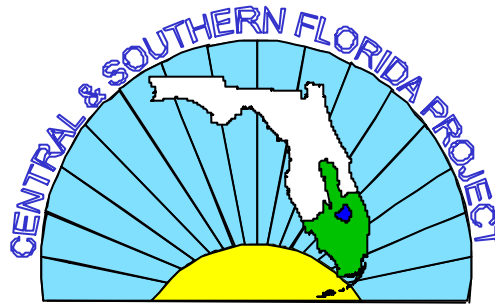


FEBRUARY 2001

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# CENTRAL AND SOUTHERN FLORIDA PROJECT

## COMPREHENSIVE EVERGLADES RESTORATION PLAN



COMPREHENSIVE EVERGLADES  
RESTORATION PLAN

## PROJECT MANAGEMENT PLAN Geodetic Vertical Control Surveys



U.S. Army Corps of Engineers  
Jacksonville District



South Florida  
Water Management District

**PROJECT MANAGEMENT PLAN**  
**GEODETTIC VERTICAL CONTROL SURVEYS**

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# PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

## **CERP: Geodetic Vertical Control Surveys**

### **1.0 Introduction**

The *Central and Southern Florida Project Comprehensive Review Study (Restudy)* presented a framework for Everglades restoration. Now known as the Comprehensive Everglades Restoration Plan (CERP), this plan contains 68 components, including structural and operational changes to the Central and Southern Florida Project (C&SF). The CERP achieves the restoration of more natural flows of water including sheet flow, improved water quality and more natural hydroperiods in the south Florida ecosystem. Improvements to native flora and fauna, including threatened and endangered species will occur as a result of the restoration of the hydrologic conditions. The plan was also designed to enlarge the region's supply of fresh water and to improve how water is delivered to the natural system.

The construction features of the CERP were designed at various levels of detail based on elevation information that was available during the plan formulation and evaluation phase. Many of the design assumptions for the components were based solely on output from the South Florida Water Management Model. This model averages hydrologic conditions across a model comprised of grid cells with lengths and widths of 2 miles by 2 miles. Other models using various cell sizes and different data were used for similar purposes. The data used for the study were adequate for that purpose but now the data needs to be more precise and consistent in order to support design and construction efforts. This effort will be the first step in providing accurate data for design and construction.

The topography of south Florida is like a flat tabletop. To accurately measure elevations on this table top, north-south and east-west lines must be surveyed to obtain a good base control survey network. The concept is the same as squaring the foundation of a house. Measurements have to be obtained on the sides and interior of the foundation to produce a square foundation. A survey network works on the same principle. The outsides of the area have to be surveyed and then the interior has to be connected to the exterior of the area to ensure balance and accuracy. This project will connect the entire system.

### **1.1 Description**

The Geodetic Vertical Control Survey Project is located in the 16 county area of south Florida within the boundary of the C&SF Project. The project will be implemented in FY-01 and is scheduled for completion in FY-05. There is a need to resolve elevation discrepancies in south Florida. Uncertainties by a tenth of a foot in terrain as flat as south Florida can lead to a gross miscalculation of water budgets and discharges as well as distortions of critical hydrologic variables. As an indication of the critical nature of this need, it has been observed that the Everglades has elevation changes as low as one-tenth of a foot over 10 miles. Not only is sound accurate scientific data needed for the analysis and design of restoration projects, but it is also critical in the future acquisition of data, essential to monitoring the success of all restoration efforts in south Florida.

## PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

Elevations used to describe water levels throughout the SFWMD are derived from monuments set in the ground, which have been assigned an elevation based on measurements against a vertical datum. There are two datums currently in use in south Florida, the National Geodetic Vertical Datum of 1929 (NGVD-29) and the North American Vertical Datum of 1988 (NAVD-88). The SFWMD and the Corps, Jacksonville District currently register water elevations relative to the NGVD-29 datum. The purpose of the project is to provide a vertical elevation base for scientific data analysis, modeling, design, construction, and operations and maintenance. Project Delivery Teams (PDTs) will use this data, which will be web served, to model, design, construct, and maintain their projects. Data needs for each project component will be identified in the project specific PMP. All data collection for the CERP project shall be based on survey monuments set for this survey. All on-going projects will tie-in the survey control that is used for the project to the monuments identified in this survey. All monitoring wells and gauging stations will be tied-in to the new monuments to ensure systems connectivity.

The Project Delivery Team (PDT) will revise the scope of work in Fiscal Year 01 to shorten the duration of this project. The change in scope and revised funding requirements will be reflected in the updated PMP. The COE will add four A-E Survey Contractors and as many crews as is necessary to complete the field work in two years and final QA/QC by NOAA/NGS in six months after the contracts are awarded. A separate contractor will be assigned to each phase to expedite the work. The COE and SFWMD will work with FDEP and NOAA/NGS to expedite survey data processing and "bluebooking." The PDT will have a revised PMP that will reflect this new scope in April 2001.

The conversion from National Geodetic Vertical Datum (NGVD 1929) to the North American Vertical Datum 1988 (NAVD 88) will be addressed in the Data Management Program Management Plan. The data project management plan will be complete in March 2001 with anticipated approval in April 2001. Standards for data collections will be identified in this plan.

This project does not address all of the surveying needs associated with CERP. Project Delivery Teams will identify project specific data collection requirements and collect the required data based on the standards set in the Data Management Plan.

The purpose of this Project Management Plan (PMP) is to provide a project-level implementation strategy for all phases of this project. This plan is not intended to be all-inclusive nor to anticipate or include all possible changes to a project during the lifecycle of its development.

# PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

## 1.2 Authority

(a) Design Agreement between the Department of the Army and the South Florida Water Management District (SFWMD) for portions of the Comprehensive Everglades Restoration Plan (Design Agreement) executed 12 March 2000.

(b) Federal Authority contained in the Water Resources Development Acts of 1992 and 1996 (Study) resulted in the Comprehensive Everglades Restoration Plan (CERP) as required by Section 528, Water Resources Development Act of 1999 (WRDA 99).

## 1.3 Background

The project features of the C&SF Project, South Florida Ecosystems Restoration Projects (Critical Projects), and Comprehensive Restudy components were planned, designed, and constructed based on survey control set relative to NGVD 1929. Piecemeal data collections, diverse methodology, and lack of a system-wide approach to survey control have eroded confidence in the accuracy of the benchmarks in south Florida. The SFWMD, Corps, other federal and state agencies supported Critical Project 14, "Geodetic Vertical Control Surveys" to resolve the elevation problems in south Florida. Due to the prioritization given to this project, legislated program limits precluded this effort from being pursued under this authority. The CERP included these Critical Projects that were not implemented under the Critical Project Program.

In the Master Program Management Plan (MPMP) Volume I, Section 2.0, Subsection 2.2, Paragraphs 2.2.1.2 and MPMP Volume 1, Appendix F, Section 3.0, the Corps and SFWMD have agreed to plan for common data formats for geospatial data. In MPMP Volume II, Section 4.6, the Corps and SFWMD have agreed to "Establish the standards and common formats necessary to easily share geospatial data by December 31, 2000. Convert geospatial data and models to conform to the established standards by September 30, 2002." These common data standards cannot be accomplished until all data are identified and referenced to the same vertical control system. This is one of the many purposes of this survey.

Other purposes include the vertical control base for all planning, surveying, mapping, design, modeling, and other related efforts for the duration of the project. All lower order control (2<sup>nd</sup> and 3<sup>rd</sup> Order) will be based on this network. All agencies involved in the CERP project will have common data points that will facilitate data exchange between federal, state, and other groups. NOAA/NGS will use this data to define the geoid model in south Florida. This data will facilitate the migration of data to NAVD 1988 and enable all users to take advantage of future technology that will result in cost savings and better data intergration in the future. Private survey firms, state of Florida, counties, municipalities, and other agencies will have the use of this data for a multitude of purposes that includes first floor elevations, emergency management, road construction, datum conversions, and other uses. All data will be available to everyone on the web

## PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

from the following Universal Resource Locator (URL) on the World Wide Web (WWW) at noaa.ngs.gov and on the common web site under development for the CERP project.

### **1.4. Related Projects**

All CERP efforts that rely on elevation data will be affected by this project. Without an accurate elevation base all planning, design, monitoring, modeling, data conversion from NGVD 1929 to NAVD 88, construction, scientific evaluation, water control, and other efforts will not have a common data reference system. This will lead to inaccurate scientific evaluation, flawed water control decisions, suspect modeling, inaccurate design, and construction claims.

### **1.5 Differences from the Comprehensive Plan**

Critical Project 14 had 1,250 linear miles (2,500 miles forward and back) of 1<sup>st</sup> Order Levels over a five year period with no requirement to process elevation data in both vertical datums and no Operations and Maintenance (O&M) program. This project consists of 1,000 linear miles (2,000 miles forward and back) of 1<sup>st</sup> Order Class II Levels, “bluebook” requirements, Global Positioning System (GPS) horizontal coordinates, posting to the National Spatial Reference System (NSRS), O&M requirement, and data processed in both vertical datums to facilitate conversions. This effort was not specifically spelled out as a CERP component but due to the need for accurate vertical control elevations over the spatial extend of the CERP Project it has been established as a stand alone project.

## **2.0 Project Scope**

Project work involves surveying 1,000 linear miles (2,000 miles forward and back) of 1<sup>st</sup> Order Class II level lines, set or recover approximately 1,000 monuments, route reconnaissance, processing and publishing the results on National Spatial Reference System (NSRS) for use by the Project Delivery Teams (PDTs), federal and state government units, private surveyors, engineering, design firms, and private individuals. The elevation data will be collected in NAVD 88 with sufficient references to monuments with NGVD 1929 to allow for adjustment in both datums. The project is divided into four phases based on estimated plans and specifications start dates for the first ten projects recommended in the WRDA 2000 and the pilot projects. The location of the lines is shown in Appendix A (Project Map). The priorities can be adjusted to fit the needs of the project and the Jacksonville District can respond with numerous Architect-Engineer (A-E) survey firms. The current project phases are as follows:

(a) Phase 1 (Priority 1) consists of 243 miles of levels and 243 monuments set in the ground. Level line locations are as follows:

1. Line 1. U.S. 41 (Tamiami Trail) from the intersection of U.S. 27 (Krome Avenue) west to State Road (S.R.) 951 in East Naples.

## PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

2. Line 18. S.R. 94 (Loop Road).

3. Line 2. I-595 from Plantation to Andytown and west along Alligator Alley from the Broward County line to S.R.951 and south to Tamiami Trail.

4. Line 3. Krome Avenue south from Tamiami Trail to Homestead.

5. Line 4 (Partial). S.R. 29 from Chokoloskee to Alligator Alley.

(b) Phase 2 (Priority 2) consists of 316 miles of levels and 316 monuments set in the ground. Level line locations are as follows:

1. Line 7. S.R. 710 from West Palm Beach to S.R. 70.

2. Line 7A. S.R. 70 from Ft. Pierce west to the intersection of U.S. 27 near Lake Placid.

3. Line 14. From the southeast corner of Loxahatchee National Wildlife Refuge north to S.R. 710.

4. Line 15. U.S. 441 north from Deerfield Beach to U.S. 98.

5. Line 8. From the west side of Loxahatchee National Wildlife Refuge northwest along the Hillsboro Canal to Belle Glade.

6. Line 5. From Tamiami Trail north on S.R. 833 to S.R. 80 & U.S. 27.

7. Line 19. From Terrytown north on U.S. 27 to South Bay.

(c) Phase 3 (Priority 3) consists of 256 miles of levels and 256 monuments set in the ground. Level line locations are as follows:

1. Line 6. U.S. 27 north from Whidden Corner to S.R. 70.

2. Line 10. From canal Point north on U.S. 98 to S.R. 710 and east on S.R. 714 to Jensen Beach.

3. Line 9. From Twenty Mile Bend and U.S. 98 northwest on U.S. 98. To Canal Point.

4. Line 11. From the intersection of S.R. 714 and S.R. 609, north on S.R. 609 and County roads to S.R. 70.

5. Line 12. From the intersection of S.R. 721 and S.R. 78 north around Lake Okeechobee and south to S.R. 714.

## PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

6. Line 13. North on S.R. 78 from Moorehaven to S.R. 712.

(d) Phase 4 consists of 188 miles of levels and 188 monuments set in the ground. Level line locations are as follows:

1. Line 4 (Remainder). From the intersection of Tamiami Trail and S.R. 29, north on S.R. 29 to LaBelle.

2. Line 16. From the intersection of S.R. 29 and S.R. 858 west on S.R. 858 to Naples Park.

3. Line 17. From the intersection of S.R. 29 and S.R. 82 west on S.R. 82 to and north on S.R. 884 to Alva.

As each phase of the project is completed elevation data will be checked, adjusted and published by NOAA/NGS in the NSRS. The Corps will furnish the elevation data and descriptions in a GIS map coverage and post on the CERP common web site.

During the first phase of this project, the PDT will evaluate new technologies that are rapidly evolving that might reduce the cost and time to complete this project. Survey lines will be added, deleted, or adjusted as necessary to complete the project. New GPS technology and advances in data acquisition and processing for higher order horizontal and vertical measurements are being evaluated by NGS. This program is the Height Modernization Program. It has the support of the American Congress of Surveying and Mapping (ACSM). The text of the ACSM recommendations is included as an attachment in Paragraph 11.

### **3.0. Work Breakdown Structure (WBS)**

The purpose of the (WBS) is to identify the products and sub-products that are required to complete the project as defined in the project Scope of Work (SOW) (Paragraph 2.0). The WBS is as follows:

3.1. Product Identification. The following products and sub-products will be produced to deliver the project as proposed in the SOW.

a. Project Management Plan (PMP). This document is a living document that was prepared by the PDT and will be periodically updated by the team. The PMP is not an all-inclusive document, rather a dynamic document that will require changes and periodic updates to reflect major changes in scope, schedule, cost, and resources. The PMP is a stand-alone document that provides all scheduling and cost information necessary to implement the project.

b. Contract Documents. The following documents will be prepared during the contracting phases of the project:

## PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

1. Request for Proposal (RFP). This document defines the technical scope of work. The RFP will be prepared by the Technical Manager. It includes all references to the applicable technical manuals, federal and state laws that regulate surveying and mapping.

2. Government Estimate. A document that assigns costs to tasks identified in the scope of work. The work effort is estimated by the TM based on experience, past work of a similar nature, and input from other technical experts. Cost is determined by rates negotiated by the Assistant Chief of Engineering Division for the Architectural-Engineer (A-E) Contracts. The contract is in place and task orders are placed against this contract.

3. Price-Negotiation Memorandum (PNM). The TM prepares this document after negotiations with the contractor. This document explains the negotiations with the contractor and clarifies for the record differences between the RFP and the contractor's proposal.

4. Notice to Proceed (NTP). A document issued to the contractor by the Contracting Officer (CO) that directs the contractor to commence work. Work cannot commence until this document is signed by the CO.

c. Survey Report. A report that is prepared by the contractor that provides a synopsis of the work. The survey report contains the following sub-products:

1. Survey methodology
2. Abstracts of field notes
3. Personnel
4. Lessons learned
5. Safety meetings
6. Weather Conditions
7. Maps
8. Metadata

d. Monument Descriptions.

1. Stamping on the monument.
2. Horizontal and vertical coordinates.
3. Datum
4. Order of accuracy.
5. How to find the monument.

e. Web Map. A web served map that shows the locations of the monuments.

## PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

3.2 Activity Identification. Activities are those tasks in the schedule that are required to deliver the products for this project. The activities for this project with estimated durations are shown in the Project Schedule, Appendix C.

### 4.0 Functional Area Plans

4.1 Advanced Formulation and Planning. N/A

4.2 Engineering and Design. Project will impact all Engineering and Design. This survey will provide the base control network upon which all project control will be based.

4.3 Construction Management. N/A

4.4 Real Estate. Land, easements, and rights-of-way are not required for this project.

4.5 Contracting and Acquisition. The field survey requirements will be procured through the placement of multiple Task Orders under existing Corps of Engineers (COE) Jacksonville District Indefinite Delivery/Indefinite Quantity (IDIQ) Architect-Engineer Contracts. The contracts selected for the placement of Task Orders are required to possess equipment and personnel to run first order geodetic vertical control surveys. The following actions will be accomplished in the procurement process:

- Development of Task Order scope of work.
- Development/approval of Independent Government Estimate.
- Identification of existing IDIQ survey contract.
- Request for Proposal with final scope of work forwarded to contractor.
- Contractor submits proposal to COE.
- Technical review of proposal and negotiation with contractor.
- Preparation of Price-Negotiation Memorandum (PNM) and award package.
- Review/Approval of PNM and issuance of Task Order (Notice-to-Proceed) by Contracting Officer.

4.6 Quality Control/Quality Assurance . Under contract to the SFWMD, the FDEP and the NGS States Advisor and staff, will be responsible to train the Corps contractors, inspect all their field work and check all their office work to ensure compliance with all applicable technical specification for the project. A list of technical manuals for this project is contained in Paragraph 11.

## PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

- 4.7 Permitting. N/A
- 4.8 Public Outreach and Involvement. The project scope, map, and updates will be posted on the Common CERP web site. The protocols for this site have not been established at this time. The current web site for this effort is [www.evergladesplan.org](http://www.evergladesplan.org).
- 4.9 Environmental and Ecological N/A
- 4.10 Value Engineering. N/A
- 4.11 Water Control. N/A
- 4.12 Operations and Maintenance (O&M). The SFWMD will assume O&M responsibilities at the completion of each phase of the project. O&M for this project will consist of replacing destroyed monuments within two miles individual projects.
- 4.13 Socioeconomics. N/A
- 4.14 Environmental Equity. Opportunities for contracting and sub-contracting for small and minority owned business will be evaluated by the contracting agency.
- 4.15 Restoration Coordination and Verification (Recover) Integration. This data will be used by RECOVER for evaluation purposes. The priorities for the work will be coordinated with RECOVER.
- 4.16 Project Cooperation Agreement. N/A
- 4.17 Project Closeout. When the project is completed, an audit will be requested to complete the fiscal closeout of the project. This activity is scheduled for FY-05.

### **5.0 Project Schedule**

- 5.1 Logic Network. Surveying is a linear activity. All activities are on the critical path.
- 5.2 Program Guidance/Constraints. The implementation of this project depends on budget and approvals. Because surveying is a linear activity, any delay in any approvals will impact the start and finish of the project. Conversely, more resources can shorten activity duration and reduce the time required to complete the project.
- 5.3 Project Schedule. The project schedule is shown in Appendix C.
- 5.4 Organizational Breakdown Structure. The Organizational Breakdown Structure (OBS) identifies the lead office/agency responsible for performing work required for project implementation. The OBS is as follows:

# PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

5.4 Organizational Breakdown Structure. The Organizational Breakdown Structure (OBS) identifies the lead office/agency responsible for performing work required for project implementation. The OBS is as follows:

CESAJ-DR-S	Project Manager
CESAJ-CT-C	Construction/A-E Contracting Branch
CESAJ-EN-DT	Survey Section/Design Branch
CESAJ-EN-T	Technical Services Branch
CESAJ-IM-I	Information Management/Implementation Branch
SFWMD	South Florida Water Management District
CESAJ-RM	Resources Management

5.5 Responsibility Assignment Matrix (RAM). The RAM is defined as the intersection of the WBS and OBS. The purpose of the RAM is to identify the office responsible for delivering the products and sub-products for the project. The RAM is shown in Appendix E.

## 6.0 Project Budget

The project budget was developed with input from the technical experts on the Project Delivery Team (PDT). Costs and duration, and estimating parameters associated with activities are shown in Appendix G. The estimated total cost of this project is \$4.0M.

## 7.0 Summary of Work-In-Kind Services

In-kind services will consist of project management, quality assurance/control, and contract administration. The estimated in-kind cost is \$549,000 for the project. The credit for in-kind services will be based actual costs incurred by the SFWMD. Supporting documentation (cost ledger, etc) will be forwarded to the COE when the SFWMD requests in-kind credit for costs.

## 8.0 Project Management Plan Change Control Procedures

This PMP will be updated in accordance with the MPMP.

## 9.0 List of Abbreviations and Acronyms

Abbreviations and acronyms are identified in the document text.

## 10.0 Project Management Plan Preparers and Project Delivery Team (PDT)

Charles D. Fales (COE)	Project Manager
Howard Ehmke (SFWMD)	Project Manager
David Robar (COE)	Technical Lead
Son Q. Vu (COE)	Chief, Survey Section
Rory Sutton (COE)	Technical Team Member

## PMP FOR GEODETIC VERTICAL CONTROL SURVEYS

Sim Smith (FDEP)	QA/QC
Randy Harrell (FDEP)	QA/QC
Ronnie Taylor (NOAA/NGS)	Independent Technical Review
John Pax (COE)	Associate District Counsel
Greg Desmond (USGS)	Technical Team Member
David Zilkowski (NGS)	Deputy Director
Linda McCarthy	FL Dept of Agriculture & Consumer Services
Ron Harris	St Lucie County
David Kealy (FDEP)	QA/QC
Gary Beaty	Palm Beach County Survey
Bill Etheridge	Palm Beach County Survey
Bill Wallace, PLS	County Surveyor/Martin County

### 11.0 Reference Documents and Forms

- a. *National Height Modernization Study*, NGS/ACSM, April 2000
- b. *Geodetic Bench Marks*, NOAA Manual NOS NGS 1, September 1978
- c. *Standards & Specifications for Geodetic Control Networks*, FGCC, Sept.1984.
- d. *Geospatial Positioning Accuracy Standards*, FGDC-STD-007-1998
- e. *Florida Statutes, Chapters 177 & 472*
- f. *Minimum Technical Standards, Chapter 61G17*, Florida Board of Professional Surveyors and Mappers.
- g. *Survey Markers and Monumentation*, COE Engineering Manual 1110-1-1002
- h. *Geospatial Data and Systems*, COE Engineering Manual 1110-1-2909
- i. *NAVSTAR Global Positioning System Surveying*, COE Engineering Manual 1110-1-1003



## 7 -- RECOMMENDATIONS

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### 7.1 Summary

As has been discussed in this report, the North American Vertical Datum of 1988 (NAVD 88) is the practical realization on the ground of a sophisticated elevation reference system for the North American continent. It is designed to be integrated into a seamless network of horizontal and vertical reference points, gravity data, GPS satellites, and tracking stations. This proposed National Spatial Reference System (NSRS), with NAVD 88 as its elevation reference, would support such diversified uses as:

- Precise navigation and aircraft landing systems
- Floodplain management and the National Flood Insurance Program
- Highway and railroad transportation infrastructure
- Intelligent vehicle highway systems
- Earthquake, volcanic, and subsidence research programs
- Disaster preparedness and relief efforts
- Water supply and delivery infrastructure
- Precision agriculture
- International boundaries and offshore boundary mapping
- Coastal zone management
- Environmental cleanup and ground water monitoring

While NAVD 88 was designed and executed over seven years ago, its implementation into the NSRS has yet to be achieved, and its deficiencies in certain regions threaten its very existence. In California, only 30% of the existing vertical control monuments were ever included in NAVD 88 because of their uncertain stability. Of this network of 17,000 NAVD 88 monuments, subsidence or seismic activity has now

significantly disturbed 25%. Similar subsidence issues exist in Texas, Louisiana, Florida, South Carolina, North Carolina, Kentucky, Ohio, Virginia, New Jersey, New York, Michigan, and Minnesota. The National Academy of Sciences has estimated subsidence damage costs in each of these states to exceed \$10 million annually. Relatively small changes in elevation often have profound impact. For instance:

- The National Research Council conservatively estimated the costs resulting from increased flooding and structural damage from subsidence in the United States to be in excess of \$125 million per year.
- The California Department of Water Resources estimates aquifers in the state are over drafted by 10 million acre-feet annually—an increase of 75% over the last five years.
- The National Science Foundation in conjunction with JPL, NASA, Scripps Institute, UCLA, and USGS provided \$7.5 million in funding in 1996 for GPS earthquake research.

The use of the 750,000 precisely located, in-the-ground or monumented reference points installed over the past 200 years to measure heights is not adequate to meet the needs of today's mobile and technology-driven society. The classical "line-of-sight" measurements do not provide the real-time accuracy needed for today's positioning technologies and applications, including precision agriculture, efficient marine transportation, and zero visibility landings of aircraft. In addition, many of these reference points have been disturbed, destroyed, or are not in compliance with today's requirements for accuracy.

The implementation of NAVD 88 means densifying the network through recomputation of existing data and execution of new surveys and studies to bring the horizontal, vertical, and gravity control networks together into a unified system joined and maintained by GPS. US Code, Title 33, Section 883 and the Office of Management and Budget Circular A-16 (revised October 19, 1990) specify this authority and responsibility to be the mission of the National Geodetic Survey.

NGS has been unable to apply appropriate resources to undertake a comprehensive solution to the challenge. What is needed is a Nation-wide effort for height modernization led by pilot or demonstration projects in the most difficult and time-critical areas of crustal motion

under the direction and expertise of NGS. This is fully compatible with the agency's official charge and its recently published mission, vision and Goals. New surveys and studies would be accomplished under contracts to private firms promoting the goals of economic benefit and technology transfer. Development of standards, contracting oversight, technical supervision, final analysis, and publication would be conducted by NGS ensuring consistency and complying with existing local legislation. In its finished state, the NSRS and NAVD 88 would provide a consistent three-dimensional framework for positioning throughout North America that is fully compatible and maintainable by GPS and/or other space-based navigation systems. The combination of an improved national height system (North American Vertical Datum of 1988–NAVD 88) first adopted by the Federal government in 1993, with the positioning technology of the GPS, offers the nation and its governments, for the first time, the ability to obtain precise vertical measurements in real-time.

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## ***7.2 Desired Outcome/Objective***

The most desirable outcome is a unified national positioning system, comprised of consistent, accurate, and timely horizontal, vertical, and gravity control networks, joined and maintained by GPS and administered by the National Geodetic Survey (NGS).

A state-of-the-art National Spatial Reference System (NSRS) with NAVD 88 as its elevation reference can make available to the nation a common, consistent set of real-time geographical coordinates or reference points. The applications of this break-through national positioning system will provide:

- Improved coastal and harbor navigation allowing for greater cost-effective transshipment of goods,
- Advanced surface transportation control and monitoring,
- Production of accurate Digital Elevation Models (DEM) allowing for better floodplain analysis and flood insurance needs,
- Highly efficient fertilizer and pesticide spreading, resulting in reduced run-off water pollution and more competitive farming through lower costs and higher crop yields,

- More accurate modeling of storm surge and pollution trajectories,
- Better monitoring of crustal movement to allow for improved understanding of tectonic movement and improved earthquake resistant designs,
- Increased reliability for improved resource management decision making through the use of Geographic Information Systems,
- Support the modernization of our transportation infrastructure and the mission and goals of the Intermodal Surface Transportation and Efficiency Act (ISTEA),
- Improved airline and aircraft safety through GPS controlled approach and landing, and
- Accurate and consistent vertical data for building major cross border projects with Canada and Mexico in support of America's environmental objectives.

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### ***7.3 Recommendations for Implementing NAVD 88***

#### **7.3.1 Approach**

To implement NAVD 88 throughout the United States, an approach is recommended that involves both Federal and private sector forces. Realizing that this implementation will carry a high short-term cost and an ongoing implementation cost, a two-phased approach is recommended. The first phase would focus on the survey work needed to establish the NAVD 88 reference bench marks, while the second phase would expand the system to more users.

#### ***Phase 1***

Phase one would be a cooperative effort between Federal and private sector forces to establish the **Federal Base System (FBS)** a nationwide network of 3-D control monuments with 10-kilometer spacing, over a recommended period of 5 years. It would include:

- (1) Geodetic surveying; activities associated with the projects, including identification of monuments to determine which monuments are suitable for GPS occupation in the project areas; performing leveling and collecting GPS observations; processing

and adjusting GPS and leveling data; and preparing reports and submitting results for publication.

- (2) Development of a capability within the NGS to manage the implementation effort, determine priority areas, select qualified private sector contractors, manage contracts, and provide technical supervision.
- (3) Analyze and document the accuracy of the heights obtained by the projects.
- (4) Publish GPS-derived ellipsoid and orthometric heights with their associated accuracy.
- (5) Perform technology transfer activities, including publishing non-technical documents describing NAVD 88 and GPS heights,
- (6) Conducting seminars to promote understanding of NAVD 88 and GPS for non-technical persons and technical personnel,
- (7) Developing training seminars for technical persons to become instructors in the use of GPS to implement NAVD 88, and
- (8) Presenting workshops to train the private sector to properly process and submit GPS and leveling data to NGS

It is recommended to use private sector firms to provide the necessary field and GPS survey work to survey the FBS. All private sector work would be out-sourced on a project basis in accordance with Qualification Based Selection (QBS) procedures and the Federal Acquisition Regulations (FAR). All contacting would be carried under the direct supervision of NGS.

## ***Phase 2***

Phase two would be the ongoing expansion of the Federal Base System, and it should be carried out under the direction of the NGS. The maintenance effort would be funded on a yearly basis and would involve the cooperation of the states. This is similar in nature to the methods used to maintain the horizontal reference systems in place today. It would involve the expertise of the NGS through their State Advisor program.

### ***State-by-State Implementation***

The most cost effective and manageable method to implement the Federal Base System for NAVD 88 throughout the continental United States will be on a state-by-state basis. It will be the responsibility of the NGS to set the priorities for each state, based on the following criteria:

- Amount of seismic activity and subsidence within the state,
- Degree of urbanization and development,
- Needs of the user community, and
- Support for the program within the state.

Once the priorities have been established, the NGS will develop a work plan consisting of a technical scope of work, schedule, and budget for each target state. This work plan will be used to set the level of funding for the term in which the implementation will be carried out.

### ***Demonstration Projects***

Two of the states having the greatest immediate need for the full implementation of NAVD 88 are California and North Carolina. Both states are subject to extreme seismic activity, subsidence, floodplain management, coastal erosion, and heavy urbanization. With this report, it is recommended that two demonstration projects be undertaken simultaneously at the inception of phase one. These demonstration projects would accomplish the following mission and be completed during the first year of the program:

- Develop the needed program management capabilities within NGS. This will allow the NGS to put in place the necessary internal procedures and staffing to manage this effort;
- Allow the NGS to develop the proper Federal procedures for outsourcing of field survey and technical services;
- Train internal NGS staff in the requirements for contract management and technical supervision;
- Test the ability of private sector contractors to carry out this mission;

- Refine technical requirements and standards for using GPS for providing the required degrees of precision;
- Develop a more precise cost model for the implementation of NAVD 88 in the remaining states; and
- Provide a status report, to the House, detailing the program's progress, recommendations for the next phase and level of funding, benefits incurred, and lessons learned.

### **7.3.2 Time Frame**

The sooner the Federal Base System for NAVD 88 is fully implemented, the sooner the Nation will be able to reap the benefits. The program could be implemented over a period of five to ten years depending upon the level of funding available. Using a combination of Federal and private sector forces, this time frame is entirely feasible. However, this cannot happen without additional resources as described below.

### **7.3.3 Costs**

Tables 22 and 23 show the estimated costs for implementing the Federal Base System, including NAVD 88, at a basic 10-kilometer spacing. This includes all costs for providing new field surveys and oversight by the NGS. Table 22 indicates the estimated costs for the first phase demonstration projects, and Table 23 includes costs for nationwide implementation.

### **7.3.4 Methodology**

To best serve the user community, a Federal Base Network is recommended, based on a nominal 10-kilometer spacing of permanent NAVD 88 reference points. This will allow for the maximum effective use by the highest percentage of users. A vast majority of the private survey firms in the United States are small businesses, with staffs under 10 persons. These firms generally cannot afford the cost for advanced GPS technology, the type needed to produce precise and accurate heights. Until the cost for this GPS technology reaches an affordable level, these firms will rely on the use of leveling to serve the height needs of their communities and clients. A denser, 5-kilometer spacing, while recommended in the urban areas, would cost almost four times as much as the 10-kilometer spacing.

Nominal spacing of 10- kilometers would yield approximately 55,000 permanent NAVD 88 reference points throughout the continental United States, (eliminating points where monuments are obviously not required) at an average cost of approximately \$1,200 per 3-D survey monument. The \$1,200 estimate is based on the approximate \$800 average cost of observing with GPS plus an estimated \$400 required to cover the point’s reconnaissance, monumentation, and administrative costs. This would allow the local surveyor or engineer easy access to the system. In no case would they have to travel more than 5 kilometers (3.1 miles) to gain access to the system. This would allow for more cost-effective surveys and encourage the use of the system. Spacing greater than 10-kilometers will have a detrimental effect to both of these issues, and defeat many of the benefits described in this report.

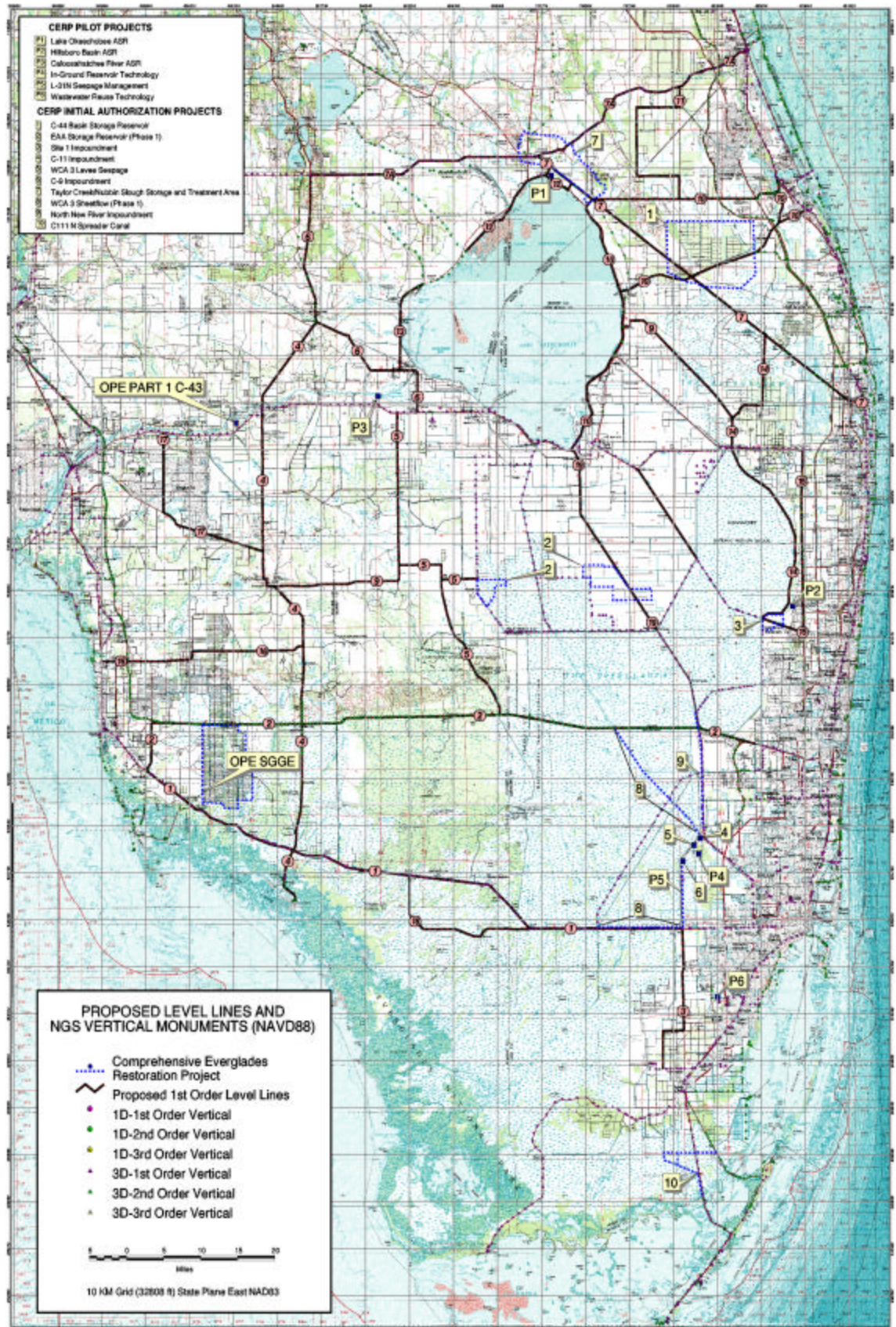
*Table 22 Phase 1 – First Year Demonstration Projects*

Activity	Estimated Cost of Using Conventional Surveying Technologies		Estimated Cost of Using GPS Technologies	
	California	North Carolina	California	North Carolina
Subtotal	\$41,200,000	\$20,040,000	\$4,600,000	\$2,380,000
<b>TOTAL</b>	<b>\$61,240,000</b>		<b>\$6,980,000</b>	

*Table 23 Nationwide Implementation of the Federal Base System*

Activity	Estimated Costs of Using Conventional Surveying Technologies	Estimated Costs of Using GPS Technologies
<b>TOTAL</b>	<b>\$596,000,000</b>	<b>\$66,000,000</b>

# APPENDIX A: PROJECT MAP




## **APPENDIX C: PROJECT SCHEDULE**




## GEODETIC VERTICAL SURVEYS

ID		Task Name	Duration	Start	Finish	Predecessors	Responsible Agency
1		<b>CERP:Geodetic Vertical Control Surveys</b>	<b>1106 d</b>	<b>08/18/00</b>	<b>01/18/05</b>		
2	✓	Initiate Project	0 d	08/18/00	08/18/00		CESAJ-DR-S
3		<b>ProjectManagement</b>	<b>1085 d</b>	<b>08/18/00</b>	<b>12/15/04</b>		
4		PM -COE	1085 d	08/18/00	12/15/04	2	CESAJ-DR-S
5		PM-SFWMD	1085 d	08/18/00	12/15/04	2	CESAJ-DR-S
6		<b>Project Management Plan Development</b>	<b>119 d</b>	<b>08/18/00</b>	<b>02/09/01</b>		
7	✓	Initiate PMP	0 d	08/18/00	08/18/00	2	CESAJ-DR-S
8	✓	Evaluate New Technology	6 d	10/10/00	10/17/00	7FS+35 d	CESAJ-EN-DT
9	✓	Scoping Meeting	2 d	10/18/00	10/19/00	8	CESAJ-DR-S
10	✓	Draft Scope and Schedule	30 d	10/20/00	12/04/00	9	CESAJ-DR-S
11	✓	PDT Meeting	1 d	12/05/00	12/05/00	10	CESAJ-DR-S
12	✓	Draft PMP Review COE/SFWMD	10 d	12/07/00	12/20/00	11FS+1 d	CESAJ-DR-S
13	✓	Incorporate/Address Comments	11 d	12/21/00	01/08/01	12	CESAJ-DR-S
14	✓	DCT Recommend Approval	1 d	01/09/01	01/09/01	13	DCT
15		PRB Approve PMP	1 d	01/10/01	01/10/01	14	COE
16		CRG Approve PMP	1 d	01/11/01	01/11/01	15	SFWMD
17		Review Period	20 d	01/12/01	02/09/01	16	CESAJ-DR-S
18		Executive Director Signs PMP	0 d	02/09/01	02/09/01	17	SFWMD
19		DDE Signs PMP	0 d	02/09/01	02/09/01	18	COE
20		Complete PMP	0 d	02/09/01	02/09/01	19	CESAJ-DR-S
21		<b>1st Order Surveys</b>	<b>897 d</b>	<b>02/09/01</b>	<b>09/06/04</b>		
22		<b>Route Reconnaissance Phase 1</b>	<b>45 d</b>	<b>02/09/01</b>	<b>04/16/01</b>		
23		Initiate Route Reconnaissance	0 d	02/09/01	02/09/01	20	CESAJ-EN-DT
24		SFWMD Executes Task Order w/FDEP	22 d	02/12/01	03/14/01	20	SFWMD
25		Field Reconnaissance	22 d	03/15/01	04/13/01	24	SFWMD
26		Receive Recon Report	1 d	04/16/01	04/16/01	25	CESAJ-EN-DT
27		Route Reconnaissance Complete	0 d	04/16/01	04/16/01	26	CESAJ-EN-DT
28		<b>Contracting Phase 1</b>	<b>41 d</b>	<b>04/16/01</b>	<b>06/13/01</b>		
29		Initiate Delivery Order	0 d	04/16/01	04/16/01	27	CESAJ-EN-DT
30		Prepare GPS Plan	10 d	04/17/01	04/30/01	29	CESAJ-EN-DT
31		Prepare RFP/ Government Estimate	10 d	05/01/01	05/14/01	30	CESAJ-EN-DT


## GEODETIC VERTICAL SURVEYS

ID		Task Name	Duration	Start	Finish	Predecessors	Responsible Agency
32		Technical Review and Approval	1 d	05/15/01	05/15/01	31	CESAJ-EN-T
33		Contractor Proposal Received	10 d	05/16/01	05/30/01	32	CESAJ-EN-DT
34		Negotiate Delivery Order	1 d	05/31/01	05/31/01	33	CESAJ-EN-DT
35		Prepare Negotiations Memorandum	2 d	06/01/01	06/04/01	34	CESAJ-EN-DT
36		Rout NTP	5 d	06/05/01	06/11/01	35	CESAJ-EN-DT
37		Technical Review and Approval	1 d	06/12/01	06/12/01	36	CESAJ-EN-T
38		Issue Notice to Proceed	1 d	06/13/01	06/13/01	37	CESAJ-CT-C
39		<b>Phase 1</b>	<b>281 d</b>	<b>06/13/01</b>	<b>07/26/02</b>		
40		Initiate Phase 1 Survey (243 Miles)	0 d	06/13/01	06/13/01	38	CESAJ-EN-DT
41		Contractor Mob to Job Site	1 d	06/14/01	06/14/01	40	A-E
42		SFWMD Mob to Job Site	1 d	06/14/01	06/14/01	41SS	SFWMD
43		Set Monuments/Write Descriptions	36 d	06/15/01	08/06/01	42	A-E
44		Field Inspection-SFWMD	36 d	06/15/01	08/06/01	43SS	SFWMD
45		Run Levels	144 d	07/10/01	02/05/02	43FS-20 d	A-E
46		Field Inspection	144 d	07/10/01	02/05/02	45SS	SFWMD
47		A-E Project Management-Field	144 d	07/10/01	02/05/02	45SS	A-E
48		GPS (Every 4 Miles/55 Monuments)	30 d	02/06/02	03/20/02	45	A-E
49		Submit Data	1 d	03/21/02	03/21/02	48,47	A-E
50		GPS Processing	10 d	03/22/02	04/04/02	49	CESAJ-EN-DT
51		Preliminary Computations	29 d	04/05/02	05/15/02	50	A-E
52		Submit Data to FDEP	1 d	05/16/02	05/16/02	51	A-E
53		Preliminary Adjustment FDEP	20 d	05/17/02	06/14/02	52	SFWMD
54		Final Adjustments and Bluebook	29 d	06/17/02	07/26/02	53	SFWMD
55		Survey Report/Complete Phase 1	0 d	07/26/02	07/26/02	54	CESAJ-EN-DT
56		<b>Route Reconnaissance Phase 2</b>	<b>60 d</b>	<b>04/13/01</b>	<b>07/09/01</b>		
57		Initiate Route Reconnaissance	0 d	04/13/01	04/13/01	45SS-60 d	CESAJ-EN-DT
58		SFWMD Prepare & Execute Task Order w/FDEP	22 d	04/13/01	05/14/01	57	SFWMD
59		Mob SFWMD	1 d	05/15/01	05/15/01	58	SFWMD
60		Route Reconnaissance	32 d	05/16/01	06/29/01	59	SFWMD
61		Receive Recon Report	5 d	07/02/01	07/09/01	60	CESAJ-EN-DT
62		Route Reconnaissance Complete	0 d	07/09/01	07/09/01	61	CESAJ-EN-DT

## GEODETIC VERTICAL SURVEYS

ID		Task Name	Duration	Start	Finish	Predecessors	Responsible Agency
63		<b>Contracting Phase 2</b>	<b>41 d</b>	<b>07/09/01</b>	<b>09/05/01</b>		
64		Initiate Delivery Order	0 d	07/09/01	07/09/01	62	CESAJ-EN-DT
65		Prepare GPS Plan	10 d	07/10/01	07/23/01	64	CESAJ-EN-DT
66		Prepare RFP & Government Estimate	10 d	07/24/01	08/06/01	65	CESAJ-EN-DT
67		Technical Review and Approval	1 d	08/07/01	08/07/01	66	CESAJ-EN-T
68		Contractor Proposal Received	10 d	08/08/01	08/21/01	67	CESAJ-EN-DT
69		Negotiate Delivery Order	1 d	08/22/01	08/22/01	68	CESAJ-EN-DT
70		Prepare Negotiations Memorandum	2 d	08/23/01	08/24/01	69	CESAJ-EN-DT
71		Technical Review and Approval	1 d	08/27/01	08/27/01	70	CESAJ-EN-T
72		Rout NTP	5 d	08/28/01	09/04/01	71	CESAJ-EN-DT
73		Issue Notice to Proceed	1 d	09/05/01	09/05/01	72	CESAJ-CT-C
74		<b>Phase 2</b>	<b>392 d</b>	<b>09/05/01</b>	<b>04/01/03</b>		
75		Initiate Phase 2 Survey (316 Miles)	0 d	09/05/01	09/05/01	73	CESAJ-EN-DT
76		Mob Contractor	1 d	09/06/01	09/06/01	75	A-E
77		Mob SFWMD	1 d	09/06/01	09/06/01	76SS	SFWMD
78		Set Monuments/Write Descriptions	53 d	09/07/01	11/23/01	77	A-E
79		Field Inspection-SFWMD	53 d	09/07/01	11/23/01	78SS	SFWMD
80		Run Levels	211 d	10/23/01	08/23/02	78FS-22 d	A-E
81		Field Inspection-SFWMD	211 d	10/23/01	08/23/02	80SS	SFWMD
82		A-E Project Management-Field	211 d	10/23/01	08/23/02	80SS	A-E
83		GPS (Every 4 Miles/79 Monuments)	30 d	08/26/02	10/07/02	80	A-E
84		Submit Data	1 d	10/08/02	10/08/02	83	A-E
85		GPS Processing	10 d	10/09/02	10/23/02	84	CESAJ-EN-DT
86		Preliminary Computations	43 d	10/24/02	12/26/02	85	A-E
87		Submit to FDEP	1 d	12/27/02	12/27/02	86	A-E
88		Preliminary Adjustment FDEP	20 d	12/30/02	01/28/03	87	SFWMD
89		Submit to NGS	1 d	01/29/03	01/29/03	88	CESAJ-EN-DT
90		Final Adjustments and Bluebook	43 d	01/30/03	04/01/03	89	SFWMD
91		Survey Report/Complete Phase 2	0 d	04/01/03	04/01/03	90	CESAJ-EN-DT
92		<b>Route Reconnaissance Phase 3</b>	<b>50 d</b>	<b>05/31/02</b>	<b>08/09/02</b>		
93		Initiate Route Reconnaissance	0 d	05/31/02	05/31/02	80FS-60 d	CESAJ-EN-DT


## GEODETIC VERTICAL SURVEYS

ID		Task Name	Duration	Start	Finish	Predecessors	Responsible Agency
94		SFWMD Prepare & Execute Task Order to FDEP	22 d	05/31/02	07/01/02	93	SFWMD
95		Mob SFWMD	1 d	07/02/02	07/02/02	94	SFWMD
96		Field Reconnaissance-SFWMD	26 d	07/03/02	08/08/02	95	SFWMD
97		Receive Recon Report	1 d	08/09/02	08/09/02	96	CESAJ-EN-DT
98		Route Reconnaissance Complete	0 d	08/09/02	08/09/02	97	CESAJ-EN-DT
99		<b>Contracting Phase 3</b>	<b>41 d</b>	<b>08/09/02</b>	<b>10/08/02</b>		
100		Initiate Delivery Order	0 d	08/09/02	08/09/02	98	CESAJ-EN-DT
101		Prepare GPS Plan	10 d	08/12/02	08/23/02	100	CESAJ-EN-DT
102		Prepare RFP & Government Estimate	10 d	08/26/02	09/09/02	101	CESAJ-EN-DT
103		Technical Review and Approval	1 d	09/10/02	09/10/02	102	CESAJ-EN-T
104		Contractor Proposal Received	10 d	09/11/02	09/24/02	103	CESAJ-EN-DT
105		Negotiate Delivery Order	1 d	09/25/02	09/25/02	104	CESAJ-EN-DT
106		Prepare Negotiations Memorandum	2 d	09/26/02	09/27/02	105	CESAJ-EN-DT
107		Technical Review and Approval	1 d	09/30/02	09/30/02	106	CESAJ-EN-T
108		Rout NTP	5 d	10/01/02	10/07/02	107	CESAJ-EN-DT
109		Issue Notice to Proceed	1 d	10/08/02	10/08/02	108	CESAJ-CT-C
110		<b>Phase 3</b>	<b>324 d</b>	<b>10/08/02</b>	<b>01/27/04</b>		
111		Initiate Phase 3 Survey (256 Miles)	0 d	10/08/02	10/08/02	109	CESAJ-EN-DT
112		Mob Crew	1 d	10/09/02	10/09/02	111	A-E
113		Mob SFWMD	1 d	10/09/02	10/09/02	112SS	SFWMD
114		Set Monuments/Write Descriptions	43 d	10/10/02	12/12/02	113	A-E
115		Field Inspection-SFWMD	43 d	10/10/02	12/12/02	114SS	SFWMD
116		Run Levels	171 d	11/12/02	07/17/03	114FS-22 d	A-E
117		Field Inspection-SFWMD	171 d	11/12/02	07/17/03	116SS	SFWMD
118		A-E Project Management-Field	171 d	11/12/02	07/17/03	116SS	A-E
119		GPS (Every 4 Miles/64 Monuments)	30 d	07/18/03	08/28/03	118	A-E
120		Submit Data	1 d	08/29/03	08/29/03	119	A-E
121		GPS Processing	10 d	09/02/03	09/15/03	120	CESAJ-EN-DT
122		Preliminary Computations	34 d	09/16/03	11/03/03	121	A-E
123		Submit to FDEP	1 d	11/04/03	11/04/03	122	A-E
124		Preliminary Adjustments	20 d	11/05/03	12/04/03	123	SFWMD

## GEODETIC VERTICAL SURVEYS

ID	Task Name	Duration	Start	Finish	Predecessors	Responsible Agency
125	Submit to NGS	1 d	12/05/03	12/05/03	124	CESAJ-EN-DT
126	Final Adjustments and Bluebook	34 d	12/08/03	01/27/04	125	SFWMD
127	Survey Report/Complete Phase 3	0 d	01/27/04	01/27/04	126	CESAJ-EN-DT
128	<b>Route Reconnaissance Phase 4</b>	<b>48 d</b>	<b>04/23/03</b>	<b>06/30/03</b>		
129	Initiate Route Reconnaissance	0 d	04/23/03	04/23/03	116FS-60 d	CESAJ-EN-DT
130	SFWMD Prepare & Execute Task Order to FDEP	22 d	04/23/03	05/22/03	129	SFWMD
131	Mob SFWMD	1 d	05/23/03	05/23/03	130	SFWMD
132	Route Reconnaissance-SFWMD	20 d	05/27/03	06/23/03	131	SFWMD
133	Receive Recon Report	5 d	06/24/03	06/30/03	132	CESAJ-EN-DT
134	Route Reconnaissance Complete	0 d	06/30/03	06/30/03	133	CESAJ-EN-DT
135	<b>Contracting Phase 4</b>	<b>41 d</b>	<b>06/30/03</b>	<b>08/27/03</b>		
136	Initiate Delivery Order	0 d	06/30/03	06/30/03	134	CESAJ-EN-DT
137	Prepare GPS Plan	10 d	07/01/03	07/15/03	136	CESAJ-EN-DT
138	Prepare RFP & Government Estimate	10 d	07/16/03	07/29/03	137	CESAJ-EN-DT
139	Technical Review and Approval	1 d	07/30/03	07/30/03	138	CESAJ-EN-T
140	Contractor Proposal Received	10 d	07/31/03	08/13/03	139	CESAJ-EN-DT
141	Negotiate Delivery Order	1 d	08/14/03	08/14/03	140	CESAJ-EN-DT
142	Prepare Negotiations Memorandum	2 d	08/15/03	08/18/03	141	CESAJ-EN-DT
143	Technical Review and Approval	1 d	08/19/03	08/19/03	142	CESAJ-EN-T
144	Rout NTP	5 d	08/20/03	08/26/03	143	CESAJ-EN-DT
145	Issue Notice to Proceed	1 d	08/27/03	08/27/03	144	CESAJ-CT-C
146	<b>Phase 4</b>	<b>257 d</b>	<b>08/27/03</b>	<b>09/06/04</b>		
147	Initiate Phase 4 Survey (188 Miles)	0 d	08/27/03	08/27/03	145	CESAJ-EN-DT
148	Mob Crew	1 d	08/28/03	08/28/03	147	A-E
149	Mob SFWMD	1 d	08/28/03	08/28/03	148SS	SFWMD
150	Set Monuments/Write Descriptions	33 d	08/29/03	10/16/03	149	A-E
151	Field Inspection-SFWMD	33 d	08/29/03	10/16/03	150SS	SFWMD
152	Run Levels	125 d	10/02/03	04/02/04	150FS-10 d	A-E
153	Field Inspection-SFWMD	125 d	10/02/03	04/02/04	152SS	SFWMD
154	A-E Project Management-Field	125 d	10/02/03	04/02/04	152SS	A-E
155	GPS (Every 4 Miles/47 Monuments)	30 d	04/05/04	05/14/04	154	A-E

## GEODETIC VERTICAL SURVEYS

ID		Task Name	Duration	Start	Finish	Predecessors	Responsible Agency
156		Submit Data	1 d	05/17/04	05/17/04	155	A-E
157		GPS Processing	10 d	05/18/04	06/01/04	156	CESAJ-EN-DT
158		Preliminary Computations	25 d	06/02/04	07/07/04	157	A-E
159		Submit to FDEP	1 d	07/08/04	07/08/04	158	CESAJ-EN-DT
160		Preliminary Adjustments	15 d	07/09/04	07/29/04	159	SFWMD
161		Submit to NGS	1 d	07/30/04	07/30/04	160	SFWMD
162		Final Adjustments and Bluebook	25 d	08/02/04	09/06/04	161	SFWMD
163		Survey Report/Complete Phase 4	0 d	09/06/04	09/06/04	162	CESAJ-EN-DT
164		<b>Project Close-Out</b>	<b>82 d</b>	<b>09/06/04</b>	<b>01/05/05</b>		
165		Initiate Project Close-out	0 d	09/06/04	09/06/04	163	CESAJ-DR-S
166		Request for Audit	11 d	09/07/04	09/21/04	165	CESAJ-DR-S
167		Audit	47 d	09/22/04	11/30/04	166	CESAJ-RM
168		Financial Close-out	24 d	12/01/04	01/05/05	167	CESAJ-RM
169		Project Complete	0 d	01/05/05	01/05/05	168,4,5	CESAJ-DR-S
170		<b>Operations and Maintenance (O&amp;M)</b>	<b>620 d</b>	<b>07/29/02</b>	<b>01/18/05</b>		
171		Commence O&M Phase 1	90 d	07/29/02	12/05/02	55	SFWMD
172		Commence O&M Phase 2	90 d	04/02/03	08/07/03	91	SFWMD
173		Commence O&M Phase 3	90 d	01/28/04	06/03/04	127	SFWMD
174		Commence O&M Phase 4	90 d	09/07/04	01/18/05	163	SFWMD



## GEODETIC VERTICAL SURVEYS

ID	Task Name	99	00	01	02	03	04	05
32	Technical Review and Approval							
33	Contractor Proposal Received							
34	Negotiate Delivery Order							
35	Prepare Negotiations Memorandum							
36	Rout NTP							
37	Technical Review and Approval							
38	Issue Notice to Proceed							
39	<b>Phase 1</b>							
40	Initiate Phase 1 Survey (243 Miles)							
41	Contractor Mob to Job Site							
42	SFWMD Mob to Job Site							
43	Set Monuments/Write Descriptions							
44	Field Inspection-SFWMD							
45	Run Levels							
46	Field Inspection							
47	A-E Project Management-Field							
48	GPS (Every 4 Miles/55 Monuments)							
49	Submit Data							
50	GPS Processing							
51	Preliminary Computations							
52	Submit Data to FDEP							
53	Preliminary Adjustment FDEP							
54	Final Adjustments and Bluebook							
55	Survey Report/Complete Phase 1							
56	<b>Route Reconnaissance Phase 2</b>							
57	Initiate Route Reconnaissance							
58	SFWMD Prepare & Execute Task Order w/FDEP							
59	Mob SFWMD							
60	Route Reconnaissance							
61	Receive Recon Report							
62	Route Reconnaissance Complete							

## GEODETIC VERTICAL SURVEYS

ID	Task Name	99	00	01	02	03	04	05
63	<b>Contracting Phase 2</b>			■				
64	Initiate Delivery Order		■					
65	Prepare GPS Plan		■					
66	Prepare RFP & Government Estimate		■					
67	Technical Review and Approval		■					
68	Contractor Proposal Received		■					
69	Negotiate Delivery Order		■					
70	Prepare Negotiations Memorandum		■					
71	Technical Review and Approval		■					
72	Rout NTP		■					
73	Issue Notice to Proceed		■					
74	<b>Phase 2</b>		■	■	■			
75	Initiate Phase 2 Survey (316 Miles)		■					
76	Mob Contractor		■					
77	Mob SFWMD		■					
78	Set Monuments/Write Descriptions		■					
79	Field Inspection-SFWMD		■					
80	Run Levels			■	■			
81	Field Inspection-SFWMD			■	■			
82	A-E Project Management-Field			■	■			
83	GPS (Every 4 Miles/79 Monuments)				■			
84	Submit Data				■			
85	GPS Processing				■			
86	Preliminary Computations				■			
87	Submit to FDEP				■			
88	Preliminary Adjustment FDEP				■			
89	Submit to NGS				■			
90	Final Adjustments and Bluebook				■			
91	Survey Report/Complete Phase 2				■			
92	<b>Route Reconnaissance Phase 3</b>			■				
93	Initiate Route Reconnaissance			■				

## GEODETIC VERTICAL SURVEYS

ID	Task Name	99	00	01	02	03	04	05
94	SFWMD Prepare & Execute Task Order to FDEP				■			
95	Mob SFWMD							
96	Field Reconnaissance-SFWMD				■			
97	Receive Recon Report							
98	Route Reconnaissance Complete				■			
99	<b>Contracting Phase 3</b>				■			
100	Initiate Delivery Order				■			
101	Prepare GPS Plan							
102	Prepare RFP & Government Estimate							
103	Technical Review and Approval							
104	Contractor Proposal Received							
105	Negotiate Delivery Order							
106	Prepare Negotiations Memorandum							
107	Technical Review and Approval							
108	Rout NTP							
109	Issue Notice to Proceed							
110	<b>Phase 3</b>				■	■		
111	Initiate Phase 3 Survey (256 Miles)				■			
112	Mob Crew							
113	Mob SFWMD							
114	Set Monuments/Write Descriptions				■			
115	Field Inspection-SFWMD				■			
116	Run Levels				■	■		
117	Field Inspection-SFWMD				■	■		
118	A-E Project Management-Field				■	■		
119	GPS (Every 4 Miles/64 Monuments)					■		
120	Submit Data							
121	GPS Processing							
122	Preliminary Computations					■		
123	Submit to FDEP							
124	Preliminary Adjustments					■		











## GEODETIC VERTICAL SURVEYS

ID	Task Name	99	00	01	02	03	04	05
125	Submit to NGS							
126	Final Adjustments and Bluebook							
127	Survey Report/Complete Phase 3							
128	<b>Route Reconnaissance Phase 4</b>							
129	Initiate Route Reconnaissance							
130	SFWMD Prepare & Execute Task Order to FDEP							
131	Mob SFWMD							
132	Route Reconnaissance-SFWMD							
133	Receive Recon Report							
134	Route Reconnaissance Complete							
135	<b>Contracting Phase 4</b>							
136	Initiate Delivery Order							
137	Prepare GPS Plan							
138	Prepare RFP & Government Estimate							
139	Technical Review and Approval							
140	Contractor Proposal Received							
141	Negotiate Delivery Order							
142	Prepare Negotiations Memorandum							
143	Technical Review and Approval							
144	Rout NTP							
145	Issue Notice to Proceed							
146	<b>Phase 4</b>							
147	Initiate Phase 4 Survey (188 Miles)							
148	Mob Crew							
149	Mob SFWMD							
150	Set Monuments/Write Descriptions							
151	Field Inspection-SFWMD							
152	Run Levels							
153	Field Inspection-SFWMD							
154	A-E Project Management-Field							
155	GPS (Every 4 Miles/47 Monuments)							

## GEODETIC VERTICAL SURVEYS

ID	Task Name	99	00	01	02	03	04	05
156	Submit Data							
157	GPS Processing							
158	Preliminary Computations							
159	Submit to FDEP							
160	Preliminary Adjustments							
161	Submit to NGS							
162	Final Adjustments and Bluebook							
163	Survey Report/Complete Phase 4							
164	<b>Project Close-Out</b>							
165	Initiate Project Close-out							
166	Request for Audit							
167	Audit							
168	Financial Close-out							
169	Project Complete							
170	<b>Operations and Maintenance (O&amp;M)</b>							
171	Commence O&M Phase 1							
172	Commence O&M Phase 2							
173	Commence O&M Phase 3							
174	Commence O&M Phase 4							

# GEODETIC VERTICAL SURVEYS

Task		Rolled Up Task		External Tasks	
Progress		Rolled Up Milestone		Project Summary	
Milestone		Rolled Up Progress			
Summary		Split			

Project: geodet2  
Date: 01/23/01

<b>PROJECT MILESTONES</b>		
Milestone	Target Completion Date	Actual Completion Date
Project Management Plan Approved	2/9/01	
Complete Phase 1 Survey	7/26/02	
Complete Phase 2 Survey	4/1/03	
Complete Phase 3 Survey	1/27/04	
Complete Phase 4 Survey	9/6/04	
Complete Project	1/5/05	

## **APPENDIX E: RESPONSIBILITY ASSIGNMENT MATRIX (RAM)**

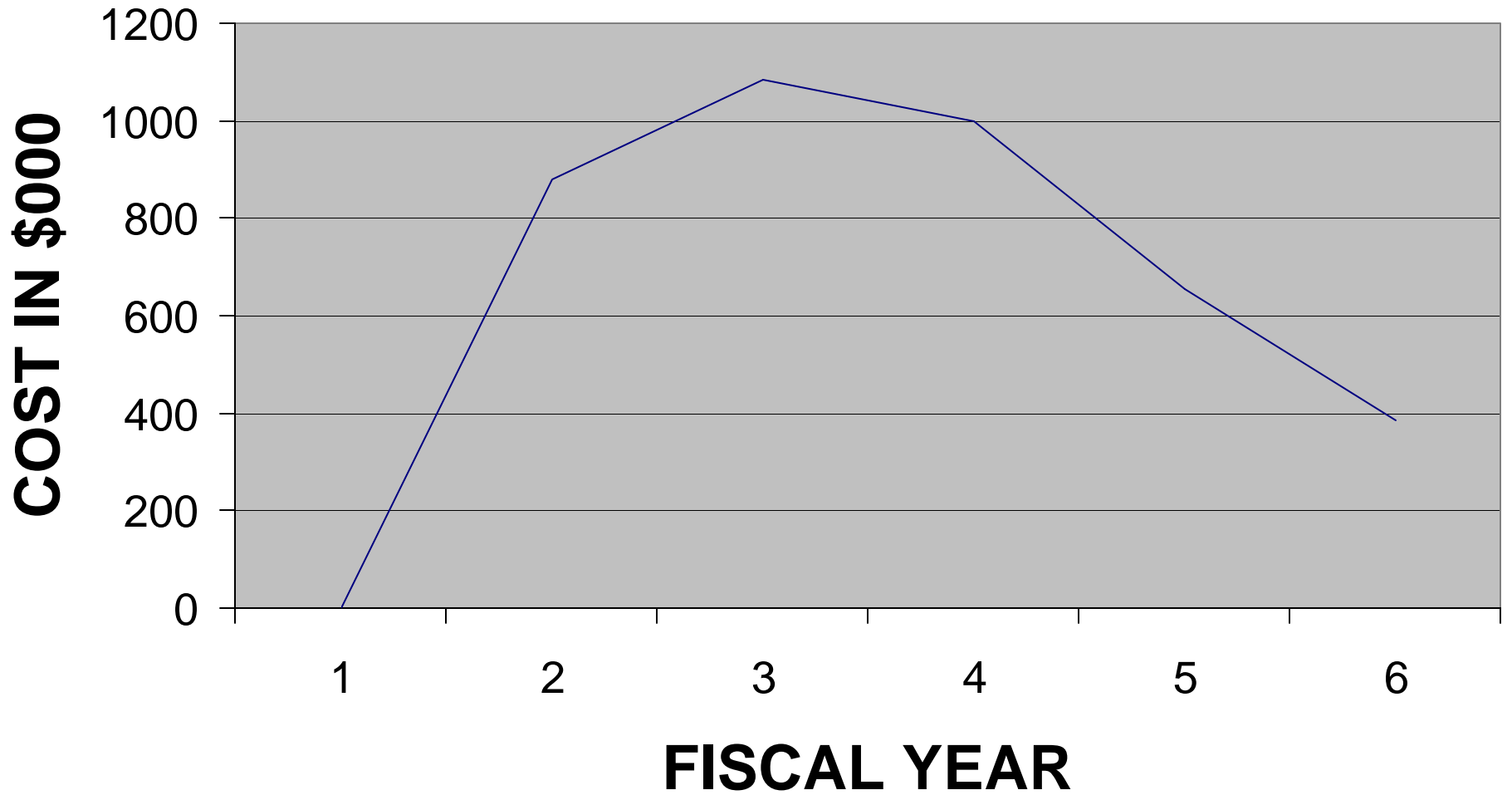
**C&SF:CERP: GEODETIC VERTICAL CONTROL SURVEYS  
RESPONSIBILITY ASSIGNMENT MATRIX**

PRODUCT	RESPONSIBLE OFFICE/AGENCY						
	CESAJ-DP-R	CESAJ-EN-DT	CESAJ-IM-I	A-E	CESAJ-CT-C	SFWMD	CESAJ-RM
Project Mangement Plan (PMP)	<b>X</b>					<b>X</b>	
Request for Proposal (RFP)		<b>X</b>					
Government Estimate		<b>X</b>					
Negotiations Memorandum		<b>X</b>					
Notice to Proceed (NTP)					<b>X</b>		
Survey Report.				<b>X</b>			
Map			<b>X</b>				
Monument Descriptions.				<b>X</b>			
Bluebook						<b>X</b>	
Audit Report							<b>X</b>
Operations & Maintenance Manual						<b>X</b>	
SFWMD Contract w/FDEP						<b>X</b>	

## **APPENDIX G: PROJECT BUDGET**

<b>BUDGET ESTIMATE (IN THOUSANDS OF DOLLARS)</b>						
<b>AGENCY</b>	<b>FY-01</b>	<b>FY-02</b>	<b>FY03</b>	<b>FY-04</b>	<b>FY-05</b>	<b>Total</b>
<b>COE</b>	439	542	500	327	276	2,000
<b>SFWMD</b>	439	542	500	326	277	2,000
<b>Fiscal Year Total</b>	878	1,084	1,000	653	169	4,000

# CASH FLOW



**PROJECT SCHEDULE & COST ESTIMATE BY ACTIVITY  
C&SF: CERP: GEODETIC VERTICAL CONTROL SURVEYS**

<b>Name</b>	<b>Start Date</b>	<b>Finish Date</b>	<b>Resource</b>	<b>Estimated Cost</b>
<b>Project Management</b>	08/18/00	12/15/04		
PM -COE	08/18/00	12/15/04	CESAJ-DR-S	\$ 150,000
PM-SFWMD	08/18/00	12/15/04	SFWMD	\$ 150,000
<b>Project Management Plan Development</b>	08/18/00	02/09/01		
Initiate PMP	08/18/00	08/18/00	CESAJ-DR-S	
Evaluate New Technology	10/10/00	10/17/00	CESAJ-EN-DT	\$ 4,000
Scoping Meeting	10/18/00	10/19/00	CESAJ-DR-S	\$ 2,000
Draft Scope and Schedule	10/20/00	12/04/00	CESAJ-DR-S	\$ 2,000
PDT Meeting	12/05/00	12/05/00	CESAJ-DR-S	\$ 2,000
Draft PMP Review COE/SFWMD	12/07/00	12/20/00	CESAJ-DR-S	
Incorporate/Address Comments	12/21/00	01/08/01	CESAJ-DR-S	
DCT Recommend Approval	01/09/01	01/09/01	DCT	
PRB Approve PMP	01/10/01	01/10/01	COE	
CRG Approve PMP	01/11/01	01/11/01	SFWMD	
Review Period	01/12/01	02/09/01	CESAJ-DR-S	
Executive Director Signs PMP	02/09/01	02/09/01	SFWMD	
DDE Signs PMP	02/09/01	02/09/01	COE	
Complete PMP	02/09/01	02/09/01	CESAJ-DR-S	
<b>1st Order Surveys</b>	02/09/01	09/06/04		
<b>Route Reconnaissance Phase 1</b>	02/09/01	04/16/01		
Initiate Route Reconnaissance	02/09/01	02/09/01	CESAJ-EN-DT	

SFWMD Executes Task Order w/FDEP	02/12/01	03/14/01	SFWMD	\$	5,000
Route Reconnaissance	03/15/01	04/13/01	SFWMD	\$	16,500
Receive Recon Report	04/16/01	04/16/01	CESAJ-EN-DT		
Route Reconnaissance Complete	04/16/01	04/16/01	CESAJ-EN-DT		
<b>Contracting Phase 1</b>	04/16/01	06/13/01			
Initiate Delivery Order	04/16/01	04/16/01	CESAJ-EN-DT		
Prepare GPS Plan	04/17/01	04/30/01	CESAJ-EN-DT	\$	5,500
Prepare RFP/ Government Estimate	05/01/01	05/14/01	CESAJ-EN-DT	\$	5,500
Technical Review and Approval	05/15/01	05/15/01	CESAJ-EN-T	\$	650
Contractor Proposal Received	05/16/01	05/30/01	CESAJ-EN-DT		
Negotiate Delivery Order	05/31/01	05/31/01	CESAJ-EN-DT	\$	550
Prepare Negotiations Memorandum	06/01/01	06/04/01	CESAJ-EN-DT	\$	1,100
Rout NTP	06/05/01	06/11/01	CESAJ-EN-DT		
Technical Review and Approval	06/12/01	06/12/01	CESAJ-EN-T	\$	550
Issue Notice to Proceed	06/13/01	06/13/01	CESAJ-CT-C	\$	550
<b>Phase 1</b>	06/13/01	07/26/02			
Initiate Phase 1 Survey (234 Miles)	06/13/01	06/13/01	CESAJ-EN-DT		
Contractor Mob to Job Site	06/14/01	06/14/01	A-E	\$	1,500
SFWMD Mob to Job Site	06/14/01	06/14/01	SFWMD	\$	750
Set Monuments/Write Descriptions	06/15/01	08/06/01	A-E	\$	54,000
Field Inspection-SFWMD	06/15/01	08/06/01	SFWMD	\$	11,250
Run Levels	07/10/01	02/05/02	A-E	\$	351,000
Field Inspection	07/10/01	02/05/02	SFWMD	\$	27,750
A-E Project Management-Field	07/10/01	02/05/02	A-E	\$	18,720
GPS (Every 4 Miles/55 Monuments)	02/06/02	03/20/02	A-E	\$	55,000
Submit Data	03/21/02	03/21/02	A-E		
GPS Processing	03/22/02	04/04/02	CESAJ-EN-DT	\$	5,500
Preliminary Computations	04/05/02	05/15/02	A-E	\$	10,150
Submit Data to FDEP	05/16/02	05/16/02	A-E		

Preliminary Adjustment FDEP	05/17/02	06/14/02	SFWMD	\$	11,000
Final Adjustments and Bluebook	06/17/02	07/26/02	SFWMD	\$	18,850
Survey Report/Complete Phase 1	07/26/02	07/26/02	CESAJ-EN-DT		
<b>Route Reconnaissance Phase 2</b>	04/13/01	07/09/01			
Initiate Route Reconnaissance	04/13/01	04/13/01	CESAJ-EN-DT		
SFWMD Prepare & Execute Task Order w/FDEP	04/13/01	05/14/01	SFWMD	\$	5,000
Mob SFWMD	05/15/01	05/15/01	SFWMD	\$	750
Route Reconnaissance	05/16/01	06/29/01	SFWMD	\$	24,000
Receive Recon Report	07/02/01	07/09/01	CESAJ-EN-DT		
Route Reconnaissance Complete	07/09/01	07/09/01	CESAJ-EN-DT		
<b>Contracting Phase 2</b>	07/09/01	09/05/01			
Initiate Delivery Order	07/09/01	07/09/01	CESAJ-EN-DT		
Prepare GPS Plan	07/10/01	07/23/01	CESAJ-EN-DT	\$	5,500
Prepare RFP & Government Estimate	07/24/01	08/06/01	CESAJ-EN-DT	\$	5,500
Technical Review and Approval	08/07/01	08/07/01	CESAJ-EN-T	\$	650
Contractor Proposal Received	08/08/01	08/21/01	CESAJ-EN-DT		
Negotiate Delivery Order	08/22/01	08/22/01	CESAJ-EN-DT	\$	550
Prepare Negotiations Memorandum	08/23/01	08/24/01	CESAJ-EN-DT	\$	1,100
Technical Review and Approval	08/27/01	08/27/01	CESAJ-EN-T	\$	650
Rout NTP	08/28/01	09/04/01	CESAJ-EN-DT		
Issue Notice to Proceed	09/05/01	09/05/01	CESAJ-CT-C	\$	650
<b>Phase 2</b>	09/05/01	04/01/03			
Initiate Phase 2 Survey (316 Miles)	09/05/01	09/05/01	CESAJ-EN-DT		
Mob Contractor	09/06/01	09/06/01	A-E	\$	1,500
Mob SFWMD	09/06/01	09/06/01	SFWMD	\$	750
Set Monuments/Write Descriptions	09/07/01	11/23/01	A-E	\$	79,500
Field Inspection-SFWMD	09/07/01	11/23/01	SFWMD	\$	14,250
Run Levels	10/23/01	08/23/02	A-E	\$	474,000
Field Inspection-SFWMD	10/23/01	08/23/02	SFWMD	\$	37,500

A-E Project Management-Field	10/23/01	08/23/02	A-E	\$	27,300
GPS (Every 4 Miles/79 Monuments)	08/26/02	10/07/02	A-E	\$	79,000
Submit Data	10/08/02	10/08/02	A-E		
GPS Processing	10/09/02	10/23/02	CESAJ-EN-DT	\$	5,500
Preliminary Computations	10/24/02	12/26/02	A-E	\$	15,050
Submit to FDEP	12/27/02	12/27/02	A-E		
Preliminary Adjustment FDEP	12/30/02	01/28/03	SFWMD	\$	11,000
Submit to NGS	01/29/03	01/29/03	CESAJ-EN-DT		
Final Adjustments and Bluebook	01/30/03	04/01/03	SFWMD	\$	27,950
Survey Report/Complete Phase 2	04/01/03	04/01/03	CESAJ-EN-DT		
<b>Route Reconnaissance Phase 3</b>	05/31/02	08/09/02			
Initiate Route Reconnaissance	05/31/02	05/31/02	CESAJ-EN-DT		
SFWMD Prepare & Execute Task Order to FDEP	05/31/02	07/01/02	SFWMD	\$	5,000
Mob SFWMD	07/02/02	07/02/02	SFWMD	\$	750
Field Reconnaissance-SFWMD	07/03/02	08/08/02	SFWMD	\$	19,500
Receive Recon Report	08/09/02	08/09/02	CESAJ-EN-DT		
Route Reconnaissance Complete	08/09/02	08/09/02	CESAJ-EN-DT		
<b>Contracting Phase 3</b>	08/09/02	10/08/02			
Initiate Delivery Order	08/09/02	08/09/02	CESAJ-EN-DT		
Prepare GPS Plan	08/12/02	08/23/02	CESAJ-EN-DT	\$	5,500
Prepare RFP & Government Estimate	08/26/02	09/09/02	CESAJ-EN-DT	\$	5,500
Technical Review and Approval	09/10/02	09/10/02	CESAJ-EN-T	\$	650
Contractor Proposal Received	09/11/02	09/24/02	CESAJ-EN-DT		
Negotiate Delivery Order	09/25/02	09/25/02	CESAJ-EN-DT	\$	550
Prepare Negotiations Memorandum	09/26/02	09/27/02	CESAJ-EN-DT	\$	1,100
Technical Review and Approval	09/30/02	09/30/02	CESAJ-EN-T	\$	650
Rout NTP	10/01/02	10/07/02	CESAJ-EN-DT		
Issue Notice to Proceed	10/08/02	10/08/02	CESAJ-CT-C	\$	550
<b>Phase 3</b>	10/08/02	01/27/04			

Initiate Priority 3 Survey (256 Miles)	10/08/02	10/08/02	CESAJ-EN-DT		
Mob Crew	10/09/02	10/09/02	A-E	\$	1,500
Mob SFWMD	10/09/02	10/09/02	SFWMD	\$	750
Set Monuments/Write Descriptions	10/10/02	12/12/02	A-E	\$	193,500
Field Inspection-SFWMD	10/10/02	12/12/02	SFWMD	\$	12,750
Run Levels	11/12/02	07/17/03	A-E	\$	384,000
Field Inspection-SFWMD	11/12/02	07/17/03	SFWMD	\$	31,500
A-E Project Management-Field	11/12/02	07/17/03	A-E	\$	22,100
GPS (Every 4 Miles/64 Monuments)	07/18/03	08/28/03	A-E	\$	64,000
Submit Data	08/29/03	08/29/03	A-E		
GPS Processing	09/02/03	09/15/03	CESAJ-EN-DT	\$	5,500
Preliminary Computations	09/16/03	11/03/03	A-E	\$	11,900
Submit to FDEP	11/04/03	11/04/03	A-E		
Preliminary Adjustments	11/05/03	12/04/03	SFWMD	\$	11,000
Submit to NGS	12/05/03	12/05/03	CESAJ-EN-DT		
Final Adjustments and Bluebook	12/08/03	01/27/04	SFWMD	\$	22,100
Survey Report/Complete Priority 3	01/27/04	01/27/04	CESAJ-EN-DT		
<b>Route Reconnaissance Phase 4</b>	04/23/03	06/30/03			
Initiate Route Reconnaissance	04/23/03	04/23/03	CESAJ-EN-DT		
SFWMD Prepare & Execute Task Order to FDEP	04/23/03	05/22/03	SFWMD	\$	5,000
Mob SFWMD	05/23/03	05/23/03	SFWMD	\$	750
Route Reconnaissance-SFWMD	05/27/03	06/23/03	SFWMD	\$	15,000
Receive Recon Report	06/24/03	06/30/03	CESAJ-EN-DT		
Route Reconnaissance Complete	06/30/03	06/30/03	CESAJ-EN-DT		
<b>Contracting Phase-Priority 4</b>	06/30/03	08/27/03			
Initiate Delivery Order	06/30/03	06/30/03	CESAJ-EN-DT		
Prepare GPS Plan	07/01/03	07/15/03	CESAJ-EN-DT	\$	5,500
Prepare RFP & Government Estimate	07/16/03	07/29/03	CESAJ-EN-DT	\$	5,500
Technical Review and Approval	07/30/03	07/30/03	CESAJ-EN-T	\$	650

Contractor Proposal Received	07/31/03	08/13/03	CESAJ-EN-DT	
Negotiate Delivery Order	08/14/03	08/14/03	CESAJ-EN-DT	\$ 550
Prepare Negotiations Memorandum	08/15/03	08/18/03	CESAJ-EN-DT	\$ 1,100
Technical Review and Approval	08/19/03	08/19/03	CESAJ-EN-T	\$ 650
Rout NTP	08/20/03	08/26/03	CESAJ-EN-DT	
Issue Notice to Proceed	08/27/03	08/27/03	CESAJ-CT-C	\$ 550
<b>Phase 4</b>	08/27/03	09/06/04		
Initiate Priority 4 Survey (188 Miles)	08/27/03	08/27/03	CESAJ-EN-DT	
Mob Crew	08/28/03	08/28/03	A-E	\$ 1,500
Mob SFWMD	08/28/03	08/28/03	SFWMD	\$ 750
Set Monuments/Write Descriptions	08/29/03	10/16/03	A-E	\$ 49,500
Field Inspection-SFWMD	08/29/03	10/16/03	SFWMD	\$ 11,250
Run Levels	10/02/03	04/02/04	A-E	\$ 282,000
Field Inspection-SFWMD	10/02/03	04/02/04	SFWMD	\$ 26,250
A-E Project Management-Field	10/02/03	04/02/04	A-E	\$ 16,250
GPS (Every 4 Miles/47 Monuments)	04/05/04	05/14/04	A-E	\$ 47,000
Submit Data	05/17/04	05/17/04	A-E	
GPS Processing	05/18/04	06/01/04	CESAJ-EN-DT	\$ 5,500
Preliminary Computations	06/02/04	07/07/04	A-E	\$ 8,750
Submit to FDEP	07/08/04	07/08/04	CESAJ-EN-DT	
Preliminary Adjustments	07/09/04	07/29/04	SFWMD	\$ 8,250
Submit to NGS	07/30/04	07/30/04	SFWMD	
Final Adjustments and Bluebook	08/02/04	09/06/04	SFWMD	\$ 16,250
Survey Report/Complete Phase 4	09/06/04	09/06/04	CESAJ-EN-DT	
<b>Project Close-Out</b>	09/06/04	01/05/05		
Initiate Project Close-out	09/06/04	09/06/04	CESAJ-DR-S	
Request for Audit	09/07/04	09/21/04	CESAJ-DR-S	\$ 6,500
Audit	09/22/04	11/30/04	CESAJ-RM	\$ 15,000
Financial Close-out	12/01/04	01/05/05	CESAJ-RM	\$ 10,000

Project Complete	01/05/05	01/05/05	CESAJ-DR-S	
Monument Materials Cost (1,000 @ \$200 ea.)				\$ 200,000
<i>Project Subtotal</i>				\$ 3,269,370
<i>Project Contingency (20%)</i>				\$ 653,874
<b>Total Project Cost</b>				<b>\$ 4,000,000</b>
<b>Operations and Maintenance (O&amp;M) **</b>	07/29/02	01/18/05		
Commence O&M Phase 1	07/29/02	12/05/02	SFWMD	
Commence O&M Phase 2	04/02/03	08/07/03	SFWMD	
Commence O&M Phase 3	01/28/04	06/03/04	SFWMD	
Commence O&M Phase 4	09/07/04	01/18/05	SFWMD	

*\*\* Cost Estimate will be developed FY-01*

	A	B	C	D	E	F	G
1	<b>RESOURCE ALLOCATION PLAN</b>						
2							
3	<b>Activity</b>	<b>Resource</b>	<b>Cost</b>	<b>COE</b>	<b>COE</b>	<b>SFWMD</b>	<b>SFWMD</b>
4				<b>LABOR</b>	<b>CONTRACT</b>	<b>LABOR</b>	<b>OUTSOURCE</b>
5							
6							
7	Contractor Mob to Job Site	A-E	\$ 1,500		\$ 1,500		
8	Set Monuments/Write Descriptions	A-E	\$ 54,000		\$ 54,000		
9	Run Levels	A-E	\$ 351,000		\$ 351,000		
10	A-E Project Management-Field	A-E	\$ 18,720		\$ 18,720		
11	GPS (Every 4 Miles/55 Monuments)	A-E	\$ 55,000		\$ 55,000		
12	Submit Data	A-E					
13	Preliminary Computations	A-E	\$ 10,150		\$ 10,150		
14	Submit Data to FDEP	A-E					
15	Mob Contractor	A-E	\$ 1,500		\$ 1,500		
16	Set Monuments/Write Descriptions	A-E	\$ 79,500		\$ 79,500		
17	Run Levels	A-E	\$ 474,000		\$ 474,000		
18	A-E Project Management-Field	A-E	\$ 27,300		\$ 27,300		
19	GPS (Every 4 Miles/79 Monuments)	A-E	\$ 79,000		\$ 79,000		
20	Submit Data	A-E					
21	Preliminary Computations	A-E	\$ 15,050		\$ 15,050		
22	Submit to FDEP	A-E					
23	Mob Crew	A-E	\$ 1,500		\$ 1,500		
24	Set Monuments/Write Descriptions	A-E	\$ 193,500		\$ 193,500		
25	Run Levels	A-E	\$ 384,000		\$ 384,000		
26	A-E Project Management-Field	A-E	\$ 22,100		\$ 22,100		
27	GPS (Every 4 Miles/64 Monuments)	A-E	\$ 64,000		\$ 64,000		
28	Submit Data	A-E					

	A	B	C	D	E	F	G
29	Preliminary Computations	A-E	\$ 11,900		\$ 11,900		
30	Submit to FDEP	A-E					
31	Mob Crew	A-E	\$ 1,500		\$ 1,500		
32	Set Monuments/Write Descriptions	A-E	\$ 49,500		\$ 49,500		
33	Run Levels	A-E	\$ 282,000		\$ 282,000		
34	A-E Project Management-Field	A-E	\$ 16,250		\$ 16,250		
35	GPS (Every 4 Miles/47 Monuments)	A-E	\$ 47,000		\$ 47,000		
36	Submit Data	A-E					
37	Preliminary Computations	A-E	\$ 8,750		\$ 8,750		
38							
39							
40							
41	Issue Notice to Proceed	CESAJ-CT-C	\$ 550	\$ 550			
42	Issue Notice to Proceed	CESAJ-CT-C	\$ 650	\$ 650			
43	Issue Notice to Proceed	CESAJ-CT-C	\$ 550	\$ 550			
44	Issue Notice to Proceed	CESAJ-CT-C	\$ 550	\$ 550			
45							
46							
47							
48	PM -COE	CESAJ-DR-S	\$ 150,000	\$ 150,000			
49	Initiate PMP	CESAJ-DR-S					
50	Scoping Meeting	CESAJ-DR-S	\$ 2,000	\$ 2,000			
51	Draft Scope and Schedule	CESAJ-DR-S	\$ 2,000	\$ 2,000			
52	PDT Meeting	CESAJ-DR-S	\$ 2,000	\$ 2,000			
53	Draft PMP Review COE/SFWMD	CESAJ-DR-S					
54	Incorporate/Address Comments	CESAJ-DR-S					
55	Review Period	CESAJ-DR-S					
56	Complete PMP	CESAJ-DR-S					
57	Initiate Project Close-out	CESAJ-DR-S					

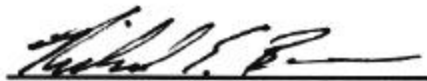
	A	B	C	D	E	F	G
58	Request for Audit	CESAJ-DR-S	\$ 6,500	\$ 6,500			
59	Project Complete	CESAJ-DR-S					
60							
61							
62							
63	Evaluate New Technology	CESAJ-EN-E	\$ 4,000	\$ 4,000			
64	Initiate Route Reconnaissance	CESAJ-EN-DT					
65	Receive Recon Report	CESAJ-EN-DT					
66	Route Reconnaissance Complete	CESAJ-EN-DT					
67	Initiate Delivery Order	CESAJ-EN-DT					
68	Prepare GPS Plan	CESAJ-EN-E	\$ 5,500	\$ 5,500			
69	Prepare RFP/ Government Estimate	CESAJ-EN-E	\$ 5,500	\$ 5,500			
70	Contractor Proposal Received	CESAJ-EN-DT					
71	Negotiate Delivery Order	CESAJ-EN-E	\$ 550	\$ 550			
72	Prepare Negotiations Memorandum	CESAJ-EN-E	\$ 1,100	\$ 1,100			
73	Rout NTP	CESAJ-EN-DT					
74	Initiate Phase 1 Survey (234 Miles)	CESAJ-EN-DT					
75	GPS Processing	CESAJ-EN-E	\$ 5,500	\$ 5,500			
76	Survey Report/Complete Phase 1	CESAJ-EN-DT					
77	Initiate Route Reconnaissance	CESAJ-EN-DT					
78	Receive Recon Report	CESAJ-EN-DT					
79	Route Reconnaissance Complete	CESAJ-EN-DT					
80	Initiate Delivery Order	CESAJ-EN-DT					
81	Prepare GPS Plan	CESAJ-EN-E	\$ 5,500	\$ 5,500			
82	Prepare RFP & Government Estimate	CESAJ-EN-E	\$ 5,500	\$ 5,500			
83	Contractor Proposal Received	CESAJ-EN-DT					
84	Negotiate Delivery Order	CESAJ-EN-E	\$ 550	\$ 550			
85	Prepare Negotiations Memorandum	CESAJ-EN-E	\$ 1,100	\$ 1,100			

	A	B	C	D	E	F	G
86	Rout NTP	CESAJ-EN-DT					
87	Initiate Phase 2 Survey (316 Miles)	CESAJ-EN-DT					
88	GPS Processing	CESAJ-EN-E	\$ 5,500	\$ 5,500			
89	Submit to NGS	CESAJ-EN-DT					
90	Survey Report/Complete Phase 2	CESAJ-EN-DT					
91	Initiate Route Reconnaissance	CESAJ-EN-DT					
92	Receive Recon Report	CESAJ-EN-DT					
93	Route Reconnaissance Complete	CESAJ-EN-DT					
94	Initiate Delivery Order	CESAJ-EN-DT					
95	Prepare GPS Plan	CESAJ-EN-E	\$ 5,500	\$ 5,500			
96	Prepare RFP & Government Estimate	CESAJ-EN-E	\$ 5,500	\$ 5,500			
97	Contractor Proposal Received	CESAJ-EN-DT					
98	Negotiate Delivery Order	CESAJ-EN-E	\$ 550	\$ 550			
99	Prepare Negotiations Memorandum	CESAJ-EN-E	\$ 1,100	\$ 1,100			
100	Rout NTP	CESAJ-EN-DT					
101	Initiate Priority 3 Survey (256 Miles)	CESAJ-EN-DT					
102	GPS Processing	CESAJ-EN-E	\$ 5,500	\$ 5,500			
103	Submit to NGS	CESAJ-EN-DT					
104	Survey Report/Complete Priority 3	CESAJ-EN-DT					
105	Initiate Route Reconnaissance	CESAJ-EN-DT					
106	Receive Recon Report	CESAJ-EN-DT					
107	Route Reconnaissance Complete	CESAJ-EN-DT					
108	Initiate Delivery Order	CESAJ-EN-DT					
109	Prepare GPS Plan	CESAJ-EN-E	\$ 5,500	\$ 5,500			
110	Prepare RFP & Government Estimate	CESAJ-EN-E	\$ 5,500	\$ 5,500			
111	Contractor Proposal Received	CESAJ-EN-DT					
112	Negotiate Delivery Order	CESAJ-EN-E	\$ 550	\$ 550			
113	Prepare Negotiations Memorandum	CESAJ-EN-E	\$ 1,100	\$ 1,100			

	A	B	C	D	E	F	G
114	Route NTP	CESAJ-EN-DT					
115	Initiate Priority 4 Survey (188 Miles)	CESAJ-EN-DT					
116	GPS Processing	CESAJ-EN-E	\$ 5,500	\$ 5,500			
117	Submit to FDEP	CESAJ-EN-DT					
118	Survey Report/Complete Phase 4	CESAJ-EN-DT					
119							
120							
121							
122	Technical Review and Approval	CESAJ-EN-T	\$ 650	\$ 650			
123	Technical Review and Approval	CESAJ-EN-T	\$ 550	\$ 550			
124	Technical Review and Approval	CESAJ-EN-T	\$ 650	\$ 650			
125	Technical Review and Approval	CESAJ-EN-T	\$ 650	\$ 650			
126	Technical Review and Approval	CESAJ-EN-T	\$ 650	\$ 650			
127	Technical Review and Approval	CESAJ-EN-T	\$ 650	\$ 650			
128	Technical Review and Approval	CESAJ-EN-T	\$ 650	\$ 650			
129	Technical Review and Approval	CESAJ-EN-T	\$ 650	\$ 650			
130							
131							
132							
133	Audit	CESAJ-RM	\$ 15,000	\$ 15,000			
134	Financial Close-out	CESAJ-RM	\$ 10,000	\$ 10,000			
135							
136							
137							
138	PRB Approve PMP	COE					
139	DDE Signs PMP	COE					
140	DCT Recommend Approval	DCT					
141							

	A	B	C	D	E	F	G
142							
143							
144	PM-SFWMD	SFWMD	\$ 150,000			\$ 150,000	
145	CRG Approve PMP	SFWMD					
146	Executive Director Signs PMP	SFWMD					
147	SFWMD Executes Task Order w/FDEP	SFWMD	\$ 5,000			\$ 5,000	
148	Route Reconnaissance	SFWMD	\$ 16,500				\$ 16,500
149	SFWMD Mob to Job Site	SFWMD	\$ 750				\$ 750
150	Field Inspection-SFWMD	SFWMD	\$ 11,250				\$ 11,250
151	Field Inspection	SFWMD	\$ 27,750				\$ 27,750
152	Preliminary Adjustment FDEP	SFWMD	\$ 11,000				\$ 11,000
153	Final Adjustments and Bluebook	SFWMD	\$ 18,850				\$ 18,850
154	SFWMD Prepare & Execute Task Order w/FDEP	SFWMD	\$ 5,000			\$ 5,000	
155	Mob SFWMD	SFWMD	\$ 750				\$ 750
156	Route Reconnaissance	SFWMD	\$ 24,000				\$ 24,000
157	Mob SFWMD	SFWMD	\$ 750				\$ 750
158	Field Inspection-SFWMD	SFWMD	\$ 14,250				\$ 14,250
159	Field Inspection-SFWMD	SFWMD	\$ 37,500				\$ 37,500
160	Preliminary Adjustment FDEP	SFWMD	\$ 11,000				\$ 11,000
161	Final Adjustments and Bluebook	SFWMD	\$ 27,950				\$ 27,950
162	SFWMD Prepare & Execute Task Order to FDEP	SFWMD	\$ 5,000				\$ 5,000
163	Mob SFWMD	SFWMD	\$ 750				\$ 750
164	Field Reconnaissance-SFWMD	SFWMD	\$ 19,500				\$ 19,500
165	Mob SFWMD	SFWMD	\$ 750				\$ 750
166	Field Inspection-SFWMD	SFWMD	\$ 12,750				\$ 12,750
167	Field Inspection-SFWMD	SFWMD	\$ 31,500				\$ 31,500
168	Preliminary Adjustments	SFWMD	\$ 11,000				\$ 11,000
169	Final Adjustments and Bluebook	SFWMD	\$ 22,100				\$ 22,100

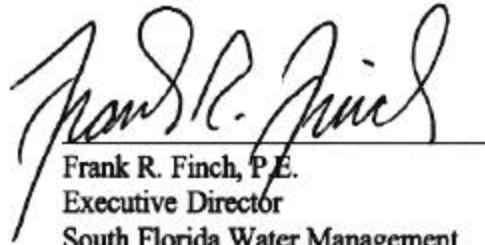
	A	B	C	D	E	F	G
170	SFWMD Prepare & Execute Task Order to FDEP	SFWMD	\$ 5,000			\$ 5,000	
171	Mob SFWMD	SFWMD	\$ 750				
172	Route Reconnaissance-SFWMD	SFWMD	\$ 15,000				\$ 15,000
173	Mob SFWMD	SFWMD	\$ 750				\$ 750
174	Field Inspection-SFWMD	SFWMD	\$ 11,250				\$ 11,250
175	Field Inspection-SFWMD	SFWMD	\$ 26,250				\$ 26,250
176	Preliminary Adjustments	SFWMD	\$ 8,250				\$ 8,250
177	Submit to NGS	SFWMD					
178	Final Adjustments and Bluebook	SFWMD	\$ 16,250				\$ 16,250
179							
180							
181	Monument Materials Cost (1,000 @ \$200 ea.)		\$ 200,000		\$ 200,000		
182							
183	<i>Project Subtotal</i>		\$ 3,269,370				
184	<i>Project Contingency (20%)</i>		\$ 731,380	\$ 731,380			
185							
186							
187	<b>Total Project Cost</b>		<b>\$ 4,000,000</b>	<b>\$ 1,002,880</b>	<b>\$ 2,448,720</b>	<b>\$ 165,000</b>	<b>\$ 383,400</b>
188							
189	<b>Operations and Maintenance (O&amp;M) **</b>						
190	Commence O&M Phase 1	SFWMD					
191	Commence O&M Phase 2	SFWMD					
192	Commence O&M Phase 3	SFWMD					
193	Commence O&M Phase 4	SFWMD					



Richard E. Bonner, P.E.  
Deputy District Engineer  
for Project Management  
Jacksonville District  
U.S. Army Corps of Engineers



Joseph Schweigart, P.E.  
Director, Programs and Project  
Management  
South Florida Water Management  
District



Frank R. Finch, P.E.  
Executive Director  
South Florida Water Management  
District