only the approximate relative location of property boundaries. Mapping may not reflect on the ground conditions. The Houston-Galveston Area Council makes no further claims as to the accuracy or reliability of the data, and neither assumes, nor will accept liability for their use. All mapping products on this website are the copyright of H-GAC and should not be sold, reproduced, or published without the written consent of H-GAC.

Parks Score Tool

The Parks Score tool shows locations of parks in the H-GAC 13 county region, as well as results of a regional analysis related to the locations of the parks.

Eco-Logical GIS

Use this tool to determine impacts on environmental resources in the region.

Regional Census ACS Data Portal

View the region's 2010 Census and ACS demographic data for counties, tracts and places.

Regional Land Use Information

View and query current and forecasted land use and socioeconomic data for the H-GAC 8-county region.

Regional Bikeway Viewer

The Regional Bikeway Viewer is an interactive map of existing and planned bikeways in the Houston-Galveston region.

Water Resources Information Map

Locate Monitoring Stations and access Water Quality Data for the region.

Closed Landfill Inventory

Use this web-based mapping tool to locate closed landfills in the 13-county region.

Recycle Centers Mapping Tool

Find recycling centers within our 13 county region using our Recycling Centers Mapping Tool.

Sign Up for GIS News

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NEW RELEASES

Regional Land Use Information
Water Resources Information Map

RESOURCES

2010 Census Maps
Census 2010 GIS Data
Using our GIS Web Mapping Services

Don't have GIS? Download ESRI's free ArcGIS Explorer

ArcGIS Services Directory
Browse online map layers for streaming to your ArcGIS desktop or applications

GIS Data Downloads
FTP site to download publicly available GIS datasets
View Metadata

Socioeconomic/Forecasting Data
Land use, economy, and population research and data for the region

Land Use & Land Cover Data
Land Use/Land Cover GIS data

Water Quality Data
Water Quality GIS data

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