

Chapter 12 Contracting GPS Surveying Services

12-1. General

This chapter describes the process for contracting GPS survey services. It covers development of survey scopes of work, performance specifications, and cost estimates for Architect-Engineer (A-E) contracts. Procedures for developing GPS survey contract specifications and cost estimates are performed similarly to those for A-E design services. Similar technical discipline scheduling and production factors are used to determine the ultimate cost of a task. Although this chapter is intended to provide guidance for estimating costs for GPS surveying services, the explanations herein regarding procurement policies and practices describe only the framework within which cost estimates are used. For detailed guidance on procurement policies and practices, refer to the appropriate procurement regulations: FAR, DFARS, EFARS, EP 715-1-7 (Architect-Engineer Contracting), and the PROSPECT course on A-E contracting.

12-2. Brooks Architect-Engineer Act

In the Federal government, professional architectural, engineering, planning, and related surveying services must be procured under the Brooks Architect-Engineer Act, Public Law 92-582 (10 US Code 541-544). The Brooks A-E Act requires the public announcement of requirements for surveying services, and selection of the most highly qualified firms based on demonstrated competence and professional qualifications. Cost or pricing is not considered during the selection process. After selection, negotiation of a fair and reasonable price for the work is conducted with the highest qualified firm. GPS surveying supporting the Corps' research, planning, development, design, construction, or alteration of real property is considered to be a related or supporting architectural or engineering service, and must therefore be procured using Brooks A-E Act qualifications-based selection, not by bid price competition.

12-3. Contracting Processes and Procedures

Corps procedures for obtaining A-E services are based on a variety of Federal and DoD acquisition regulations. The following paragraphs synopses the overall A-E process used in the Corps.

a. Types of contracts. Two types of A-E contracts are principally used for surveying services: Firm-Fixed-Price (FFP) contracts and Indefinite Delivery contracts (IDC). FFP contracts are used for moderate to large mapping projects (e.g., > \$1 million) where the scope of work is known prior to advertisement and can be accurately defined during negotiations--typically for a large new project site. Due to variable and changing engineering and construction schedules (and funding), most mapping work involving GPS services cannot be accurately defined in advance; thus, these fixed-scope FFP contracts are rarely used, and well over 95% of surveying services are procured using IDC.

b. Announcements for surveying services. Requirements for surveying services are publicly announced and firms are given at least 30 days to respond to the announcement. The public announcement contains a brief description of the project, the scope of the required services, the selection criteria in order of importance, submission instructions, and a point-of-contact. This public announcement is not a request for price proposal, and firms are directed not to submit any price-related information.

c. Selection criteria. Federal and DoD regulations set the criteria for evaluating prospective surveying contractors as listed below. These criteria are listed in the public announcement in their order

of importance and the selection process assigns descending weights to each item in that order. (The order listed below may be modified based on specific project requirements.)

- (1) Professional qualifications necessary for satisfactory performance.
- (2) Specialized experience and technical competence in the type of work required.
- (3) Past performance on contracts with Government agencies and private industry in terms of cost control, quality of work, and compliance with performance schedules.
- (4) Capacity to perform the work in the required time.
- (5) Knowledge of the locality of the project.
- (6) Utilization of small or disadvantaged businesses.
- (7) Geographic location.
- (8) Volume of work awarded by the Department of Defense.

[Note: (6), (7), and (8) are secondary selection criteria--see EP 715-1-7 (Architect-Engineer Contracting) for latest policy on A-E selection procedures and evaluation criteria]

d. Selection process. The evaluation of firms is conducted by a formally constituted Selection Board in the Corps district seeking the services. This board is made up of highly qualified professional employees having experience in architecture, engineering, surveying, etc. A majority of the board members for surveying services must have specific technical expertise in that area. At least one member must be a licensed surveyor if real property surveys are involved. The board evaluates each of the firm's qualifications based on the advertised selection criteria and develops a list of at least three most highly qualified firms. As part of the evaluation process, the board conducts interviews with these top firms prior to ranking them. The firms are asked questions about their experience, capabilities, organization, equipment, quality management procedures, and approach to the project. These interviews are normally conducted by telephone. The top three (or more) firms are ranked and the selection is approved by the designated selection authority--typically the District Commander. The top ranked firms are notified they are under consideration for the contract. Unsuccessful firms are also notified, and are afforded a debriefing as to why they were not selected, if they so request.

e. Negotiations and award. The highest qualified firm ranked by the selection board is provided with a detailed scope of work for the project, project information, and other related technical criteria, and is requested to submit a detailed price proposal for performing the work. In the case of IDC, price proposals consist simply of unit rates for various disciplines, services, and equipment. This list becomes the contract "Schedule B" of prices, and typically each line item of services contains all overheads, profits, and incidental supplies. Once a fair and reasonable price (to the government) is negotiated, the contract is awarded. The Government Contracting Officer is obligated to strive to obtain a negotiated price that is "fair and reasonable" to both the Government and the contractor.

12-4. Indefinite Delivery Contracts and Task Orders

The vast majority of the Corps surveying services are procured using Indefinite Delivery Contracts (IDC). These IDCs are procured using the selection and negotiation process described above. IDC (once termed "Open-End" or "Delivery Order" contracts) have only a general scope of work--e.g., "GPS surveying services in Southeastern United States." When work arises during the term of the contract, task orders are written for performing that specific work. In the Corps, IDCs are currently (2002) issued for \$1 million

with two additional \$1 million option term (not year) extensions -- for a total award of \$3 million. Task orders may be issued up to \$1 million each. Larger IDC awards are often made, both in overall award size and task order limit. Task orders are negotiated using the unit rate "Schedule" developed for the main contract. Thus, negotiations are focused on the level of effort and performance period. Task orders typically have short scopes of work--a few pages. The scope is sent to a contractor who responds with a time and cost estimate, from which negotiations are initiated. Under emergency conditions (e.g., flood fights, hurricanes) contractors can be issued task orders verbally by the Contracting Officer, with the scope of work simply defined as a limiting number of days for survey crew at the contract schedule rate. The entire process--from survey need to task order award--should routinely take only 2 to 4 weeks. From the IDC Schedule, a GPS survey crew and equipment is pieced together using the various line items--adding or deducting personnel or equipment as needed for a particular project. A number of methods are used for scheduling GPS services in a fixed-price or IDC contract. The most common method is a Daily Rate. A daily rate basis is the cost for a GPS field crew (including all instrumentation, transport, travel, and overhead) over a nominal 8-hour day. A daily crew rate is the preferred unit price basis for estimating contracted GPS services for IDC contracts and their task orders. It provides the most flexibility for IDC contracts, especially when individual project scopes are expected to vary widely. The crew personnel size, number of GPS receivers deployed, vehicles, etc., must be explicitly indicated in the contract specifications, with differences resolved during negotiations. Options to add additional GPS receiver units (along with personnel and/or transport) must be accounted for in the estimate and unit price schedule. As an example, the daily rate for a GPS surveying crew could be estimated using the following detailed analysis method.

Table 12-1. Factors for Estimating A-E Costs

Item	Description
I	Direct labor or salary costs of GPS survey technicians: includes applicable overtime or other differentials necessitated by the observing schedule
II	Overhead on Direct Labor *
III	G&A Overhead Costs (on Direct Labor) *
IV	Material Costs
V	Travel and Transportation Costs: crew travel, per diem, etc. Includes all associated costs of vehicles used to transport GPS receivers
VI	Other Costs: includes survey equipment and instrumentation, such as GPS receivers. GPS receiver costs should be amortized down to a daily rate, based on average utilization rates, expected life, etc. Exclude all instrumentation and plant costs covered under G&A, such as interest
VII	Profit (Computed/ negotiated on individual task order or developed for all task orders in contract)

* these may be combined into a single overhead rate

12-5. Contract Price Schedule

The various personnel, plant and equipment cost items like those shown in Table 12-1 above are used as a basis for negotiating fees for individual line items in the basic IDC contract. During negotiations with the A-E contractor, individual components of the Independent Government Estimate (IGE) and the contractor's price proposal may be compared and discussed. Differences would be resolved in order to

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arrive at a fair and reasonable price for each line item. The contract may also schedule unit prices based on variable crew sizes and/or equipment. A typical negotiated IDC price schedule (i.e. Section B - Supplies or Services and Prices/Costs) is shown below in Table 12-2. The contract specifications would contain the personnel and equipment requirements for each line item. Each Corps district has its unique requirements and therefore line items used in schedules will vary considerably. For instance, some districts may elect to apply overhead as a separate line item. Others may compute profit separately for each task order and others may not include travel costs with crew rates.

Table 12-2. Sample Contract Schedule of Services for an Indefinite Delivery Contract used for GPS Surveying Services

Item	Description	Quantity	U/M	Unit Price
0001	Registered/Licensed Land Surveyor--Office	[1]	Day	\$ 497.31
0002	Registered/Licensed Land Surveyor--Field	[1]	Day	\$ 459.22
0005	Professional Geodesist Computer--Office	[1]	Day	\$ 415.76
0007	Engineering Technician (CADD Draftsman)--Office	[1]	Day	\$ 296.00
1003	Civil Engineering Technician--Field Supervisor	[1]	Day	\$ 245.00
1005	Supervisory GPS Survey Technician (Field)	[1]	Day	\$ 452.73
1006	Surveying Technician--GPS Instrumentman/Recorder	[1]	Day	\$ 374.19
1007	Surveying Aid--Rodman/Chainman	[1]	Day	\$ 246.94
1008	One-Person GPS RTK Survey Crew [two receivers--one vehicle--travel]	[1]	Day	\$1,323.76
1008a	Two-Person GPS Static or RTK Survey Crew [two receivers--one vehicle--travel]	[1]	Day	\$1,868.05
1008b	Three-Person GPS Static or RTK Survey Crew [three receivers--two vehicles--travel]	[1]	Day	\$2,234.72
1008c	Four-Person GPS Static or RTK Survey Crew [four receivers--three vehicles--travel]	[1]	Day	\$2,546.98
1101	Additional GPS receiver	[1]	Day	\$ 100.00
1102	Additional survey vehicle	[1]	Day	\$ 40.00
1013	Air Boat (Florida w/operator)	[1]	Day	\$ 330.00
1014	Marsh Buggy (Florida w/operator)	[1]	Day	\$ 360.00
1210	Station Monuments [standard concrete monument]	[1]	EA	\$ 25.00
1211	Station Monuments [deep rod vertical monument]	[1]	EA	\$ 950.00
1215	Bluebooking	[1]	BL	\$ 500.00
1300	Nominal Per diem [to be adjusted on each task order]	[1]	Day	[per JTR rate]

Abbreviations EA = Each BL=Baseline

Scheduled prices include overhead and profit [these could be listed separately if desired]

GPS survey crew includes all field equipment, auxiliary data loggers, tripods, and computers needed to observe, reduce, and adjust baselines in the field. Per diem is included. [The contract scope of work will specify items that are included with a crew, including GPS receiver quality standards]

12-6. Sample Cost Estimate for Contracted GPS Survey Services

The following cost computation is representative of the procedure used in preparing the IGE for an A-E contract and ultimately the contract price schedule above. The example shows the computation for a two-man GPS survey crew. Larger crew/receiver size estimates would be performed similarly. Costs and overhead percentages are shown for illustration only--they are subject to considerable geographic-, project-, and contractor-dependent variation (e.g., audited G&A rates could range from 50 to 200 percent). GPS instrumentation rates are approximate (2002) costs. Associated costs for GPS receivers, such as insurance, maintenance contracts, interest, etc., are presumed to be indirectly factored into a firm's G&A overhead account. If not, then such costs must be directly added to the basic equipment depreciation rates shown. Other equally acceptable accounting methods for developing daily costs of equipment may be used. Equipment utilization estimates in an IGE may be subsequently revised (during negotiations) based on actual rates as determined from a detailed cost analysis and field price support audits.

SAMPLE COMPUTATION FOR FULLY EQUIPPED 3-MAN GPS SURVEY CREW
[3 geodetic quality receivers, auxiliary equipment, 2-vehicles, laptops, and adjustment software]

LABOR

Supervisory Survey Tech (Party Chief)	\$42,776.00/yr (based on GS 11/5)	
Overhead on Direct Labor (36%)	\$15,399.36/yr	
G&A Overhead (115%)	<u>\$49,192.40/yr</u>	
Total:	\$107,367.76/yr	\$411.57/day *
Survey Technician--GPS observer	\$35,355/yr (based on GS 9/5)	
@ 151% O/H (36%+115%)	\$88,741.05	\$340.17/day
Survey Aid		\$23,332/yr (based on GS 5/5)
@ 151 % O/H	\$58,563.32	\$224.49/day

Total Labor Cost for 3-Man GPS Crew/day: **\$976.23**

*[adding 10% profit = \$452.73 --Schedule B]

TRAVEL (NOMINAL RATE)

Per Diem (Nominal): 3 persons @ \$ 88/day
(subject to JTR adjustment on task orders)

Total Travel Cost/day: **\$264.00**

SURVEY INSTRUMENTATION & EQUIPMENT

DGPS Carrier Phase Positioning System --3 geodetic quality receivers (static or kinematic positioning), batteries, tripods, data collectors, etc.	\$40,000 ea or \$120,000 @ 4 yrs @ 100 d/yr	\$300/day
Total Station: data collector, prisms, etc.	\$32,000 @ 5 yrs @ 120 d/yr (rental rate: \$60/d)	\$ 53/day
Survey Vehicle	\$40,000 ea @ 6 yrs @ 225 d/yr plus O&M @ 2 reqd	\$ 80/day
Misc Materials (field books, survey supplies, etc)		\$ 25/day

Total Instrumentation & Equipment Cost/day: **\$ 458.00**

Subtotal : \$ 1,698.23
Profit @ 10.0% \$ 169.82

Total Estimated Cost per Day -- 3 man GPS Survey Crew \$ 1,868.05

Similar computations are made for other line items in the price schedule.

12-7. Cost Per Work Unit (GPS Station) Schedule

If a cost-per-work-unit fee structure is desired on an IDC, the computed daily/hourly crew rates and other applicable cost items can be divided by the estimated daily/hourly productivity in order to schedule work units. Typical work unit measures on a GPS contract might be cost per static point or cost per kinematic point. Both the estimated crew daily rate and the estimated productivity rates are subject to negotiation. An infinite number of work unit measures could be formed, given the variety in units of measure, survey classifications, expected local conditions, etc. Use of work unit rates is obviously restricted to individual project areas where work is fairly repetitious. Costs per GPS stations were commonly used during the early days of GPS (mid-1980s) when GPS receivers cost \$150,000 and only 3-4 hours of satellite constellation was available each day. Today there is little justification for using work unit costs for pricing GPS surveys.

12-8. Contract Specifications and Accuracy Standards

a. Contract specifications and standards for Corps surveying work should make maximum reference to existing standards, publications, and other references. The primary reference standard is this manual. Drafting and CADD/GIS standards are contained in various (Tri-Service) CADD/GIS Technology Center publications. Corps headquarters does not specify standard hardware or software for its districts--each district may establish their own standards based on their unique requirements. US Government policy prescribes maximum use of industry standards and consensus standards established by private voluntary standards bodies, in lieu of government-developed standards. This policy is further outlined in EM 1110-1-2909, as follows:

"Voluntary industry standards shall be given preference over non-mandatory Government standards. When industry standards are non-existent, inappropriate, or do not meet a project's functional requirement, ...[other] standards may be specified as criteria sources. Specifications for surveying and mapping shall use industry consensus standards established by national professional organizations, such as the American Society for Photogrammetry and Remote Sensing (ASPRS), the American Society of Civil Engineers (ASCE), the American Congress on Surveying and Mapping (ACSM), or the American Land Title Association (ALTA). Technical standards established by state boards of registration, especially on projects requiring licensed surveyors or mappers, shall be followed when legally applicable. Commands shall not develop or specify local surveying and mapping standards where industry consensus standards or Army standards exist."

b. According to Corps policy, technical specifications for obtaining GPS survey data shall be "performance-based" and not overly prescriptive or process oriented. Performance-based specifications shall be derived from the functional project requirements and use recognized industry standards where available. Performance-oriented (i.e. outcome based) specifications set forth the end results to be achieved (i.e. final drawing/chart format or accuracy standard) and not the means, or technical procedures, used to achieve those results. A performance-oriented specification provides the most flexibility and allows the most economical and efficient methods to achieve the desired end product. Performance specifications should succinctly define the basic mapping limits, feature location and attribute requirements, scale, contour interval, map format, sheet layout, and final data transmittal, archiving or storage requirements, the required accuracy criteria standards for topographic and planimetric features that are to be depicted, and describe quality assurance procedures that will be used to verify conformance with the specified criteria. Performance-oriented specifications should be free from unnecessary equipment, personnel, instrumentation, procedural, or material limitations; except as needed

to establish comparative cost estimates for negotiated services. This would include any in-progress reviews or approvals during various phases of the project.

c. EM 1110-1-2909 also states that use of prescriptive (i.e. procedural) specifications shall be kept to a minimum, and called for only on highly specialized or critical projects where only one prescribed technical method, in the opinion of the Government, is appropriate or practical to perform the work. Overly prescriptive specifications typically require specific field instrumentation (e.g., brand name GPS receiver), personnel, office adjustment procedures (e.g., product-specific software or output format), or rigid project phasing with on-going design or construction. Prescriptive specifications reduce flexibility, efficiency, and risk, and can adversely impact project costs if antiquated survey methods or instrumentation are required.

12-9. Contract Statements of Work

Technical specifications for GPS surveying that are specific to the project (including items such as the scope of work, procedural requirements, and accuracy requirements) are inserted in the appropriate section of the contract (e.g., Statement of Work--Section C). This GPS engineer manual should be attached to and made part of any A-E service or construction contract requiring GPS surveying. References to USACE survey classifications (and related criteria tables) may also be made if required. References to this manual will normally suffice for most USACE survey specifications; however, areas where deviations from (or additions to) this manual must be considered in developing the Statement of Work. A guide specification for GPS surveying services is found in Appendix C of this manual. This guide specification is readily adaptable to all types of GPS surveying services.

12-10. Contract Quality Control and Quality Assurance

Under the Corps professional contracting system, contractors are responsible for performing all quality control (QC) activities associated with their work. The Corps is responsible for quality assurance (QA) oversight of the contractor's QC actions. Therefore, Corps QA or testing functions should be focused on whether the contractor meets the required performance specification (e.g., survey accuracy) and not the intermediate surveying or compilation steps performed by the contractor. As a result, for surveys procured using the Brooks A-E Act qualifications-based selection method, Corps representatives do not regularly observe work in progress (i.e. perform QC activities)--the contractor was selected as being technically qualified to perform the work; including all QC associated with it. Corps-performed field testing of a contractor's work is an optional QA requirement, and should be performed only when technically and economically justified.

12-11. Task Order Time and Cost Estimates

Once unit prices have been negotiated and established in the basic IDC schedule as illustrated in the above sections, each IDC task order is negotiated primarily for effort, i.e. time. The process for estimating the time to perform any particular survey function in a given project is highly dependent on the knowledge and personal field experience of the government and contractor estimators. The negotiated fee on a task order is then a straight mathematical procedure of multiplying the agreed-upon effort against the established unit prices in Schedule B, plus an allowance for profit if not included in the unit rates. An IGE is required for task orders over \$100,000, along with a detailed profit computation, documented records of negotiations, etc. The scope is attached to a DD 1155 order placed against the basic contract. If a preliminary site investigation is scheduled for this project, any such adjustments should be investigated and resolved prior to negotiating subsequent task orders for the various phases of the work, to the maximum extent possible. As such, the negotiated costs for the subsequent work phases would be considered fixed price agreements. Any later adjustments to these agreed to prices would be issued in the

form of modifications to task orders (i.e. change orders), and would have to be rigorously defended as significant, unforeseen changes in the scope. The contractor would be expected to immediately notify the contracting officer (KO) or Contracting Officer's Technical Representative (COTR) of the need for cost adjustments.

12-12. Sample Task Order for GPS Services

Following is an example of a task order for GPS surveying services that are performed within a task order for monitoring a beach renourishment project. Included in this example is the letter request for proposal to the IDC contractor. Attached to this letter request is the detailed statement of work that identifies the scope, standards, and specifications that are to be performed. The final record of negotiations compares the Independent Government Estimate with the contractor's proposal, and records the final negotiated cost to perform the task order.

SAMPLE LETTER REQUEST FOR PROPOSAL

Engineering Division
Design Branch

Sea Systems, Inc.
3456 Northwest 27th Avenue
Pompano Beach, Florida 33069-1087

SUBJECT: Contract No. DACW17-98-D-0004

Gentlemen:

Enclosed are marked drawings depicting the scope of work required for the following project:

Brevard County, Sand Bypass System Post Construction
One-Year Monitoring Beach Erosion Survey
Canaveral Harbor, Florida (Survey 99-267)

General Scope. Furnish all personnel, plant, equipment, transportation, and materials necessary to perform and deliver the survey data below in accordance with the conditions set forth in Contract No. DACW17-98-D-0004. Services not specifically described herein are nonetheless a firm requirement, if they can be identified as an item or items commonly a part of the professional grade work of a comparative nature required by your contract. All work shall be accomplished in accordance with the Manuals and TM's specified in your contract.

Your attention is directed to the Site Investigation and Conditions Affecting the Work clause of your contract. After we have reached agreement on a price and time for performance of this work, neither the negotiated price nor the time for performance will be exchanged as a consequence of conditions at the site except in accordance with the clause. Costs associated with the site investigation are considered overhead costs which are reimbursed in the overhead rates included in your contract. Additional reimbursement will not be made.

a. Scope of Work. Hydrographic and topographic monitoring data shall be collected for CCAFS-29, CCAFS-30, CCAFS-33 through CCAFS-42, BC-5 through BC-14, and DEP R-0 through DEP R-18 including DEP R-1-AA and DEP R-1A. The area is shown on Enclosure 1, USGS quads. Enclosure 2 is the control monument descriptions and profile line azimuth. Enclosure 3 is the technical requirements for the surveys.

b. Data Processing. The Contractor shall make the necessary computations to verify the accuracy of all measurements and apply the proper theory of location in accordance with the law or precedent and publish the results of the survey.

c. CADD. The survey data shall be translated or digitally captured into Intergraph IGDS 3D design files according to the specifications furnished. The survey data shall be provided in Intergraph MicroStation Version 5.0 or higher.

d. Digital Geospatial Metadata. Metadata are "data about data". They describe the content, identification, data quality, spatial data organization, spatial reference, entity and attribute information, distribution, metadata reference, and other characteristics of data. Each survey project shall have metadata submitted with the final data submittal.

e. Compliance. Surveying and Mapping shall be in strict compliance with EM-1110-1-1000 Photogrammetric Mapping, EM-1110-1-1002 Survey Markers and Monumentation, EM-1110-1-1003 NAVSTAR Global Positioning System Surveying, EM-1110-1-1004 Deformation Monitoring and Control Surveying, EM-1110-1-1005 Topographic Surveying, EM-1110-2-1003 Hydrographic Surveying, EM-1110-1-2909 Geospatial Data and System, Tri-Services A/E/C CADD Standards, Tri-Services Spatial Data Standards, Related Spatial Data Products and Chapter 177, Chapter 472, and Chapter 61G17 of the Minimum Technical Standards set by the Florida Board of Professional Surveyors and Mappers.

The completion date for this assignment is 60 days after the Notice to Proceed is signed by the Contracting Officer.

Contact Design Branch at 904-232-1613 for assistance, questions, and requirements.

You are required to review these instructions and make an estimate in writing of the cost and number of days to complete the work. Please mark your estimate to the attention of Chief, Design Branch.

This is not an order to proceed with the work. Upon successful negotiation of this delivery order the Contracting Officer will issue the Notice to Proceed.

Sincerely,

Enclosures

Walter Clay Sanders, P.E.
Assistant Chief, Engineering Division

Sample Task Order Scope of Work--Sand Bypass Project

TECHNICAL QUALITY CONTROL REQUIREMENTS
BREVARD COUNTY, SAND BYPASS SYSTEM POST CONSTRUCTION
ONE-YEAR MONITORING BEACH EROSION SURVEY
CANAVERAL HARBOR, FLORIDA
(SURVEY 99-267)

1. LOCATION OF WORK. The project is located in Brevard County at Canaveral Harbor, Florida.
2. SCOPE OF WORK.
 - 2a. The services to be rendered by the Contractor include obtaining topographic and hydrographic survey data (x, y, z,) and CADD data for 47 beach profile lines.
 - 2b. The services to be rendered by the Contractor include all the work described in these technical requirements. Details not specifically described in these instructions are nevertheless a firm requirement if they can be identified as an item, or items, commonly a part of professional grade work of a comparative nature.
 - 2c. The Contractor shall furnish all necessary materials, labor, supervision, equipment, and transportation necessary to execute and complete all work required by these specifications.
 - 2d. The Corps of Engineers, Survey Section shall be contacted the same day that the Contractor plans to commence the work.
 - 2e. Rights-of-Entry must be obtained verbally and recorded in the field book before entering on the private property. Enter in the field book the name and address of the property owner contacted for rights-of-entry.

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2f. COMPLIANCE. Surveying and Mapping shall be in strict compliance with EM-1110-1-1000 Photogrammetric Mapping, EM-1110-1-1002 Survey Markers and Monumentation, EM-1110-1-1003 NAVSTAR Global Positioning System Surveying, EM-1110-1-1004 Deformation Monitoring and Control Surveying, EM-1110-1-1005 Topographic Surveying, EM-1110-2-1003 Hydrographic Surveying, EM-1110-1-2909 Geospatial Data and System, Tri-Services A/E/C CADD Standards, Tri-Services Spatial Data Standards, Related Spatial Data Products and Chapter 177, Chapter 472, and Chapter 61G17 of the Minimum Technical Standards set by the Florida Board of Professional Surveyors and Mappers.

2f1. Digital Geospatial Metadata. Metadata are "data about data". They describe the content, identification, data quality, spatial data organization, spatial reference, entity and attribute information, distribution, metadata reference, and other characteristics of data. Each survey project shall have metadata submitted with the final data submittal.

2f2. Furnish a digital file using CORPSMET 95 (Metadata Software) with the appropriate data included. Point of contact in survey section Mr. Bill Mihalik at 904-232-1462.

2g. All digital data shall be submitted on CD ROM's.

2h. EXISTING DATA. The Contractor shall be furnished DTM files and existing sheet layout of previous monitoring survey. The Contractor shall utilize this information to perform survey comparisons. These comparisons are quality assurance measures for the Contractor to the correctness of his data.

3. FIELD SURVEY EFFORT. Hydrographic and topographic monitoring data shall be collected for CCAFS-29, CCAFS-30, CCAFS-33 through CCAFS-42, BC-5 through BC-14, and DEP R-0 through DEP R-18 including DEP R-1-AA and DEP R-1-A. The area is shown on Enclosure 1, USGS quads. Enclosure 2 is the control monument descriptions and profile line azimuth. Enclosure 3 is the technical requirements for the surveys.

3a. CONTROL. The Horizontal datum shall be NAD 1927 and the vertical datum shall be NGVD 29 MLW. All control surveys shall be Third-Order, Class II accuracy and shall comply with the Engineering Manuals listed above.

3a1. The basic control network shall be accomplished using precise differential carrier-phase Global Positioning System (GPS) and Differential GPS baseline vector observations.

3a2. Network design, station and baseline occupation requirements, for static and kinematic surveys, satellite observation time per baseline, baseline redundancies, and connection requirements to existing networks, shall follow the criteria given in the above said engineering manual. A field observation log shall be completed at each setup in the field.

3a3. GPS derived elevation data shall be supplied in reference to the above said datum. Existing benchmark data and stations shall be used in tandem in a minimally constrained adjustment program to model the geoid. All supporting data used in vertical adjustment shall be submitted to Survey Section. The GPS plan shall be submitted and approved by Mr. Lonnie Zurfluh prior to commencing work.

3a4. Establish or recover 1 horizontal and vertical control monument for each profile line. The established position for each monument recover shall be utilized and new positions shall be established for any new monuments established. The GPS network (if required) shall commence from the control shown on Enclosure 2. All established or recovered control shall be fully described and entered in a FIELD BOOK, in accordance with the Technical Requirements of this contract. All control surveys shall be Third-Order, Class II accuracy. The Contractor shall submit the field data and abstracts for the control networks to Survey Section for computation before commencing the mapping. The monument designations shall be furnished as requested.

3a5. All horizontal and vertical control (double run forward and back) established shall be a closed traverse or level loop no spur lines, with Third-Order accuracy. All horizontal and vertical control along with baseline layouts, sketches, and pertinent data shall be entered in field books.

3a6. All monuments, survey markers, etc., recovered shall be noted on the copies of control descriptions. Control points established or recovered with no description or out-of-date (5 Years old) description shall be described with sketches for future recovery use.

3a7. All original field notes shall be kept in standard pocket size field books and shall become the property of the Government. The first four pages of the field books shall be reserved for indexing and the binding outside edge shall be free of all marking. All control surveys shall be Third-Order, Class II accuracy.

3b. BEACH PROFILES. Recover or establish one (1) horizontal and vertical control monument for Sand Bypass System CCAFS-29, CCAFS-30, CCAFS-33, CCAFS-34, CCAFS-35, CCAFS-36, CCAFS-37, CCAFS-38, CCAFS-38A, CCAFS-39, CCAFS-39A, CCAFS-40, CCAFS-40A, CCAFS-41, CCAFS-41A, CCAFS-42, BC-5, BC-6, BC-7, BC-8, BC-9, BC-10, BC-11, BC-12, BC-13, BC-14, DEP R-0, R-1T RESET, R-1-AA, R-1A, R-2, R-3, T-4 RESET, R-5, R-6-T RESET, R-7-T RESET, R-8 RESET, R-9, T-10, R-11, R-12, R-13, R-14, R-15-T, R-16, R-17 and R-18. Utilize the coordinates, elevations, and azimuths shown on Enclosure 2.

3b1. Certification of original and all reset DEP monuments shall be conducted prior to any survey data being collected. In the event several benchmarks are discovered for one specific monument, the enclosed excel worksheet highlights the benchmark to be conserved (all others should be destroyed). This work shall be accomplished and completed prior to collecting any survey data in Jun/Jul 99.

3b2. All profile lines shall extend 150 feet landward (or to the limits of the beach), from the established DNR monument or until a building, road, wall, protected vegetation, water, etc. is encountered (note features along profiles and write descriptor in field book for all land features located west of and including the monuments at point collected on land side). The profile lines shall extend seaward from the monument a distance of no less than 3,000 feet.

3b3. Obtain data points (X, Y, Z) on 10-foot ranges (land), all breaks in grade greater than 1 foot vertically, vegetation line, tops and toes of dunes, seawalls, or other manmade features along the profile line. Soundings shall be identified at 12.5' ranges along the profile.

3c. TIDE STAFF. Establish an on-site tide staff referenced to mean low water, which is 1.90' below NGVD of 1929. Maintain a 0.1' frequency reading log during the water portion of the survey. Monument "SOUTHPORT" shall be utilized for the tide staff.

3d. BREAKLINE. Breaklines shall be located for all natural or man-made features as needed. The breaklines shall be located with X, Y, and Z and identified.

3e. SOUNDING POLE / 6" DISK: A sounding pole or sounding rod with a 6 inch diameter disk attached to the bottom shall be used.

3f. DATA COLLECTION (RTK or TOTAL STATION). Data collection will be allowed for data points only, showing all instrument positions, calibration, backsights, and closing readings in the field book.

4. DATA PROCESSING. The Contractor shall make the necessary computations to verify the correctness of all measurements and apply the proper theory of location in accordance with the law or precedent and publish the results of the survey. The Contractor shall submit advance copies of the horizontal control so that USACE can compute the final positions before commencing mapping. Compute and tabulate the horizontal and vertical positions on all work performed. Review and edit all field data for discrepancies before plotting the final drawings.

4a. Furnish X, Y, Z and descriptor ASCII file for each profile line and one X, Y, Z, and descriptor ASCII file with all data included for each area.

4b. Furnish a DEP format ASCII file for each profile line.

5. CADD. The survey data shall be translated or digital capture into Intergraph IGDS 3D design files according to the specifications furnished. The survey data shall be provided in Intergraph MicroStation Version 5.0 or higher as shown in the letter dated 30 September 1992. The neat mapping area on all sheets (cover and plan) shall be 30-inches by 25-inches.

5a. GLOBAL ORIGIN. The IGDS 3-D design file shall be prepared with a global origin of 0, 0, 2147483.65, Design file master units: FT., Sub units: 1,000, and positional units: 1. The file name shall be the survey number prefixed to an "A" i.e., a267S1.DGN. All reference file names shall commence with the a267 also.

5b. DIGITAL TERRAIN MODEL (DTM) DATA. The Contractor shall develop and deliver a surface model of the area using Intergraph compatible Digital Terrain Modeling software and the model file shall have the .dtm extension. The digital terrain model shall be developed from the collected data. Breaklines should include ridges, drainage, road edges, surface water boundaries, and other linear features implying a change in slope. The surface model shall be of adequate density and quality to produce a one-foot contour interval derived from the original DTM (Digital Terrain Model) file. The contour data shall be incorporated as a reference file into the final data set. All data used to develop the DTM's shall be delivered in Intergraph 3-D design files.

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5b1. CONTOURS. The contours shall be developed in the digital terrain model (DTM). The contours shall be provided in one or more master DGN files, attached as a reference file to all sheet files utilizing the clip bounds methods. Each contour shall be drawn sharp and clear as a continuous solid line, dashed contours are not acceptable. Every index contour shall be accentuated as a heavier line than the intermediate and shall be annotated according to its actual elevation above MLW. Whenever index contours are closer than one-quarter (1/4) inch, and the ground slope is uniform, the intermediate shall be omitted. Labeling or numbering of contours shall be placed on top of the contour line, so that the elevation is readily discernible, do not break contours. Labeling of intermediate contours may be required in areas of low relief.

5c. MODEL DGN FILES (SCALE 1:1).

5c1. The beach profile upland (land) data shall be provided in one or more master DGN file attached as a reference file to all sheet files utilizing the clip bounds methods.

5c2. The beach profile offshore (water) data shall be provided in one or more master DGN file attached as a reference file to all sheet files utilizing the clip bounds methods.

5c3. The control data shall be provided in one or more master DGN file attached as a reference file to all sheet files utilizing the clip bounds methods.

5c4. The contours shall be provided in one or more master DGN file attached as a reference file to all sheet files utilizing the clip bounds methods.

5c5. The breaklines shall be provided in one or more master DGN file attached as a reference file to all sheet files utilizing the clip bounds methods.

5d. COVER AND CONTROL SHEET. The first sheet shall be a cover sheet showing the control sketch, survey control tabulation, sheet layout or index, legend, project location map, survey notes, north arrow, graphic scale, grid ticks, and large signature block. Tabulate, plot, and list the horizontal control used for the survey on the final drawings.

5e. PLAN SHEETS. The plan sheets shall be prepared to a scale of 1"=100', in the Corps of Engineers format (reference letter and instruction dated September 30, 1992) showing notes, title block, grid, north arrow, graphic scale, legend, sheet index, and D. O. File Number. Sheets shall be oriented with north to the top. The extreme right 7 inches of the sheet shall be left blank for notes, legends, etc. The second sheet and all sheets following shall be a continuation sheet and shall have a minimum of two notes, note 1: See Drawing number 1 for notes, note 2: Refer to Survey No. 99-267. The existing sheet layout shall be furnished.

5d. SECTION VIEWS. The sections shall be extracted and displayed from the digital terrain model (DTM OR TTN) utilizing INROADS OR INXPRESS. The sections shall be generated or extracted along the same azimuth as the section was collected in the field. The sections shall be displayed at a 10 to 1 vertical exaggeration. The planimetric lines (alignment of extraction), alignment, stations, and cross sections shall be displayed in one DGN file (NO PLOTS).

6. MAP CONTENT.

6a. COORDINATE GRID (NAD 27). Grid ticks (English) of the applicable State Plane Coordinate System shall be properly annotated at the top, bottom and both sides of each sheet. Spacing of the grid ticks shall be five (5) inches apart.

6b. CONTROL. All horizontal and vertical ground control monuments shall be shown on the maps in plan and tabulated.

6c. TOPOGRAPHY. The map shall contain all representable and specified topographic features that are visible or identifiable.

6d. SPOT ELEVATIONS. Spot elevations shall be shown on the maps in proper position.

6e. MAP EDIT. All names, labels, notes, and map information shall be checked for accuracy and completeness.

6f. SHEET INDEX AND LEGEND. On plan drawings a small-scale sheet index shall be shown on each sheet of the series; highlighting the sheets in the standard manner. Planimetric and topographic feature legends shall be shown on each sheet. Contractor logo shall be shown on each drawing.

6g. MAP ACCURACY. All mapping shall conform to the national map accuracy standards except that no dashed contour line will be accepted.

7. OFFICE REVIEW AND COMPUTATIONS. The Contractor shall make the necessary computations to verify the correctness of all measurements and apply the proper theory of location in accordance with the law or precedent and publish the results of the survey. The contractor shall submit the original field notes and horizontal and vertical abstract (computation abstract) to Survey Section for final computation before mapping commences.

8. DELIVERIES. On completion, all data required shall be delivered or mailed to Design Branch, Survey Section at the address shown in contract, and shall be accompanied by a properly numbered, dated and signed letter or shipping form, in duplicate, listing the materials being transmitted. All costs of deliveries shall be borne by the Contractor. Items to be delivered include, but are not limited to the following:

- 8a. GPS network plan, (before GPS work commences).
- 8b. GPS raw data along with field observation log sheets filled out in field with all information and sketches.
- 8c. Computation files with Horizontal and Vertical abstracts along.
- 8d. Horizontal and Vertical Field Books.
- 8e. Furnish X, Y, Z, and descriptor ASCII file for each beach profile and one merged with all beach profile data.
- 8f. Furnish DEP format file for each profile line.
- 8g. DTM File.
- 8h. Master DGN files.
- 8i. DGN sheet files at 1"=100.
- 8j. Furnish a digital file using CORPSMET 95 (Metadata Software) with the appropriate data included.
- 8k. Excel file with Monument ID, X, Y, Z, and Azimuth of profile line.

AUTHOR EN-DT JERRY T. BURCHFIELD

APPROVED BY _____
ED HODGENS (EN-HC)

SAMPLE RECORD OF NEGOTIATIONS

CESAJ-EN-DT (1110-2-1150a) 24 Jun 99

MEMORANDUM FOR: CONTRACT FILES

SUBJECT: Negotiations Memorandum: Contract No. DACW17-98-D-0004, Brevard County, Sand Bypass System Post Construction One-Year Monitoring Beach Erosion Survey, Canaveral Harbor, Florida (Survey 99-267)

1. References.

- a. Letter RFP CESAJ-EN-DT, 9 Jun 99, subject: Contract No. DACW17-98-D-0004.
 - b. Government Survey Estimate, 3 Jun 99, prepared by Mr. Burchfield (CESAJ-EN-DT), in the amount of \$60,831.00 and approved by Mr. Walter Clay Sanders, Assistant Chief, Engineering Division, 9 Jun 99.
 - c. Contractor's (Sea System, Inc - SEA) initial letter of proposal, 23 Jun 99, in the amount of \$76,135.00.
 - d. Contractor's (Sea System, Inc - SEA) revised letter of proposal, 24 Jun 99, in the amount of \$59,775.00.
2. The Contractor's initial proposal of \$76,135.00 is above the Government Estimate of \$60, 831.00 by \$15,304.00. The Contractor's revised proposal of \$59,775.00 is below the Government Estimate of \$60,831.00 by \$1,056.00.
3. On 24 Jun 99, a line-by-line comparison of the estimate and proposal was performed (per References 1b and 1c) as follows:

<u>CONTRACTOR'S PROPOSAL (23 JUN 99)</u>			
	<u>Item</u>	<u>Quantity</u>	<u>Amount</u>
2002	5-Man Hydro Crew	38.0 CD @ \$1,404.00	\$ 53,352.00
2003	Survey Helper (Deduct)	38.0 MD @ 144.00	- 5,472.00
2004a	Per Diem	152.0 MD @ 65.00	9,880.00
2005	Project Manager	5.0 MD @ 436.00	2,180.00
2006a	Per Diem (PM)	5.0 MD @ 92.00	460.00
2007	CADD Operator	15.0 MD @ 333.00	4,995.00
2008	Survey Computer	20.0 MD @ 318.00	6,360.00
2011	Establish Monuments	4.0 EA @ 25.00	100.00
2015a	GPS First Unit	26.0 DY @ 130.00	3,380.00
2015b	Second Unit	10.0 DY @ 90.00	900.00
	Total-----		\$ 76,135.00

<u>GOVERNMENT ESTIMATE (3 JUN 99)</u>			
	<u>Item</u>	<u>Quantity</u>	<u>Amount</u>
2002	5-Man Hydro Crew	30.0 CD @ \$1,404.00	\$ 42,120.00
2003	Survey Helper (Deduct)	30.0 MD @ 144.00	- 4,320.00
2004a	Per Diem	120.0 MD @ 65.00	7,800.00
2005	Project Manager	7.0 MD @ 436.00	3,052.00
2006a	Per Diem (PM)	7.0 MD @ 92.00	644.00
2007	CADD Operator	27.0 MD @ 333.00	8,991.00
2008	Survey Computer	8.0 MD @ 318.00	2,544.00
	Total-----		\$ 60,831.00

4. Line-by-line discussions with the Contractor took place on 24 Jun 99 between Jerry T. Burchfield (CESAJ-EN-DT) and Stan Copeland (SEA). The Request for Proposal (RFP), the technical requirements (TR), work effort, line items, and time period were reviewed with the Contractor.

4a. Line item's 2005, 2006a, and 2007 were the same or below the Government Estimate. Line item's 2002, 2003, 2004a, 2008, 2011, 2015a, and 2015b of the Contractor's proposal is above the Government Estimate. We agreed to use the existing positions of the control monuments therefore line item's 2011, 2015a, and 2015b of the

Contractor's proposal are not required and line item's 2002, and 2003 were reduced. Line item 2008 was reduced and line item 2007 was increased base on the computation and CADD requirements.

4b. During discussion with the Contractor, it was discovered that line item's 2002 requires 30 days, 2003 requires 30 days (Deduct), 2004a requires 120 days, 2005 requires 5 days, 2006a requires 5 days, 2007 requires 27 days, and 2008 requires 8 days.

5. The Contractor and the Government agreed to a completion date of 60 days after the Notice To Proceed is signed by the Contracting Officer and that these negotiations are subject to approval of the Contracting Officer and do not authorize the Contractor to commence work. The Contracting Officer will issue the Notice to Proceed.

6. The Contractor's Proposed cost of \$59,775.00 is considered fair and reasonable based on time and effort reasonably expected of a prudent contractor or Government forces performing the same services, and is recommended for acceptance by the Contracting Officer.

7. Sea System, Inc was selected for this Task Order based on an equitable distribution of work among our AE Contractors.

PREPARED BY _____ DATE
JERRY T. BURCHFIELD/CESAJ-EN-DT

REVIEWED BY _____ DATE
D. TONEY LANIER
CHIEF, SPECIFICATIONS SECTION

APPROVAL RECOMMENDED _____ DATE
WALTER CLAY SANDERS, P.E.
ASSISTANT CHIEF, ENGINEERING DIVISION

APPROVED BY _____ DATE
