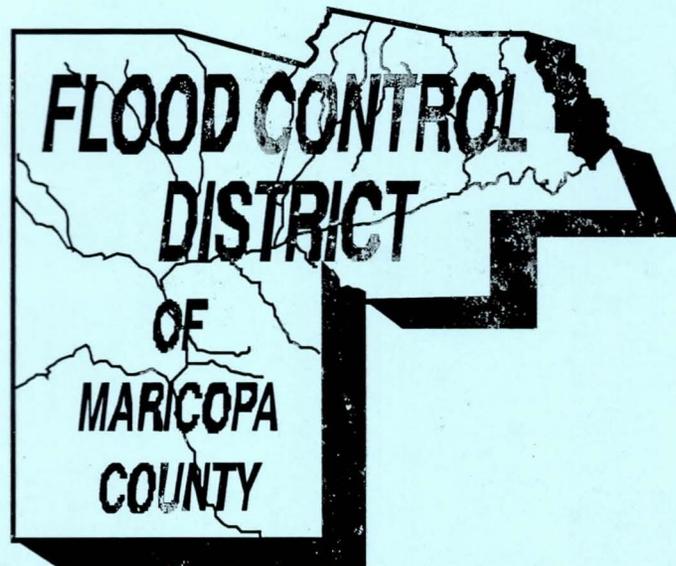


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**CONSULTANT GUIDELINE**  
**INCORPORATED BY REFERENCE**  
**FOR**  
**CONSULTANT SERVICES CONTRACTS**



*Flood Control District of Maricopa County*  
*2801 W. Durango Street*  
*Phoenix, Arizona 85009-6399*

*October 1, 1998*

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## EXHIBITS

- Exhibit 1 : Engineering Change Order
- Exhibit 2 : Certificate of Performance and Payment of All Claims
- Exhibit 3 : Letters of Forbearance
- Exhibit 4 : Minority/Women-Owned Business Enterprises Program  
D/M/WBE Participation Report
- Exhibit 5 : Schedule Template
- Exhibit 6 : Consultant/Subconsultant Cost Proposal Summary
- Exhibit 7 : Consultant/Subconsultant Estimated Manhours and Direct Labor
- Exhibit 8 : Consultant/Subconsultant Scheduled Project Manhours
- Exhibit 9: Calculation of Projected Expenditure and  
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## 1.0 GENERAL PROVISIONS

### 1.1 PURPOSE

This Consultant Guidelines Manual is issued by the Flood Control District of Maricopa County (District) to provide the Consultant with an understanding of the District's interpretation of specific contract language and requirements and to standardize planning and design deliverables and submittals. It is incorporated by reference into the District's Contracts for Consultant Services and is therefor part of the contract documents. Unless otherwise specifically stated in the Scope of Work or Special Conditions to the contract, all terms and conditions and requirements identified by these Guidelines are in full force and effect for consultant services contracts with the Flood Control District of Maricopa County.

### 1.2 DEFINITIONS

When the following terms are used in the contract documents, the meaning will be as follows:

ADWR – Arizona Department of Water Resources

Agent – The representative of the District authorized to negotiate terms of the contract and provide direction to the Consultant during the term of the contract. The Agent is the sole District contact for administering the contract.

Agreement – The term "Agreement" is also referred to and may be designated as "Contract."

Amendment – A written alteration to the executed contract, within the general scope of work, which authorizes and directs any of the following: an addition, deletion, or revision to the scope of work; or an adjustment in the contract performance period or contract value; or any combination thereof. The term "Amendment" is also referred to and may be designated as "Change Order." (**Exhibit 1**)

A.R.S. – Arizona Revised Statutes, as amended, through the most recently completed legislative session.

Certificate of Performance – Consultant certification required prior to final contract payment by the District, certifying that all lawful claims for labor, rental of equipment, material used and any other claims in connection with the contract have been paid by the Consultant. (**Exhibit 2**)

Change Order – The term "Change Order" is also referred to and may be designated as "Amendment." (**Exhibit 1**)

CLOMR – Conditional Letter of Map Revision issued by FEMA.

Consultant – The individual, partnership, firm, corporation, joint venture, or other business entity with whom the District has entered into a contract to provide professional services. The term "Consultant" means and includes the Consultant and all of its representatives and subconsultants.

Contract – The fully executed contract for consultant services entered into between the District and the Consultant for completion of the scope of work. The contract is a mutually binding legal relationship which includes all attachments, exhibits, supplements, and amendments to the

contract and represents the entire and integrated agreement between the District and the Consultant. It supersedes all prior discussions, negotiations, representations, or agreements pertaining to the scope of work, whether written or oral. The term "Contract" is also referred to and may be designated as "Agreement."

Contract Adjustment – See Amendment or Change Order.

Contract Fee - The total compensation to be paid by the District to the Consultant for the acceptable completion of the scope of work. The contract fee can only be changed by a written amendment to the contract. The term "Contract Fee" is also referred to and may be designated as "Contract Value."

Contract Value – The term "Contract Value" is also referred to and may be designated as "Contract Fee."

Cost Estimate – The Consultant's best professional estimate of the value of the construction project. The cost information in the cost estimate shall be adjusted to reflect costs effective the date that bids are opened.

County – Maricopa County, Arizona.

Day – A calendar day of 24 hours, measured from midnight to the following midnight.

Design Specification – Category of specifications which sets out in detail the materials used for contract work and the mode and manner in which contract work is to be performed.

District – The Flood Control District of Maricopa County, Arizona, a political taxing subdivision of the state of Arizona organized under Section 48, Chapter 21, of the Arizona Revised Statutes, having all the powers, privileges and immunities granted generally to municipal corporations.

Errors and Omissions – Wrongful acts of the insured Consultant arising out of performing, or failing to perform, professional services.

FEMA – Federal Emergency Management Agency.

Forbearance – Formal action by the District to reserve and maintain all contractual rights and remedies while allowing the Consultant to complete the contract requirements beyond the contract completion date when the Consultant has been delayed through no fault of the District or other Agencies identified by the Scope of Work. **(Exhibit 3)**

LOMR – Letter of Map Revision issued by FEMA.

Maricopa County Procurement Code – Code adopted by the Maricopa County Board of Supervisors and the District Board of Directors, which applies to all expenditures of public monies, except contracts between the County or District and other political subdivisions or other governments. The Code defines the responsibilities and authorities granted to County and District representatives for solicitation, negotiation, and award of contracts, or other purchasing agreements.

MBE/WBE Program – Minority and Women-Owned Business Enterprise Program whose purpose is to establish guidelines for increased full and equitable opportunities for minority business enterprises (MBE) and women business enterprises (WBE) to provide goods and services to Maricopa County. The District has adopted this program and, with the County, endeavors to ensure in every way possible that minority and women-owned business enterprises have every opportunity to participate in providing professional services, purchased goods, and contractual services to the County and District without being discriminated against on the grounds of race, religion, gender, age or national origin. Contracts with MBE/WBE participation are required to submit a completed D/M/WBE Participation Report (**Exhibit 4**) with each request for payment.

Milestone – A principal event specified in the contract documents relating to an intermediate schedule completion date or time prior to the final contract completion date.

Notice to Proceed (NTP) – The formal notification issued by the District to the Consultant authorizing the Consultant to proceed with the work and establishing the date of commencement of the performance period.

Performance Period – The period of time provided in the contract for the completion of the scope of work by the Consultant. The performance period is initiated by the Notice to Proceed. The performance period may only be revised by an amendment to the contract.

Progress Payments – Monetary payment made to the Consultant as contract work progresses and determined on the basis of percentage of completion accomplished.

Project – The total work identified by the Scope of Work, to be completed pursuant to the contract requirements.

Project Manager – Consultant's representative and primary contact with the District. The Project Manager is knowledgeable and responsible for all aspects and phases of the project.

Retention – A percentage withheld from the progress payments to the Consultant in accordance with the contract documents. The retention is held until all terms of the contract have been fulfilled.

Scope of Work – Contract document detailing the specific work requirements in addition to the Consultant Guidelines.

Schedule – A timeline of the scope of work that, at a minimum, contains those elements of the District scheduling template (**Exhibit 5**) which are applicable to the project, i.e., contract start and completion dates, coordination meetings, dates of required submittals, and significant project milestones.

Seal - The approval of a Professional Engineer, Architect, or Land Surveyor registered in the State of Arizona and who is both qualified and regularly and customarily engaged in the technical discipline of the scope of work which is approved by the seal.

Specification – A description of the technical requirements for a material, product, or service that includes the criteria for determining whether these requirements are met.

Stamp – The term “Stamp” is also referred to and may be designated as “Seal”.

Standard – A document that establishes engineering and technical limitations and applications of materials, processes, methods, designs, and engineering practices.

Study – An investigation that results in the acquisition of knowledge through the analysis of a proposed project or issue. At the completion of the study, the Consultant provides the District with a written report of the information attained during the study period.

Subconsultant – An individual or a business entity which has a direct contract with the Consultant to perform a portion of the scope of work. The term “subconsultant” means and includes the subconsultant and the subconsultant’s authorized representatives.

Technical Data Notebook – The organization of technical documentation for flood studies according to the State Standard SSA1-97.

Termination – Right reserved by the District to bring an end to a contract for either the convenience of the District, or due to the unexcused failure of the Consultant to perform.

Written or In Writing – Any worded or numbered expression which can be read, reproduced, and later communicated, and includes electronically transmitted and stored information.

### 1.3 TERMS AND CONDITIONS

#### 1.3.1 The District’s Responsibilities

The District shall furnish the Consultant, at no cost to the Consultant, the following information or services for this project:

- 1.3.1.1 One copy of on-hand maps, records, survey ties, bench marks or other data pertinent to the project. This does not, however, relieve the Consultant of the responsibility of searching records for additional information, for requesting specific information or for verification of that information provided. The District does not warrant the accuracy or comprehensiveness of any such information.
- 1.3.1.2 All available information and data relative to policies, standards, criteria, and studies, etc. impacting the project as identified by the Consultant.
- 1.3.1.3 Availability of staff for consultation with the Consultant during the performance of the studies and plan development in order to identify the problems, needs, and other functional aspects of the project.
- 1.3.1.4 Examination of documents submitted by the Consultant and rendering of decisions pertaining thereto promptly, to avoid unreasonable delay in the progress of the work by the Consultant. The District will keep the Consultant advised concerning the progress of the District’s review of work.

#### 1.3.2 Alteration in Scope of Work

This Contract may be amended by mutual written agreement of the District and the Consultant. Any alteration in the scope of work that will result in a substantial change in the nature of the project so as to materially increase or decrease the contract fee will

require negotiation of an amendment to the contract to be executed by the District and the Consultant. No work shall commence on the change until the contract amendment has been approved by the District and the Consultant has been notified to proceed by the Agent. It is distinctly understood and agreed that no claim for extra work done or materials furnished by the Consultant will be allowed by the District except as provided herein, nor shall the Consultant do any work or furnish any materials not covered by this agreement unless such work is first authorized in writing in accordance with the Maricopa County Procurement Code. Any such work or materials furnished by the Consultant without such written authorization first being given shall be at his own risk, cost, and expense, and he hereby agrees that without such written authorization he will make no claim for compensation for such work or materials furnished. (See Exhibit 1)

### 1.3.3 Records

Records of the Consultant's payroll expense pertaining to this project and records of accounts between the District and the Consultant shall be kept on a generally recognized accounting basis and shall be available upon request to the District or its authorized representative for audit during normal business hours. The records shall be subject to audit by appropriate grantor agency if the project is funded all or in part by a grant.

All procurement records shall be retained for a period of one year and disposed of in accordance with the records retention guidelines and schedules approved by the State of Arizona Department of Library, Archives, and Public Records unless applicable Federal regulations require a longer period.

### 1.3.4 Project Completion

If during the course of this contract situations arise which prevent completion within the allotted time, an extension may be granted by the Agent.

### 1.3.5 Termination

- 1.3.5.1 The District may terminate this contract with written notification to the Consultant at any time and upon reimbursement to the Consultant of expenses, which include reasonable charges for time and material for the percentage of work satisfactorily completed, submitted to and approved by the District.
- 1.3.5.2 The District reserves the right to postpone, terminate or abandon this project for the Consultant's failure to complete the project on time, or failure to comply with the provisions of the contract. The District also reserves the right to terminate any or all parts of this contract for its own convenience as the District may determine at its sole discretion.
- 1.3.5.3 The District hereby gives notice that pursuant to A.R.S. Section 38-511 "A", this contract may be canceled without penalty or further obligation within three years after execution if any person significantly involved in initiation, negotiation, securing, drafting, or creating this contract on behalf of the District is, at any time while the contract or any extension of the contract is in effect, an employee or agent of any other party to the contract in any capacity or a consultant to any other part of the contract with respect to the subject matter of the contract. Cancellation under this section shall be effective when written notice from the Chief Engineer and General Manager is received by all of the

parties of the contract. In addition, the District may recoup any fee or commission paid or due to any person significantly involved in initiation, negotiation, securing, drafting, or creating the contract on behalf of the District from any other party to the contract arising as a result of the contract.

- 1.3.5.4 The Consultant may terminate this contract in the event of nonpayment of fees as specified in the Payments section of the contract.

### 1.3.6 Ownership of Documents

All original documents including, but not limited to, studies, reports, tracings, drawings, physical and computer models, electronic files and media, estimates, field notes, investigations, design analyses, calculations, computer software, and specifications, prepared in the performance of this contract are to be and remain the property of the District and are to be delivered to the Agent before final payment is made to the Consultant. The District reserves the right to reuse the documents as it sees fit. However, the District will not reuse, alter, or modify these documents without noting such alterations, modifications, or intent of their reuse, and will hold the Consultant harmless from any claims arising from the reuse, alteration, or modification of the documents. The Consultant may retain reproducible copies of all such documents delivered to the District.

### 1.3.7 Compliance with Laws

The Consultant is required to comply with all Federal, State and local laws, ordinances and regulations. The Consultant's signature on this contract certifies compliance with the provisions of the I-9 requirements of the Immigration Reform and Control Act of 1986 for all personnel that the Consultant and any subconsultants employ to complete this project. It is understood that the District shall conduct itself in accordance with the provisions of the Maricopa County Procurement Code.

### 1.3.8 General Considerations

- 1.3.8.1 Prior to beginning the work, the Consultant shall furnish the District for approval the names of its key employees, and of its subconsultants and their key employees to be used on this project. Any subsequent changes are subject to the written approval of the District.
- 1.3.8.2 The Consultant, in replacing a MBE/WBE subconsultant, should attempt to contract with another MBE/WBE.
- 1.3.8.3 The failure of either party to enforce any of the provisions of this contract or to require performance of the other party of any of the provisions hereof shall not be construed to be a waiver of such provisions, nor shall it affect the validity of this contract or any part thereof, or the right of either party to thereafter enforce each and every provision.
- 1.3.8.4 The Consultant shall be responsible for the cost of any additional design, field layout, testing, construction and supervision necessary to correct those errors or omissions attributable to the Consultant and for any damage incurred by the District as a result of additional construction costs caused by such Consultant errors or omissions.
- 1.3.8.5 The fact that the District has accepted or approved the Consultant's work shall in no way relieve the Consultant's responsibility.

1.3.8.6 It is mutually understood and agreed that this contract shall be governed by the laws of the State of Arizona, both as to interpretation and performance. Any action at law, suite in equity, or judicial proceeding for the enforce of this contract, or any provision thereof, shall be instituted only in the courts of the State of Arizona.

1.3.9 Successors and Assigns

This Contract shall not be assigned by either party without prior written approval of the other except that the Consultant may use in the performance of this contract without prior approval of the District, personnel or services of its related entities and affiliated companies as if they were an integral part of the Consultant; and it shall extend to and be binding upon the heirs, executors, administrators, successors and assigns of the parties hereto.

1.3.10 No Kick-Back Certification

1.3.10.1 The Consultant warrants that no person has been employed or retained to solicit or secure this contract upon any agreement or understanding for a commission, percentage, brokerage, or contingent fee; and that no member of the Board of Directors/Supervisors or any employee of the District has any interest, financially or otherwise, in the Consultant firm.

1.3.10.2 For breach or violation of this warranty, the District shall have the right to annul this contract without liability, or at its discretion to deduct from the contract price or consideration, the full amount of such commission, percentage, brokerage, or contingent fee.

1.3.11 Anti-Discrimination Provision

1.3.11.1 The Flood Control District of Maricopa County will endeavor to ensure in every way possible that minority and women-owned business enterprises shall have every opportunity to participate in providing professional services, purchased goods, and contractual services to the District without being discriminated against on the grounds of race, religion, gender, age, disability, or national origin.

1.3.11.2 The Consultant agrees not to discriminate against any employee or applicant for employment because of race, religion, color, gender, national origin, age or disability and further agrees not to engage in any unlawful employment practices. The Consultant further agrees to insert the foregoing provisions in all subcontracts hereunder.

**1.4 CONSULTANT FEE**

1.4.1 It is the District's intent that the Consultant receive fair and equitable reimbursement for reasonable direct labor costs, payroll additives, overhead (including general and administrative expenses), subconsultants and other direct costs (ODCs), and shall also make a reasonable profit. The District considers a cost to be "reasonable" if, in its nature and amount, it does not exceed that which would be incurred by a prudent person in the conduct of competitive business. It is the District's policy to determine the appropriateness and reasonableness of proposal fees. The fee will be submitted in the

format identified by **Exhibit 6**, for the prime Consultant and any major subconsultants as identified by the District. The fee will be comprised of the following:

1.4.1.1 Labor-Related Costs

Labor related costs are actual salaries of the personnel directly charging time to the project, including applicable sick leave, vacation, and holiday pay, plus unemployment compensation insurance, retirement benefits, deferred compensation (or like plan qualified under the applicable section of the Internal Revenue Code), and medical and insurance benefits. The salaries of principals or partners to the extent that they perform only advisory services directly applicable to the project will be added to the salary cost without additions for employee benefits. Where the services of the principals or partners are necessary for the successful completion of the project, and this has been demonstrated to the satisfaction of the District, then the salaries of the principals or partners will be treated as directly chargeable to the project, inclusive of all employee benefits.

1.4.1.2 Multiplier

This provides the compensation for the Consultant's overhead, plus a margin for interest on invested capital, readiness and ability to serve, and profit.

The largest component of this multiplier is Overhead (indirect salary expenses), and is inclusive of the following unless otherwise accounted for in the audit of the firm's expenses:

- a. The salaries of personnel in the executive and administrative salary pool other than those identifiable salaries included in salary cost, and expenses included and reimbursable and non-salary expenses, plus salaries or imputed salaries of partners and principals, to the extent that they perform general executive and administrative services.
- b. Business taxes and insurance, other than those included in salary cost, but excluding state and federal income taxes.
- c. Office space, including light, heat, cooling, and similar items.
- d. Depreciation allowances or rental for furniture, drafting equipment, and engineering instruments.
- e. Transportation expenses, including corporate automobile expense, and maintenance.
- f. Office, printing, and drafting supplies.
- g. Education and professional development (may include cost for consultant employee's attendance at technical conferences).
- h. Communication expenses, including telephone, telegraph, and facsimile, with the exception of those long distance calls directly chargeable to a specific project.
- i. Professional expenses, including fees for memberships in professional organizations.
- j. Interest and finance.
- k. Proposal preparation, preliminary arrangements for new projects, or like expenses.
- l. Computer expenses, exclusive of salary cost of operation for specific projects, but inclusive of all other related computer operation expenses. If otherwise provided for in the cost allocation plan of a firm (such as

direct project expense), the District reserves the right to review and approve such expense allocation and amount at the time of fee negotiation.

- m. Graphic and engineering supplies.
- n. Reproduction and photo expense, including use of copier for work not specified as a direct expense.
- o. Postage, messenger, delivery and freight expenses other than those chargeable to a specific project.
- p. Outside and temporary help.
- q. Outside services – reproduction and printing, other than those costs directly chargeable to the project.
- r. Equipment rental.

#### 1.4.1.3 Direct Non-Salary Expenses

The District will negotiate the estimated expense categories for both Consultant and subconsultant. Backup documentation may be requested by the District. Expense itemization, during the negotiation stage, must be compatible with the amount of direct expenses being proposed by the Consultant, and will vary with both the amount and type of the Consultant's contract assignment. These expenses will be identified by consultants on a project-by-project basis and may include, but not necessarily be limited to, the following:

- a. Living and traveling expenses for principals and employees when away from the home office on business connected with the project, either actual expenses or a negotiated per diem rate.
- b. Identifiable communication expense, such as long distance telephone calls, telegraph, and express mail charges incurred for the project.
- c. Services directly applicable to the project, such as legal, accounting, special consultants (including subcontractors), borings, laboratory charges, commercial printing and binding, and similar costs that are not applicable nor have been included in general overhead.
- d. This may also include "special" computer costs where the project requirements are such that a specific program purchase or additional computer equipment, such as rental, is necessary and identifiable. Any personnel time required in the application of specific programs will be charged as a salary cost. The District may request additional information regarding computer charges during the fee proposal and negotiation phases to ensure the cost effectiveness of the charges in relation to the project objectives and that the charges are not included in general overhead.
- e. Reproduction and printing services directly related to the project and identified by a specific deliverable, such as reports, plans and specifications.
- f. If an outside service does not involve the consultant's use of a professional services subconsultant, this type of consultant cost must be included within the direct expenses category.

#### 1.4.2 Unallowable Expenses

The following expenses are unallowable for inclusion in the Consultant's overhead (indirect salary) expenses:

##### 1.4.2.1 Entertainment or advertising.

- 1.4.2.2 Time spent for participating in civic and charitable activities.
- 1.4.2.3 Bad debts, including interest, and charges for legal and collection fees.
- 1.4.2.4 Cost of life insurance policies where corporation is named as beneficiary.
- 1.4.2.5 Employee recreation and/or morale enhancement.
- 1.4.2.6 Property taxes on other than the property primarily occupied by the corporation.
- 1.4.2.7 Fines, penalties or other payments for violations of whatever kind or description.
- 1.4.2.8 Errors and omissions payments in settlement of claims or judgements.
- 1.4.2.9 Contributions and gifts.

1.4.3 Estimated Manhours

Listings of the manhours proposed to be directly spent on the project by non-overhead, project personnel involved in each major task/phase/additional service/post design category are to be included in the fee proposal and totaled by tasks and personnel classifications (**Exhibit 7**). When a subconsultant is being employed for the work, the consultant will include a separate task for subconsultant project management. No additional markup will be allowed on work performed by subconsultants.

1.4.4 Scheduled Project Manhours

A tabulation of the Consultant's/Subconsultant's estimated direct project manhours, by project personnel classification, on a month-by-month basis, is required. (**Exhibit 8**)

1.4.5 Cost Proposal Summary

- 1.4.5.1 Under the "direct labor" classification, the labor classifications must match the personnel classifications contained in the "Consultant/Subconsultant Estimated Manhours" sheet. It is intended that all personnel/personnel categories (other than overhead-type personnel) who will be directly involved in the contract scope of work be included. The District will assess the reasonableness of the skill level required to accomplish the work, i.e., the Consultant should not propose using staff more qualified (and therefor possibly more costly) than necessary for a specific task.
- 1.4.5.2 Estimated manhours should be the same as the individual and total categories listed in the "Consultant/Subconsultant Estimated Manhours" sheet.
- 1.4.5.3 The hourly rate shall reflect:
  - a. The actual hourly rates of identified key project personnel; and
  - b. The average hourly rates for all other personnel classifications at the office where the work will be performed.
- 1.4.5.4 At the start of the negotiation process, salary and overhead data may be required. If required, salary data must be substantiated by an officer of the company. Overhead may be supported by the firm's most recent audit or by a determination of overhead by an audit conducted by another government agency such as DCAA, ADOT, MCDOT, Caltrans, etc. If a firm does not have an audited overhead rate, a provisional overhead may be assigned by the District. It is expected that a reasonable overhead for most firms will not exceed 160%. Highly specialized firms may have a higher overhead. This will be reviewed by the District on a case by case basis.

- 1.4.5.5 During the contract negotiation stage, all components (salary, fringes, G&A overhead and net fee percentage) of a consulting firm's fee proposal will be subject to review and approval by the District for general compliance with current standards. If salaries or overhead are not acceptable, the District will so advise the Consultant who can voluntarily reduce them if they wish to continue the contract process.
  - 1.4.5.6 Profit will be determined by degree of risk, complexity of the job, size of the contract and related factors. Normally acceptable profit ranges are 8% to 15%. Large, simple, low risk projects will have a lower profit range. The higher profit margins will be for small or complex, high risk projects. Most studies should have a median profit margin, depending on the size of the scope.
  - 1.4.5.7 Unless specifically called out within the contract, the District will not entertain increases to any component of a Consultant's overall multiplier during the performance of a contract.
- 1.4.6 All major professional subconsultant services being proposed by the Consultant must receive the same level of detail as the Consultant's fee proposal.

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## 2.0 SCHEDULE AND PROJECT COORDINATION

### 2.1 SCHEDULE

- 2.1.1 The Consultant will submit a schedule for the project at the Kick-Off Meeting, which will be scheduled within 14 days of the Notice to Proceed. The schedule will show coordination meetings, dates of all required submittals for each of the tasks in the scope, significant project milestones, and District review periods, formatted to conform with the Schedule Template (**Exhibit 5**). The schedule shall be developed in a computerized format that contains the anticipated beginning and end dates for the tasks identified in the scope, the time duration of each task, a bar chart (Gantt Chart) showing the tasks and the overall duration of the project. The computer program MS Project, Version 4.0 or compatible is preferred. The Consultant shall update this project schedule monthly.
- 2.1.2 A projection of estimated project costs consistent with the scheduled project manhours and project schedule as provided in the fee proposal shall be submitted at the Kick-Off Meeting. The monthly expenditure forecast of costs shall be presented in tabular and graphic form (**Exhibit 9**).
- 2.1.3 The Consultant shall allow for a three (3) week review and comment period by the District and other involved parties in the schedule for all reports and data identified in the scope of work.

### 2.2 PROJECT COORDINATION

#### 2.2.1 Project Manager

The Consultant shall appoint a Project Manager who shall be knowledgeable of the progress and have responsible charge of the progress of each phase of the project. The Project Manager shall be the same person listed in the Consultant's Technical Proposal, unless otherwise approved by the District. The District may request replacement of the Project Manager if it becomes apparent that this would be in the best interest of the project. The Project Manager shall be the point of contact for the District. The District may terminate this agreement if the Project Manager is not available or if the Consultant is unable to provide a replacement Project Manager acceptable to the District.

#### 2.2.2 Invoices

- 2.2.2.1 The Consultant will submit a quarterly estimation of the projected billing at the Kick-Off Meeting. The estimation shall include the amount of retention to be withheld quarterly. Thereafter, this estimation will be updated and submitted to the District's Project Manager at least 10 days prior to the end of each quarter. This estimation will include the method to be used by the Consultant for measuring the actual progress of the work (e.g. earned value system) in comparison to the schedule and expended budget.
- 2.2.2.2 Consultant will submit monthly (or other time intervals approved by the District) invoices requesting progress payment, which reflect work accomplished during the invoice period. The invoices shall identify the

contract number and shall include: the amount for each work task and subcontracted service identified in the approved fee proposal multiplied by the percent complete and a total for all work tasks; the amounts previously billed; and the amount due for the period. Invoices for other types of contracts, such as Cost Plus Fixed Fee (CPFF), may require additional detail in levels of effort, man-hours worked, and rates paid.

- 2.2.2.3 Invoices shall be submitted to the District's Project Manager, who will review and approve the basis of the payment request. The Project Manager will then forward the invoice to the District's Accounts Payable for processing and payment.

### 2.2.3 Progress Reports

- 2.2.3.1 The Consultant will submit monthly progress reports with the invoice. These reports shall discuss project activities for the same time period as included in the monthly invoices. The report shall be brief (no more than two typed pages). At a minimum, the monthly report shall contain the following:
- a. A description of the significant work accomplished during the reporting month.
  - b. A determination of the percent (%) completed for the month and percent (%) cumulative completed for the contract.
  - c. A brief description of the work to be accomplished in the following month.
  - d. A description of any problems encountered and actions to resolve the problems.
- 2.2.3.2 The Project Manager shall call the District's Project Manager once a week to provide a verbal progress report, unless directed otherwise by the District's Project Manager.
- 2.2.3.3 The Project Manager shall keep the District informed of all coordination with outside agencies and other affected parties.
- 2.2.3.4 The Project Manager shall provide copies of minutes of meetings, and significant telephone conversations, and correspondence to the District on a monthly basis. At the end of the project copies of all minutes, conversations, correspondence, etc. shall be submitted in the Project Data Notebook.
- 2.2.3.5 The Consultant shall provide a summary of the monthly and cumulative invoice amounts compared to the projected amounts as established at the project Kick-Off Meeting or as subsequently revised to reflect project change orders.

## 2.3 **PARTNERING AND VALUE ENGINEERING**

- 2.3.1 The District intends to encourage the foundation of a partnering relationship with the Consultant and its subconsultants. This partnering relationship will be structured to draw on the strengths of each organization and to identify and achieve reciprocal goals. The objectives are effective and efficient contract performance, intended to achieve completion within budget, on schedule, and in accordance with contract requirements.

- 2.3.2. The Consultant and the District will participate in a facilitated Value Engineering/ Partnering Session prior to the final submittal of the contract fee proposal. The District will provide the facilitator for this session. During the session the content of the Scope of Work, the anticipated level of effort to execute tasks and an anticipated contract schedule will be discussed and agreed upon. Those in attendance should include representatives from the Consultant, appropriate subconsultants, the District, and other participating agencies or utilities. The participation of the various parties will be coordinated between the Consultant and the District.
- 2.3.3 Following award of the contract, the partnering relationship will continue. A partnering workshop shall be facilitated by a third party competent in the fundamentals of partnering, and acceptable to the District, if provided by the Consultant.
- 2.3.4 Unless otherwise stated in the scope of work, the District shall be responsible for scheduling, coordinating, and hiring the third party facilitator, and planning all of the partnering meetings in consultation with the Consultant. The District will be responsible to notify and coordinate attendance at the partnering meetings by other agencies. To achieve the desired partnering relationships, the consultant will need to encourage attendance by its major subconsultants on the project. Follow-up workshops to be held periodically throughout the duration of the contract shall be defined in the scope of work as agreed to by the Consultant and the District.

## 2.4 OUT OF SCOPE ITEMS

- 2.4.1 Should the Consultant feel that the District, or any project partner such as city or agency staff, is requiring the Consultant to provide work that is not within the scope of the contract documents, the Consultant must notify the District Project Manager immediately and in writing and describe the work which the Consultant feels is out of scope. Such notification shall be provided to the District Project Manager prior to the commencement of any such out of scope work.
- 2.4.2 It is the Consultant's sole responsibility to assure that no additional services beyond the Scope of Work defined in the contract documents shall commence without the written authorization of the District Project Manager.
- 2.4.3 No work defined in the contract documents shall be delayed by the Consultant's request for additional fee for a change or addition in the agreed Scope of Work unless so directed by the District Project Manager.
- 2.4.4 Retroactive requests for additional fee shall neither be considered nor approved.

## 2.5 MEETINGS

- 2.5.1 The Consultant shall participate in regular monthly (or more frequently as identified in the Scope of Work) coordination meetings with the District's Project Manager and in milestone coordination meetings. The Consultant is responsible for the minutes of all meetings. Whenever possible, coordination and milestone/deliverable review meetings will be combined.
- 2.5.2 The Consultant shall meet with officials from the towns, cities, agencies, utilities, project partners, and other interested parties as may be appropriate and as identified in the Scope of Work. The purpose of such meetings is to identify local flooding problems and obtain information on current and planned public works projects, infrastructure modifications, storm drainage systems, development, corporate limits, and other items of interest that will facilitate the completion of a successful project.
- 2.5.3 Meetings with other agencies and utilities will be held as required and shall generally be held at their offices. The District shall be kept informed of all such meetings and shall attend the meetings when needed. The District shall be copied on all meeting minutes.
- 2.5.4 Meetings with the District will generally be held at the District offices.
- 2.5.5 Kick Off Meeting  
The Consultant shall meet with the District within 14 days of the Notice to Proceed. At the meeting the Consultant will submit the project schedule which shall include dates of all proposed coordination meetings, dates of all required submittals for each of the tasks in the scope, significant project milestones, and District review periods. The Consultant will also submit a monthly estimation of the projected billing. The Consultant shall bring the key project team members, including the project checkers, to the meeting to introduce them to the District staff who will be working on the project. The District will provide to the Consultant such project information and data as the District may have, including aerial topographic mapping, utility record drawings, and other information and data as outlined in the Scope of Work.
- 2.5.6 Project Review Meetings  
Following the District's review of project deliverables, the Consultant shall meet with the District Project Manager and review team to review the overall project status and to discuss the District's review comments which will be provided to the Consultant at least three working days prior to the meeting. The Consultant shall make every effort to obtain the review comments of outside agencies and utilities in advance of the review meeting, so that these comments can also be reviewed. These comments will be provided to the District prior to the review meeting whenever possible. The Consultant should be prepared to discuss all review comments and the status of the project. Any problems will be identified and discussed.
- 2.5.7 Other meetings may be required as identified in the Scope of Work, and other sections within this Guideline.

### 3.0 SURVEY, PHOTOGRAMMETRY, AND MAPPING

#### 3.1 SUPERVISORY QUALIFICATION REQUIREMENTS

The Consultant shall conduct all field surveys and prepare all mapping necessary to complete the project. All survey work shall be supervised by a registered land surveyor.

#### 3.2 CONTROL SURVEYING FOR PHOTOGRAMMETRIC MAPPING

##### 3.2.1 Accuracy and Procedural Standards

All survey work performed to obtain topographic mapping shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995. This includes, but is not limited to the establishment of "permanent" elevation reference marks (ERMs), field control surveys, and verification of profiles by the ground survey profile procedure.

##### 3.2.2 Aerial Control Points

The Consultant shall systematically set aerial targets and establish horizontal and vertical control points throughout the areas to be mapped for use in compilation by the aerial survey contractor. All aerial targets are to be removed following completion of the topographic mapping. The controls for the aerial mapping shall be in sufficient numbers and shall be in locations which will be compatible with the mapping accuracy requirements. Section corners, quarter corners, and mid-section points will be used for control points where ever possible. Ties shall be made to existing monuments including section and/or quarter section monuments. The controls shall be of at least third order accuracy.

##### 3.2.3 Elevation Reference Marks (ERMs)

Field control shall be sufficient to provide at least one "permanent" point per mile of mapping, with said point(s) being used as Elevation Reference Marks (ERMs). "Permanent" survey points shall consist of existing monumentation, such as brass caps or similar survey monuments, whenever possible. Where additional monumentation is needed, survey markers conforming to Maricopa Association of Governments (MAG) Uniform Standard Detail for Public Works Construction, detail 120-1, Type C, shall be placed 2" +/- above grade, and topped with a brass cap. Elevation Reference Marks will be labeled on available maps and described in a manner that allows ready location in the field.

##### 3.2.4 Horizontal Control Datum

All horizontal control surveys shall be tied to the NAD83 State Plane Coordinate System. All horizontal control points and corresponding coordinates, shall be listed in the project survey report (see Section 3.2.8). Horizontal control points shall also be noted on the appropriate plan sheets.

### 3.2.5 Vertical Control Datum

All vertical surveys will be based on National Geodetic Vertical Datum (NGVD) 1929, per FEMA guidelines. A conversion factor, including documentation of how it was derived, will be provided by the Consultant to allow comparison of NGVD 29 elevations to NAVD 88 elevations and will be included in the project survey report (see Section 3.2.8). The conversion processes outlined in FEMA 37 shall be used.

### 3.2.6 Structure Surveys

Field surveys of bridges, culverts, roadway improvements, and other structures are to be obtained by the Consultant when as-built plans are not available or when changes significant to the hydraulic modeling and/or design drawings, such as sedimentation, have occurred since the date of as-built. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the project survey report. For hydraulic modeling use, the information presented in the drawing should be in a format appropriate for use in the HEC-2 or HEC-RAS model. Field surveys of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures since the as-built plans may not be on 1929 NGVD. Existing above ground utilities shall be located and shown on the mapping.

### 3.2.7 Topographic Features

For projects without photogrammetry, location surveys shall be performed to adequately show all topographic features including existing drainage swales, bridges, storm drainage outfalls, gravel mining operations, fences, buildings, roads, etc, that exist within the limits of the project or study area.

### 3.2.8 Section Corner Restoration

Restoration of lost or obliterated section corners shall be re-established in accordance with current versions of 1) "Minimum Standards for Arizona Land Boundary Surveys" by Arizona State Board of Technical Registration and 2) "Restoration of Lost or Obliterated Corners and Subdivision of Sections" by the United States Department of Interior Bureau of Land Management. The monuments shall be set per MAG Standard Detail 120-1, type C.

### 3.2.9 Documentation of Survey Data

The ERM's, benchmarks, and aerial control points shall be shown on maps and plan sheets. Survey data will be documented in a project survey report. The project survey report shall include the following:

- 3.2.9.1 Copies of all survey notebooks and office calculations or printout of digital files developed with data collectors.
- 3.2.9.2 All ERM's, benchmarks, aerial control, and other horizontal and vertical control points shall be included. At a minimum, the table shall summarize for each point the horizontal coordinates, elevation, the datum upon which the benchmark was originally established, and a detailed description of the point location for ready recovery in the field.
- 3.2.9.3 A drawing with a base map of suitable scale to show the location of the ERM's, benchmarks, and aerial control points.
- 3.2.9.4 Conversion to other datums as required herein.

### 3.2.10 Data Format

3.2.10.1 All field collected survey data obtained using conventional survey methods shall be noted in standard 5" x 7" hard-bound survey books. All survey data collected electronically shall be submitted in an ASCII text file on 3.5-inch diskettes or CDROM.

3.2.10.2 The project survey report shall be 8½" x 11" in size and bound together. Any 11" x 17" maps shall be fan-folded and included in the report.

## 3.3 UTILITIES

3.3.1 Permanent survey ties shall be established where the project corridor crosses major streets. The purpose of these ties is to provide horizontal and vertical control from which the location of utility relocations can be easily verified by inspectors. The consultant shall determine the need for this temporary monumentation, and recommend their locations to the District's Agent for approval.

3.3.2 The Consultant shall survey the location and elevation of utilities at locations where potholes are completed.

## 3.4 PHOTOGRAMMETRY

3.4.1 Topographic mapping shall be prepared to the scale and contour intervals specified in the project scope of work. The limits of mapping shall also be defined in the project scope of work.

3.4.2 All topographic features including major and minor contour lines, depression and crest ticks and spot elevations, existing drainage swales, bridges, storm drainage outfalls, gravel mining operations, fences, buildings, roads, etc., and existing above ground utilities shall be shown on the mapping. Mapping with a contour interval of one foot shall include full planimetrics for curbs, water meters, manholes, poles, center line of street, vegetation, parking stripes, and any other visible features.

3.4.3 The Consultant shall verify the accuracy of the mapping by the procedures called for in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995 or other methods approved by FEMA. This shall include the verification of cross sections used in the floodplain delineation.

### 3.4.4 Blind Aerial Targets

If required by the Scope of Work, in addition to the aerial targets required for the photogrammetry, additional aerial targets shall be set, spaced uniformly throughout the project area, and both horizontal and vertical values established. The number of additional aerial targets will be at least 25 percent of the number of targets required for the photogrammetric accuracy and shall include at least one target per photogrammetric model.

3.4.5 The photogrammetry subcontractor will not be provided the surveyed elevations and coordinates at these additional aerial targets. The photogrammetry subcontractor shall be required to provide the elevation and coordinates of these blind targets, with 100 percent of the points meeting the accuracy requirements established in the FEMA Document 37 for the required project accuracy, prior to proceeding with the topographic mapping. The

surveyed elevation and coordinate data shall be provided to the District at the same time as it is provided to the photogrammetry subcontractor. The photogrammetry subcontractor shall provide the data for the blind aerial targets to the District at the same time as it is provided to the Consultant.

3.4.6 HEC-2/RAS Cross Section Files

The Consultant shall provide data files of the DTM data which will allow extrapolation of HEC-2/RAS cross-sections.

3.4.7 The final submittal of all digital maps, computer files, and other data shall be prepared and submitted in the manner defined for input by the guidelines in "Data Delivery Specifications: The Hydrologic Information System (HIS)" which is available from the District.

3.4.8 The final submittal shall include a permanent, reproducible set of the survey and mapping information on 3 mil mylar sheets and shall be sealed by a registered land surveyor.

3.4.9 Quality Assurance

3.4.9.1 The final submittal of mylar drawings shall be sealed by a qualified registrant.

3.4.9.2 The work of each sub-consultant shall be performed in accordance with the Scope of Work and these Guidelines. The Consultant shall check all work prior to each submittal to the District. All drawings shall be initialed and dated by both the person who did the work and the checker.

3.4.9.3 The work of any sub-contractors utilized by the prime Consultant for this contract shall be reviewed by the prime Consultant for compliance with the Scope of Work and these Guidelines prior to submittal for review by the District.

## 4.0 GIS/HIS DTM STANDARDS

"Data Delivery Specifications: The Hydrologic Information System (HIS) REV. 3.1 June 1, 1998" Flood Control District of Maricopa County, latest edition.

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## 5.0 PUBLIC INVOLVEMENT

- 5.1 The public involvement activities may include public meetings, City Council Meetings, Village Planning Boards, Neighborhood and Homeowner Associations, etc., as identified in the Scope of Work. Public Meetings will be held in an "Open House" format.
- 5.2 The District and the Consultant will plan and conduct these types of meetings as required for a particular project, and as identified in the Scope of Work. The number and purpose of the meetings will be as identified in the Scope of Work. At least one representative from the Consultant will attend each of the meetings, and will participate as required, including but not limited to making presentations and answering questions.
- 5.3 The Consultant will provide an exhibit (8 ½ inch x 11 inch) showing the general project features or project impact area suitable for reproduction or publication and distribution with project mailings.
- 5.4 Generally the District will prepare the graphics for such meetings using digital and hard copies of drawing, figures, and data prepared by the Consultant. The responsibility for the preparation of the graphic displays will be defined in the Scope of Work.
- 5.5 The Consultant will prepare a meeting summary for inclusion in project reports, and will respond to the public's comments with appropriate changes and revisions to project documents and submittals.

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## 6.0 RIGHTS OF WAY AND EASEMENTS

- 6.1 The Scope of Work will identify if (1) the Consultant will notify all property owners and obtain any necessary Rights of Entry for the study area. In which case, the Consultant will furnish the District with a list of all the property owners notified and a sample Right of Entry letter. Or, (2) the District will acquire rights-of-entry for site investigations including geotechnical investigations. The Consultant shall coordinate the schedule of any field investigations with the District's Agent.
- 6.2 Existing rights of way adjacent to the project site which may be disturbed by project construction shall be researched and identified by the Consultant.
- 6.3 The Consultant shall review parcel ownership maps and identify which properties will be affected by the proposed project.
- 6.4 The Consultant shall identify permanent right-of-way and easement requirements necessary for the project features.
- 6.5 The Consultant shall identify or review and confirm (as required by the Scope of Work) any temporary construction easements required to complete the project.
- 6.6 If the District's "Right of Way Delineation Specifications" are made a part of the Scope of Work, then the Consultant shall prepare all exhibits, strip maps and legal descriptions for rights-of-way and easements necessary for project features according to the Specifications.

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## **7.0 ENVIRONMENTAL REQUIREMENTS**

### **7.1 HAZARDOUS MATERIALS**

- 7.1.1 The Consultant shall clearly identify if the project design requires the use of any materials either brought onto the site or created on the site that are covered by the State of Arizona Hazard Communication Standard. This identification shall be included on all affected drawings and within the specifications. The Consultant shall provide any required Special Provisions listing of the hazardous materials and a cross-reference to the plans. The Consultant shall provide Material Safety Data Sheets where appropriate.
- 7.1.2 The Consultant shall contact the Arizona Department of Environmental Quality and the Environmental Protection Agency to identify any known contamination or Super Fund sites within the project area. Findings shall be documented in the project report.
- 7.1.3 For pre-design studies, the Consultant shall conduct a surface investigation of lands which may need to be acquired for the project, and potential contamination or visible materials which may require special mitigation or removal shall be documented in the project report.
- 7.1.4 The Consultant shall submit a recommendation for additional studies or testing which may be required to confirm and identify the occurrence of existing contamination within lands which will need to be acquired for the project.

### **7.2 HISTORIC PROPERTY DOCUMENTATION, INVENTORY AND NATIONAL REGISTER OF HISTORIC ELIGIBILITY ASSESSMENT**

#### **7.2.1 Study Area**

The area to be studied includes the floodplain and areas included in the project alternatives for conveyance of flood flows, and shall include all areas potentially disturbed by project construction as described in the Scope of Work.

#### **7.2.2 Purpose**

The purpose is to conduct an inventory and National Register of Historic Places eligibility assessment of historic properties. The District desires to develop appropriate professional documentation of the project area to meet the compliance requirements and recommendations of Section 106 of the National Historic Preservation Act of 1966, the Archeological and Historic Antiquities Act of 1974, the Arizona Antiquities Act of 1960, the State Historic Preservation Act of 1982, NPS Bulletin 38 on Traditional Cultural Properties, and other applicable local, State, and Federal regulations. Historic properties are defined to include: Historic buildings or structures, historic archaeological sites, prehistoric archaeological sites, Traditional Cultural Properties (TCP's) human remains and associated mortuary assemblages, and isolated cultural features and artifacts.

#### **7.2.3 Existing Literature Review and Archival Research**

7.2.3.1 This task is authorized with the Notice to Proceed.

7.2.3.2 The Consultant shall conduct archival research to identify previously documented surveys and historic properties within the proposed project area boundaries. This includes but is not limited to an Arizona State Museum

(ASM) site file check and State Historic Preservation Office (SHPO) records review to evaluate documentary records dealing with historic properties in the project area and region. The literature search shall obtain published information pertaining to the local environment and historic properties, conducted at other archives, government offices and repositories as appropriate.

7.2.3.3 The Consultant shall prepare a report documenting the results of the archival and literature search. The report shall describe the significance of any known recorded sites and the potential impact of the project alternatives on the sites. The report shall include recommendations for further study, including intensive surveys, if required.

7.2.3.4 The Consultant shall coordinate with the District, ASM, SHPO, and others as appropriate to determine the need and specific requirements for a 100 percent intensive archaeological survey.

#### 7.2.4 Intensive Archaeological Survey

7.2.4.1 This work is not authorized with the Notice to Proceed and may be authorized in writing by the District based upon the results of the Archival research documentation. The Consultant shall submit separate cost estimates for this work in the fee proposal and all invoices shall separately identify costs for work under this paragraph.

7.2.4.2 The Consultant shall perform an intensive (100%) archaeological survey, and prepare appropriate documentation in accordance with applicable local, State, and Federal regulations and requirements.. The documentation will be used by the District and consulting parties to guide discussions, review, and obtain cultural resources clearance of the project area.

7.2.4.3 The Consultant shall arrange for access to the project site with the District, and obtain all necessary permits, and rights-of-entry.

7.2.4.4 The Consultant shall submit a "Notification of Intent", to conduct the survey to the ASM and other appropriate Federal or State agencies.

7.2.4.5 The Consultant shall not collect artifactual materials encountered during the survey.

7.2.4.6 The survey will provide intensive (100%) coverage of the permanent right-of-way and all temporary construction easements within the project area.

7.2.4.7 The Standard Survey Method for the (100%) intensive pedestrian survey is parallel transects with swaths spaced no more that 20 meters (65.6 ft) apart.

7.2.4.8 The Consultant shall make field records according to the following:

- a. All sites shall meet Federal or ASM site definition policy as appropriate.
- b. In accordance with current standards as interpreted by the lead agency in consultation with SHPO.
- c. Isolated Prehistoric and historic artifacts shall be recorded as directed by the lead agency in consultation with SHPO.
- d. All project sites shall receive official ASM site designation, and all ASM site cards and records shall be properly completed.
- e. Each site shall have an instrument site map.
- f. The Consultant, the District and the SHPO shall deem necessary further field documentation by photographing all surface archaeological features.

- g. The Consultant shall provide a daily journal of all relevant aspects of the project.
- 7.2.4.9 The Consultant shall produce a professionally acceptable report describing the results of the survey. The Consultant shall coordinate with the District, ASM, SHPO, and others as appropriate. The report shall document reasonable alternatives which may result in avoiding, limiting or mitigating adverse impacts which have potential to occur as a result of the project. The report shall include recommendations for further work or cultural resources clearance as appropriate. The report shall meet all Federal or State Standards as appropriate and include all appropriate tables, figures and photographs, including supporting documentation in a separate appendices.
- 7.2.4.10 The Consultant shall assess the type and level of direct, indirect and potential impacts to all historic properties within the project area.
- 7.2.4.11 The Consultant shall evaluate the potential significance of all project sites. The significance shall be based on eligibility, or potential eligibility, to be nominated to either the State or National Register of Historic Places. The eligibility requirements shall be those established by the National Park Service as codified by 36 CFR Part 60.
- 7.2.4.12 The Consultant shall coordinate at least once each week with the District Agent by telephone, unless significant problems (within 24 hours) exist.

### 7.3 BIOLOGICAL SURVEY DOCUMENTATION AND REPORT

#### 7.3.1 Purpose

The purpose of this study is to document the potential existence of threatened, endangered, proposed, and candidate species that may be adversely affected by the proposed project alternatives and all potential areas of project disturbance, and to document whether habitat that potentially supports threatened, endangered, proposed, and candidate species may be adversely affected or modified. The District desires to develop appropriate professional documentation of the project area as identified in the Scope of Work to meet the compliance requirements and recommendations of the Endangered Species Act of 1973, and supplements, Executive Order 11990 (Protection of Wetlands), and the Arizona Native Plant Law. The Consultant shall conduct all vegetative and wildlife surveys and prepare documentation in accordance with these Federal and State regulations and policies.

#### 7.3.2 Inventory of Threatened, Endangered, Proposed and Candidate Species

- 7.3.2.1 This task is authorized with the Notice to Proceed
- 7.3.2.2 The Consultant shall request from the U.S. Fish and Wildlife Service (USFWS) and the Arizona Department of Game and Fish (ADGF) an inventory of threatened and endangered species that may potentially inhabit the project area.
- 7.3.2.3 Based on the results of the inventory request, the Consultant shall conduct a non-intensive reconnaissance of the project area in order to assess if the project area potentially contains habitat that supports threatened or endangered species.
- 7.3.2.4 The Consultant shall prepare a brief letter report documenting the results of the reconnaissance. The letter report shall document existing vegetation, habitat types and species observed, and areas within the project that may meet the habitat requirements for threatened or endangered species. The Consultant shall also include recommendations for further study, including intensive surveys and a Biological Assessment, if required.

- 7.3.2.5 The Consultant shall coordinate with the District, USFWS, ADGF, and others as appropriate to determine the need and specific requirements for an intensive biological survey.
- 7.3.3 Intensive Biological Surveys
- 7.3.3.1 This task is not authorized with the Notice to Proceed and may be authorized in writing by the District based on the results of the reconnaissance. The Consultant shall submit separate cost estimates for this work in the fee proposal and all invoices shall separately identify costs for work under this paragraph.
- 7.3.3.2 The Consultant shall perform an intensive biological survey and prepare appropriate documentation in accordance with applicable State and Federal regulations and policies. The documentation will be used by the District and consulting parties to guide discussions, review and obtain biological clearance of the project area.
- 7.3.3.3 The Consultant shall arrange for access to the project site with the District, and obtain all necessary permits and right-of-entry.
- 7.3.3.4 The Consultant will conduct an intensive biological survey of all areas that may be disturbed during construction and operation of the project, including temporary construction easements and proposed maintenance roads. The survey shall document all existing vegetative communities utilizing aerial photography and field inspection. The limits of the vegetation shall be digitally mapped as a layer to the topographic mapping to allow superimposing of the project alternatives and the extent of project impacts. A description of the existing vegetation shall be provided in a report describing the type of vegetation, density, size, maturity, and condition. During the survey, the Consultant shall document all observed species identified. Species may include both terrestrial and aquatic species.
- 7.3.3.5 Based on a field investigation of vegetative communities, Consultant shall document whether the project alternatives contain any suitable habitat (including wetlands and riparian areas) that may potentially support listed, proposed, or candidate species, as protected by the Endangered Species Act of 1973, and supplements. All areas will be assessed for habitat quality.
- 7.3.4 Wetlands Delineation
- 7.3.4.1 This work is not authorized with the Notice to Proceed and may be authorized in writing by the District based upon the results of the reconnaissance. The Consultant shall submit separate cost estimates for this work in the fee proposal and all invoices shall separately identify costs for work under this paragraph.
- 7.3.4.2 If wetlands are identified based upon the results of the reconnaissance, the Consultant shall perform a Wetlands Delineation, in accordance with the Army Corps of Engineers Wetlands Delineation Manual, 1987. The delineation shall describe wetlands indicators observed in the field - soils, vegetation, and hydrology - and shall discuss methods in which wetlands impacts may be avoided, minimized or mitigated.

7.3.5 Biological Assessment and Section 7 Consultation with USFWS

- 7.3.5.1 This work is not authorized with the Notice to Proceed and may be authorized in writing by the District based upon the results of the Biological Survey. The Consultant shall submit separate cost estimates for this work in the fee proposal and all invoices shall separately identify costs for work under this paragraph.
- 7.3.5.2 If, based on the results of the Biological Survey, the Consultant determines that the project may potentially jeopardize a listed or proposed species or destroy or adversely modify proposed critical habitat, the Consultant shall immediately notify the District. The District will be responsible for initiating Section 7 consultation with the USFWS. Based on the results of informal consultation with the USFWS, the District may direct the Consultant in the preparation of a Biological Assessment (BA). The BA will be prepared in accordance with the Endangered Species Act of 1973 and supplements, and the requirements of the USFWS. The Consultant will assess if both construction (direct) and operation (indirect) impacts of all proposed project alternatives would adversely effect or jeopardize a sensitive species or destroy or modify a sensitive species habitat. The BA will describe how potential impacts to listed species may be avoided, minimized, or mitigated.
- 7.3.5.3 The Consultant shall coordinate at least once a week with the District Agent by telephone, unless significant problems (within 24 hours) exist.

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## **8.0 GEOTECHNICAL INVESTIGATION**

The Consultant shall conduct or contract for geotechnical investigations as required for the design of the proposed work. In addition to the following requirements, the investigations shall address the specific requirements in the project Scope of Work.

### **8.1 FIELD INVESTIGATION**

- 8.1.1 The Consultant shall submit, and obtain approval of, an investigation plan prior to beginning the field investigation. The plan shall include the proposed boring and test pit locations and depths, sampling frequencies and testing program.
- 8.1.2 In linear projects, such as levees or storm drains, borings and/or test pits shall be located at the beginning and ending of the alignment, and at intervals of approximately 1,000 feet in between, or as called for in the project Scope of Work. Proposals for other test intervals will be considered by the District.
- 8.1.3 Where possible, borings shall penetrate at least five (5) feet below the lowest adjacent excavation or foundation elevation. In-situ soils testing shall be in accordance with NAVFAC DM-7.1, Soil Mechanics Design Manual 7.1, dated May, 1982. If ground water is encountered, then standard penetration tests shall be performed with the water level in the hole at or above the ground water level.
- 8.1.4 Soil cement projects will require samples from all proposed borrow areas to determine the suitability of the materials for use as soil cement aggregate and to perform a preliminary soil cement design.
- 8.1.5 Projects that will include sediment transport analysis will require test pit samples that are representative of the full depth of the moveable bed. If an armoring analysis is to be performed, the gradation samples and analysis shall include any cobbles and boulders encountered. A reference for bed material sampling procedures is "Computing Degradation and Local Scour, Technical Guideline for Bureau of Reclamation."
- 8.1.6 The Consultant shall promptly notify the District of any hazardous or other landfill materials encountered during the investigations.

### **8.2 ANALYSIS**

- 8.2.1 Allowable soil bearing values and lateral load capacities shall be determined in accordance with NAVFAC DM-7.2, Foundations and Earth Structure Design Manual 7.2, May 1982, and in accordance with AASHTO Specifications. In case of conflict between AASHTO and NAVFAC specifications, AASHTO specifications shall govern. The effect of future elevated moisture content or saturated condition of the soil due to potential future seepage from the drainage structure should be considered and included in the soils report recommendations.
- 8.2.2 If the project involves the construction of either cut or fill slopes, the stability of the slopes shall be addressed. Slope stability calculations shall be submitted for District review. Where applicable, the analysis shall consider pore pressure caused by rapid draw-down. The loading conditions for stability analysis and safety factors shall be as

shown in US Army Corps of Engineers EM-1110-2-1913, Table 6.1. The stability and piping potential of the back (land) side of proposed levees shall also be addressed.

### **8.3 REPORT**

- 8.3.1 The Consultant shall provide the District with the original and four copies of the Geotechnical Report and any addenda. The report shall be sealed by a qualified, Arizona-registered Civil Engineer, and shall be completed prior to the 30% design submittal. The report shall include brief descriptions of the project, the site, and the subsurface conditions encountered. Test results shall be summarized in tabular form.
- 8.3.2 Where applicable, the report shall address the potential for subsidence, fissures and collapsible or expansive soils and provide the appropriate recommendations.
- 8.3.3 Projects that involve cut and fill work shall include recommended shrink and swell factors.
- 8.3.4 Soil cement projects will require a preliminary soil cement design, including recommended aggregate gradation ranges.
- 8.3.5 The Consultant shall provide sealed boring log mylars for incorporation into the design plans.

## **9.0 HYDROLOGY**

The Consultant shall perform complete and detailed hydrologic analysis of the project area in order to fulfill the specific requirements identified in the Scope of Work.

### **9.1 PROCEDURES**

The Consultant shall follow the procedures outlined in the Drainage Design Manual for Maricopa County, Volume I Hydrology (Rev. Jan 95) for all hydrologic modeling and calculations and the Scope of Work, General Requirements and Procedures.

### **9.2 MODELING**

Hydrologic modeling shall be completed for the specific frequency and duration required by the Scope of Work. The 100-year 24-hour and 100-year 6-hour will be used for all projects. Projects requiring design of storm drains will require the 10-year 6 and/or 24-hour event and projects requiring design of culvert road crossings will require the 50-year 6 and/or 24-hour event.

### **9.3 EXISTING STUDIES AND FIELD RECONNAISSANCE**

The Consultant shall research and give consideration to existing hydrologic studies of the area and shall become familiar with the general hydrology of the area. A detailed field reconnaissance shall be done to determine the following:

- 9.3.1 Verify sub-basin delineations boundaries
- 9.3.2 Verify flow patterns
- 9.3.3 Determine the actual current land use for parcels
- 9.3.4 Identify flow diversion locations caused by natural obstructions, drainage structures, storm drains, site grading, etc.
- 9.3.5 Obtain field cross-sections at hydraulic flow splits locations

### **9.4 BASE MAPS**

The Consultant shall develop the hydrologic base maps using the topographic mapping supplied by the District. For those areas not covered by the supplied mapping, U.S. Geological Survey (USGS) topographical quadrangle maps will be used. An overall watershed drainage basin map with sheet index will be prepared at a scale of 1 inch = 2000 feet, or as appropriate.

### **9.5 COMPUTER PROGRAM**

The Consultant shall use the U.S. Army Corps of Engineers computer program HEC-1, 1991 Version, to develop a hydrologic model for the area.

### **9.6 WATERSHED AND SUB-BASIN DELINEATIONS**

Using appropriate hydrologic judgment, sub-basins are to be identified that provide reasonable depiction of the watershed condition. The sub-basins must be as homogeneous as possible, using

watershed area, watershed type (mountainous and flat lands or urban and undeveloped areas), and time of concentration as criteria. Sub-basin break-downs will be done in sufficient detail to provide peak discharges at structures, major road crossings, confluences, and at boundary lines. An appropriate time step and number of ordinates is to be selected that allows for complete calculation of the flood hydrograph without sacrificing resolution of the flood peak. All calculations, or assumptions used in developing sub-basin and routing parameters shall be documented and made a part of the appendix for the hydrology report. Field surveys may need to be taken for HEC-1 modeling purposes.

## 9.7 MEETINGS

Four meetings associated with four tasks, and two field trips shall be held with the District staff at the following milestones:

- 9.7.1 One field trip at the start of the project to scope out the critical points of the watershed and problem areas.
- 9.7.2 Meeting number 1: held as soon as basic data are gathered and the sub-basins have been delineated. Sample HEC-1 parameter estimations should also be presented and discussed at this meeting. A copy of the draft maps of the sub-basins must be delivered to the District at this meeting.
- 9.7.3 Meeting number 2: after all the parameters have been estimated. A draft copy of the parameters must be delivered to the District at least one week prior to this meeting.
- 9.7.4 Meeting number 3: after the preliminary HEC-1 results have been obtained and a draft report has been prepared. A copy of the draft report and the copy of the HEC-1 on a floppy disc, compatible with the District's computer, must be delivered two weeks prior to the meeting.
- 9.7.5 Meeting number 4: to review comments by the District. A second field trip may be scheduled for the same day so the results obtained could be discussed.

## 9.8 HYDROLOGIC TECHNIQUES

The Drainage Design Manual for Maricopa County, Volume I, Hydrology, Revision January, 1995 shall be used. The District's computer program DDMS may be used to develop HEC-1 input data if the Consultant provides a copy of the input and output data with the submittal of the HEC-1 model. The specific hydrologic techniques to be used are:

- 9.8.1 Rainfall Excess: The Green and Ampt methodology will be utilized for estimation of rainfall losses.
- 9.8.2 Unit Hydrograph: The Clark and S-Graph method should be used. The choices in methodology will be to the discretion of the Consultant, with consent from the District.
- 9.8.3 Time of Concentration and S-Graph Lag Equation: The Papadakis method should be used with the Clark unit hydrograph, along with the District's MCUHP1 computer

program, to determine the time of concentration. If this method results in unsuitable times of concentration, other method(s) must be used and compared for the most realistic result. The S-graph lag equation, along with the MCUHP2 computer program, should be used with the appropriate S-graph (Phoenix mountain or Phoenix Valley).

- 9.8.4 Channel Routing: Channel routing will be accomplished using the methods in the Drainage Design Manual for Maricopa County, Volume I, Hydrology, Revision January, 1995. The choice of methodology will be at the discretion of the Consultant, with consent from the District. Average cross sections will be developed utilizing available mapping and field reconnaissance data. Sufficient field cross sections will be taken to ensure that routing reaches are reasonable and representative of field conditions. The HEC-1 routing parameters for the reaches modeled using HEC-2 will be adjusted after the HEC-2 cross sections are available. The resulting velocities and depths, for all reaches, must be assessed for realistic values.
- 9.8.5 Reservoir Routing: Detailed analysis of structures and ponding areas will be accomplished using the Modified Puls reservoir routing option of HEC-1. Stage versus discharge tables for hydraulic structures will be estimated using appropriate hydraulic methodology.
- 9.8.6 Channel Transmission Losses: Attempts should be made to estimate infiltration losses through channel bottoms based on existing field data or literature. If sufficient data is not available, the final report must acknowledge so and explain how the peaks and volumes of flow are affected by not including the transmission losses.
- 9.8.7 The District will provide appropriate references to facilitate parameter estimation.
- 9.8.8 Output of the computer model should be reviewed to see if the peak flows and volumes are realistic. An adjustment to input for obtaining the most realistic results is normal to the scope.
- 9.8.9 The Consultant shall attempt to recover historic stream gage data and use it to compare with the results obtained by the hydrologic model. Major differences must be discussed in the final report.

## 9.9 REVIEW AND APPROVAL

It is required that the Consultant obtain the approval of the District at each of the following steps:

- 9.9.1 Soil maps, watershed boundary maps, and land use maps.
- 9.9.2 HEC-1 parameter estimation.
- 9.9.3 HEC-1 flow diagram and input parameters.
- 9.9.4 HEC-1 results.

## 9.10 THE HYDROLOGIC REPORT

- 9.10.1 The findings of the hydrologic study will be presented in Section 3 of the Technical Data Notebook and will be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA 1-97). The report will be organized as specified by the District, following SSA 1-97 format. The report shall be submitted in draft form for review and comment and the final report shall be submitted upon incorporation of review comments.
- 9.10.2 Tables and Figures for the appendices:
  - 9.10.2.1 Topographic base map(s) showing the sub-basins, routing reaches, Tc flow paths or lag flow paths, major man-made structures, and references (i.e. street names, Township, Range, Section, etc.) at a scale of 1 inch = 2000 feet.
  - 9.10.2.2 Soils map(s) at the same scale as the base map.
  - 9.10.2.3 Land use map(s) at the same scale as above.
  - 9.10.2.4 Schematic map for the HEC-1 showing the sub-basins, the routing, order of combining the hydrographs, channel, pipe or culvert dimensions (where appropriate).
  - 9.10.2.5 Pertinent data on all the structures in the watershed (such as spillway elevation, rating curves, etc.).
  - 9.10.2.6 One set of study maps (i.e. sub-basin boundary maps, flow path maps, soils maps, land use maps) to be folded and delivered in a binder.
  - 9.10.2.7 Schematic map for the HEC-1 showing the 100-year flows (cfs) at each concentration and combination point.

## 10.0 HYDRAULICS

*If the hydraulics will be part of a package submitted to FEMA, the District's Floodplain Delineation guidelines shall be used.*

### 10.1 STANDARDS

- 10.1.1 The Consultant shall follow the procedures outlined in the Drainage Design Manual for Maricopa County, Volume II Hydraulics, January 1996 for all hydraulics calculations, except as amended or modified herein or in the scope of work.
- 10.1.2 The design event frequency shall be established on a per project basis to meet project goals.
- 10.1.3 The Consultant shall research and give consideration to existing drainage studies of the area.

### 10.2 OPEN CHANNEL HYDRAULICS FOR MAJOR WATERCOURSES

- 10.2.1 HEC-RAS or HEC-2 shall be used to perform water surface profile calculations, unless the District agrees to another method. A hard copy and floppy disk with input and output files shall be submitted for District review. The HEC input and output files shall be prepared in a format suitable for submittal to FEMA.
- 10.2.2 Tributary (side) drainage shall be addressed such that the more severe of the following conditions governs:
  - 10.2.2.1 100-year frequency peak in the main channel with 10-year frequency peak tributary drainage or
  - 10.2.2.2 10-year frequency peak in the main channel with the 100-year frequency peak tributary drainage.
- 10.2.3 The consultant shall estimate blockage due to debris at bridge piers based on field conditions. As a minimum, use the greater of 2 times the diameter of the pier or 1' on each side of the pier.
- 10.2.4 Unless otherwise agreed, provide freeboard equal to  $0.25(\text{depth} + \text{velocity head})$ , with a minimum one foot provided for subcritical flow and two feet for supercritical flow. Levees shall additionally comply with FEMA freeboard criteria, 100-year peak flow with three feet of freeboard plus one additional foot at bridges.
- 10.2.5 Locations of cross sections used in the water surface profile calculations shall be provided on a scaled map and also in a tabular format. The cross section labels on the maps shall reflect cross sections in the models.
- 10.2.6 Design shall conform to subcritical flow regime, with a Froude Number less than or equal to 0.86, unless otherwise approved by the District.

### **10.3 GEOTECHNICAL**

Refer to the Geotechnical Section 8.0 for requirements.

### **10.4 CHANNEL STABILIZATION DESIGN**

- 10.4.1 Channel competency based on permissible velocity shall only be used for preliminary design purposes. The tractive shear stress approach shall be used to confirm the stability of the unlined channel.
- 10.4.2 Provide calculations to show that the type of bank protection (riprap, gabions, concrete, etc.) is suitably sized to resist hydraulic forces (tractive shear, impingement, buoyancy, etc.) at the design frequency peak flow.
- 10.4.3 All hydraulics and structural calculations shall be provided for District review.
- 10.4.4 Consideration shall be given to how the upstream and downstream floodplain conditions will impact the proposed channel. The effects of existing and potential mining and fill operations shall be addressed. Overbank flooding upstream of the channelization shall be analyzed to ensure that flows enter and are contained within the improved channelization. The design and analysis shall address the potential impacts of future modifications proposed by others. Gradual transition of the existing floodplain/floodway upstream and downstream of the channelization is required for FEMA submittal.
- 10.4.5 Minimum factors of safety applied to hydraulic forces on structural components shall be 1.5 based on the 100-year frequency peak flow.

### **10.5 SEDIMENT TRANSPORT, SCOUR, LATERAL MIGRATION, AND RIVER MECHANICS**

- 10.5.1 Scour analysis shall be performed using an analytical approach based on flow characteristics associated with 100-year frequency peak flow, the depth of the thalweg, and the channel bed materials.
- 10.5.2 Toe-down elevations for bank protection shall be based on the sum of all scour components determined to occur for the 100-year peak flow, times a factor of safety of 1.3, and shall be measured from the channel thalweg elevation. A factor of safety of 1.5 shall be used in cases where only one component of scour is present.
- 10.5.3 Local scour calculations are to be tabulated at all critical design locations and presented with a map showing the locations. All of the following shall be considered in determining the total amount of local scour.
  - 10.5.3.1 Scour due to river bend.
  - 10.5.3.2 Scour due to any local obstruction (bridge pier, abutment, bankline, debris etc.) shall be determined.
  - 10.5.3.3 Contraction scour in the vicinity of bridge crossings and river sections that have been constricted due to fill or any other type of encroachment shall be computed by

methods described in Federal Highway Administration, FHWA, Hydraulic Engineering Circular Numbers 18 and 20.

- 10.5.4 Long-term aggradation (deposition) and degradation (general scour) shall be computed by using the concept of equilibrium slope or the concept of streambed armoring, depending on which approach controls the long-term channel profile. The equilibrium slope concept shall utilize a sediment transport relationship, which incorporates the median size ( $D_{50}$ ) and gradation of the streambed sediment. The streambed-armoring concept shall use a critical tractive shear stress approach and the representative armoring particle size. A series of flood frequency hydrographs from 10 to 100-year shall be used to represent the hydrologic history that the structure may experience in its life as a basis for determining these long-term trends. The dominant discharge shall generally be assumed to be the 10-year frequency discharge.
- 10.5.5 Bed-form scour, due to the passage of dunes or antidunes, shall be computed from analytical relationships developed by investigators such as Yalin and Kennedy, as described in textbooks on sediment transport technology. The maximum hydraulic parameters associated with the passage of a 100-year frequency peak shall be used to establish the quantitative values for this scour component.
- 10.5.6 If a sediment transport analysis is necessary, the analysis shall consider the sediment load entering the study reach. If computer software is used to analyze sediment transport a hard copy and floppy disk with input and output files shall be submitted for review.
- 10.5.6.1 Unless otherwise directed, the analysis shall include both the Level 1 and Level II analysis as defined in the State of Practice Report, Lateral Migration and Channel Degradation, Attachment 2, Channel Degradation Estimation for Alluvial Channels in Arizona, Draft May 25, 1995.
- 10.5.6.2 The Consultant shall complete an analysis of the stability of the existing channel to determine the long-term stability of the channel and to estimate the potential scour depths. The HEC-2 or HEC-RAS model water surface profile channel hydraulics shall be used to establish averaged hydraulic conditions for existing and proposed conditions within the study reach. Alternative channel configurations considered for the project shall be evaluated to assess the impact of the proposed alternative on the channel stability. Scour estimates shall be used to estimate the depth of toe down required for bank armor and grade control structures. The methods described in the Arizona Department of Water Resources State of Practice Report, Lateral Migration and Channel Degradation shall be followed. Narrative summarizing the evaluation shall be included in project report (Master Plan or Pre-design Report) and calculations shall be included in the Technical Data Notebook.
- 10.5.6.3 Sediment Sampling and Testing. The Consultant shall obtain and test samples of the existing channel bed and banks throughout the study reach and the upstream sediment source area. Samples shall be obtained at intervals of approximately 1,000 feet. The sampling procedures shall be consistent with procedures described in the Bureau of Reclamation's, Computing Degradation and Local Scour, January 1984, or the US Army, Corps of Engineers', Sedimentation Investigations of Rivers and Reservoirs, 31 October 1995. Gradations of the sediment samples shall be plotted for both the channel bed

and banks. Changes in the gradations throughout the study reach shall be documented. Test data, gradation plots, plots of the longitudinal change in size, and any other supporting data shall be included in the Technical Data Notebook.

## **10.6 GENERAL**

- 10.6.1 Plans submitted for review shall include profiles showing the top of levee protection, toe-down, hydraulic grade line, design invert elevation at the thalweg, and the low chord elevations for bridges.
- 10.6.2 Maintenance access and channel invert access ramps shall be incorporated into the design. They should be a minimum of 15 feet wide, and no steeper than 10:1.

## 11.0 FLOODPLAIN DELINEATION STUDIES

### 11.1 COORDINATION

- 11.1.1 The Consultant is responsible for placing the legal advertising at the beginning of the study, notifying the public of the study. The ad will be run in a widely circulated newspaper two times, with approximately one week between runs. The ad must also be run two times in a local newspaper that serves the area being studied. After the ad is run the Consultant will supply the District with the original affidavit of publication from each of the newspapers for each day that the ad ran.
- 11.1.2 The Consultant shall notify all property owners and obtain any necessary Rights of Entry for the study area. The Consultant shall furnish the District with a list of all the property owners notified and a sample Right of Entry letter.
- 11.1.3 The Consultant shall meet with officials from the local public works department. The purpose of this meeting is to identify local flooding problems and obtain information on current and planned public works projects, channel modifications, storm-drainage systems, development, and corporate limits.
- 11.1.4 The District shall plan and conduct two public meetings in conjunction with this study. The first meeting will be to inform the public of the purpose and scope of the study. The second meeting will be to inform the public and obtain public comment on the study results, and shall take place prior to the submittal of the final report to FEMA. The Consultant/District shall be responsible for the preparation of the graphic displays for these meetings. One representative from the Consultant shall attend **one** of the meetings. The Consultant shall respond to the public's comments and make revisions to the study if necessary.
- 11.1.5 Consultant/District Performance Evaluations will be performed. An informal evaluation will be performed at the completion of the hydrologic analysis. A formal evaluation will be performed at the completion of the project upon receipt of all deliverables.

### 11.2 DATA COLLECTION

- 11.2.1 The Consultant shall collect and review pertinent data from the District and other outside sources. Data to be collected will include previous flood hazard reports and hydrology for the study area; existing topographic mapping; historical flooding information; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, and other pertinent information.
- 11.2.2 A written report summarizing the data collected shall be submitted to the District for information purposes. A preliminary draft of this report is due within 90 days of Notice to Proceed.

## 11.3 PHOTOGRAMMETRIC MAPPING AND CONTROL SURVEYING

11.3.1 The limits and scale of the project mapping shall be as defined in the contractual Scope of Work. All photogrammetric mapping and control survey work performed shall meet or exceed Federal Emergency Management Agency (FEMA) minimum criteria as defined in FEMA Document 37, Flood Insurance Study Guidelines and Specifications for Study Contractors, January 1995. This includes, but is not limited to the establishment of "permanent" elevation reference marks (ERMs), field control surveys, and verification of profiles by the ground survey profile procedure.

### 11.3.2 Project Datum

11.3.2.1 The horizontal datum for all mapping and control surveys shall be referenced to the NAD83 State Plane Coordinate System. All horizontal control points and corresponding coordinates shall be listed in the project survey report (see Section 11.3.7). Horizontal control points shall also be noted on the appropriate plan sheets.

11.3.2.2 The vertical datum for all mapping and control surveys will be based on the 1929 National Geodetic Vertical Datum (NGVD1929), per FEMA guidelines. A conversion factor, including documentation of how it was derived, will be provided by the Consultant to allow comparison of NGVD 29 elevations to North American Vertical Datum of 1988 (NAVD88) elevations and will be included in the project survey report (see Section 11.3.7). The conversion processes outlined in FEMA 37 shall be used.

### 11.3.4 Control and Location Surveying

11.3.4.1 The Consultant shall systematically set aerial targets and establish horizontal and vertical control points throughout the area(s) to be mapped for use in compilation by the aerial survey contractor. All aerial targets are to be removed following completion of the topographic mapping. The controls for the aerial mapping shall be in sufficient numbers and shall be in locations that will be compatible with the mapping accuracy requirements. Section corners, quarter corners, and mid-section points will be used for control points wherever possible. Ties shall be made to existing monuments including section and/or quarter section monuments. The controls shall be of at least third order accuracy.

11.3.4.2 Field control shall be sufficient to provide at least one "permanent" point per mile of mapping, with said point(s) being used as Elevation Reference Marks (ERMs). "Permanent" survey points shall consist of existing monumentation, such as brass caps or similar survey monuments, whenever possible. Where additional monumentation is needed, survey markers conforming to Maricopa Association of Governments (MAG) Uniform Standard Detail for Public Works Construction, detail 120-1, Type C, shall be placed 2" +/- above grade, and topped with a brass cap. Elevation Reference Marks will be labeled on available maps and described in a manner that allows ready location in the field.

11.3.4.3 Field surveys of bridges, culverts, roadway improvements, and other structures are to be obtained by the Consultant when as-built plans are not available or

when changes significant to the hydraulic modeling and/or design drawings, such as sedimentation, have occurred since the date of as-built. This information should be reduced and compiled into an 11"x 17" (maximum size) drawing for inclusion in the project survey report. For hydraulic modeling use, the information presented in the drawing should be in a format appropriate for use in the HEC-2 or HEC-RAS model. Field surveys of bridges, culverts, hydraulic structures, and routing reaches must also be obtained where necessary for proper hydrologic modeling. It may be necessary to field survey some structures since the as-built plans may not be on 1929 NGVD. Existing above ground utilities shall be located and shown on the mapping.

- 11.3.4.4 Restoration of lost or obliterated section corners shall be re-established in accordance with current versions of 1) "Minimum Standards for Arizona Land Boundary Surveys" by Arizona State Board of Technical Registration and 2) "Restoration of Lost or Obliterated Corners and Subdivision of Sections" by the United States Department of Interior Bureau of Land Management. The monuments shall be set per MAG Standard Detail 120-1, type C.

#### 11.3.5 Documentation of Survey Data

- 11.3.5.1 The ERM's, benchmarks, and aerial control points shall be shown on project maps and plan sheets wherever possible.
- 11.3.5.2 Survey data will be documented in a project survey report, which shall include the following items:
- a. Copies of all survey notebooks and office calculations or printout of digital files developed with data collectors.
  - b. All ERM's, benchmarks, aerial control, and other horizontal and vertical control points shall be included. At a minimum, the table shall summarize for each point the horizontal coordinates, elevation, the datum upon which the benchmark was originally established, and a detailed description of the point location for ready recovery in the field.
  - c. A drawing with a base map of suitable scale to show the location of the ERM's, benchmarks, and aerial control points.
  - d. Conversion to other datums as required herein.

#### 11.3.6 Survey Data Delivery Format

- 11.3.6.1 All field collected survey data obtained using conventional survey methods shall be noted in standard 5" x 7" hardbound survey books. All survey data collected electronically shall be submitted in an ASCII text file on 3.5" diskettes or CDROM.
- 11.3.6.2 The project survey report shall be 8½" x 11" in size and bound together. Any 11" x 17" maps shall be fan-folded and included in the report.

### 11.3.7 Photogrammetric Mapping

- 11.3.7.1 Topographic mapping shall be prepared to the scale and contour intervals specified in the contract Scope of Work. The limits of mapping shall also be as defined in the contract Scope of Work.
- 11.3.7.2 All topographic features including major and minor contour lines, depression and crest ticks and spot elevations, existing drainage swales, bridges, storm drainage outfalls, gravel mining operations, fences, buildings, roads, etc., and existing above ground utilities shall be shown on the mapping. Mapping with a contour interval of one foot shall include full planimetrics for curbs, water meters, manholes, poles, centerline of street, vegetation, parking stripes, and any other visible features.
- 11.3.7.3 The Consultant shall verify the accuracy of the mapping by the procedures called for in FEMA Document 37 or other methods approved by FEMA. This shall include the verification of cross sections used in the floodplain delineation.
- 11.3.7.4 Digital terrain model (DTM) data shall be submitted to the District for review and approval. The DTM data delivery shall comply to the requirements of the Data Delivery Specifications: The Hydrologic Information System (HIS), Revision 3.1, June 1, 1998.

## 11.4 HYDROLOGY

- 11.4.1 The development of watershed hydrology shall follow Section 4 of these guidelines, except as noted in this section or in the contract Scope of Work.
- 11.4.2 Unless otherwise specified in the contract Scope of Work, the limits of the watershed for hydrologic analysis shall be limited to that required for the adequate estimation of peak discharges for the project floodplain delineation reach.
- 11.4.3 Peak discharges shall be developed for the 100-year, 6- and 24-hour storms based on the procedures and criteria outlined in the Drainage Design Manual for Maricopa County, Volume I, Hydrology, January 1, 1995.

## 11.5 FLOODPLAIN DELINEATION

- 11.5.1 Floodplain delineations must be accomplished using the U.S. Army Corps of Engineers' most recent version of the HEC-RAS computer model, or in cases where required, the HEC-2 Water Surface Profiles computer model, version 4.6.2, May 1991. Other modeling methodologies acceptable to FEMA shall be considered on a case by case basis, and particularly specified in the Scope of Work. The Consultant will conduct the study using the guidelines established in FEMA Document 37, Flood Insurance Study Guidelines and Specification for Study Contractors, January 1995 and F.I.A. Document 12, Appeals, Revisions, and Amendments to Flood Insurance Maps, January 1990, and the project Scope of Work.
- 11.5.2 The delineation work shall meet requirements for floodplain and floodway delineations as prescribed by FEMA, and the Arizona Department of Water Resources. The

delineation work may also require review and acceptance by other cities, towns, or local agencies as identified in the contract Scope of Work.

- 11.5.3 The delineation study shall be based on the final results of the hydrologic study as summarized in Section 4 of this document, or existing hydrology data supplied by the District at the beginning of the project.
- 11.5.4 The Consultant is to make refinements to the HEC-RAS or HEC-2 model based on review of the model results by the District, ADWR, FEMA, and the FEMA Technical Evaluation Contractor. The Consultant shall also review the HEC-RAS or HEC-2 model results for reasonableness. Work normal to the scope shall include all adjustments to the input parameters required for obtaining the most realistic results.
- 11.5.5 Floodways are to be determined using equal conveyance encroachment (HEC-2 or HEC-RAS method 4) to start with, but only encroachment method 1 will be used in the final analysis. The floodway encroachment should produce a rise in the water surface elevation that is as near the one-foot maximum as possible.

11.5.6 Review and Approval

The Consultant must obtain District approval at each of the following steps:

- 11.5.6.1 Field reconnaissance report and estimation of Manning's "n" values.
- 11.5.6.2 Proposed location and alignment of the cross sections and channel centerline.
- 11.5.6.3 Floodplain (natural) delineation.
- 11.5.6.4 Floodway delineation using equal conveyance encroachment method 4.
- 11.5.6.5 Floodway delineation using encroachment method 1.
- 11.5.6.6 Finalized reporting in Technical Data Notebook.

11.5.7 Field Reconnaissance

- 11.5.7.1 The Consultant will conduct a field reconnaissance of the full study reach. This will include observation of channel and floodplain conditions for estimation of Manning's "n" values, photographic documentation of floodplain characteristics, determination of channel bank stations, observation of possible overflow areas, inspection of levees or other flood control structures, and measurement of bridge dimensions.
- 11.5.7.2 Manning's "n" values are to be determined using the methodology in the USGS report, Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona, April 1991. Copies of the report are available through the District.
- 11.5.7.3 A draft report on the field reconnaissance will be submitted to the District for review and approval prior to beginning the HEC-RAS or HEC-2 modeling. The report will present the determination of channel and overbank "n" values using captioned color photographs or color photocopies. The report will also discuss floodplain conditions affecting the delineation, describe structures and obstructions, and provide color photos or photocopies of major hydraulic structures. The location of photos and direction of view, structures, and "n"

values will be displayed on reduced scale mapping. The Final Report is to be included in the Technical Data Notebook.

#### 11.5.8 Cross Sections

- 11.5.8.1 The location and alignment of cross sections and channel centerline will be submitted for the District's review and approval prior to digitizing the cross section data. Cross section stationing will be from left to right looking downstream with the thalweg as station 10,000. Cross sections will be spaced approximately every 500 feet, unless geographic or structural constraints dictate otherwise, and will extend the full width of the area inundated by 100-year flood waters. Identification of cross sections will be in river miles, increasing upstream. The stationing will tie into the specified river mile of the existing FEMA studies. Cross section orientation may need to be altered after running the HEC-RAS or HEC-2 model to ensure that sections are perpendicular to flow per FEMA criteria.
- 11.5.8.2 All cross sections will be plotted using a pen, laser, or electrostatic plotter. The cross section plots will show water surface profiles, ineffective flow areas, "n" values, encroachments, channel stationing and other pertinent information. All plots are to be accompanied by a legend. These plots are to be available at all reviews. The cross section plots are limited to one plot at the following three stages of work:
- A plot of digitized "GR", STCHL, STCHR, centerline (station 10,000) to be used as a check of input data and for working sections during compilation of the floodplain model.
  - A plot of the cross section for the completed floodplain run which shows the floodplain water surface elevation, ineffective flow areas, "n" factor, and encroachments to be used as working sections for development of the floodway model.
  - A plot of the final floodway model cross sections which will show Type 1 encroachments and encroached water surface, in addition to data covered in items (a.) and (b.). These cross sections, generated under (c.), will be submitted as part of the final Technical Data Notebook.
- 11.5.9 Bridges and culverts must be modeled in compliance with HEC-RAS or HEC-2 modeling requirements for the selected routine. Where multiple bridges occur, each bridge will be modeled separately. The HEC-RAS or HEC-2 modeling results for bridges, culverts, and other hydraulic structures must be checked using an independent method approved by the District to analyze these structures.
- 11.5.10 For floodplains identified as ponding areas, it is preferable to analyze these areas by using storage routing techniques as provided in the HEC-1 computer model (see Section 4), unless it can be demonstrated that movement of flood-flows is riverine in nature. If appropriate, the Consultant shall identify a floodway for the purpose of allowing the pond to seek a constant stage throughout the areal extent of the ponding, versus the creation of two independent ponds.
- 11.5.11 Flood zones must be determined according to FEMA criteria and clearly labeled on the final work-study drawings.

11.5.12 The total area of the floodplain and floodway must be determined for each reach in square miles and acres.

11.5.13 A Technical Data Notebook (TDN) shall be prepared in accordance with the ADWR State Standards Attachment 1-97 (SSA1-97) to present the findings of the floodplain/floodway delineations. The format of the TDN shall follow "ADWR/FEMA Submittals" as outlined in SSA1-97 unless otherwise specified in the Scope of Work. Pertinent information from other sections of these guidelines shall also be documented as necessary to fully complete the TDN for a FEMA submittal and review.

11.5.14 Work-Study Maps

11.5.14.1 The Consultant shall provide permanent non-erasable topographic mylars of the work study drawings. The drawings shall be 24" x 36" in size, with a scale of 1-inch = 200-feet and a contour interval of 2-foot for all mapping with the exception of section line roads which will have a contour interval of 1 foot and/or spot elevations. A cover sheet will be provided with the project title, date of topographic mapping, and a location map showing geographic range covered by each specific mapping sheet. Each drawing shall include the floodplain and floodway delineations and a minimum of a north arrow, scale, section corners and quarter corners, current and proposed streets and highway names, NAD83 State Plane Coordinate System grid marks, major drainage features, corporate boundaries, cross section lines, channel station center line, index map, and description and elevation of elevation reference marks (ERMs). A note explaining the proper means to convert the NGVD 29 elevations to NAVD 88 elevations shall be included in "NOTES" in the map border.

11.5.14.2 The final submittal of mylar drawings shall be sealed by each qualified registrant according to the work performed. The work of each subconsultant and/or sub-contractor shall be performed in accordance with the Scope of Work and these Guidelines. The Consultant shall check all work prior to each submittal to the District. All drawings shall be initialed and dated by the person who did the work and the checker.

11.5.15 Quality Assurance

11.5.15.1 The final submittal of mylar drawings shall be sealed by a qualified registrant.

11.5.15.2 The work of each subconsultant shall be performed in accordance with the Scope of Work and these Guidelines. The Consultant shall check all work prior to each submittal to the District. All drawings shall be initialed and dated by both the person who did the work and the checker.

11.5.15.3 The work of any sub-contractors utilized by the prime Consultant for this contract shall be reviewed by the prime Consultant for compliance with the Scope of Work and these Guidelines prior to submittal for review by the District.

11.5.16 Delivery of digital study data for population of the District's Hydrologic Information System (HIS) database shall comply with the District's HIS Data Delivery Specifications,

Rev 3.1, June 1, 1998. The Consultant shall have the option of delivering the digital data in one of two formats:

**OPTION 1** – Digital data shall be delivered in a Geographical Information System (GIS) format per District specifications; OR,

**OPTION 2** – Digital data shall be delivered in a CADD standard binary DXF format from either AutoCAD or MicroStation per District specifications.

For either option, the following themes shall be delivered according to District HIS specifications:

Name	Page No.	Description
NDXPRJ	LP-40	Shows the map sheet boundaries of the project
PRJ	LP-60	Defines the boundary of the project
CARTO	LP-110	Planimetric features captured but not used by HIS (Fences, tree lines, etc)(if any)
CORNERS	LP-210	Section corners as defined by the PLSS (Public Land Survey System)
CTRL	LP-215	Other control points that are not corners
AGRCLTR	LP-305	Dairy and Agricultural Areas
STRCT	LP-360	Structures like building footprints (if any)
DQ	LP-410	Data Quality of Data: Scale, date, Vertical Datum, Projection
PRJ.REL	LP-430	Contractor name, Project Name, Project ID
FPBLN	LP-520	Floodway center line
FPCTLFCD	LP-523	Elevation Reference Marks
FPSRFFCD	LP-535	Surface Water Elevation
FPXFCD	LP-540	Cross sections used in HEC-RAS
FPZNFCD	LP-550	Floodplain Zones
FPZNHZ	LP-560	Floodplain Hazard Zones
CNL	LP-610	Canals (If any)
FLTY	LP-620	FCD Project in the area (if any)
RR	LP-650	Railroads in the area (if any)
STRTCLN	LP-655	Street Centerlines

Name	Page No.	Description
STRDTL	LP-660	Edge of Pavement (if any)
UTLTY	LP-670	Utilities, Power poles, etc (if any)
ELV	LP-710	Contours and spot elevations
BRIDGE	LP-608	Bridges, including any headwalls or wing walls
CULVERT	LP-612	Culverts, including any headwalls or wing walls
VEG	LP-775	Areas of similar vegetative mix
DRNBSN	LP-920	Drainage basins
DRNPTH	LP-930	Drainage Path
LAKE	LP-950	Lakes that are in the area (if any)
RIVER	LP-960	Washes or streams in the area (if any)
DRNTOC	LP-932	Time of Concentration flowpath

This is a comprehensive listing of possible features. If there are no features collected under one of the categories mentioned, then the theme does not need to be delivered.

The HIS data submittal under Task 11.5.15 will be subject to a quality control (QC) check by the District staff. The District makes use of a checklist and a computer program to document and automate the QC process. A hardcopy of the checklist shall be delivered to the Consultant at the kickoff meeting. The Consultant shall use the checklist to review each HIS data submittal for compliance and deliver a completed copy of the checklist to the district along with the data submittal.

The computerized application that automates the QC process is available upon request at no charge to the Consultant. The Consultant is recommended to make use of the computer application to review the data prior to the HIS submittal. The application is available for Arc/Info on all UNIX platforms.

All required HIS submittals must be reviewed and accepted prior to finalizing the Technical Data Notebook for submittal to FEMA.

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## 12.0 FEMA SUBMITTALS

The consultant will submit the following items to the District for review by FEMA and any other appropriate governmental agency. All of the following products are considered deliverables for the FEMA submittal:

- 12.1 Original Affidavits of Publication.
- 12.2 Two (2) complete sets of blueline topographic base maps with the floodplain/floodway delineations shown. All drawings shall be signed and sealed by persons of appropriate professional registration(s). Each registrant shall provide a specific statement as to what service they performed.
- 12.3 Two (2) complete copies of the Technical Data Notebook, including HEC-1 and HEC-RAS (or HEC-2) digital input/output files on diskettes. The Technical Data Notebook shall be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA1-97) using the ADWR/FEMA Submittals outline, unless otherwise specified by the District.
- 12.4 Three (3) sets of the project survey report.
- 12.5 Final Submittal - The following products are considered deliverables for the final submittal to the District after FEMA approval is issued.
  - 12.5.1 One (1) complete sets of mylars and four (4) complete sets of sealed blueline topographic base maps with the floodplain/floodway delineations shown. All drawings shall be signed and sealed by persons of appropriate professional registration(s). Each registrant will provide a specific statement as to what service they performed.
  - 12.5.2 Four (4) complete copies of the Technical Data Notebook including HEC-1 and HEC-RAS (or HEC-2) input/output files on diskettes. The Technical Data Notebook shall be prepared in accordance with ADWR State Standards Attachment 1-97 (SSA1-97) using the ADWR/FEMA Submittals outline, unless otherwise specified by the District. This submittal of the Technical Data Notebook shall include any correspondence and/or meeting minutes with the reviewing agencies, and shall reflect any revisions required by those reviewing agencies. Revisions may include, but are not limited to, modifications to the delineation maps, the HEC-1 model, the HEC-RAS or HEC-2 model, and/or the final Technical Data Notebook.

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## 13.0 PERMITS AND APPROVALS

- 13.1 The Consultant shall be responsible for determining if plan approvals, permits, or licenses from other agencies will be required. Other agencies may include, but may not be limited to: municipalities, tribal governments, the County Health Department, the Arizona Department of Environmental Quality, the Arizona Department of Water Resources, the Army Corps of Engineers, railroads, utilities, and water districts. Requirements for permits shall be documented in the appropriate report. The Consultant will identify permits required for construction, and such requirements shall be reflected in the appropriate construction documents.
- 13.2 The Consultant shall be responsible for providing information to assist the District in obtaining the required permits.
- 13.3 Clean Water Act Section 401 and 404 Permits
- 13.3.1 The District will be responsible for coordination with the US Army Corps of Engineers (ACOE) for processing documentation to obtain a permit application as required by Section 404 of the Clean Water Act (CWA) and with the Arizona Department of Environmental Quality (ADEQ) for water quality certification in accordance to Section 401 of the CWA. This is inclusive of pre-application meeting with the ACOE to determine the jurisdictional limits of "waters of the US" within the project area and reviewing design plans.
- 13.3.2 The District will provide aerial photographs with a minimum scale of 1 inch equals 100 feet to a maximum scale of 1 inch equals 400 feet, defining the ACOE's jurisdictional limits within the project boundary. The Consultant shall provide digitized drawings (i.e., autocad, arcview), using photo-identified references for horizontal control, and superimpose the limits on aerial photographs for submittal with the 404 application.
- 13.3.3 The Consultant shall provide the total surface area, in acres, of impact within the jurisdictional boundaries and shall provide an estimate of the volume of material to be excavated or filled within the ACOE's jurisdictional limits of the project area. Additionally, the Consultant will provide an alternative analysis report, watershed studies and scour analysis (if available) focusing on practicable solutions and engineering design drawings including typical cross-sections and plan views (8.5" x 11") to the District for submittal with 404 application package to the ACOE and other reviewing agencies (ADEQ). Where possible the Consultant shall modify designs to minimize the impact area within the jurisdictional limits, in order to qualify for a nationwide permit.
- 13.3.4 The Consultant shall provide additional analysis and cost estimates to assist the District in identifying modifications to the project which may reduce the impact to the jurisdictional limits, provide environmental enhancements, and serve to mitigate adverse project impacts.
- 13.3.5 The District will be responsible for compiling and submitting all Section 401 and 404 permit application documentation inclusive of agency concurrence letters (i.e., SHPO, Arizona Game and Fish) design drawings, alternative analysis, jurisdictional delineations,

standard 404 and 401 application forms, aerial photographs and maps, and mailing lists for adjacent property owners.

## **14.0 PLANNING STUDIES**

### **14.1 SITE VISITS**

The Consultant shall make site visits as necessary to become familiar with existing conditions and to facilitate the design and preparation of the contract documents. The Consultant shall document the results of site visits in the Project Administrative Report. The Consultant will make at least three site visits. The first site visit is to review the existing site conditions prior to starting work on the study, and to determine any initial conflicts or opportunities. The second site visit will occur near the end of the Alternative Analysis. The third site visit will occur during the Preferred Alternative Analysis to identify any possible oversights.

### **14.2 DATA COLLECTION & EXISTING CONDITIONS ANALYSIS**

- 14.2.1 The Consultant shall collect and review pertinent data from the District and other outside sources. Data to be collected will include materials relevant to the project such as: previous hydrology for the study area; existing topographic mapping; as-built plans for existing structures; FEMA Flood Hazard Boundary Maps and any Letters of Map Amendment and/or Revisions, drainage reports, site plans and future drainage improvement plans and other pertinent information. Interviews should be arranged with appropriate agencies for information on drainage problems in the area. The Consultant shall prepare a list summarizing the collected data.
- 14.2.2 The Consultant shall develop a comprehensive list and historic photographs if available of known flooding problems within the study area. Development of this list will require coordination with the officials from each of the municipalities, transportation agencies, Irrigation Districts, and other sources. The Consultant shall evaluate and develop a cost estimate for damages from flooding within the study area and shall document the results of the Flooding Damage Analysis in the Project Final Report.
- 14.2.3 The Consultant shall prepare an inventory of drainage facilities that are being planned by other public jurisdictions, Irrigation Districts or private development. These will be illustrated on the Existing Facilities Exhibit. These facilities are to be incorporated into the drainage master plan alternatives as appropriate.
- 14.2.4 The Consultant shall prepare an Existing Facilities Exhibit illustrating the location of major natural washes and man-made drainage facilities in the watershed. The condition, capacity and ownership of man-made facilities will be noted. These facilities will become part of the base map for alternatives. The Consultant shall make maximum use of these facilities, where feasible, as part of the storm water management plan alternatives. The base map for the exhibit will be developed from base mapping provided by the District as described in the following section.
- 14.2.5 The Consultant shall prepare a Data Collection Report with the Existing Facilities Exhibit summarizing the data collection effort. The report shall include documentation of existing flooding problems, current drainage and topographic features, existing flood plains, and current plans for facilities by others. The Consultant shall submit a draft of this report and include the final report in the Project Final Report.

### **14.3 LEVEL I ANALYSIS – ALTERNATIVES FORMULATION / PRELIMINARY ANALYSIS**

- 14.3.1 The purpose of the Level I Analysis – Alternatives Formulation / Preliminary Analysis is to identify possible solutions to the flooding problem and to narrow the number of alternatives to those which are the most feasible.
- 14.3.2 The Consultant shall identify possible project alternatives to mitigate the existing flooding problems. The alternatives shall include concepts and designs suggested by the public, the local jurisdictions, and the District. The “do nothing” alternative shall be included as the benchmark for comparison of all alternatives. Recommendations, preferences, and comments from applicable public meetings shall be considered, and additional alternatives shall be developed or existing alternatives may need to be modified. Elements of each alternative plan may include, but is not limited to alternative design concepts (e.g. incorporating storage to affect peak flows, non-structural alternatives, and conduits vs. open channels), alternative alignments, and alternative construction materials.
- 14.3.3 The Consultant shall contact utilities, known or suspected to have facilities within the project area, to request the alignment and size of the utilities facilities. Utilities within the project construction limits which may impact the project shall be identified and shall be shown on the planimetric mapping and project layout. Estimates of the cost to relocate or realign the utilities shall be included in the project cost estimates as a separate line item.
- 14.3.4 The Consultant shall complete the study at a level of detail sufficient to compare the alternatives and select those which are the most practical for implementation. The evaluation shall consider items such as technical feasibility, project costs, potential environmental impacts, potential for incorporating multi-use activities, aesthetics, and social value. Documentation of the findings shall be prepared and submitted to the District. The documentation shall be submitted as a working document for decision purposes and will be included as a chapter in the Master Plan Report. The documentation shall include a summary description of the alternatives, exhibits, the findings of the evaluation, and a recommendation of those alternatives to be studied in further detail.
- 14.3.5 The Consultant shall meet with the District to review and discuss the alternatives, and to select the alternatives for further consideration. Those alternatives which can be initially eliminated with no or minimal analysis shall be identified and eliminated from further consideration. The Consultant shall recommend the alternatives to be studied further. The District will make the final selection of alternatives. The alternatives so eliminated shall be documented in the Level II – Alternatives Analysis Report. The list of alternatives shall be reduced to not more than three major alternatives plus the “do nothing” alternative, or as provided in the Scope of Work.

### **14.4 LEVEL II ANALYSIS – ALTERNATIVE ANALYSIS**

- 14.4.1 The purpose of the Level II Analysis – Alternative Analysis is to study the alternatives selected in the Level I phase at a level of detail to allow comparison of the alternatives and selection of the preferred alternative.

- 14.4.2 Those alternatives designated for further study shall be further evaluated in sufficient detail to select a recommended plan. All alternatives shall be evaluated in the same level of detail, e.g. based upon generalized hydraulics and cost estimates, to determine the engineering feasibility and approximate costs. The studies shall be completed in sufficient detail to demonstrate technical feasibility. The designs shall be based on available topographic mapping and shall be supplemented with field surveys at hydraulically or structurally critical locations as required.
- 14.4.3 The Consultant shall evaluate the selected alternatives on any or all of the following evaluation criteria:
- 14.4.3.1 Potential benefits to adjacent property
  - 14.4.3.2 Engineering feasibility
  - 14.4.3.3 Approximate costs
  - 14.4.3.4 Capital costs, effectiveness
  - 14.4.3.5 Environmental impacts
  - 14.4.3.6 Potential for staged construction, maintenance
  - 14.4.3.7 Acceptability to local residents
  - 14.4.3.8 Compatibility with other projects and plans
  - 14.4.3.9 Desired level of flood protection
  - 14.4.3.10 Potential for flooding or damage to property
  - 14.4.3.11 Potential for removal of existing FEMA flood zones
  - 14.4.3.12 Site accessibility, inconvenience and loss of productivity
  - 14.4.3.13 Major or minor transportation routes
  - 14.4.3.14 Sole access
- 14.4.4 The Consultant shall prepare a matrix by which alternatives will be evaluated by assigning scores to each of the evaluation criteria. The recommended alternative will be the alternative receiving the highest composite score based on the scores assigned by the reviewers. The 100-year level of protection will be considered as the baseline with more frequent events given consideration based upon the evaluation criteria.
- 14.4.5 The Consultant shall prepare an Alternative Analysis Report that shall discuss the selected alternatives, the discarded alternatives, the results of the alternative analysis, the associated cost estimates, and other items considered in the evaluation criteria. The report shall also include discussion on public preferences, and the overall success of each alternative in meeting the objectives of the Project. The Consultant shall submit a draft report for review and comment. The Consultant shall address all appropriate comments when the Alternative Analysis Report is incorporated into the final draft of the Project Final Report.
- 14.4.6 The Consultant shall meet with the District to review and discuss the alternatives, and to select the recommended alternative for further consideration. The District will make the final selection of the preferred alternative based upon the Consultant's findings and recommendation, comments from the public, comments from affected agencies, municipalities and local jurisdictions.

## 14.5 LEVEL III ANALYSIS – PREFERRED ALTERNATIVE ANALYSIS

- 14.5.1 The purpose of the Level III Analysis – Preferred Alternative Analysis is to refine the design of the recommended alternative sufficient to evaluate alternatives for major features, to finalize locations and alignments, and determine project costs sufficient for budgeting. It is appropriate to base designs upon available topographic mapping, supplemented with field surveys at hydraulically or structurally critical locations. Design detail shall be refined to allow approximate calculation of unit quantities of major project features. Design of the project features shall be limited to typical sizes and dimensions and shall be sufficient to determine the costs of major project components. All alternatives shall be analyzed with the same level of detail and cost estimates shall be comparative. The level of detail shall be sufficient to determine the approximate environmental impacts, such as approximate depths or areas.
- 14.5.2 The Consultant shall refine the design and cost estimate for the recommended alternative identified in the Alternatives Analysis Report. The Consultant shall document the results of the Preferred Alternative Analysis in the Master Plan Report. Calculations, computer print outs, notes, sketches, quantity calculations, and cost estimates shall be submitted in a Technical Data Report accompanying the Draft Master Plan Report.
- 14.5.3 The Consultant shall complete designs and prepare design plans consistent with a 30% level of design completion. The design plans shall be included in the Preferred Alternative Analysis Report. Design Plans shall identify the approximate sizes, slopes, profiles, alignments, and planimetric view of proposed project features. Existing utility locations and relocation requirements shall be shown on the design plans. Landscaping and aesthetic features shall be included in project drawings and cost estimates.
- 14.5.4 The District will form an advisory committee to recommend aesthetic features for the project. The committee will be composed of the District's Agent, public involvement coordinator, ecologist; the Consultant; and if available a neighborhood representative, cooperative agency project managers, other District staff, and other agency representatives. The District, assisted by the Consultant, will present and discuss the project aesthetic treatment at the public involvement meetings.
- 14.5.5 The Consultant shall provide project cost estimates for major construction items consistent with the 30 percent level of design detail. An allowance for unlisted or miscellaneous items shall be included as appropriate. The cost estimates shall include separate line items for the major construction items and utility relocations showing quantities, unit costs, and extended totals. Costs for contingencies, engineering, and rights-of-way shall be included in the total project cost.
- 14.5.6 The Consultant shall review parcel ownership maps and identify which properties will be affected by the preferred alternatives. The Consultant shall identify permanent and temporary right-of-way and easement requirements necessary for the preferred alternatives. The Consultant shall complete a drawing showing the anticipated rights-of-way and easements required, to be purchased or dedicated, for the preferred alternative. Estimated right of way costs shall be based upon unit cost values to be provided by the District and shall include relocation costs if relocation of businesses or residences are required. The required acreage and costs shall be included in the project cost estimate as

a separate line item. The Consultant shall document the land ownership, right-of-way and/or easements in the Project Technical Report.

- 14.5.7 The Consultant shall estimate maintenance requirements and costs for the preferred alternative on an annual basis. The life cycle to be used in calculations shall be 50 years. The District will provide maintenance and cost data to the Consultant. The Consultant shall document the Maintenance Plan in the Project Final Report.
- 14.5.8 The Consultant shall prepare an implementation plan for the preferred alternative that shall document the available tools or procedures for implementing the results of the Project. The Consultant shall identify tools, such as existing ordinances and regulations, for each jurisdiction within the study area that may be modified or created to encourage development standards that are compatible with the Project. The Consultant shall document the Implementation Plan in the Project Final Report.

#### **14.6 DELIVERABLES**

- 14.6.1 The Consultant shall submit all items 'sealed' by a registered civil engineer. Upon receipt of the final submittal, the District shall review the report and preliminary plans for the accurate incorporation of all final comments. If incomplete and/or incorrect incorporation of those comments is found, the original documents shall be returned to the Consultant for correction and re-submittal.
- 14.6.2 The Consultant shall submit computer files of the information to the District delivered on 3.5" diskettes or CDROMs. Reports should be in Word 6.0 or alternate format approved by the District. Plans should be in AUTO CADD version 12 format or alternate format approved by the District.
- 14.6.3 The Consultant shall submit, unless otherwise specified in the Scope of Work, three copies of all draft submittals for review and five copies of the final submittals, and shall submit two copies of both draft and final to other review agencies as specified in the Scope of Work.

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## **15.0 PRE-DESIGN STUDY**

### **15.1 PURPOSE**

The purpose of the Pre-Design Study is to refine the design of the project in sufficient detail such that the size, alignment, and profile of major project features are determined, field data is collected which will be required for completion of the final design, and project costs are refined.

### **15.2 COST ESTIMATE**

The Consultant shall refine the design and cost estimate for the recommended plan identified in the final Preferred Alternative Analysis Report. The recommended alternative shall be evaluated at a level of detail sufficient to evaluate remaining unresolved issues related to project feature alternatives, alternative site locations, or alternative project alignments, and to refine the estimated project costs. Field required for completion of the final design calculations and preparation of the construction contract documents shall be obtained.

### **15.3 TRAFFIC**

The Consultant shall identify requirements for public and private access within and across the project limits, review traffic control requirements and provide traffic control plans, and, if necessary, detour plans for the construction phase. The Consultant shall coordinate, as required, all aspects of traffic control and detour design, subject to the review and approval of the jurisdictional authority.

### **15.4 AESTHETIC TREATMENT AND LANDSCAPING**

The District will form an advisory committee to recommend aesthetic features for the project. The committee will be composed of the District's Agent, public involvement coordinator, ecologist; the Consultant; and if available a neighborhood representative, cooperative agency project managers, other District staff, and other agency representatives. The District will conduct a public involvement meeting to present and discuss the project aesthetic treatment.

### **15.5 UTILITIES**

15.5.1 The Consultant shall identify major existing utility corridors. Utilities shall be identified within the project construction limits that may impact the project. The alignment of the utilities shall be shown on the project layout. Estimates of the cost to relocate or realign the utilities shall be included in the project cost estimates as a separate line item. The Consultant shall contact each utility company that has facilities, known or suspected, within the project area, to request the alignment and size of the utilities facilities. Record drawings shall be obtained to ascertain all underground utility locations. Where record drawings are not available, blue stake services shall be utilized to locate the horizontal alignment of the underground facilities. The vertical location of sanitary and storm sewers will be determined from field surveys as appropriate. Utility companies with other major utilities within the project alignment will be contacted and pothole information requested.

15.5.2 The Consultant shall identify potholing requirements and shall survey the location and elevation of utilities at locations where potholes are completed. The Consultant shall

submit in writing a proposed plan and associated costs to complete the required potholing. Performance of potholing is not authorized with the NTP for this scope of work but, upon review of the Consultant plan, the District may authorize the work under a separate NTP. The unit base costs for performance of potholing will be included in the fee schedule as a separated item to be negotiated by the District.

- 15.5.3 The Consultant shall identify and show utilities on the planimetric mapping and project layout.
- 15.5.4 The Consultant shall establish permanent survey ties where the project corridor crosses major streets. The purpose of these ties is to provide horizontal and vertical control from which the location of utility relocations can be easily verified by inspectors. The Consultant shall determine the need for temporary monuments, and recommend their locations to the District for approval.
- 15.5.5 The Consultant shall include existing utility locations on the 30% plan submittal.
- 15.5.6 The Consultant shall coordinate any utility relocations with the jurisdiction that owns the facilities to determine the procedures, costs, and time requirements for the relocations. Relocation of municipally or privately owned facilities shall be in accordance with the standards of the owner.
- 15.5.7 The Consultant shall provide for the preferred alternative design calculations, plans, and specifications for the relocation of all utility relocations.
- 15.5.8 The Consultant shall document the data from the utilities analysis in the Project Technical Report.

## **15.6 LAND OWNERSHIP AND RIGHTS OF WAY**

The Consultant shall complete a drawing showing the existing land ownership property lines and the anticipated rights of way required to be purchased for the recommended plan. Estimated costs to purchase the right of way shall be based upon unit cost values to be provided by the District and shall include relocation costs if relocation of businesses or residences are required. The required acreage and costs shall be included in the project cost estimate as a separate line item.

## **15.7 HYDRAULIC ANALYSIS**

The hydraulic analysis shall be completed in sufficient detail to document the hydraulic adequacy of the project in sufficient detail for use in the final design and for documentation of the impact of the project on the existing floodplain.

## **15.8 ESTIMATED COSTS**

The project cost estimates shall include costs for major construction items. An allowance for unlisted or miscellaneous items shall be included as appropriate. The cost estimates shall include as separate line items for the major construction items, rights of way, utility relocations, contingencies, and engineering services.

## 15.9 PRE-DESIGN STUDY REPORT

The Consultant shall prepare a Preliminary Design Report which summarizes the study data. The report shall document the alternatives considered and the final plan. Environmental impacts and project permitting requirements shall be summarized. The major project construction items and special design considerations shall be described. The report shall include plan – profile, site plans, and structure drawings and details which show the major project features and typical sections. The report shall be submitted to the District and identified agencies for review. Upon receipt of review comments, the Consultant shall make appropriate revisions and submit the final report. Digital files containing the project drawings, figures and exhibits shall be submitted with the final report.

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## 16.0 FINAL DESIGN AND CONSTRUCTION DOCUMENTS

### 16.1 MEETINGS

#### 16.1.1 Draft Design Concept Analysis Report Review Meeting

The Consultant will meet with the District Project Manager and members of the review team to discuss the Draft Design Concept Analysis Report. The Consultant should be prepared to discuss the design concept analysis. A consensus on the design concept to be used in final design will be reached at this meeting.

#### 16.1.2 30% Submittal Meeting

The Consultant shall meet with the District Project Manager and members of the review team to review the overall project status, and to discuss the 30% review comments. The Consultant will be prepared to discuss all review comments. Any problems will be identified and corrective actions agreed upon at this meeting. Notice to Proceed with the 60% submittal may be given at the completion of this meeting and the Consultant shall include the results of the Value Engineering Session as required.

#### 16.1.3 "Value Engineering" (VE) Session

Following the 30% Submittal Meeting, the Consultant shall participate with the District Project Manager, the review team and all interested project partners in a Value Engineering Session to discuss cost saving measures and other VE related issues for the project. Generally the District will provide a session facilitator. The Consultant shall prepare all appropriate minutes and results of the session for distribution, and inclusion in the Design Data Report. The Consultant shall include the results of the Value Engineering Session as required into the 60% submittal.

#### 16.1.4 60% Submittal Meeting

The Consultant will meet with the District Project Manager and members of the review team to review the overall project status, and to discuss the 60% review comments. The Consultant will be prepared to discuss all review comments. Generally, the 60% Submittal Meeting shall include a "plans-in-hand" field review. Any problems will be identified and corrective actions agreed upon at this meeting. Notice to Proceed with the 90% submittal may be given at the completion of this meeting

#### 16.1.5 "Constructability Analysis (CA) Session"

Following the 60% Submittal Meeting, the Consultant shall participate with the District Project Manager, the review team, and all interested project partners in a Constructability Analysis Session. Generally the District will provide a session facilitator. The Consultant shall prepare all appropriate minutes and results of the session for distribution, and inclusion in the Design Data Report. The Consultant shall include the results of the Constructability Analysis Session as required into the 90% submittal.

#### 16.1.6 90% Submittal Meeting

The Consultant will meet with the District Project Manager and members of the review team to review the overall project status, and to discuss the 90% review comments. The Consultant will be prepared to discuss all review comments. Any problems will be identified and corrective actions agreed upon at this meeting. Notice to Proceed with the 100% submittal may be given at the completion of this meeting.

16.1.7 Final (100%) Submittal Meeting

The Consultant will meet with the District Project Manager to make the final submittal of the final deliverables which have been modified to incorporate the 90% review comments.

**16.2 FINAL DESIGN AND CONSTRUCTION DOCUMENTS**

16.2.1 Design Concept Analysis Report

The Consultant shall review existing designs as presented in the Planning Study, Feasibility Study, or the Pre-Design Report and provided by the District. The Concept Analysis shall include recommendations for design alternatives for the project and specific project features. The report shall include appropriate data and/or calculations to support the alternatives presented. Four (4) copies of the Report shall be submitted to the District for review.

16.2.2 Design Data Report

The Consultant shall maintain a design report throughout the project, which contains documentation of the designs, analysis, and calculations. The report shall be organized to include, but not limited to, the following sections as appropriate to the project:

- 16.2.2.1 A recommendation of lateral design, configuration, alignment, and feature locations. (Include a 1"=100' scale preliminary plan at 2 scale).
- 16.2.2.2 Location of conflicting utility relocations and potholing locations.
- 16.2.2.3 Requirements for public and private access.
- 16.2.2.4 Right-of-way and easement information.
- 16.2.2.5 Identification of hazardous materials.
- 16.2.2.6 Design review and permitting requirements.
- 16.2.2.7 Construction duration and schedule.
- 16.2.2.8 Special project features, including unusual construction techniques, special materials, and/or conditions.
- 16.2.2.9 Maps, sketches, calculations, and other supporting documentation as required.
- 16.2.2.10 Recommendations for additional field surveys and/or soils investigations.
- 16.2.2.11 Results of the Value Engineering Session and the Constructability Analysis Session.
- 16.2.2.12 The Consultant shall submit four (4) copies of the Report to the District for review.

16.2.3 Construction Cost Estimates

The District is limited to award of construction contracts that are no more than 10% greater than the Construction Cost Estimate provided by the Consultant. The Consultant shall make every effort to provide a realistic and accurate cost estimate within this 10% range. This shall include, but not be limited to:

- 16.2.3.1 Using District and other agency historical bid tabulation information.
- 16.2.3.2 Investigation of industry conditions as pertains to labor and material availability.
- 16.2.3.3 Providing adequate calculations to support bid quantities.
- 16.2.3.4 Providing adequate unit cost calculations for Lump Sum and Unit price bid items.

### 16.3 30% SUBMITTAL

Upon review and approval of the Design Concept Analysis Report by the District, the Consultant shall incorporate review comments and perform preliminary investigation and calculations necessary to prepare the 30% Submittal. All submitted items shall be dated and marked "Preliminary, 30% Submittal". The following submittals shall be included:

#### 16.3.1 Plans

- 16.3.1.1 Indicate existing topography.
- 16.3.1.2 Indicate lateral alignment, plan/profile, cross-section, and traffic control requirements.
- 16.3.1.3 Include the approximate size and configuration of project features.
- 16.3.1.4 Indicate right-of-way and easements required.
- 16.3.1.5 Indicate conflicting utilities that are to be relocated and/or protected.
- 16.3.1.6 Details need not be included.
- 16.3.1.7 Submit six (6) full size sets to the District for review.
- 16.3.1.8 Submit copies as required to all project partners, other outside agencies, and to municipalities for review of water and sewer relocations, and to all other utilities which may have conflicting utilities.

#### 16.3.2 Quantity and Cost Estimate

Submit three (3) copies to the District for review.

#### 16.3.3 Plans delineating right-of-way and easement requirements

Submit four (4) copies for use by the District to begin the final right-of-way acquisition process.

#### 16.3.4 Correspondence and minutes of conversations/meetings with other affected agencies and utility owners

Submit one (1) copy for District records.

#### 16.3.5 Survey Data and Report

Submit two (2) copies to the District.

#### 16.3.6 Geotechnical Report

Submit six (6) copies to the District for review.

#### 16.3.7 Design Data Report

Submit two (2) copies to the District for review to incorporate any changes since the initial submittal.

### 16.4 60% SUBMITTAL

- 16.4.1 Upon review and approval of the 30% Submittal by the District, the Consultant shall incorporate review comments and perform hydrology, hydraulic, civil, and structural calculations necessary to prepare the 60% Submittal. All Submitted items shall be dated and marked "Preliminary, 60% Submittal".

- 16.4.2 Design Concept Analysis Report
  - 16.4.2.1 Update the Report to reflect changes identified since the initial submittal.
  - 16.4.2.2 Submit two (2) copies to the District for review.
  
- 16.4.3 Plans
  - 16.4.3.1 Plans shall be complete with the exception that details and schedules may be preliminary in nature.
  - 16.4.3.2 Submit six (6) full size sets to the District for review.
  - 16.4.3.3 Submit copies as required to all project partners, other outside agencies and to municipalities for review of water and sewer relocations, and to all other utilities which may have conflicting utilities.
  
- 16.4.4 Construction Special Provisions (CSPs) and Supplementary General Conditions (SGCs)
  - 16.4.4.1 Include Bidding Schedule
  - 16.4.4.2 Submit four (4) copies to the District for review.
  
- 16.4.5 Design Calculations and Analyses  
Submit four (4) copies to the District for review.
  
- 16.4.6 Quantity Calculations and Cost Estimate  
Submit three (3) copies to the District for review.
  
- 16.4.7 Anticipated Construction Schedule
  - 16.4.7.1 Prepare a bar chart type of schedule showing the major construction activities and the anticipated duration for each, thereby deriving an anticipated construction contract schedule, which will be used by the District for establishing the construction contract duration.
  - 16.4.7.2 Submit three (3) copies to the District for review.
  
- 16.4.8 Correspondence and minutes of conversations/meetings with other affected agencies and utility owners  
Submit one (1) copy for District records.
  
- 16.4.9 Design Data Report  
Submit two (2) copies to the District for review to incorporate any changes since the 30% submittal.

## **16.5 90% SUBMITTAL**

- 16.5.1 Upon review and approval of the 60% Submittal by the District, the Consultant shall incorporate review comments and perform final revisions and refinements to the hydrology, hydraulic, civil, and structural calculations necessary to prepare the 90% Submittal. All Submitted items shall be dated and marked "Preliminary, 90% Submittal".
  
- 16.5.2 Design Concept Analysis Report
  - 16.5.2.1 Update the Report to reflect changes and refinements made since the 60% Submittal.
  - 16.5.2.2 Submit two (2) copies to the District for review.

- 16.5.3 Plans
  - 16.5.3.1 Plans shall be complete and appear ready to bid.
  - 16.5.3.2 Include soil boring logs sheets.
  - 16.5.3.3 Submit six (6) sets to the District for review.
  - 16.5.3.4 Submit copies as required to all project partners, other outside agencies, and to municipalities for review of water and sewer relocations.
- 16.5.4 Construction Special Provisions (CSPs) and Supplementary General Conditions (SGCs)
  - 16.5.4.1 The CSPs and SGCs shall be complete and appear ready to bid and shall include the Bidding Schedule
  - 16.5.4.2 Submit four (4) copies to the District for review.
- 16.5.5 Design Calculations and Analyses  
Submit four (4) copies to the District for review.
- 16.5.6 Quantity Calculations and Cost Estimate  
Submit three (3) copies to the District for review.
- 16.5.7 Anticipated Construction Schedule  
Submit three (3) copies of the update and refined Construction Schedule to the District for review.
- 16.5.8 Correspondence and minutes of conversations/meetings with other affected agencies and utility owners  
Submit one (1) copy for District records.
- 16.5.9 Design Data Report  
Submit two (2) copies to the District for review to incorporate any changes since the 60% submittal.

## 16.6 99% SUBMITTAL

A 99% submittal may be required primarily due to the number of outstanding review comments remaining after the 90% submittal for any one or more of the submittal documents. The District Project Manager shall determine the need for a 99% submittal, and for which document(s) the submittal is applicable. No additional contract time or fee will be provided for such a submittal, and the contract end date for the final 100% submittal shall be maintained.

## 16.7 FINAL SUBMITTAL

- 16.7.1 Upon approval of the 90% Submittal, or if required the 99% Submittal, by the District, the Consultant shall incorporate review comments and make required corrections, changes, etc., to the hydrology, hydraulic, civil, and structural calculations, and incorporate comments and make changes and corrections to the Design Concept Analysis Report, Design Data Report, plans, CSPs, SGC's, calculations, and the quantity calculations and cost estimate.
- 16.7.2 All submitted items shall include the construction contract number and the Project Control Number (PCN), and shall be 'sealed' by a registered civil engineer and ready for advertising and bidding. Upon receipt of the final submittal, the District shall review the plans, SGC's and CPSs for the accurate incorporation of all final comments. If

incomplete and/or incorrect incorporation of those comments is found, the original documents shall be returned to the Consultant for correction and resubmittal.

16.7.3 Design Concept Analysis Report

Submit ten (10) copies to the District in final bound format.

16.7.4 Plans

16.7.4.1 Submit original sealed mylars ready for reproduction and two (2) half size sets.

16.7.4.2 Submit floppy diskettes containing .DGN or .DWG files.

16.7.5 Construction Special Provisions (CSPs) and Supplementary General Conditions (SGC's)

16.7.5.1 Submit sealed original documents ready for reproduction.

16.7.5.2 Submit floppy diskettes containing files in either Microsoft WORD or ASCII format.

16.7.6 Design Calculations and Analyses

Submit four (4) sealed copies to the District in final bound format.

16.7.7 Quantity Calculations and Cost Estimate

16.7.7.1 Submit three (3) copies in final bound format.

16.7.7.2 An original copy of the final Construction Cost Estimate shall be sealed by a registered civil engineer, and placed in a sealed envelope addressed to the Contracts Branch Manager. The envelope shall be identified by project name and contract number.

16.7.8 Correspondence and minutes of conversations/meetings with other affected agencies and utility owners

Submit one (1) copy for District records.

16.7.9 Final Design Data Report.

Submit four (4) copies.

## 17.0 QUALITY ASSURANCE AND QUALITY CONTROL

- 17.1 The Consultant shall independently check all design drawings and calculations. Each drawing and every calculation sheet shall be initialed and dated by both the designer and checker for each and every submittal of design drawings and calculations. The Consultant shall verify the completeness of the check before submitting drawings or calculations to the District. Submittals received which have not been initialed and dated, or which appear to have not been checked will be returned. Re-submittal shall be made within two working days, and no formal contract time extension will be considered for the re-submittal.
- 17.2 All design calculations submitted to the District shall be complete in detail and shall be checked. All engineering assumptions made during the design other than standard engineering judgments shall be documented with appropriate references on the calculation sheets.
- 17.3 The person checking the calculations shall not be the originator, and shall be of equal or better qualifications than the originator.
- 17.4 Calculations can be either hand calculations or computer generated calculations. Computer generated calculations can be used for either the design or the check, but cannot be used for both the design and the check. All hand calculations and computer-generated calculations shall be sealed by a registered engineer prior to submittal to the District. HEC-1 and HEC-2 and HEC-RAS modeling are excepted from the hand calculation requirement.
- 17.5 The work of any sub-consultants utilized by the prime Consultant for this contract (i.e., civil design, and structural design) shall be reviewed by the prime Consultant for compliance with the scope of work and project specifications prior to submittal for review by the District.
- 17.6 The Consultant shall submit a copy of its QC/QA procedures with the technical proposal. The procedure should outline the Consultant's method of checking plans and calculations, including the use of check prints. Check prints should be kept on file during the term of the contract for review by the District.

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## 18.0 MAINTENANCE PLAN

- 18.1 The Consultant shall prepare a maintenance plan which shall document the required maintenance of the project facilities. The plan shall include descriptions of the required vegetation maintenance, periodic dredge and fill requirements within the channel, materials (paints, lubricants, etc.), structural inspections of levees, culverts, etc., any specialized equipment required, maintenance intervals, manufacturers data and specifications, and an estimate of the required manpower and costs required. The maintenance plan shall be submitted in draft form for review and in final form after completing revisions to incorporate review comments.
- 18.2 The maintenance plan will be submitted to the U.S. Army Corps of Engineers in support of a Clean Water Act Section 404 permit. The Consultant shall make revisions to the maintenance plan which may be required to satisfy the Section 404 permit requirements. The maintenance plan shall be prepared in such a way that it can be used by the District as a guideline for its operation and maintenance responsibilities and those of its project partners.

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## 19.0 CADD/DRAFTING STANDARDS

### 19.1 GENERAL

These guidelines are to be followed in preparation of drawings. Except as modified herein, drawing layout, format and lettering sizes will be presented in the current FCDMC Drafting Guide, 1998.

#### 19.1.1 Abbreviations

Abbreviations should not be used where the meaning may be in doubt. Standard abbreviations can be found in Section 101 of the MAG Standard Specification.

Whenever an abbreviation is used that is not found in Section 101 of the MAG Standard Specification, it should be listed and defined on the General Notes Sheet.

#### 19.1.2 Omission of Periods.

Periods shall be omitted after abbreviations. For example, 60 cu ft per sec rather than 60 cu. ft. per sec.

#### 19.1.3 Working Units

Working Area	4,294,967 FT
Subunits/Master Unit	10
Positional Units/Subunit	100

### 19.2 CONTRACT DRAWINGS

#### 19.2.1 General

All contract drawings will be prepared using 24-inch by 36-inch 4 mil mylar, bordered and titled in accordance with the guidelines. Standard border sheets can be downloaded from the District's internet site (Show address). All drawings are to be prepared in accordance with the guidelines described herein or as otherwise directed, and are to be signed and sealed by a professional engineer registered in the State of Arizona. Initials of the drafter, designer, and checker must be included as appropriate in the Title Block.

19.2.2 FCDMC sample plans may be provided with the intention that they shall be used as a guide, and are not a substitute for design criteria, technical assistance, or sound engineering judgement. The Consultant shall use plan symbols shown in the MAG Standard Details and MCDOT Supplement to the MAG Standard Details, unless otherwise requested. The Consultant shall submit sample plans for approval prior to commencing work. Plans not capable of producing high quality prints by FCDMC in reduced form shall be considered unacceptable and shall be redrawn by the Consultant at no additional cost to FCDMC.

19.2.3 The District uses a "Xerox" process for final reproduction of drawings for bid sets. The Consultant shall not draw on the backside of drawings, or use any form of shading techniques that will not reproduce clearly using this form of reproduction.

- 19.2.4 Unless otherwise directed, the Consultant shall use the following plan scales.
- 19.2.4.1 1" = 40' Horizontally and 1" = 4' Vertically in rural areas, unless otherwise approved in writing by FCDMC.
  - 19.2.4.2 Plans for construction in urban areas are usually 1"=20' Horizontally and 1" = 2' Vertically unless otherwise approved in writing by FCDMC.
  - 19.2.4.3 The Consultant shall use a larger scale if necessary to obtain good clarity in the plans and reduced prints.
- 19.2.5 Drawings shall be prepared using MicroStation PC, Version 5.07 or older per District standards or translated into MicroStation PC, Version 5.07 for submittal.
- 19.2.6 The final (100%) submittal shall be plotted at a minimum of 400 dots per square inch. The final plot shall be plotted or photo reproduced without sticky backs. If plans have been hand drafted, the final (100%) submittal shall be rapidograph-inked drawings. If sticky backs have been used, photo reproducible mylars shall be submitted, with original seal and signature on the photo mylars. All seals and signatures shall be in smudge-proof ink.
- 19.2.7 The Consultant may obtain a copy of the standard cover, border, and other standard sheets by downloading them from the District's web site (show address).
- 19.2.8 The plans shall include a Quantity Summary Sheet that lists each bid item.
- 19.2.9 The plans shall include a summary table of bid quantities, concrete, excavation and structural backfill quantities for each structure. These quantities shall be shown on an appropriate structures sheet. The quantities in the table shall add up to the bid item quantities for each bid item, including the appropriate class and strength of concrete (i.e., Class "A", Class "AA").
- 19.2.10 Drawing Numbering  
 All contract drawings will be numbered and sequenced in accordance with the following categories. The purpose of drawing categories and series is to allow establishing drawing numbers for cross referencing of drawings while allowing sheet numbers to be added prior to submittal. Table 19.2.10-1 lists categories of drawings that together make up an exemplary set of contract drawings. Each category is to be identified by a letter designation, i.e., G = General, D = Detail Sheet, etc.

**Table 19.2.10-1**

<u>Designation</u>	<u>Category</u>
G	General
C	Civil
D	Detail
I	Irrigation
LS	Landscaping
S	Structures
U	Utilities

#### 19.2.11 Lettering

All lettering on drawings shall be vertical, plain, and legible. 'Architectural' style lettering shall not be accepted. The following lettering sizes apply. All lettering shall be as follows:

TX = 15	(existing items) (0.1500" on full size plots)
TX = 17.5(new items)	(0.1750" on full size plots)
TX = 22 (titles)	(0.220" on full size plots)
LS = 7.5	(existing items) (0.07500" on full size plots)
LS = 8.75	(new items) (0.08750" on full size plots)
WT = 2 (existing items)	
WT = 4 (new items)	

#### 19.2.12 Stationing

Stationing will always increase from left to right on the drawings. Additionally, the graphic should be oriented such that the north arrow points to the top or right of a sheet. In those cases when the direction of the stationing and the north arrow direction conflict, the orientation of the station will govern.

#### 19.2.13 Project Control Numbers

The District's Project Control Number (PCN) shall be included in the appropriate place in the title block on all sheets.

### 19.3 **DRAWING CONTENT**

#### 19.3.1 General

The drawings will be prepared in accordance with FCDMC Drafting Guide, 1998 (In process of being prepared), and as supplemented by the example drawings contained in the Appendix.

##### 19.3.1.1 Face Sheet

Face sheets are provided by FCD for delivery to the Consultant. A location map is centered on the sheet with provision in the lower right corner for Department approval signatures.

##### 19.3.1.2 General Note Sheet

The General Note Sheet will be prepared in accordance with the sample format illustrated in the Appendix. The General Note Sheet will immediately follow the Face Sheet and include the Index of Drawings.

##### 19.3.1.3 Typical Sections

Typical section drawings should depict the varying configurations of the channel(s), storm drain alignment(s), dams, basins, etc. throughout the length of the project. The number of typical sections will depend on the number of significantly different section conditions. These drawings should be adequately dimensioned and depict structures, side slope, catch points, slope conditions, cut ditch dimensions, all drainage profile points and other pertinent

information. At least one section should be provided which depicts all the facilities within the limits of the project right-of-way.

19.3.1.4 Plan Summary Sheets

Plan Summary sheets list summarized quantities, dimensional data and other specifications pertinent for contractors during both the bidding and construction of the project. The following summary sheets are available on the District's internet site at (address).

New Pipe Summary  
Reinforced Concrete Box Culverts  
Quantity Summary Sheet

19.3.1.5 Special Detail Sheets

These drawings provide details of all miscellaneous non-standard items. Such details are generated on a project specific need and basis. Details shall be designated as specified in Section xxx.

19.3.1.6 Geometric Layout and Existing Conditions

The geometric sheets, normally drawn at 1" = 100' scale, a single line drawing depicting the survey control lines. The survey control data (e.g. control points, curve data ) shall be provided for all work and is to be presented to the hundredth of a foot or second of arc. Ties to section monuments at crossroads are to be provided.

The following note is to appear on the first Geometric Sheet: "Coordinate values as shown are on ground datum. All bearings shown are grid. "

Curves are to be designated as numeric or alphanumeric to best identify the curves. Curve data is to be tabulated in a manner similar to that shown in the attached example.

Matchlines are not required on geometrics or plan sheets.

19.3.1.7 Existing Conditions

Existing conditions sheets are used to show existing conflicts that will be encountered on the project. Existing conditions sheets show: locations of existing utilities, structures, trees, streets and other conflicts to be removed and /or relocated, as well as the project construction centerline and right-of-way limits. These sheets are intended to instruct the contractor as to what conflicts are to be removed and what is to remain. Notation should be provided to reference the appropriate utility relocation and improvement drawings at the back of the plan set.

19.3.1.8 Existing conditions drawings are not always necessary. If the project is in an area where there are relatively few utilities and / or obstructions, the existing condition information should be provided on the construction plans, keeping the number of plan sheets to a minimum.

### 19.3.2 Drainage Drawings

- 19.3.2.1 Drainage plan/profile sheets are generally to be drawn at 1" = 40' scale unless directed otherwise in the Project Scope of Work.
- 19.3.2.2 The drainage plans shall show the design discharge (Q) for all pipes, culverts, channels and bridges. The hydraulic grade line shall be shown for all storm drains larger than 18-inches and for all major channels. The design high water elevation shall be shown for all culverts and bridges.
- 19.3.2.3 Plan sheets for retention /detention basins shall show the basin area in acres at the maximum water surface elevation, the basin storage volume in acre-feet, the design inflow at each inlet, and the design discharge at the outlet.
- 19.3.2.4 At least one (1) cross-section through the pipeline shall be shown on each sheet at a scale of one inch equals ten feet, vertical and horizontal. The cross-sections shall show all adjacent utilities within 15 feet each side and utilities crossing above or below the utility being designed.

### 19.3.3 Structures

Structures drawings are to be prepared in accordance with the Procedures for Development of Structure Plans by Consultants as prepared by ADOT Structures Section, dated July 23, 1987 and subsequent revisions. All sheets may not be required, depending upon the scope and complexity of the particular project.

### 19.3.4 Utilities

- 19.3.4.1 Plan and profiles for the water and sewer lines shall be prepared on standard border sheets with standard project title blocks. It is preferred to use plan and profile sheets with the upper part plain, and a ruled grid bottom for the profile portion. If the profile has an extreme difference in elevation, or if the plan requires more space than provided, two separate sheets shall be used with the plan on a plain bordered sheet and the profile on a full grid sheet. An alternate scale, subject to approval, may be used if the existing data and proposed work can be presented accurately and legibly. When selecting a scale, consideration must be given to the drawings being reduced to half scale for construction documents. Each sheet shall have a north arrow.
- 19.3.4.2 Existing utilities shall be shown in plan with the size and material indicated. The acronym for the name of the owner shall also be indicated on the line when more than one owner for similar facilities are located within the project; such as El Paso Natural Gas (EPNG) and Southwest Gas (SWG) or Arizona Public Service (APS) and Salt River Project-Power (SRP).
- 19.3.4.3 Existing utilities, which will cross above or below the water or sewer line under design, shall be shown in profile. Crossing facilities over 4" in size shall be drawn to scale. Lines less than 4" in size shall be shown using two lines forming a 2 sided box with a letter between the lines such as: "G" for gas, "T" for telephone, "C" for cable T.V., "W" for water, and "E" for electric power. The vertical line of box will indicate crossing location and the horizontal line will be plotted to indicate the elevation of the utility below grade.

- 19.3.4.4 Under no condition, where the relocated or future utility will cross over or under an existing utility, shall the note “elevation unknown “ appear. It shall be the responsibility of the Consultant to request that the utilities in question be pot holed and the Consultant shall obtain the true elevation and location for accurate indication on the profile.
- 19.3.4.5 Reference to MAG Standard Details shall be used. The details shall not be reproduced and shown on the plans, unless they require modification to suit a specific condition. Details which have not been provided in the MAG Standard Details shall be developed by the Consultant and shown on the plans.
- 19.3.4.6 All items of work related to the utility such as the lineal feet of pipe shown on each plan sheet, and quantities of valves, fittings, manholes, surface replacement and other appurtenances shall be itemized on the right-hand of the sheet. Information notes and work related to project features or other utilities that is to be performed by others shall be boxed.
- 19.3.4.7 The stations for all valves, manholes, etc. on the pipeline shall be shown with reference to the detail to be used in construction. When the work can not be clearly defined in plan and profile, an isometric schematic shall be provided and the material list provided in a box under or adjacent to the detail. An example would be a fire hydrant installation.
- 19.3.4.8 On each sheet where a high pressure gas line appears and specifically where another utility will cross the gas line a caution note shall be boxed in and read “CAUTION HIGH PRESSURE GAS.”
- 19.3.4.9 On each sheet where overhead powerlines appears and specifically where a utility will be constructed underneath the lines a caution note shall be boxed in and read “CAUTION OVERHEAD POWER LINES.”
- 19.3.4.10 Generally, the stationing of utilities shall comply with the orientation of project centerline stationing.

**19.4 LEVEL COLOR DESIGNATIONS**

Unless explicitly specified by the District, the color shall be assigned by the Consultant. Displayed colors depend on the color definitions in the color tables and can be defined to suit individual needs.

**19.5 LEVEL DESIGNATIONS**

- LEVEL 01 grid ticks, line terminators
- LEVEL 02 spot elevations, photo and primary control points
- LEVEL 03 section corners, quarter corners, range lines, center of section, photogrammetry text
- LEVEL 04 monuments, boundaries: city, county, state, park, forest, reservation
- LEVEL 05 existing Index contour lines and text
- LEVEL 06 existing intermediate contour lines

LEVEL 07	existing vegetation and text
LEVEL 08	mapping symbols: water items and text
LEVEL 09	existing man-made topography: buildings, noise walls, billboards, foundations, driveways, sidewalks, cattle guards, pump houses, etc.....
LEVEL 10	text for level 09 items
LEVEL 11	existing minor drainage items: ditches, dikes, canals, dams, gabions, spillways, aprons, pipe outlets, riprap, bank protection, railroads, standpipes, wells
LEVEL 12	text for level 11 items
LEVEL 13	existing utilities (colors for utilities should match blue stake color guide: san sewer = green, water = blue, gas = yellow, electric = red, communications = orange.), catch basins, manholes, storm drains, sanitary sewers,
LEVEL 14	text for level 13 (exist. minor drainage items) text for level 22 (exist. major drainage items)
LEVEL 15	existing easement and permit lines, text
LEVEL 16	existing edges of roadways, gore paving, grader roads, turnouts
LEVEL 17	existing traffic items: walks, roadway stripping, signal and light poles, all signs and delineation
LEVEL 18	text for level 17 items
LEVEL 19	road names, text for level 16 items
LEVEL 20	unassigned
LEVEL 21	unassigned
LEVEL 22	existing major drainage items: bridges, box culverts, retaining walls, major channels, structural plate pipes, tunnels
LEVEL 23	existing channelization items: curbs, guardrails, impact attenuators, concrete barriers (median and half), barricades, chain link, cable barriers
LEVEL 24	text for level 23 items
LEVEL 25	north arrow, milepost markers, roadway dimensions, match lines and other miscellaneous items

LEVEL 26	all miscellaneous centerlines: survey, office, etc. miscellaneous centerline items: bearings, stationing, equations curve data, id for: PC, PI, PT location services: all new centerlines and c1 items
LEVEL 27	new construction centerline with tick marks, centerline stationing
LEVEL 28	new construction centerline items: bearings, curve data, equations, id for: PC, PI, PT
LEVEL 29	existing fences, right-of-way markers and lines
LEVEL 30	new fences, right-of-way markers and lines
LEVEL 31	existing lot/property lines
LEVEL 32	temporary construction easements
LEVEL 33	Construction and Removal symbols
LEVEL 34	no designation
LEVEL 35	new edges of pavement, turnouts, grader roads, saw cuts
LEVEL 36	text for level 35 items
LEVEL 37	new intermediate and index contour lines, new cut and fill lines
LEVEL 38	new minor drainage items: catch basins, manholes, storm drains, sanitary sewers, ditches dikes, canals, dams, gabions, headwalls, end sections, berms, downdrains, spillways, pipe outlets, aprons, pipes, riprap, bank protection
LEVEL 39	text for level 38 items (new minor drainage items) text for level 48 items (new major drainage items)
LEVEL 40	new utilities, railroads, standpipes, walls
LEVEL 41	text for level 40 items
LEVEL 42	new miscellaneous items (hazards): concrete barriers, guardrails, barricades, block fences
LEVEL 43	text for level 42 items
LEVEL 44	new miscellaneous items (roadway edges), gore paving, curbs, sidewalks, driveway, roadway, shoulders
LEVEL 45	text for level 44 items

LEVEL 46	3-D breaklines for graphic importation into InRoads
LEVEL 47	text for level 46 items
LEVEL 48	new major drainage items: bridges, box culverts, tunnels, retaining walls, pump houses, major channels, structural plate pipe
LEVEL 49	Floodplain study results; floodplain boundaries, cross section locations, wse elevations, watershed boundaries (differentiate items by color).
LEVEL 50	new drainage easement
LEVEL 51	text for level 49 and level 50 items
LEVEL 52	3-D random points for graphic importation into InRoads
LEVEL 53	text for level 52 items
LEVEL 54	unassigned
LEVEL 55	landscape details
LEVEL 56	text for level 55 items
LEVEL 57	irrigation details
LEVEL 58	text for level 57
LEVEL 59	all area patterning and shading
LEVEL 60	standard grid – profile sheet (1 inch)
LEVEL 61	standard grid – profile sheet (intermediate)
LEVEL 62	plan sheet text nodes
LEVEL 63	plan sheet border

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## **20.0 DESIGN REFERENCES, SPECIFICATIONS AND STANDARDS**

### **20.1 STANDARD DETAILS AND SPECIFICATIONS**

- 20.1.1 "Uniform Standard Details for Public Works Construction", Maricopa Association of Governments (MAG), 1979 and all revisions to 1998;
- 20.1.2 "Uniform Standard Specifications for Public Works Construction", MAG, 1979 and all revisions to 1998;
- 20.1.3 "Supplement to the MAG Uniform Standards Details and Specifications for Public Works Construction" by Maricopa County Highway Department (now referred to as MCDOT), together with current revisions shall be utilized as part of the design criteria.
- 20.1.4 Use standard MAG details on plans unless otherwise requested by FCDMC. ADOT standard details may be used, as approved and when appropriate, then modified to be referenced to MAG specifications.
- 20.1.5 "Policy for the Aesthetic Treatment and Landscaping of Flood Control Projects", December 16, 1992.

### **20.2 DESIGN MANUALS, POLICIES, GUIDES AND PROCEDURES**

- 20.2.1 "Drainage Design Manual for Maricopa County, Arizona, Volume I Hydrology", January 1, 1995.
- 20.2.2 "Drainage Design Manual for Maricopa County Arizona, Volume II Hydraulics", January 28, 1996.
- 20.2.3 "Drainage Design Manual for Maricopa County, Arizona, Volume III Erosion Control", January 1, 1993.
- 20.2.4 "Urban Highways, Channel Lining Design Guidelines", February 1989, ADOT.
- 20.2.5 Structural design shall be in accordance with current AASHTO Specifications. Street and maintenance road crossings shall be designed to accommodate HS20-44 loading. Calculations shall be based on service loads and the working stress method.
- 20.2.6 "Policy on Geometric Design of Highways and Streets", AASHTO, 1990, commonly referred to as the "Green Book", and "Maricopa County Department of Transportation Roadway Design Manual" latest edition and revisions shall be used, unless otherwise requested by FCDMC.
- 20.2.7 "Roadside Design Guide", 1989, AASHTO, to be used to establish clear distances and other related safety issues.
- 20.2.8 "Landscaping and Irrigation Design Manual for the Flood Control District of Maricopa County", latest revision.

## **20.3 SURVEY AND MAPPING**

### **20.3.1 Data Format**

- 20.3.1.1 All field collected survey data obtained using conventional survey methods shall be noted in standard 5" x 7" hard-bound survey books.
- 20.3.1.2 All survey data collected electronically shall be submitted on 3.5" or 5.25" diskettes.

### **20.3.2 Elevation Datum**

- 20.3.2.1 Alternate A: Plans shall be based on state plane ground coordinate system of 1927 and NGVD 1929 datum, with conversions to NAD83 horizontal datum and NAVD88 vertical datum, as noted in Section 3.2.1.1.
  - 20.3.2.2 Alternate B: USGS or USC&G datum shall be used (and noted on the plans) only if authorized by FCDMC. The elevation datum shall be tied to any adjacent ongoing project (ADOT, local city, SRP, etc.). The elevation of existing section corner monuments along the alignment shall also be obtained.
- 20.3.3 Restoration of lost or obliterated section corners shall be set in accordance with current publications of the following and shall be per MAG Standard Detail 120-1, type C: "Minimum Standards for Arizona Lang Boundary Surveys" by Arizona State Board of Technical Registration and "Restoration of Lost or Obliterated Corners and Subdivision of Sections" by the United States Department of Interior Bureau of Land Management.
- 20.3.4 Elevation Reference Marks ( ERMS) shall be labeled on the plans and described in a manner which allows them to be relocated in the field.

## **20.4 DRAFTING STANDARDS FOR CONSTRUCTION DRAWINGS**

- 20.4.1 FCDMC sample plans may be provided with the intention that they shall be used as a guide, and are not a substitute for design criteria, technical assistance, or sound engineering judgement. The Consultant shall use plan symbols shown in the MAG Standard Details and MCDOT Supplement to the MAG Standard Details, unless otherwise requested. FCDMC makes extensive use of reduced plan sets. The Consultant shall submit sample plans for approval prior to commencing work. Plans not capable of producing high quality prints by FCDMC in reduced form shall be considered unacceptable and shall be redrawn by the Consultant at no additional cost to FCDMC.
- 20.4.2 The District uses a "Xerox" process for final reproduction of drawings for bid sets. The Consultant shall not draw on the backside of drawings, or use any form of shading techniques that will not reproduce clearly using this form of reproduction.
- 20.4.3 Unless otherwise directed, the Consultant shall use the following plan scales.
  - 20.4.3.1 1" = 40' Horizontally and 1" = 4' Vertically in rural areas, unless otherwise approved in writing by FCDMC.
  - 20.4.3.2 Plans for construction in urban areas are usually 1"=20" Horizontally, unless otherwise approved in writing by FCDMC.

- 20.4.3.3 The Consultant shall use a larger scale if necessary to obtain good clarity in the plans and reduced prints.
- 20.4.3.4 The Consultant shall be responsible for using a scale that results in good plan clarity.
- 20.4.4 Drawings shall be prepared using MicroStation PC, Version 5 per District standards.
- 20.4.5 All lettering on drawings shall be vertical, plain, and legible. 'Architectural' style lettering shall not be accepted. The following lettering sizes apply:
  - 20.4.5.1 1/8" Lettering and Notes
  - 20.4.5.2 5/32" Subtitles
  - 20.4.5.3 7/32" Main Titles
- 20.4.6 The final (100%) submittal shall be plotted at a minimum of 400 dots per square inch on 4 mil mylar. The final plot shall be plotted or photo reproduced on 4 mil mylar without sticky backs. If plans have been hand drafted, the final (100%) submittal shall be rapidograph-inked drawings on 4 mil mylar. If sticky backs have been used, 4 mil photo reproducible mylars shall be submitted, with original seal and signature on the photo mylars. All seals and signatures shall be in smudge-proof ink.
- 20.4.7 The District shall provide the Consultant with a diskette containing .DWG or .DGN files for the standard cover sheet and working drawing sheets.
- 20.4.8 The plans shall include a summary table of concrete, excavation and structural backfill quantities for each structure. These quantities shall be shown on an appropriate structures sheet. The quantities in the table shall add up to the bid item quantities for each bid item, including the appropriate class and strength of concrete (i.e., Class "A", Class "AA").

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**EXHIBITS**

**EXHIBIT 1**

ENGINEERING CHANGE ORDER  
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

Contract Change Order No. \_\_\_\_\_

Date: \_\_\_\_\_

PCN No.: \_\_\_\_\_

FCD Contract No./Name: \_\_\_\_\_

TO: \_\_\_\_\_, Consultant

By mutual agreement of the parties, the following contract change(s) are incorporated into Contract FCD \_\_\_\_\_. All other contract terms and conditions remain unchanged.

Description of Change(s)	
Total dollar amount of this Change Order	\$ _____.
Total contract amount through this Change Order	\$ _____.
By means of this change order, _____ days are added to the contract completion date. The revised contract completion date is _____.	

We, the undersigned Consultant, hereby agree that upon execution of this change order we will perform all services as identified above, and will accept the above specified amount(s) as full payment therefor.

Consultant Name/Address: \_\_\_\_\_ By: \_\_\_\_\_  
\_\_\_\_\_ Title: \_\_\_\_\_  
\_\_\_\_\_ Date: \_\_\_\_\_

Recommended by: \_\_\_\_\_ Date \_\_\_\_\_

Approved by: \_\_\_\_\_ Date \_\_\_\_\_  
Chief Engineer and General Manager



**EXHIBIT 3**  
**Letter of Forbearance (with cause)**

DATE

CONSULTANT

Address

City, State

Subject: Contract No. \_\_\_\_\_, [Title]

Letter of Forbearance

The Flood Control District must advise [*consultant*] that the contract completion date of \_\_\_\_\_ can not be contractually waived. However, in view and consideration of \_\_\_\_\_, the District will forbear the contract completion date to \_\_\_\_\_.

The District reserves and retains all contractual rights and remedies under the subject contract. [*Consultant*] shall pursue all aspects of this extended schedule to ensure the successful completion of the contract and shall submit to the District a recovery plan and schedule indicating major milestones and associated dates of delivery or completion.

This forbearance letter establishes a new completion date only and shall not increase the contract price. By affixing a signature in the space provided below and returning to the undersigned, [*Consultant*] acknowledges receipt and acceptance of this forbearance letter.

Very truly yours,

Chief Engineer and General Manager

[CONSULTANT] Acknowledgement

By: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**EXHIBIT 3 (Con't)**  
**Letter of Forbearance (without cause)**

DATE

CONSULTANT

Address

City, State

Subject: Contract No. \_\_\_\_\_, [Title]

Letter of Forbearance

The Flood Control District must advise [*consultant*] that the contract completion date of \_\_\_\_\_ can not be contractually waived. Prior written communications notwithstanding, your firm has still not met its commitments and the District must take further action. Accordingly, the District forbears the contract completion date to \_\_\_\_\_, but will keep a record of this unsuccessful fulfillment of the contract schedule and completion date. This information may be considered on future contract selection and determination of responsibility.

The District reserves and retains all contractual rights and remedies under the subject contract. [*Consultant*] shall pursue all aspects of this extended schedule to ensure the successful completion of the contract and shall submit to the District a recovery plan and schedule indicating major milestones and associated dates of delivery or completion.

This forbearance letter establishes a new completion date only and shall not increase the contract price. By affixing a signature in the space provided below and returning to the undersigned, [*Consultant*] acknowledges receipt and acceptance of this forbearance letter.

Very truly yours,

[CONSULTANT] Acknowledgement

By: \_\_\_\_\_

Chief Engineer and General Manager

Title: \_\_\_\_\_

Date: \_\_\_\_\_

**EXHIBIT 4**

**MARICOPA COUNTY  
MINORITY/WOMEN-OWNED BUSINESS ENTERPRISES PROGRAM  
D/M/WBE PARTICIPATION REPORT  
(To be attached with Each Request for Pay)**

Date: \_\_\_\_\_

General Contractor/Prime Consultant: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Fax Number: \_\_\_\_\_

Project Description: \_\_\_\_\_

Contract Number: \_\_\_\_\_

For Pay Period of (indicate dates): \_\_\_\_\_

D/M/WBE Subcontractor/Subconsultant Name: \_\_\_\_\_

Contact Person: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Type of Firm: \_\_\_\_\_

Type of Work performed for this project: \_\_\_\_\_

Total D/M/WBE Subcontract Amount: \$ \_\_\_\_\_

Amount Paid to Subcontractor this invoice: \$ \_\_\_\_\_

Total paid to this Subcontractor to date: \$ \_\_\_\_\_

Total D/M/WBE Contract Goal this project = \_\_\_\_\_ %

Total D/M/WBE Participation on this contract to date = \_\_\_\_\_ %

cc: Maricopa County Infrastructure  
Contracts and D/W/MBE Office  
2901 West Durango Street  
Phoenix, Arizona 85009

## EXHIBIT 5

### FLOOD CONTROL DISTRICT OF MARICOPA COUNTY SCHEDULING TEMPLATE FOR CONCEPTUAL DESIGN or PLANNING CONTRACT

ID	Task	Duration	Start	Finish	Predecessor
	<b>Initiate Project</b>				
	Notice to Proceed				
	Kickoff Meeting				
	Submit Project Schedule				
	<b>Data Collection &amp; Existing Conditions Analysis</b>				
	Prepare Mapping				
	Identify Existing Features				
	Identify Current Flooding				
	Orientation Site Visit #1				
	Perform Flood Damage Cost Analysis				
	Identify Existing Plans				
	Purpose and Scope Public Meeting #1				
	Update/Verify Hydrologic Model				
	Submit Data Collection Report				
	Data Collection Report Review				
	Data Collection Meeting				
	<b>Level I Analysis – Alternatives Formulation</b>				
	Identify Feature Alternatives				
	Identify Landownership, ROW, Easements				
	Perform Geotechnical Analysis				
	<b>Perform Environmental Assessments</b>				
	Environmental Permits (410/404)				
	Environmental Regulator Records Review				
	Biological Assessment				
	Cultural Resources Assessment				
	Hazardous Waste Inventory				
	Identify Utilities				
	Identify Landownership/Land Rights/Limitations				
	Submit Preliminary Alternatives Report				
	Preliminary Alternatives Report Review				
	Preliminary Alternatives Meeting				
	<b>Level II Analysis – Alternatives Analysis</b>				
	Conceptual Design, Construction Cost Estimate				
	Evaluation Matrix				
	Alternative Analysis Site Visit #2				
	Alternatives Public Meeting #2				
	Submit Alternatives Analysis Report				
	Alternatives Analysis Report Review				
	Alternative Analysis Report Meeting				
	<b>Level III Analysis – Preferred Alternative Analysis</b>				
	Recommended Preferred Alternative				
	Conduct Field Surveys				

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
SCHEDULING TEMPLATE FOR  
CONCEPTUAL DESIGN or PLANNING CONTRACT**

ID	Task	Duration	Start	Finish	Predecessor
	Locate/Finalize Utility Conflicts				
	Identify ROW, Easement Requirements				
	Prepare Hydraulic Calcs for Preferred Alternatives				
	Final Site Visit				
	Prepare 30% Plans				
	Submit Preferred Alternatives Report				
	Preferred Alternative Meeting				
	Study Results Public Meeting #3				
	<b>Maintenance Plan</b>				
	Estimate Requirements/Costs				
	<b>Implementation Plan</b>				
	Prepare Plan				
	<b>Final Report Meeting</b>				
	Final Report Meeting				
	Submit Final Report				
	Submit Project Survey Report				
	Submit Project Technical Report				
	Submit Project Geotechnical Report				
	Submit Project Administrative Report				

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
SCHEDULING TEMPLATE FOR  
DESIGN CONTRACT**

ID	Task	Duration	Start	Finish	Predecessor
	<b>Initiate Project</b>				
	Notice to Proceed				
	Kickoff Meeting				
	Submit Project Schedule				
	<b>Design and P&amp;S</b>				
	Survey and Geotechnical				
	30% Submittal				
	District Review of 30% Submittal				
	60% Submittal				
	District Review of 60% Submittal				
	90% Submittal				
	District Review of 90% Submittal				
	99% Check Submittal				
	District Review of 99% Check Submittal				
	100% Submittal				
	Plans and Specifications to Reproduction				

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
SCHEDULING TEMPLATE FOR  
FLOODPLAIN DELINEATION CONTRACT**

ID	Task	Duration	Start	Finish	Predecessor
	<b>Initiate Project</b>				
	Notice to Proceed				
	Kickoff Meeting				
	Submit Project Schedule				
	<b>Project Coordination</b>				
	<b>Data Collection</b>				
	Field Review Meeting				
	Office and Field Recon				
	<b>Survey and Mapping</b>				
	Recon and Property Research				
	Primary Control (Horiz)				
	Secondary Control (Vert)				
	Set Panels				
	Locate Panels, Corners, ERMs				
	Aerial Photography				
	Create DTM				
	Map Checks and Supplemental Topo				
	GIS Processing				
	Complete Mapping				
	District Review Mapping				
	<b>Hydrology Studies</b>				
	Determine Basin & Sub-basin Boundaries				
	Develop Model Schematic w/ Routing				
	Estimate Hydro Model Parameters				
	Hydraulic Analyses for Routing/Flow Split				
	Iterative Computations				
	Model Calibration				
	Interim District Review				
	Report Preparation				
	GIS Processing				
	Complete Hydrology				
	District Review				
	<b>Hydraulic Studies</b>				
	Establish Flowline and Cross-Section Locations				
	Develop Cross-Sections from DTM				
	Field Recon				
	Determine Manning's "n" Values				
	Determine Structure Parameters				
	Interim District Review				
	Develop HEC-RAS model				
	Crosscheck depth/Velocity Results				
	Perform Model Calibration				
	Interim District Review				
	Establish Natural Floodplain Boundaries				
	Interim District Review				

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
SCHEDULING TEMPLATE FOR  
FLOODPLAIN DELINEATION CONTRACT**

<b>ID</b>	<b>Task</b>	<b>Duration</b>	<b>Start</b>	<b>Finish</b>	<b>Predecessor</b>
	Determine Floodway Limits-Encroachment				
	Interim District Review				
	Report and TDN Preparation				
	GIS Processing				
	Complete Hydraulics				
	District Review Hydraulics				
	<b>Prepare FEMA Submittals</b>				
	<b>FEMA Review</b>				
	<b>GIS Processing</b>				
	<b>Final Submittals to District</b>				

**EXHIBIT 6**

**FLOOD CONTROL DISTRICT OF MARICOPA COUNTY  
CONSULTANT/SUBCONSULTANT COST PROPOSAL SUMMARY**

CONSULTANT/SUBCONSULTANT:

PROJECT NAME:

CONTRACT NO.:

CHANGE ORDER NO.:

**DIRECT LABOR**

Classifications	Man-hours	Hourly Rates	Labor Costs
-----------------	-----------	--------------	-------------

Subtotal Labor \$ \_\_\_\_\_

OVERHEAD @ \_\_\_\_\_% (of Labor) \* \$ \_\_\_\_\_

Total Labor & O/H \$ \_\_\_\_\_

\* LABOR OVERHEAD:

Salary Fringes \_\_\_\_\_%

G&A Overhead \_\_\_\_\_%

**DIRECT AND OUTSIDE EXPENSES**

<u>Description</u>	<u>Expense Amount</u>
--------------------	-----------------------

Subtotal Expenses \$ \_\_\_\_\_

## EXHIBIT 6 (Con't)

### SUBCONSULTANTS

Name	Cost
------	------

Subtotal Labor & Overhead \$ \_\_\_\_\_

Subtotal Expenses \$ \_\_\_\_\_

Subtotal Subconsultants \$ \_\_\_\_\_

Total Consultant Cost \$ \_\_\_\_\_

Net Fee (Subtotal Labor x \_\_\_\_\_%) \$ \_\_\_\_\_

**TOTAL PROPOSED FEE** \$ \_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

\_\_\_\_\_  
Date







# EXHIBIT 9 (Con't)

## Sample Expenditure Forecast for Total Project

Project Title

Contract No.

